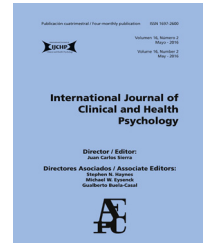




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ORIGINAL ARTICLE

Negative emotions and quality of life among adolescents: A moderated mediation model

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KEYWORDS

Negative emotions;
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Abstract

Background/Objective: Depression, anxiety and stress are known as negative emotions. Previous studies have shown that negative emotions were associated with quality of life. There are a lot of researches on quality of life. However, previous studies mainly focused on health-related quality of life among patients. This study aims to examine the relationship between negative emotions and quality of life as well as the underlying psychological mechanism among community-based samples.

Method: We surveyed 6,401 adolescents (age: 9–15 years old). Participants were assessed using the Depression Anxiety Stress Scale, Resilience Scale for Chinese Adolescent, Perceived Social Support Scale and the Pediatric Quality of Life Inventory 4.0 Generic Scale for Negative Emotions, Resilience, Social Support and Quality of Life.

Results: Results revealed that negative emotions were negatively associated with quality of life, and resilience mediated the relationship between negative emotions and quality of life. Social support moderated all the paths among negative emotions, resilience and quality of life.

Conclusions: Adolescents' quality of life was indirectly affected by negative emotions via resilience, and less affected by negative emotions and more affected by resilience with the improvement of social support. The theoretical and practical implications of these results are discussed.

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PALABRAS CLAVE

Emociones negativas;
Resiliencia;
Apoyo social;
Calidad de vida;
Encuesta transversal

Emociones negativas y calidad de vida en adolescentes: un modelo de mediación**Resumen**

Antecedentes/Objetivo: Estrés, ansiedad y depresión son emociones negativas. Estudios previos mostraron que las emociones negativas se asocian con la calidad de vida. Existen numerosas investigaciones centradas en la calidad de vida, sin embargo, los estudios se centran en la calidad de vida de pacientes en relación con su salud. En este estudio se examina la relación entre emociones negativas y calidad de vida, y los mecanismos psicológicos subyacentes.

Método: Encuestamos a 6.401 adolescentes (9-15 años). Los participantes fueron evaluados con la Depression Anxiety Stress Scale, la Resilience Scale for Chinese Adolescent, la Perceived Social Support Scale y el Pediatric Quality of Life Inventory 4.0 Generic Scale for Negative Emotions, Resilience, Social Support and Quality of Life.

Resultados: Las emociones negativas fueron negativamente asociadas con la calidad de vida, y la resiliencia medió la relación entre emociones negativas y calidad de vida. El apoyo social moderó todas las vías entre emociones negativas, resiliencia y calidad de vida.

Conclusiones: La calidad de vida de los adolescentes fue indirectamente afectada por las emociones negativas mediante la resiliencia, menos afectada por emociones negativas y más afectada por la resiliencia con la mejora en el apoyo social. Se discuten las implicaciones teóricas y prácticas de estos resultados.

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Depression, anxiety and stress, the typical negative emotions, are risk factors for adolescents nowadays. In China, 59.2% of Chinese students, reported academic stress (Choi, Lee, & Lee, 2010), 28.6% of adolescents suffered from depressive symptoms (Li, Chen, Zhao, & Xu, 2017). Besides, 7.6% of the Chinese suffered from anxiety disorders in lifetime (Huang et al., 2019). Depression, anxiety and stress had a close relationship with each other (Anyan & Hjemdal, 2016), some scholars claimed that depression, anxiety and stress could be combined into a higher-order mental variable, that is negative emotions (Henry & Crawford, 2005). These negative emotions were closely correlated with many negative outcomes, such as suicidal behavior (Apter, Bleich, Plutchik, Mendelsohn, & Tyano, 1988; Frison & Eggermont, 2016). Psychological researchers have long been interested in identifying negative outcomes that can be caused by depression, anxiety and stress. One of these negative outcomes is quality of life (QoL).

QoL is a multidimensional concept, which is defined as person's perception of his position in life in the context of the cultural and value systems in which person lives and determined in relation to his goals, expectations, standards, and concerns (World Health Organization, 2014), reflecting the individuals' overall well-being towards physical and mental health (Bevan, Gomez, & Sparks, 2014).

Many studies had indicated that depression, anxiety and stress had a close relationship with QoL (Arraras, Ibanez, Pereda, Iribarren, & Basterra, 2019; Bevan et al., 2014; Dryman, Gardner, Weeks, & Heimberg, 2016; Li et al., 2016). For example, some previous studies had demonstrated that excessive and continuous stress could have a negative effect on students' health and lead to poor academic performance and illness (Austin, Saklofske, & Mastoras, 2011; Ribeiro, Pereira, Freire, de Oliveira, Casotti, & Boery, 2018;

Saklofske, Austin, Mastoras, Beaton, & Osborne, 2012). What's more, some researches demonstrated that anxiety had a close relationship with poor quality of life (QoL) (Dryman et al., 2016; Li et al., 2016). A recent study showed that depression had a close relationship with the poor QoL (Arraras et al., 2019; Pakpour et al., 2019). Consistently, Siarava et al. (2019) found that depression was a powerful predictor of QoL and individuals with major depression reported lower social well-being (Wersebe et al., 2018), meaning lower quality of life. From the above review, we could conclude that it was apparently that negative emotions (depression, anxiety and stress) had a close association with quality of life, but the underlying mechanism was not clear.

In this paper, we regarded resilience as a mediator. Resilience, referring to the ability to recover from adversity and trauma quickly (Gaffey, Bergeman, Clark, & Wirth, 2016; Luthar, Cicchetti, & Becker, 2010), was supposed to help individuals to better adapt to stressful or traumatic situation (Komachi & Kamibeppu, 2018). According to resilience theory, resilience is a dynamic process and it may be influenced by many factors such as negative emotions. Previous studies had demonstrated that negative emotions, including depression, anxiety and stress could result in decreased level of resilience (Dias et al., 2015; Xindi et al., 2015). One study indicated that higher psychological flexibility was positively associated with an increase in well-being, meaning better QoL (Wersebe et al., 2018). Some researchers regarded resilience as promoters of well-being (Toland & Carrigan, 2011) as well as indicators of adolescent development (Masten & Tellegen, 2012). That was to say, resilience could predict quality of life to some extent. In fact, there was increasing evidence for a link between resilience and QoL. For example, one previous

study found that resilience could predict QoL among bipolar disorder patients (Lee et al., 2017; Oliva et al., 2019). Other researches also demonstrated that resilience could significantly predict quality of life or some domains of quality of life (Calvete, Las, & Gómez, 2018; Cau-Bareille, 2011; UNDP 2014). Therefore, according to the findings that negative emotions, resilience, and quality of life are closely related, it was reasonable for us to regard resilience as a mediator between negative emotions and quality of life in current study.

Although negative emotions may result in poor quality of life through the mediating role of resilience, not all individuals suffered from negative emotions homogeneously experience lower levels of resilience and have poor quality of life. Social support may moderate the effect of negative emotions on resilience and quality of life. According to the buffering effect model of social support, social support could promote mental health condition via alleviating the effect of negative factors on mental health. Social support, referring to the external support getting from the important others and the society, and could provide individuals with instrumental or emotional help (Cohen, 2004). Individuals with different levels of external support would react differently to difficulties in life, social support had been proved to be correlated with some good outcomes such as well beings (Chu, Saucier, & Hafner, 2010), low stress (Swickert, Rosentreter, Hittner, & Mushrush, 2002), low anxiety and depression (Ft, Cacciatore, Schnebly, & Froen, 2009), and better physical and mental functions, the specific aspects of QoL (Krokavcova et al., 2008; Wu et al., 2018). In addition, Sim, Bowes, & Gardner, 2019 found that mothers' perceived social support could promote psychological resilience, which was consistent with finding by Glozah and Pevalin (2014) that social support from different fields played a promoting role in the development of psychological resilience (Khan, Hamdan, Ahmad, Mustaffa, & Mahalle, 2016). So, in current study, we regarded social support as a moderator.

As for the reason we should do this research was that previous studies had some limitations in the field of quality of life. First, previous studies had mainly focused on the health-related QoL (Nourbakhsh, Julian, & Waubant, 2016; Tepavcevic et al., 2013), relatively less exploring other aspects of QoL, such as emotional, social and behavioral aspects (Varni, Burwinkle, Seid, & Skarr, 2003). Second, previous researches mainly explored the individuals with diseases such as insomnia, dialysis, and cardiovascular diseases, etc. (Jalali, Abdolazimi, Alaei, & Solati, 2019; Ribeiro et al., 2018). Third, the mechanism underlying the relationship between negative emotions and QoL is not clear. Therefore, given that the findings that negative emotions, resilience, and quality of life are closely related, and given that social support is also associated with these variables, we tried to investigate the relationship between the negative emotions and QoL among adolescents and to figure out the mediating role of resilience and the moderating role of social support in a large sample from Chinese adolescents. Basing on previous findings, we hypothesized that (1) negative emotions could predict lower QoL via decreasing resilience; (2) social support moderated the relationships among negative emotions, resilience and QoL. Our hypothesized model can be seen in Figure 1.

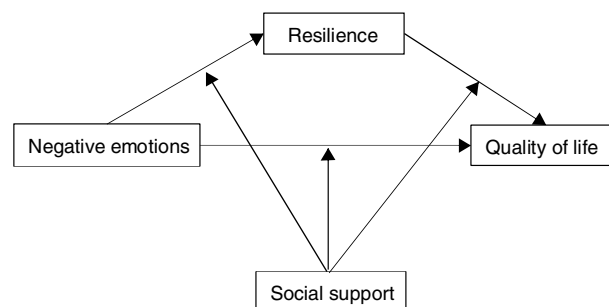


Figure 1 The hypothesized model.

Method

Participants and procedure

We collected the data by cluster sampling. The study was approved by the Ethical Committee of Zhengzhou University and carried out in accordance with the approved guidelines and regulations before data collection. We contacted several Primary Schools and Secondary Schools in Hong Kong and Zhengzhou to explain the study purpose to them. Some schools expressed interest in assisting us to recruit participants. Then, students were also asked to complete a series of questionnaires under the supervision of school teachers or research assistants after getting information consent. Participants were assured that their answers were confidential and anonymous. 6,401 participants with a mean age of 11.94 ($SD = 1.72$), ranging from 9 to 15 with 3,390 boys (53%) and 3,011 girls (47%) were recruited. Primary school students (Grade 4, Grade 5, and Grade 6) accounted for (56.3%) and secondary school students (Grade 1, Grade 2, and Grade 3) accounted for (43.7%). 6354 participants were born in Mainland, China. Participants were asked to complete questionnaires and demographics including sex, age and class.

Instruments

The Pediatric Quality of Life Inventory 4.0 Generic Scale (PedsQL; Varni et al., 2003) included four facets: physiological function, emotional function, social function and school function. Each item in PedsQL was the survey of the frequency of an event in recent months. Each item ranged from 0-4: 0 (100 points) for *never*, 1 (75 points) for *hardly ever*, 2 (50 points) for *sometimes*, 3 (25 points) for *often* and 4 (0 points) for *always*. The score of each aspect was the sum of the scores of the contained items divided by the number of the contained items. The score of the total scale was the sum of the scores of the items divided by the number of the items in the whole scale. The higher score represented the better QoL. The Cronbach's coefficient was .89.

The Depression Anxiety Stress Scale (NESS; Lovibond & Lovibond, 1995) consisted of 3 sub-scales with 21 items, which respectively measured individual's experience of depression, anxiety, and stress. Each item has a four-point Likert scale (0 = *never applied to oneself*, 1 = *some degree/some of the time*, 2 = *considerable degree/a good part of time*, 3 = *very much/most of the time*). The score of each sub-scale was the sum of the 7 items multiplied by 2,

with the range from 0 to 42 points. The higher the score was, the more serious the degree of depression, anxiety or stress was. The total score of the scale is the sum of the scores of the sub-scale (Lee, 2019). In the current study, the Cronbach coefficient was .94.

Resilience Scale for Chinese Adolescent is a 27-item, self-rating and validated measure (Hu & Gan 2008). Each item was rated on a 5-point Likert scale (1 = *strongly disagree*, and 5 = *strongly agree*). The total score was the sum of the all items, and higher score meant the higher level of resilience. In this study, the Cronbach coefficient was .84.

The Perceived Social Support Scale (PSSS; Zimet, Dahlem, Zimet, & Farley, 2010) is a 12-item, self-rating measure. Each item ranged from 1 (*totally disagree*) to 7 (*completely agree*), with the total score ranging from 12 to 84. And higher score meant the higher level of social support. In this study, the Cronbach coefficient was .93.

Data analysis

Descriptive analysis was calculated for describing sociodemographic characteristics. The correlations of study variables (negative emotions, resilience, social support and QoL) were analyzed by Pearson correlation analyses. The mediation and moderated mediation model were analyzed using the PROCESS macro for SPSS (Hayes, 2013). Confidence intervals that do not contain zero indicate significant mediation effects (Hayes, 2013). To determine whether an indirect effect or a total effect was statistically significant, we used maximum likelihood estimation and the bias-corrected bootstrap 95% confidence interval based on 5,000 bootstrapping. Firstly, we tested whether the associations between negative emotions and QoL was mediated by resilience using Model 4. If the 95% CI of indirect effect did not contain zero, it indicated that the mediating effect was significant. Next, Model 59 was used to examine the moderated mediation effect, that was, whether social support moderated the direct and indirect effects of negative emotions on QoL. Statistical significance was defined as a two-tailed p -value $< .05$.

Results

Descriptive data and correlations

Descriptive statistics and bivariate correlations between study variables are shown in Table 1. All variables were significantly correlated in conceptually expected ways. Negative emotions were negatively correlated with resilience, QoL and social support. In addition, resilience was positively associated with social support and QoL. Specifically, negative emotions were negatively related to resilience ($r = -.45$, $p < .01$), QoL ($r = -.51$, $p < .01$) and social support ($r = -.30$, $p < .01$). Resilience was positively associated with social support ($r = .48$, $p < .01$) and QoL ($r = .44$, $p < .01$).

Mediation analyses

The results (Table 2) showed that the indirect (mediated) effect of negative emotions on QoL was significant ($\beta = -$

Table 1 Correlations, means and standards deviations of study variables.

	NES	QoL	SS	R
NES	1			
QoL	-.51**	1		
SS	-.30**	.29**	1	
R	-.45**	.44**	.48**	1
M	10.37	81.12	64.71	96.55
SD	11.41	12.51	15.35	15.73

Note. NES = depression, anxiety and stress; QoL = quality of life; SS = social support; R = resilience.

** $p < .01$.

Table 2 Summary of bootstrapped mediation analyses of the effects of NES on QoL through resilience.

Outcome	Mediation analysis paths	Estimated	95% bias-corrected CI	
			Lower	Upper
QoL	Direct effect	-.39**	-.41	-.36
	Indirect effect	-.12**	-.13	-.10
	NES \rightarrow R	-.45**	-.48	-.43
	R \rightarrow QoL	.26**	.23	.28
	NES \rightarrow QoL	-.39**	-.41	-.36

Note. NES = depression, anxiety and stress; R = resilience; QoL = quality of life; Standardized regression coefficients shown for each path CI bias-corrected confidence intervals based on 5000 bootstrapped samples, 95% confidence interval does not include zero.

** $p < .01$.

Table 3 Moderated mediating effect analyses.

	Model 1(R) B (SE)	Model 2 (QoL) B (SE)	Model 3 (QoL) β (SE)
NES	-.35 (.01)**	-.39 (.01)**	-.39 (.01)**
SS	.39 (.01)**	.07 (.01)**	
R	.		.22 (.01)**
R \times SS			.02 (.01)**
NES \times SS	-.07 (.00)**	-.02 (.01)**	

Note. NES = depression, anxiety and stress; QoL = quality of life; SS = social support; R = resilience.

** $p < .01$.

.12, CI [-.41, -.36]). The direct effect of negative emotions on QoL was significant ($\beta = -.39$, CI [-.13, -.10]). Specifically, resilience mediated the relationship between negative emotions and QoL. In other words, negative emotions predicted decreased resilience ($\beta = -.45$, CI [-.48, -.43]), and lower QoL ($\beta = -.39$, CI [-.41, -.36]).

Moderated mediation analyses

Based on the mediation model, we proposed a moderated mediation model. Table 3 showed the results of moderated mediation. According to our Hypothesis 2, social support may moderate both the direct effect (negative emotions -

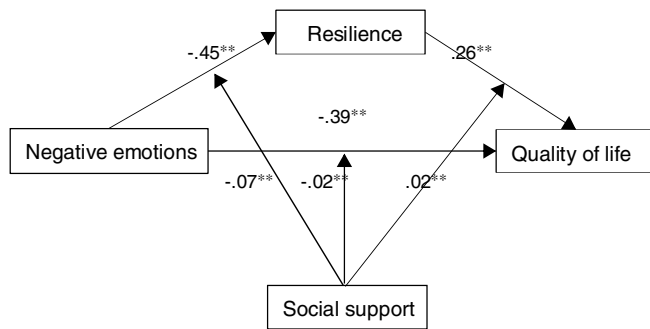


Figure 2 The proposed moderated mediation model.

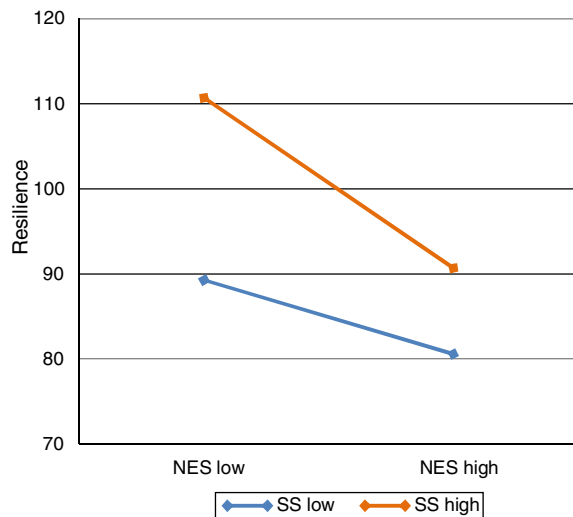


Figure 3 Resilience as a function of NES and SS.
Note. NES = depression, anxiety and stress; SS = social support.

QOL) and indirect effect (negative emotions - resilience and resilience - QOL). The results showed that social support moderated the direct effect of negative emotions on QoL (negative emotions \times social support: $\beta = -.02$, 95% CI $[-.04, -.00]$) and moderated the path between negative emotions and resilience (negative emotions \times social support: $\beta = -.08$, 95% CI $[-.09, -.05]$), signifying that the direct effect of negative emotions on resilience and QoL was moderated by social support among adolescents. Besides, the results confirmed our hypothesis that social support did play a moderating role between resilience and QoL (resilience \times social support: $\beta = .02$, 95% CI $[.00, .04]$). In conclusion, social support moderated the mediation model (Figures 2, 3, 4 and 5), which was in accordance with our hypothesis.

Discussion

The aim of this study was to investigate the effect of negative emotions on QoL and the underlying psychological mechanisms among adolescents. To our knowledge, we are not the first to examine the relationship between negative emotions and QoL, but we are the first to examine the mediating role of resilience between them, and the first to examine whether social support could moderate the mediation model.

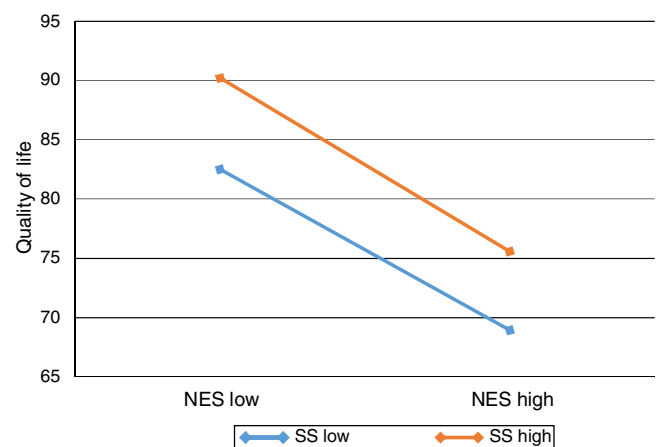


Figure 4 QoL as a function of NES and SS.
Note. QoL = quality of life; NES = depression, anxiety and stress; SS = social support.

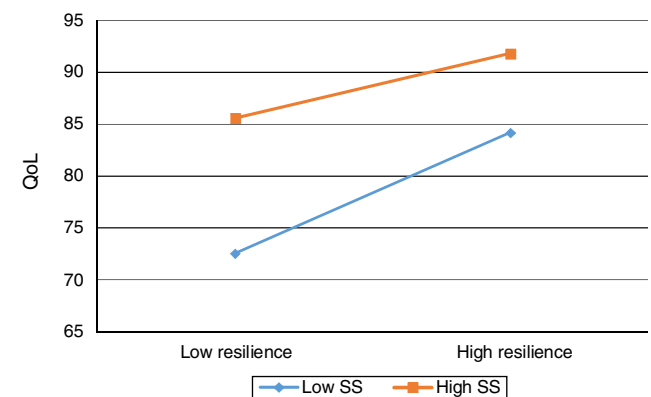


Figure 5 QoL as a function of resilience and SS.
Note. QoL = quality of life; R = resilience; SS = social support.

As hypothesized, we found that negative emotions were significantly and negatively correlated with QoL, which was consistent with previous studies (Aggelopoulou et al., 2017; Bujang et al., 2015; Gao, Su, Sweet, & Calabrese, 2019), and resilience was significantly and positively correlated with QoL (García-León et al., 2019). Importantly, we found that resilience mediated the relationship between negative emotions and QoL, which could be explained by the following reasons: first, resilience is not only regarded as a stable personality (Luthar & Cicchetti, 2000; Van Kessel, 2013), but also considered as a dynamic progress; second, according to Feder, Fred-Torres, Southwick, and Charney (2019), resilience, as a complex and dynamic process, could be affected by so many factors such as psychological, social and biological factors. Thus, it was reasonable to infer that negative emotions could decrease the level of resilience and further predict the lower level of QoL (Aggelopoulou et al., 2017). Additionally, we also found that negative emotions could reduce resilience as well as QoL to a greater extent for adolescents with lower social support, compared with those with higher social support (Figures 3 and 4), and resilience combined with social support could increase QoL (Figure 5). Our results were consistent with the previous findings (Ruiz-Robledillo, De Andres-García, Pérez-Blasco, González-Bono,

& Moya-Albiol, 2014; Song, Fu, & Wang, 2019) that social support could exert a positive influence on mental health.

It was well-known that social support, defined as interactions that lead someone to believe that he is cared for and loved, esteemed (Cobb, 1976), can protect adolescents from negative outcomes such as suicidal ideation and suicide attempts in both adults (Chioqueta & Stiles, 2007; Kleiman & Liu, 2013) and adolescents (Mackin, Perlman, Davila, Kotov, & Klein, 2017; Miller, Esposito-Smythers, & Leichtweis, 2015). That is to say, although negative emotions can produce negative effects on QoL, the individuals who have gained social support from their families and friends will be less affected by negative emotions. In conclusion, the moderated mediation effect enlightens that it is necessary to consider resilience and social support when investigating the relationship between negative emotions and QoL.

These results have practical implications that point to the importance of cultivating positive psychological development in order to achieve good QoL. From the results of this paper, we could infer that some interventions aiming to increasing the level of resilience were necessary. Getting aspirations from Feder et al. (2019), we could enhance the level of resilience from two perspectives: psychosocial and cognitive interventions and neurobiological interventions. During adolescence, adolescents were sensitive to the environment (Gee & Casey, 2015; Tottenham, 2014)). According to the social interaction theory, social support, regarded as external support, can be offered by important others in individuals' life, meaning that parents, teachers and peers regarded as important others for adolescents are vital to adolescents' healthy development. So, good parenting skills and ample resources are beneficial to children's development. Some interventions focused on helping parents recognize children's needs and improving the attachment security and providing ample resources might be beneficial (Dozier et al., 2009; Duncan, Magnuson, & Votruba-Drzal, 2014; Fisher, Gunnar, Dozier, Bruce, & Pears, 2010).

There are some limitations in this study. First, the self-report measures may be not objective. Second, because of the cluster sampling, our results are not representative of the entire population of adolescents. Third, this study is a cross-sectional survey, and we are unable to make causal inferences. Therefore, further longitudinal research should be conducted to validate the findings. Future studies should include a design that can measure QoL more objectively and more research on the temporal relationship between negative emotions and QoL is needed. In addition, this study demonstrates that resilience and social support can be regarded as the underlying psychological mechanisms between negative emotions and QoL, future studies can further dig out some other variables and explore their roles between negative emotions and QoL.

Conclusions

Our findings not only suggest that individuals' QoL can be affected by negative emotions via decreasing resilience, but also that individuals with higher social support are likely to report higher level of quality of life. Thus, we can conclude that QoL can be improved by two different aspects. On the one hand, increasing the resilience is a good way. On

the other hand, offering enough social support is also very useful. Thus, our findings are of great importance and may reveal the need to enhance resilience, to offer social support among adolescents. In conclusion, this paper provides a new perspective view of improving QoL by using a large sample.

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