

RESEARCH ARTICLE

Chinese High School Students' Academic Stress and Depressive Symptoms: Gender and School Climate as Moderators

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Abstract

In a sample of 368 Chinese high school students, the present study examined the different effects of Chinese high school students' academic stress on their depressive symptoms and the moderating effects of gender and students' perceptions of school climate on the relationships between their academic stress and depressive symptoms. Regression mixture model identified two different kinds of subgroups in the effects of students' academic stress on their depressive symptoms. One subgroup contained 90% of the students. In this subgroup, the students' perceptions of academic stress from lack of achievement positively predicted their depressive symptoms. For the other 10% of the students, academic stress did not significantly predict their depressive symptoms. Next, multinomial regression analysis revealed that girls or students who had high levels of achievement orientation were more likely to be in the first subgroup. The findings suggested that gender and students' perceptions of school climate could moderate the relationships between Chinese high school students' academic stress and their depressive symptoms. Copyright © 2011 John Wiley & Sons, Ltd.

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Keywords

academic stress; school transition; Chinese students; high school; depressive symptoms; school climate

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Introduction

In previous research, there is a growing body of evidence around the world that stressful life events during adolescence can cause depression (Byrne, Davenport, & Mazanov, 2007; Dearthoff, Gonzales, & Sandler, 2003; Lazaratou, Dikeos, Anagnostopoulos, & Soldatos, 2010). On the other hand, theories of resilience suggested that although living in a context of significant hardships, someone might overcome them and develop over time (Gomez & McLaren, 2006; Liu & Lu, 2011). In empirical research, some studies supported the theories of resilience (Liu & Lu, 2011). For instance, Liu and Lu (2011) found that stress in the school was negatively related to most Chinese high school students' academic achievement, but some students surmounted the negative effects of stress on their academic achievement. However, to date, we still know little about whether students' academic stress exerts different effects on their depressive symptoms. Therefore, in the present study, we first seek to examine the different relationships between students' academic stress and their depressive

symptoms in a Chinese high school sample. The existing literature suggests that Chinese students experienced more academic stress than their Western counterparts did (Liu & Lu, 2011; Wu & Sun, 2008). In the present study, we expect that Chinese high school students' academic stress will exert different effects on their depressive symptoms. The academic stress may be positively related to some students' depressive symptoms but not related to some others' depressive symptoms. Then, we are interested in examining whether school climate and gender can moderate the relationships between academic stress and depressive symptoms.

From a developmental contextual perspective, it was proposed that adolescents' individual differences and developmental contexts interactively contributed to their developmental outcomes (Lerner & Castellino, 2002; A Loukas & Robinson, 2004). In previous research, some researchers suggested that the school climate might buffer the impact of some risk factors on students' emotional and behavioural adjustment (Kuperminc, Leadbeater, & Blatt, 2001; A. Loukas & Murphy, 2007;

A Loukas & Robinson, 2004). However, in empirical research, findings are mixed. For instance, Kuperminc et al. (2001) found that positive school climate moderated the relationships between adolescents' self-efficacy and internalizing problem, but Loukas and Robinson's (2004) study showed that students' perceptions of school climate did not moderate the relationships between effortful control and depressive symptoms. In the present study, we aim to examine whether Chinese high school students' perceptions of school climate can moderate the relationships between their academic stress and depressive symptoms.

On the other hand, several researchers suggested that gender contributed significantly to the differences in the relationships between adolescents' stress and their depressive symptoms (Hampel & Petermann, 2006; Hankin, Mermelstein, & Roesch, 2007; 2004). In previous research, two models were put forward to explain the gender differences in the associations between adolescents' stress and their depressive symptoms (Hankin, et al., 2007; Rudolph, 2002). Firstly, the mediational-stress exposure model indicated that girls who experienced more stressors than boys and girls were more likely to become depressed, whereas the moderational-stress reactivity model suggested that girls responded with higher levels of depressive symptoms to stressors than boys (Hankin, et al., 2007). In previous research, several empirical studies found that consistent with the mediational-stress exposure model, girls reported more stressors overall than boys during adolescence (Allgood-Merten, Lewinsohn, & Hops, 1990; Byrne, et al., 2007; Davies & Windle, 1997; Ge, Lorenz, Conger, Elder, & Simons, 1994; Hankin, et al., 2007). Furthermore, girls reported more interpersonal-related stressors from their peers and family members than boys who were more likely to report achievement-related stressors (Gore, Aseltine, & Colten, 1993; Hankin, et al., 2007; Leadbeater, Blatt, & Quinlan, 1995; Rudolph, 2002).

Contrarily, some recent evidence revealed that adolescents' perceptions of school-related stressors were similar between girls and boys (Seiffge-Krenke, Aunola, & Nurmi, 2009). For the moderational-stress reactivity model, the empirical findings were also mixed. Some studies indicated that girls responded with more negative outcomes to general stressors than boys (Ge, et al., 1994; Hankin, et al., 2007; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Rudolph, 2002; Wagner & Compas, 1990), whereas some other studies showed that stress reactivity did not differ between girls and boys (Leadbeater, Kuperminc, Hertzog, & Blatt, 1999; Wagner & Compas, 1990). In the present study, another purpose is to examine whether gender can moderate the relationships between Chinese high school students' academic stress and their depressive symptoms.

The present study

In the present study, the first purpose is to investigate whether there are different effects of students' perceptions of academic stress on their depressive symptoms for Chinese high school students. We expect that the

relationships between academic stress and depressive symptoms will differ among students. The second purpose is to examine the moderating effects of gender and students' perceptions of school climate on the relationships between Chinese high school students' academic stress and their depressive symptoms. We expect that (a) girls will be more likely to be influenced by academic stress and (b) students' perceptions of school climate will moderate the relationships between academic stress and depressive symptoms.

Method

Participants

Participants were recruited from two urban senior high schools (12 classes) located in Jiangsu province, China. The two schools were randomly selected from local high schools. The classes were randomly chosen from the two schools. In the present study, 368 students (221 females) from grade 10 agreed to participate in our study. The mean age was 16.76 years [standard deviation (SD) = 0.60] for males and 16.74 years (SD = 0.54) for females. The students' abilities and socioeconomic status were similar in each classroom. They were primarily from working-class and middle-class families.

Procedure

We collected the data nearly 5 months after the first school term began in order that the students were settled in their new surroundings. During investigations, the students completed a 20-min survey during classroom time. Graduate students of psychology carried out the administration of the measures. Ethical approval was granted from institutional review of our institution.

Measures

Academic stress

Students' academic stress was assessed with a seven-item measure (Appendix 1). The students were asked to respond on a four-point scale, ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Exploratory factor analysis yielded two factors. One factor (three items) accounting for 32.05% of the variance appeared to represent students' academic stress from too much homework, and the other factor (four items) accounting for 31.82% of the variance was related to academic stress from lack of achievement. In addition, the internal consistencies of the two dimensions ($\alpha = 0.85$ for lack of achievement and $\alpha = 0.90$ for homework, respectively) were both good. We computed an average score for each dimension.

Depressive symptoms

Students' depressive symptoms were measured with a 10-item (e.g. I can never be as good as other kids) shortened Chinese version of the Children's Depression Inventory (Kovacs, 1992). The students were asked to

respond on a three-point scale ranging from 0 (*never*) to 2 (*always*). Higher scores indicated more depressive symptoms. This scale had been widely used in previous research and had yielded good reliability and validity (Jia et al., 2009). The internal consistency of this scale was also good in the present study ($\alpha = 0.79$).

Perceptions of school climate

The students' perceptions of school climate were assessed with a 23-item scale adapted from the scales by Cemalcilar (2009) and Brand et al. (2003). The scale measured students' perceptions of teacher–student relationship (e.g. our teachers respect our ideas), student–student relationship (e.g. we often help each other in class), achievement orientation (e.g. grades are very important to students) and disciplinary harshness (e.g. teachers are very strict here). Responses were scored on a four-point scale, ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). An average score was computed for each subscale. The internal consistencies of all subscales were good ($\alpha = 0.90$ for teacher–student relationship, $\alpha = 0.82$ for student–student relationship, $\alpha = 0.85$ for achievement orientation and $\alpha = 0.74$ for disciplinary harshness, respectively). Moreover, confirmatory factor analysis also indicated moderate validity; $\chi^2/\text{degrees of freedom} = 4.72$, comparative fit index = 0.91, root mean square error of approximation = 0.08.

Analytic strategy

As a new statistical technique, compared with traditional regression, regression mixture model can identify subgroups of participants, in which the predictions between independent variables and dependent variables are different (Van Horn, Jaki, Masyn, & Ramey, 2009). In the present study, following the analytic strategies employed by Liu and Lu (2011) using regression mixture model (Muthe'n & Muthe'n, 2004), we examined the differences in the relationships between Chinese high school students' academic stress and their depressive symptoms. The analysis was conducted in Mplus 3.0 (Muthe'n &

Muthe'n, 2004). We investigated models from one to three latent subgroups to find the optimal number of subgroups. We examined the fit indices, subgroup proportions, classification efficiency and interpretability in each subgroup. In the present study, Bayesian information criterion (BIC) and Akaike information criterion (AIC) were used to determine the optimal model. Lower BIC and AIC values suggested a better fit of the model (Liu & Lu, 2011; Muthe'n & Muthe'n, 2004).

The traditional method for examining the moderating effects usually relied on using interaction terms. However, in the present study, there were at least 10 interaction terms. It was very difficult to interpret. Hence, for testing the moderating effects of gender and students' perceptions of school climate on the relationships between academic stress and depressive symptoms, we used a method that was suggested by Van Horn et al. (2009). The students' gender and their perceptions of school climate were entered into the regression mixture model as predictors of latent subgroup membership by using multinomial regression. We selected one subgroup as the reference subgroup so that parameters were illustrated as the increase in log odds of being in a given subgroup for one unit increase of the predictor (Liu & Lu, 2011; Muthe'n & Muthe'n, 2004; Van Horn, et al., 2009). In addition, in this study, missing values (less than 2%) for the explanatory variables were imputed by the expectation-maximization algorithm (Dempster, Laird, & Rubin, 1977).

Results

Descriptive results

Means, standard deviations and inter-correlations among the variables are listed in Table I. The results revealed that the students' academic stress from homework and lack of achievement were positively associated with their depressive symptoms. Furthermore, as Chinese students were nested in classrooms and teachers and students in each classroom were usually the

Table I. Descriptive data and inter-correlations among academic stress, perceived school climate and depressive symptoms

Variable	1	2	3	4	5	6	7
1. Stress from homework							
2. Stress from lack of achievement	0.51**						
3. Depressive symptoms	0.19**	0.29**					
4. Teacher–student relationships	−0.31**	−0.24*	−0.33**				
5. Student–student relationships	−0.28**	−0.25*	−0.33**	0.56**			
6. Achievement orientation	−0.20**	−0.16*	−0.36**	0.52**	0.54*		
7. Disciplinary harshness	0.01	0.02	−0.13*	−0.18**	−0.28**	0.34**	
8. Gender	−0.01	−0.10	0.14**	0.05	0.08	0.01	0.02
Mean	2.41	2.44	14.33	3.36	3.31	3.28	3.06
Standard deviation	0.82	0.74	3.88	0.54	0.59	0.59	0.61

Note. $N = 368$; * $p < 0.05$, ** $p < 0.01$; for gender, 1 = male, 0 = female.

same during high school years, a series of analyses of variance was performed to determine whether there were between-group differences in the main study variables between students in each classroom. The results indicated that the students' academic stress [for lack of achievement, $F(10,357) = 3.77$, $\eta^2 = 0.10$, $p < 0.01$, and for homework, $F(10,357) = 3.93$, $\eta^2 = 0.10$, $p < 0.01$] varied in each classroom. Furthermore, we found that the students' perceptions of school climate [for teacher–student relationship, $F(10,357) = 10.66$, $\eta^2 = 0.23$, $p < 0.01$, for student–student relationship, $F(10,357) = 3.50$, $\eta^2 = 0.09$, $p < 0.01$, for achievement orientation, $F(10,357) = 7.26$, $\eta^2 = 0.17$, $p < 0.01$, and for disciplinary harshness, $F(10,357) = 7.39$, $\eta^2 = 0.17$, $p < 0.01$, respectively] also varied in each classroom. Hence, the students' class memberships were entered into the regression mixture model as a covariate during further analysis. In addition, we did not find significant differences in academic stress across boys and girls.

Identification of latent subgroups

To determine the optimal number of subgroups, we investigated models from one to three latent subgroups. Table II indicates fit indices and estimates of the proportion of students in each subgroup from the one-subgroup model to the three-subgroup model. We found that although the AIC dropped from the two-subgroup model to the three-subgroup model, the other information available supported the two-subgroup model. Furthermore, one of the three subgroups in the three-subgroup model consisted of 1% participants, which was too small. Thus, the two-subgroup model was preferred to form the basis for the further analysis of the present study. Additionally, the entropy of the two-subgroup model (0.83) was high, which indicated that the two-subgroup model classified individuals well.

For the two subgroups, one subgroup contained about 90% of the participants. As shown in Table III, the results indicated that in this subgroup, the students' academic stress from lack of achievement positively predicted their depressive symptoms ($\beta = 1.08$, $p < 0.01$). Because this

Table II. Fit indices for regression mixture model

Criterion	One-subgroup	Two-subgroup	Three-subgroup
AIC	2010.17	1934.12	1917.30
BIC	2029.71	1973.20	1975.92
Subgroup 1 (%)	100	10	1
Subgroup 2 (%)		90	15
Subgroup 3 (%)			84

Note. $N = 368$; AIC, Akaike information criterion; BIC, Bayesian information criterion. One-subgroup referred to the regression mixture model that identified only one subgroup. Two-subgroup referred to the regression mixture model that identified two subgroups. Three-subgroup referred to the regression mixture model that identified three subgroups.

Table III. Parameter estimates and standard errors (SEs) for the two-subgroup model

Parameter	Not-significant effects (10%)		Significant effects (90%)	
	<i>B</i>	SE	<i>B</i>	SE
Intercept	17.55	2.70	11.34	0.67
Stress from homework	0.59	1.39	0.14	0.25
Stress from lack of achievement	2.86	1.74	1.08**	0.14
Class memberships	−0.76	0.50	−0.15	0.05

Note. $N = 368$; ** $p < 0.01$.

subgroup was characterized by the positive effects of students' academic stress on their depressive symptoms, it was denoted as the *significant effects* subgroup. For the other subgroup that was made up of about 10% of the participants, the results indicated that the students' academic stress from neither lack of achievement nor homework significantly predicted their depressive symptoms. In contrast to the first subgroup, this subgroup was thus termed as the *not-significant effects* subgroup.

Moderating effects of gender and students' perceptions of school climate

The next analysis assessed the moderating effects of students' gender and perceptions of school climate on the relationships between their academic stress and depressive symptoms. The results indicated that when we added the predictors, the entropy of the model did not significantly change and the parameter estimates for each subgroup changed slightly. The effects of academic stress from lack of achievement remained strong and significant for the significant effects subgroup but not significant for the subgroup of not-significant effects. The findings suggested that the results of the model were robust. As revealed in Table IV, results showed that the gender ($\beta = 1.28$, $p < 0.01$) and achievement orientation ($\beta = 1.30$, $p < 0.01$) significantly predicted the subgroup membership, whereas the other three dimensions of the students' perceptions of school climate did not significantly predict the subgroup membership. Furthermore, the

Table IV. Multinomial regression of subgroup membership on gender and perceived school climate

Parameter	<i>B</i>	SE	OR
Significant versus not significant			
Female	1.28**	0.44	3.60
Teacher–student relationships	0.66	0.54	1.93
Student–student relationships	0.13	0.48	1.14
Achievement orientation	1.30**	0.57	3.67
Disciplinary harshness	0.50	0.47	1.64

Note. $N = 368$; OR, odds ratio; SE, standard error; ** $p < 0.01$.

results indicated that female students were about 3.60 times more likely than boys to be in the significant effects subgroup (odds = 3.60) than in the subgroup of not-significant effects. Furthermore, the students who perceived academic achievement was greatly emphasized in their classrooms were more likely to be in the significant effects subgroup than in the not-significant effects subgroup (odds = 3.67).

Discussion

As previous research on adolescents' stress and depressive symptoms often focused on the average effects and ignored differences in the effects of adolescents' stress on their depressive symptoms, in the present study, we expand the existing literature by examining the relationships between Chinese high school students' academic stress and their depressive symptoms. By using the regression mixture model that can identify different effects of predictors on outcomes (Muthe'n & Muthe'n, 2004; Van Horn, et al., 2009), the present study provided strong evidence regarding the differential effects of Chinese high school students' academic stress on their depressive symptoms. Furthermore, we examined the moderating effects of gender and students' perceptions of school climate on the relationships between academic stress and their depressive symptoms.

In the descriptive results, we found that Chinese high school students got relatively high levels of academic stress and that academic stress was significantly associated with their depressive symptoms, which is consistent with the previous empirical findings from other cultures (Byrne, et al., 2007; Deardorff, et al., 2003; Lazaratou, et al., 2010). It suggests that there is a consistency in the relationships between students' stress during adolescence and their depressive symptoms. Furthermore, the results indicated that Chinese high school students' academic stress was similar across gender. The present findings supported the previous findings that adolescents' school-related stressors were similar across girls and boys (Seiffge-Krenke et al., 2009) but did not support the other empirical findings that boys were more likely to report achievement-related stressors than girls (Gore et al., 1993; Leadbeater et al., 1995; Rudolph, 2002).

For our first hypothesis, we expected that there would be different relationships between Chinese high school students' academic stress and their depressive symptoms. The results supported this hypothesis. As listed in Table II, the regression mixture model identified two different kinds of subgroups. In line with previous findings from various cultures (Byrne, et al., 2007; Deardorff, et al., 2003; Lazaratou, et al., 2010), we found that the majority of students' academic stress from lack of achievement positively predicted their depressive symptoms. However, we also found that nearly 10% of the students' academic stress did not significantly predict their depressive symptoms. Combined with the previous empirical study of the relationships between Chinese high school students' academic stress and their academic achievement (Liu & Lu, 2011), the

present findings suggest that although facing high levels of academic stress, some students may overcome the negative effects of academic stress on their developmental outcomes (Gomez & McLaren, 2006). The findings also provide support for theories of resilience. In addition, the findings imply that there may be moderators between the relationships of Chinese high school students' academic stress and their depressive symptoms.

After the first hypothesis was confirmed, the second purpose of the present study was to test the moderating effects of gender and students' perceptions of school climate on the relationships between academic stress and depressive symptoms. As shown in Table IV, the results indicated that the female students were more likely to be in the significant effects subgroup than in the not-significant effects subgroup. The findings support our second hypothesis that girls' depressive symptoms were more likely to be influenced by stressors. Combined with the descriptive results showing that academic stress did not differ across boys and girls, the findings provide support for the moderational-stress reactivity model that adolescent girls respond to general stressors with higher levels of depressive symptoms than boys (Ge, et al., 1994; MacKinnon, et al., 2002; Rudolph, 2002; Wagner & Compas, 1990).

For the moderating effects of students' perceptions of school climate, the results partly supported our hypothesis and revealed that if students perceived that academic achievement was greatly emphasized in their classrooms, academic stress was likely to increase their depressive symptoms. Furthermore, the results suggested that the school climate could not only act as a protective factor (A Loukas & Robinson, 2004; Luthar, Cicchetti, & Becker, 2000) but also serve as a factor that can elevate negative impacts of risk factors on students' developmental outcomes. On the other hand, in line with the previous findings that when adolescents grow up, the effects of their interpersonal relationships usually lessen (Seiffge-Krenke, et al., 2009), we found that students' perceptions of teacher–student relationships and student–student relationships in their school settings did not moderate the relationships between their academic stress and depressive symptoms.

The present study provides some implications for school practices as well. For instance, teachers in the school can reduce Chinese high students' depressive symptoms by reducing their academic stress. They may not assign too much additional homework to students. Moreover, they may try to use different kinds of teaching methods to make students understand their learning tasks in some easier ways. The practices are more efficient for girls than boys. Furthermore, teachers should not overemphasize academic achievement, particularly that academic stress in a classroom has already reached a high level. These practices may benefit students' adjustment by reducing the negative effects of academic stress on their depressive symptoms.

Limitation and future directions

There are some limitations in the present study. Firstly, the measures of students' academic stress, depressive symptoms and their perceptions of school climate were based on self-report scales. Secondly, the participants come from only two Chinese high schools; we cannot generalize the present findings to the larger Chinese population. Thirdly, similar to several other studies, the cross-sectional nature of the present study did not allow us to examine the causal effects; longitudinal or experimental studies may be helpful in clarifying the causal mechanism of the relationships between Chinese high school students' academic stress and depressive symptoms. Finally, although we used subgroup memberships

as a covariate during analysis, a further direction of the present study is to collect data from more classes and do a multilevel analysis such as hierarchical linear modeling or multilevel structural equation modeling.

Conclusion

Chinese high school students' academic stress had different effects on their depressive symptoms. Some students were vulnerable to academic stress, while others were not. Furthermore, gender and students' perceptions of school climate can moderate the relationships between Chinese high school students' academic stress and their depressive symptoms.

REFERENCES

- Allgood-Merten, B., Lewinsohn, P. M., & Hops, H. (1990). Sex differences and adolescent depression. *Journal of Abnormal Psychology, 99*, 55–63.
- Brand, S., Felner, R., Shim, M., Seitsinger, A., & Dumas, T. (2003). Middle school improvement and reform: Development and validation of a school-level assessment of climate, cultural pluralism, and school safety. *Journal of Educational Psychology, 95*, 570–588.
- Byrne, D. G., Davenport, S. C., & Mazanov, J. (2007). Profiles of adolescent stress: The development of the adolescent stress questionnaire (ASQ). *Journal of Adolescence, 30*, 393–416.
- Cemalcilar, Z. (2009). Schools as socialisation contexts: Understanding the impact of school climate factors on students' sense of school belonging. *Applied Psychology, 59*, 243–272.
- Davies, P. T., & Windle, M. (1997). Gender-specific pathways between maternal depressive symptoms, family discord, and adolescent adjustment. *Developmental Psychology, 33*, 657–668.
- Deardorff, J., Gonzales, N. A., & Sandler, I. N. (2003). Control beliefs as a mediator of the relationship between stress and depressive symptoms among inner city adolescents. *Journal of Abnormal Child Psychology, 31*, 205–217.
- Dempster, A. P., Laird, N. M., & Rubin, D. B. (1977). Maximum likelihood from incomplete data via the EM algorithm. *Journal of the Royal Statistical Society, 39*, 1–38.
- Ge, X., Lorenz, F. O., Conger, R. D., Elder, G. H., & Simons, R. L. (1994). Trajectories of stressful life events and depressive symptoms during adolescence. *Developmental Psychology, 30*, 467–483.
- Gomez, R., & McLaren, S. (2006). The association of avoidance coping style, and perceived mother and father support with anxiety/depression among late adolescents: Applicability of resiliency models. *Personality and Individual Differences, 40*, 1165–1176.
- Gore, S., Aseltine, R. H., & Colten, M. E. (1993). Gender, social-relational involvement and depression. *Journal of Research on Adolescents, 3*, 101–125.
- Hampel, P., & Petermann, F. (2006). Perceived stress, coping, and adjustment in adolescents. *Journal of Adolescent Health, 38*, 409–415.
- Hankin, B. L., Mermelstein, R., & Roesch, L. (2007). Sex differences in adolescent depression: Stress exposure and reactivity models. *Child Development, 78*, 279–295.
- Jia, Y. M., Way, N., Ling, G. M., Yoshikawa, H., Chen, X. Y., Hughes, D., et al. (2009). The influence of student perceptions of school climate on socioemotional and academic adjustment: A comparison of Chinese and American adolescents. *Child Development, 80*, 1514–1530.
- Kovacs, M. (1992). *Children's Depression Inventory manual*. North Tonawanda, NY: Multi-Health Systems.
- Kuperminc, G. P., Leadbeater, B. J., & Blatt, S. J. (2001). School social climate and individual differences in vulnerability to psychopathology among middle school students. *Journal of School Psychology, 39*, 141–159.
- Lazaratou, H., Dikeos, D., Anagnostopoulos, D., & Soldatos, C. (2010). Depressive symptomatology in high school students: The role of age, gender and academic pressure. *Community Mental Health Journal, 46*(3), 289–295.
- Leadbeater, B. J., Blatt, S. J., & Quinlan, D. M. (1995). Gender-linked vulnerabilities to depressive symptoms, stress, and problem behaviors in adolescents. *Journal of Research on Adolescence, 5*, 1–29.
- Leadbeater, B. J., Kuperminc, G. P., Hertzog, C., & Blatt, S. J. (1999). A multivariate model of gender differences in adolescents' internalizing and externalizing disorders. *Developmental Psychology, 35*, 1268–1282.
- Lerner, R. M., & Castellino, D. R. (2002). Contemporary developmental theory and adolescence: Developmental systems and applied developmental science. *Journal of Adolescent Health, 31*, 122–135.
- Liu, Y., & Lu, Z. (2011). The Chinese high school student's stress in the school and academic achievement. *Educational Psychology: An International Journal of Experimental Educational Psychology, 31*(1), 27–35.
- Loukas, A., & Murphy, J. L. (2007). Middle school student perceptions of school climate: Examining protective functions on subsequent adjustment problems. *Journal of School Psychology, 45*, 293–309.
- Loukas, A., & Robinson, S. (2004). Examining the moderating role of perceived school climate in early adolescent adjustment. *Journal of Research on Adolescence, 14*(2), 209–233.
- Luthar, S. S., Cicchetti, D., & Becker, B. (2000). The construct of resilience: A critical evaluation and guidelines for future work. *Child Development, 71*, 543–562.
- MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods, 7*, 83–104.
- Muthe'n, B., & Muthe'n, L. K. (2004). *Mplus user's guide* (3rd ed.). Los Angeles, CA: Author.
- Rudolph, K. D. (2002). Gender differences in emotional responses to interpersonal stress during adolescence. *Journal of Adolescent Health, 30*, 3–13.
- Seiffge-Krenke, I., Aunola, K., & Nurmi, J.-E. (2009). Changes in stress perception and coping during adolescence: The role of situational and personal factors. *Child Development, 80*, 259–279.
- Van Horn, M. L., Jaki, T., Masyn, K., & Ramey, S. L. (2009). Assessing differential effects: Applying regression mixture models to identify variations in the influence of family resources on academic achievement. *Developmental Psychology, 45*, 1298–1313.
- Wagner, B. M., & Compas, B. E. (1990). Gender, instrumentality, and expressivity: Moderators of the relation between stress and psychological symptoms during adolescence. *American Journal of Community Psychology, 18*, 383–406.
- Wu, W. Q., & Sun, L. L. (2008). The relations between academic stress and mental health of the Chinese middle school students. *Mental Health Education for Students in Elementary Schools and Middle Schools, 24*, 14–16.

Appendix 1

Academic stress questionnaire

1. To finish my homework makes me feel pressure.
2. My homework is a burden for me.
3. I have a lot of homework to do.
4. Learning tasks in my class are so difficult.

5. In classes, I have to learn something that is hard for me to understand.
 6. Exams are usually difficult for me.
 7. To solve the problems assigned by teachers is so difficult.
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