



Perceived Stress and Life Satisfaction: A Multiple Mediation Model of Self-control and Rumination

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Abstract

Objectives Previous research has documented that perceived stress is negatively associated with adolescent life satisfaction. However, the mediating mechanisms underlying this relation are largely unknown. The present study tested whether self-control and rumination mediate the link between perceived stress and adolescents' lower life satisfaction.

Methods A sample of 1196 senior high school students (ages 13–19, 54% boys) completed questionnaires regarding demographics, perceived stress, self-control, rumination and life satisfaction.

Results After controlling for gender, the results indicated that: (a) perceived stress was negatively associated with life satisfaction; (b) both self-control and rumination partially mediated the link between perceived stress and life satisfaction in a parallel pattern; and (c) self-control and rumination also sequentially mediated the relation between perceived stress and life satisfaction.

Conclusions The current study advances our understanding of how perceived stress might lead to poor life satisfaction. Furthermore, the multiple mediation analysis reveals that self-control and rumination can not only in parallel, but also sequentially mediate the relation between perceived stress and life satisfaction.

Keywords Perceived stress · Life satisfaction · Self-control · Rumination · Adolescents

Life satisfaction has been a popular research theme in the social sciences. Life satisfaction is defined as a general assessment of one's current feelings and attitudes about life, including satisfaction with the past and the future (Diener 1984). People with higher levels of life satisfaction feel that they have a better life than other people do (Erdogan et al. 2012). This is especially true for adolescents who are in an unstable developmental stage, when higher life satisfaction predicts lower levels of internalizing problems (e.g., anxiety, depression or attention problems) and less peer victimization in adolescents (Martin and Huebner 2007). In addition, life satisfaction can effectively buffer against the impact of undesirable factors on adolescents' mental health (Tang and Chan 2017). Finally, enhancing adolescents' life satisfaction has been considered the cornerstone of health

promotion (Zullig et al. 2005) in this age group. Therefore, to provide practical suggestions for promoting health in this age group, it is essential to identify the underlying mediation mechanisms in the association between perceived stress and life satisfaction.

Perceived stress is a state reflecting the global evaluation of the significance of, and difficulty dealing with, personal and environmental challenges (Cohen et al. 1983). There is a positive relationship between stress and a wide range of negative outcomes (Bluth and Blanton 2014; Campbell-Grossman et al. 2016), and acute or chronic stressful situations generally put individuals at risk for psychological and physical problems (Dohrenwend 1998). Consistent with this viewpoint, a great many studies have found that perceived stress is strongly associated with negative emotions such as anxiety, anger and depression (Spada et al. 2008). These negative emotions are associated with lower life satisfaction (Suldo and Huebner 2004), as is perceived stress (Bluth and Blanton 2014).

Self-control refers to effortful control over the self by the self (Muraven and Baumeister 2000). When people attempt to change the ways that they would otherwise think, feel or behave, they are acting to increase self-control (Muraven, and Baumeister 2000). According to the strength model of

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self-control, stress undermines self-control (Muraven and Baumeister 2000). A body of research is consistent with this assumption (Boisvert et al. 2017; Cho et al. 2015; Converse et al. 2018; Duckworth et al. 2013). For example, childhood (grades 4 and 6) stress is related to poor self-control and appears to influence the ongoing development of self-control (Duckworth et al. 2013). Recently, both cross-sectional and longitudinal studies have demonstrated that perceived stress is negatively associated with self-control among both adolescents and young adults (Boisvert et al. 2017; Converse et al. 2018).

Self-control positively predicts adaptive behaviors (e.g., adaptive emotional responses) and negatively predicts problematic behaviors (e.g., alcohol abuse) in university students (Tangney et al. 2004). Research has also found that high levels of self-control predict job satisfaction, relationship satisfaction and parenting satisfaction (Converse et al. 2018). In addition, higher levels of self-control mean higher grade point average, higher self-esteem, more secure attachment, and better relationships with classmates and teachers, all of which enable adolescents to live happier and healthier lives (Tangney et al. 2004). From this perspective, previous studies have also shown that self-control can contribute to improved life satisfaction (Gao et al. 2016). Given that adjusting to stressful situations is thought to consume self-control resources and can lead to poor self-control (Muraven and Baumeister 2000), which in turn is associated with low life satisfaction, we assumed that self-control would act as a mediator in the relation between perceived stress and life satisfaction.

When people ruminate in the context of a dysphoric mood, they recall more negative memories from the past, interpret their current situation more negatively, and are more pessimistic about their future (Lyubomirsky et al. 1998). The response styles theory (Nolen-Hoeksema 1991) argues that rumination can lead to pessimistic thinking and interfere with instrumental behavior. Supporting this theory, there is evidence that rumination can prompt individuals to recall the unpleasant life events that they believe have caused their low levels of well-being (Song and Zhang 2016). Rumination may then lead to a negative appraisal of life. That is, the more rumination individuals engage in, the lower their life satisfaction. Studies on the direct link between rumination and life satisfaction have also demonstrated that rumination was a risk factor for low life satisfaction. For instance, some research has found that rumination can negatively predict life satisfaction even after controlling for subjective happiness and forgiveness (Eldeleklioglu 2015; Ysseldyk et al. 2007).

Adolescence is a period of heightened stress (Katz and Greenberg 2015). The stress-reactive model of rumination emphasizes that stress generally increases rumination (Smith and Alloy 2009). Research has also found a

significant positive correlation between perceived stress and rumination (Morrison and O'Connor 2008), and stress could significantly induce and exacerbate rumination (Watkins 2008). Moreover, stress can influence individuals' physical and mental health through the mediation effect of rumination (Valena and Szentagotai-Tatar 2015). For instance, Berset et al. (2011) demonstrated that the relationship between work stress and sleep quality was mediated via work-related rumination. Fan et al. (2016) revealed that rumination mediated the association between adolescents' stressful peer interactions and depression. Considering that perceived stress is positively correlated with rumination, and rumination in turn is negatively correlated with life satisfaction, we assumed that rumination would be a significant mediator in the relation between adolescents' perceived stress and lower life satisfaction.

Self-control has an important influence on rumination. Some researchers have argued that an individual with better self-control will feel a greater sense of control over the future (Baumeister et al. 2007). Self-control can effectively help ameliorate negative moods (Tangney et al. 2004), regulate negative emotion and inhibit unreasonable beliefs (Baumeister et al. 2007; Heatherton and Wagner 2011). Liu et al. (2018) demonstrated that self-control negatively predicted rumination. Thus, we proposed that self-control and rumination can sequentially mediate the link between perceived stress and life satisfaction.

In the present study, we tested the mediating mechanisms underlying the link between adolescents' perceived stress and life satisfaction. Based on the literature reviewed above, we put forward three hypotheses: (a) self-control would mediate the relation between perceived stress and lower life satisfaction, (b) rumination would mediate the relation between perceived stress and lower life satisfaction, and (c) self-control and rumination would mediate not only in parallel but also sequentially the link between perceived stress and lower life satisfaction.

Method

Participants

The sample consisted of 1196 public senior high school students from 10th grade to 12th grade, identified through cluster random sampling. There were 562 girls and 634 boys, with a mean age of 16.75 years ($SD = 0.94$).

Procedure

This research was approved by the Ethics Committee of Psychological Research of the corresponding author's institution. After informed consent was obtained from the

schools, teachers, and the adolescents themselves, the students completed questionnaires regarding demographics, perceived stress, life satisfaction, rumination and self-control.

Measurements

Perceived stress

The Stress Subscale of the Chinese Short Version of the Depression Anxiety and Stress Scale (DASS-C21; Gong et al. 2010) was used to measure perceived stress. The Chinese version of the DASS-21 is a reliable and valid instrument and suitable for Chinese adolescents (Gong et al. 2010). The subscale is a 7-item self-report measure that assesses adolescents' perceived stress. It uses a 4-point Likert type response format with values ranging from 1 (strongly disagree) to 4 (strongly agree). An example item is "I found it difficult to relax". In our study, Cronbach's α for the scale was 0.81.

Life satisfaction

The Satisfaction with Life Scale (SWLS; Diener et al. 1985) was used to assess how satisfied an individual is with his or her life in terms of well-being. The Chinese version of the SWLS developed by Qiu and Zheng (2007). This self-report questionnaire measures perceived level of life satisfaction across five items using a 7-point Likert-type response format (1 = strongly disagree, 7 = strongly agree). An example item is "I'm satisfied with my life". Results of the five items are summed to produce an overall score with high scores indicating high satisfaction with life. SWLS has been widely used in measuring Chinese adolescents' life satisfaction, and has shown good reliability and validity (e.g., Chen et al. 2016; Luo et al. 2016). In our study, Cronbach's α for the scale was 0.78.

Self-control

The self-control questionnaire was developed by Chinese researchers (Dong and Lin 2011) to measure the ability to control and regulate impulsive behavior and impulsive expressions of emotion. This measure has been used in adolescent samples (Liu et al. 2018). The scale uses a 5-point Likert type response format with values ranging from 1 (strongly disagree) to 5 (strongly agree). An example item is "even though I'm angry, I don't show it in my face". A higher score means a higher level of adolescent self-control. In our study, Cronbach's α for the scale was 0.82.

Rumination

Adolescents' rumination is often assessed with the Ruminative Response Scale (RRS, Nolen-Hoeksema and Morrow 1991). In this study, we used the 21-item Chinese version of the RRS developed by Yang et al. (2009). The Chinese version of RRS has been widely used in measuring Chinese adolescents' rumination, and has shown good reliability and validity (e.g., Fan et al. 2016; Liu et al. 2018). Adolescents rate how true each item is for them, using a four-point scale ranging from 1 (never) to 4 (always). The mean was taken, with higher scores representing higher levels of a ruminative response style. An example item is "I go away by myself and think about why I feel this way". Cronbach's α for the current sample was 0.92.

Data Analyses

To analyze the research data, we first used the software SPSS 23.0 to conduct descriptive statistics and correlational analyses. To test our hypothesized model, we conducted path analysis using SEM. We then conducted a Bootstrap analysis to test the multiple mediation model using Model 6 of the SPSS PROCESS macro (Hayes 2013). The PROCESS macro is available to test multiple mediating and moderating models with the bias-corrected percentile bootstrap method, and it has been used extensively in psychological research (e.g., Jia et al. 2017; Liu et al. 2019).

Results

Table 1 provides descriptive statistics and correlations among variables. Overall, the correlations among variables were consistent with our expectations. Specifically, perceived stress was negatively associated with self-control and life satisfaction ($r = -0.34$, $p < 0.01$; $r = -0.36$, $p < 0.01$), but positively associated with rumination ($r = 0.62$, $p < 0.01$). Self-control was positively associated with life satisfaction ($r = 0.37$, $p < 0.01$) and negatively associated

Table 1 Descriptive statistics and correlations between variables

Variables	<i>M</i>	<i>SD</i>	1	2	3	4
1. Perceived stress	0.92	0.36	–			
2. Self-control	2.53	0.75	–0.34**	–		
3. Rumination	2.04	0.55	0.62**	–0.39**	–	
4. Life satisfaction	3.33	1.24	–0.36**	0.37**	–0.48**	–

N = 1196. ** $p < 0.01$

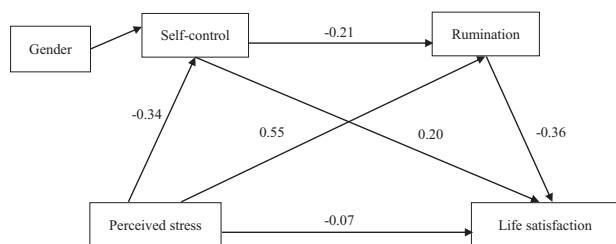


Fig. 1 The multiple mediation model

Table 2 Testing the pathways of the multiple mediation model

Path	<i>b</i>	<i>se</i>	BCa 95% CI	
			Lower	Upper
Perceived stress →self-control →life satisfaction	−0.07***	0.01	−0.10	−0.05
Perceived stress →rumination →life satisfaction	−0.20***	0.02	−0.24	−0.16
Perceived stress →self-control →rumination →life satisfaction	−0.03*	0.01	−0.04	−0.02

N = 1196. Bootstrap sample size = 5000. Gender was controlled

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

with rumination ($r = -0.39$, $p < 0.01$). In addition, rumination was negatively associated with life satisfaction ($r = -0.48$, $p < 0.01$). There were no significant age differences on any variable. However, there was a significant gender difference in self-control ($F(1, 1194) = 5.15$, $p < 0.05$), with girls showing higher self-control than boys. Therefore, gender was used as a control variable in subsequent analyses.

Because of the gender difference in self-control, we added a specific path from gender to self-control to make sure that the relationships among core variables could be better estimated (see Fig. 1). Results of fitness tests for the SEM path analysis were $\chi^2/df = 0.420$, RMSEA = 0.001, CFI = 0.999, NFI = 0.999, GFI = 0.999, which indicated an acceptable model fit.

As the results in Table 2 and Fig. 1 show, all the pathway coefficients were significant. After controlling for gender, perceived stress was negatively associated with self-control ($b = -0.34$, $p < 0.001$), and self-control in turn was positively related to life satisfaction ($b = 0.20$, $p < 0.001$). Meanwhile, high levels of perceived stress were positively associated with rumination ($b = 0.55$, $p < 0.001$), which in turn was negatively related to adolescent life satisfaction ($b = -0.36$, $p < 0.001$). Moreover, perceived stress was negatively related to life satisfaction ($b = -0.07$, $p < 0.05$), which suggested that the residual direct pathway of “perceived stress → life satisfaction” was also significant. Thus, self-control and rumination only partially mediated the link between perceived stress and life satisfaction. The indirect

effects were estimated using 5000 bootstrap samples. Results were deemed significant when the 95% CI did not include zero. Both the pathway representing “perceived stress →self-control →life satisfaction” (indirect effect = -0.07 , 95% CI = -0.10 to -0.05), and the pathway representing “perceived stress →rumination →life satisfaction” (indirect effect = -0.20 , 95% CI = -0.24 to -0.16) were significant. Moreover, the sequential pathway of “perceived stress →self-control →rumination →life satisfaction” was significant (indirect effect = -0.03 , 95% CI = -0.04 to -0.02). Thus, self-control and rumination mediated the link between perceived stress and life satisfaction, not only in parallel but also sequentially.

Discussion

Perceived stress has been shown to have a significant association with adolescents’ life satisfaction. The results of our study extend the existing research by demonstrating that self-control and rumination, in parallel and sequentially, mediated this link. The current research contribute to document the role of how perceived stress is associated with adolescent life satisfaction.

Consistent with our hypothesis, our study found that self-control mediated the relationship between perceived stress and lower adolescent life satisfaction. This finding coincides with the self-control strength model, which posits that exposure to stressful and uncontrollable situations may deplete self-control resources, interrupt growth (e.g., relapse of negative habits), and further negatively influence individuals’ lives (e.g., poor life satisfaction) (Muraven and Baumeister 2000; Tangney et al. 2004). In addition, high levels of perceived stress are accompanied by negative moods, and people who want to bring themselves out of negative states will exert self-control (Muraven and Baumeister 2000). Moreover, in the context of high pressure, adolescents may use negative coping strategies (Xia and Ye 2014), such as smoking, drinking alcohol and overeating, and inhibiting these behaviors will deplete self-control. Adequate self-control resources are beneficial to ameliorate negative emotions and facilitate positive outcomes (Converse et al. 2018; Tangney et al. 2004); however, low self-control is associated with a series of undesirable effects. Based on related theory and existing research, we interpret our results as showing that perceived stress depletes self-control resources, and in turn relates to poor life satisfaction.

Congruent with our hypothesis, our results demonstrated that rumination was another significant mechanism through which perceived stress is linked to life satisfaction. This finding is consistent with previous research that showed that people who focused more on the present were less likely to

be involved in rumination, which in turn triggered greater life satisfaction (Felsman et al. 2017). People with high perceived stress tend to feel threatened and challenged by stressors, and may think about negative events repeatedly (Song and Zhang 2016). They are inclined to recall negative events and memories and have difficulty in focusing on the present; that is, they engage in rumination. Based on the response styles theory, rumination thwarts effective problem-solving, triggers more negative emotion, and leads to lower levels of social support and higher levels of pessimism (Nolen-Hoeksema 1991). Rumination can produce a series of negative results, including less social support and more negative emotions, which further disrupt individuals' lives and life satisfaction.

Finally, we found that self-control and rumination mediated the association between perceived stress and adolescent life satisfaction not only in parallel but also sequentially. Specifically, perceived stress was significantly linked to adolescent life satisfaction through both the unique effects of self-control and rumination, and their combined effect. Adolescents consume self-control resources when they try to control stressful events (Muraven and Baumeister 2000), and inadequate self-control resources can be connected with more rumination (Liu et al. 2018). This finding is in line with the self-control strength model that posits that stress consumes people's limited self-control, and the decreased self-control resources may relate to negative performance (Cohen and Lichtenstein 1990). Specifically, low self-control can amplify negative emotions, which in turn trigger repetitive and passive thinking.

The impact of perceived stress on adolescent life satisfaction was sequentially mediated through self-control and rumination, although the magnitude of this association was relatively small. This result suggests that adolescents who experience high perceived stress have insufficient self-control resources, which drive them to engage in rumination (Liu et al. 2018), which in turn is associated with low life satisfaction. The finding that self-control and rumination are sequential mediators highlights the two major effects of high perceived stress—consuming and disrupting. Perceived stress consumes self-control resources and disrupts emotion regulation, thus ultimately exacerbating low life satisfaction. Meanwhile, self-control and rumination may show sequential relation; in other words, depleted self-control resources affect the emotional management process. It is necessary to note that although the sequential mediation effect of this study is basically equivalent to that of previous sequential mediation model (Jia et al. 2017) and has reached statistical significance, it is still weak, and the necessary caution should be maintained when interpreting the results.

By integrating the self-control strength model and the response styles theory, this study tested the mediating roles of self-control and rumination simultaneously. Our

integrated multiple mediation model provides a more comprehensive conceptualization of how perceived stress is associated with adolescent life satisfaction. These two processes, namely self-control and rumination, jointly illuminate how perceived stress can play a role in adolescent life satisfaction.

Limitations

There are several limitations of this study. First, the study relied on self-report data, which may produce common method bias. Harman's one factor test (Podsakoff and Organ 1986) was conducted on all measurement items to assess the possible common method bias. If the bias is substantial, either a single factor will emerge or one general factor will account for most of the variance (>40%). In the current study, the results revealed that the first factor did not account for the majority of the variance (28%) and there was no general factor in the unrotated factor structure. Moreover, we told participants that the questionnaire was anonymous, there were no right or wrong answers and they should answer the questions as honestly as possible (Podsakoff et al. 2003). Thus, we concluded that common method variance did not pose a serious threat in this study. Nevertheless, reports from multi-method and multi-informant methods (e.g., parents, teachers, and peers) should be considered in the future research. Second, as this study was conducted in adolescents, the findings may not generalize to other samples. Therefore, future research should rec

ruit a more diverse sample of participants and further replicate the multiple mediation model in other samples. Third, this study used a cross-sectional research design, thus, causality cannot be determined. Future studies might address questions about causality with longitudinal or experimental designs. Fourth, given that self-control and rumination only partially mediated the relation between perceived stress and life satisfaction, it is warranted for future studies to examine the potential mediating effects of other variables, such as adolescents' self-esteem. Finally, although beyond the scope of this study, it is possible that the direct link between perceived stress and life satisfaction is moderated by individual or environmental factors (e.g., social support). Future studies would benefit from further investigation of the moderating roles of these factors. Despite these limitations, this study makes a unique contribution by generating a theoretically-driven, relatively comprehensive model to clearly explain how perceived stress is associated with life satisfaction.

Author Contributions Y.Z. designed and executed the study, and wrote the paper. Z.Z. collaborated with the design and writing of the study. Q. L. analyzed the data and collaborated with the writing of the study.

X.Y. collaborated in the writing and editing of the final manuscript. C. F. collaborated in the writing and editing of the final manuscript.

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. Central China Normal University had provided IRB approval for the study.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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