

Stress, Coping and Mental Health in Chinese Adolescents —in View of Puberty and Gender

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Abstract: *Adolescents have a particularly high risk of emotional and behavioral problems and of experiencing the onset of psychiatric disorders. This study aimed to investigate the status of middle- and high-school students in China and to examine the extent to which puberty, gender, stress types and coping styles are related to psychological maladjustment and psychiatric disorders. The sample consisted of 9565 adolescents recruited from 38 middle schools and 16 high schools in China. The results revealed that puberty is related to increasing stress levels, less adaptive coping and more avoidant coping, and higher incidence of both maladjustment and psychiatric disorders. Compared with girls, boys reported higher levels of non-interpersonal stress and applied less adaptive coping and more avoidant coping. Regarding mental health, boys reported higher levels of maladjustment, whereas girls reported higher levels of psychiatric disorders. Interpersonal stress, problem-focused and avoidant coping were associated with both adolescent maladjustment and psychiatric disorders, while cognition-focused coping was only predictive in maladjustment but not in psychiatric disorders. All these findings emphasized the necessity of more targeted interventional programs considering gender, puberty, stress type and coping strategies.*

Keywords: *Stress; Coping; Mental Health; Chinese Context; Adolescents.*

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1. Introduction

Most mental disorders begin during adolescence. Moreover, studies have shown that 10 to 20% of adolescents worldwide are affected by mental health problems, which accounts for a large portion of the global burden of mental health disease² (Kieling et al., 2011). Other studies have found that adolescents are particularly vulnerable to a wide range of psychological maladjustment, including social, emotional and behavioral problems and psychiatric disorders, such as depression, anxiety, schizophrenia, and obsessive-compulsive disorder^{3,4,5,6,7,8,9}. A number of factors have been associated with the emergence of psychological disorders in adolescence, such as stress, coping style, cognitive style, gender, the timing of puberty, neurobiological changes, parenting, peer relationships, social contexts, etc.^{10,11,12,13,14,15,16}.

² Kieling, C., Baker-Henningham, H., Belfer, M., Conti, G., Ertem, I., Omigbodun, O., Rahman, A.: “Child and adolescent mental health worldwide: Evidence for action.” *Lancet*, 378, pp.1515-1525(2011)

³ Deković, M., Buist, K. L., & Reitz, E.: “Stability and changes in problem behavior during adolescence: Latent growth analysis.” *Journal of Youth and Adolescence*, 33, pp.1-12(2004)

⁴ Harder, V. S., Mutiso, V. N., Khasakhala, L. I., Burke, H. M., Rettew, D. C., Ivanova, M. Y., & Ndeti, D. M.: “Emotional and behavioral problems among impoverished Kenyan youth: Factor structure and sex-differences.” *Journal of Psychopathology and Behavioral Assessment*, 36, pp.580-590(2014)

⁵ Magiati, I., Ponniah, K., Ooi, Y. P., Chan, Y. H., Fung, D., & Woo, B.: “Self-reported depression and anxiety symptoms in school-aged Singaporean children.” *Asia-Pacific Psychiatry*, 7, pp.91-104(2013)

⁶ Magklara, K., Bellos, S., Niakas, D., Stylianidis, S., Kolaitis, G., Mavreas, V., & Skapinakis, P.: “Depression in late adolescence: A cross-sectional study in senior high schools in Greece.” *BMC Psychiatry*, 15, p.199(2015)

⁷ Mills, R., Scott, J., Alati, R., O’ Callaghan, M., Najman, J. M., & Strathearn, L.: “Child maltreatment and adolescent mental health problems in a large birth cohort.” *Child Abuse & Neglect*, 37, pp.292-302 (2013)

⁸ Patel, V., Flisher, A. J., Hetrick, S., & McGorry, P.: “Mental health of young people: A global public-health challenge.” *Lancet*, 369, pp.1302-1313(2007)

⁹ Sawyer, M. G., Arney, F. M., Baghurst, P. A., Clark, J. J., Graetz, B. W., Kosky, R. J., & Zubrick, S. R.: “The mental health of young people in Australia.” Canberra: Mental Health and Special Programs Branch, Commonwealth Department of Health and Aged Care,(2000)

¹⁰ Cairns, K. E., Yap, M. B. H., Pilkington, P. D., & Jorm, A. F.: “Risk and protective factors for depression that adolescents can modify: A systematic review and meta-analysis of longitudinal studies.” *Journal of Affective Disorders*, 169, pp.61-75(2014)

¹¹ Corrieri, S., Heider, D., Conrad, I., Blume, A., König, H. H., & Riedel-Heller, S. G.: “School-based prevention programs for depression and anxiety in adolescence: A systematic review.” *Health Promotion International*, 29, pp.427-441(2014)

¹² Hampel, P., & Petermann, F.: “Perceived stress, coping, and adjustment in adolescents.” *Journal of Adolescent Health*, 38, pp.409-415(2006)

¹³ Liu, R. T.: “Stress generation: Future directions and clinical implications.” *Clinical Psychology Review*, 33, pp.406-416(2013)

¹⁴ Matud, M. P.: “Gender differences in stress and coping styles.” *Personality and Individual Differences*, 37, pp.1401-1415(2004)

¹⁵ Niarchou, M., Zammit, S., & Lewis, G.: “The Avon longitudinal study of parents and children (ALSPAC) birth cohort as a resource for studying psychopathology in childhood and adolescence: A summary of findings for depression and psychosis.” *Social Psychiatry and Psychiatric Epidemiology*, 50, pp.1017-1027(2015)

¹⁶ Rudolph, K. D., Troop-Gordon, W., Lambert, S. F., & Natsuaki, M. N.: “Long-term consequences of pubertal timing for youth depression: Identifying personal and contextual pathways of risk.” *Development and Psychopathology*, 26, pp.1423-1444(2014)

Stress has been emphasized as one of the most important risk factors for adolescent maladjustment and psychiatric disorders, such as the first onset and recurrence of depression and anxiety^{17,18,19}. In the past 20 years, the stress generation model has been increasingly emphasized, in addition to the traditional stress exposure model²⁰. Compared with independent stressors, dependent stressors, particularly within interpersonal contexts, appear to be associated with a greater risk of depression^{21,22,23}. Longitudinal studies have demonstrated that stress is related to both internalizing and externalizing problems in children and adolescents^{24,25}. Since human beings are positive generator instead of negative receivers of their stress environment, the way they cope with stress has been proved to be an important intermediary factor. Coping is defined as the constantly changing cognitive and behavioral efforts of an individual to manage specific external and/or internal demands that are considered exhausting or in excess of their resources²⁶; ineffective coping has been identified as another significant risk factor of psychiatric illness²⁷. Several categories of coping have been developed, including a 3-dimensional model distinguishing 2 adaptive coping styles (problem-focused and emotion-focused) and 1 maladaptive coping style²⁸. In the 3-dimensional model, problem-focused coping represents the cognitive and behavioral attempts used to modify or eliminate a stressful situation, whereas emotion-focused coping attempts to regulate the emotional responses elicited by situations²⁹. However, several of the emotion-focused coping statements used by Hampel and Petermann (2005) focused not only on emotion but also on cognition (e.g.,

¹⁷ Compas, B. E.: "Coping with stress during childhood and adolescence." *Psychological Bulletin*, 101, pp.393-403(1987)

¹⁸ Liu, R. T.: "Stress generation: Future directions and clinical implications." *Clinical Psychology Review*, 33, pp.406-416(2013)

¹⁹ Schmaus, B. J., Laubmeier, K. K., Boquiren, V. M., Herzer, M., & Zakowski, S. G.: "Gender and stress: differential psychophysiological reactivity to stress reexposure in the laboratory." *International Journal of Psychophysiology*, 69, pp.101-106(2008)

²⁰ Liu, R. T., & Alloy, L. B.: "Stress generation in depression: A systematic review of the empirical literature and recommendations for future study." *Clinical Psychology Review*, 30, pp.582-593(2010)

²¹ Hammen, C.: "Generation of stress in the course of unipolar depression." *Journal of Abnormal Psychology*, 100, pp.555-561(1991)

²² Hammen, C.: "Stress generation in depression: Reflections on origins, research, and future directions." *Journal of Clinical Psychology*, 62, pp.1065-1082(2006)

²³ Liu, R. T.: "Stress generation: Future directions and clinical implications." *Clinical Psychology Review*, 33, pp.406-416(2013)

²⁴ Compas, B. E., Connor-Smith, J. K., Saltzman, H., Thomsen, A. H., & Wadsworth, M. E.: "Coping with stress during childhood and adolescence: Problems, progress, and potential in theory and research." *Psychological Bulletin*, 127, pp.87-127(2001)

²⁵ Compas, B. E., Orosan, P. G., & Grant, K. E.: "Adolescent stress and coping: implications for psychopathology during adolescence." *Journal of Adolescence*, 16, pp.331-349(1993)

²⁶ Lazarus, R. S., & Folkman, S.: "Stress." *Appraisal, and Coping*, p.725(1984)

²⁷ Hampel, P., & Petermann, F.: "Perceived stress, coping, and adjustment in adolescents." *Journal of Adolescent Health*, 38, pp.409-415(2006)

²⁸ Hampel, P., & Petermann, F.: "Perceived stress, coping, and adjustment in adolescents." *Journal of Adolescent Health*, 38, pp.409-415(2006)

²⁹ Lazarus, R. S., & Folkman, S.: "Stress." *Appraisal, and Coping*, p.725(1984)

“I say to myself: It isn’t so serious” and “I keep in mind: It isn’t a big deal”)³⁰. Therefore, this factor is referred to as cognition-focused coping in this study, which is itself a commonly applied strategy used in conjunction with behavioral adjustment in clinical prevention. Furthermore, the statements of maladaptive coping used in this study were all applied to the passive avoidance category developed by Hampel and Petermann (2005) (e.g., “I’d like to rest in order to forget the troubles” and “I’d like to wait until the situation gets better”), and the 3-dimensional model employed in the present study thus became problem-focused coping, cognition-focused coping and avoidant coping. Two broad dimensions have been repeatedly identified, approach strategies and avoidant strategies, though various categorization approach methods have been developed (Herman-Stahl, Stemmler, & Petersen, 1994). According to the result of factor analysis and the original scale, we classified two approach strategies, the problem-focused coping and cognition-focused coping, and one avoidant strategy, the avoidant coping.

The traditional stress-coping model is undoubtedly classic, but we need to develop it further within the contexts of specific objects. As to adolescents, the tremendous development they experience in one year might be more than what adults experience in decade. Besides, adolescents experience their most important sexual development at puberty, and since then their gender role, gender consciousness and gender difference become much more significant. In order to apply the targeted adolescent psychological health education, the role of gender and puberty status in the development of mental disorders must be emphasized. Boys have been shown a greater likelihood of developing externalizing disorders, autism, attention deficit hyperactivity, conduct and oppositional disorders, whereas girls are reported to suffer from a higher risk of internalizing disorders, adolescent and adult depressive disorders and anxiety disorders³¹. However, the causal pathways of these disorders remain unclear. In addition, pre-pubertal incidence rates of depression and anxiety disorders were found to be higher for boys than girls³². A more-mature pubertal status and early timing of puberty has been associated with depression in girls, whereas a less-mature pubertal status and late timing of puberty affects boys³³. Studies on the Chinese population have suggested that pre-pubescent individuals have better learning attitudes, social relationships, and self-concepts and are better adjusted than early-, middle-, and late-adolescents^{34,35}. According to previous studies, the average pubertal timing of girls (12.08 years) and boys (12.57 years) in Shanghai, China are both

³⁰ Hampel, P., & Petermann, F.: “Age and gender effects on coping in children and adolescents.” *Journal of Youth and Adolescence*, 34, pp.73-83(2005)

³¹ Hampel, P., & Petermann, F.: “Perceived stress, coping, and adjustment in adolescents.” *Journal of Adolescent Health*, 38, pp.409-415(2006)

³² Wesselhoeft, K. M.: “Review of Muslim childhood: Religious nurture in a European context.” *Journal of Religion*, 95, pp.280-282(2015)

³³ Conley, C. S., & Rudolph, K. D.: “The emerging sex difference in adolescent depression: Interacting contributions of puberty and peer stress.” *Development and Psychopathology*, 21, pp.593-620(2009)

³⁴ Gao, Y., & Zhang, R.: “The investment of psychological health of Beijing primary and middle school students with different developmental stages.” *Chinese School Health*, 32, pp.486-487(2011)

³⁵ Zhang, Y., & Yu, G.: “The trend of mental health and gender differences in early puberty.” *Chinese Journal of Clinical Psychology*, 12, pp.380-382(2004)

later than pubertal timing in western countries^{36,37}. Since Shanghai is the only city in China in which sixth grade is included in middle schools—and because the average age of sixth grade students is 11.5 years old—the current research divided all the participants into three groups: sixth grade as the pre-puberty group, seventh to ninth grade as the early puberty group, and tenth to twelfth grade as the late puberty group.

Puberty and gender affect almost every step in the stress process. Regarding the effects of puberty, it is generally agreed that increases in puberty status are associated with higher levels of stress³⁸. Gender plays an important role in one's determining whether a situation should be perceived as stressful and identifying the appropriate reaction to stress³⁹. Some studies on children and adolescents have suggested that although depression is associated with interpersonal stress in both genders, adolescent girls seem to experience more interpersonal stress and use more social support than boys^{40,41}. Other studies, though very few, have found the opposite, i.e., that boys experience more interpersonal and non-interpersonal dependent stress than girls^{42,43}. Based on these findings, it is clear that previous studies have not reached at a consensus regarding the effects of gender on stress perception.

Studies have also shown the effects of puberty and gender on coping styles. The coping process is a key topic for adolescents because they must address a great number of stressors with limited numbers of coping strategies. Girls have been shown to apply more emotion-focused coping and maladaptive coping than boys, but the findings on problem-focused coping are inconsistent, which suggests that girls may be prone to developing physical and mental disorders^{44,45,46,47}. Besides, studies that applied models other than the

³⁶ Li, D., Shi, H., Wang, W., Zhang, Y., Tan, H., & Wang, Z.: "An epidemiologic study of girls' pubertal onset in Shanghai." *Chinese Journal of Child Care*, 21, pp.234-254(2012)

³⁷ Shi, H., Li, D., Wang, W., Zhang, Y., Tan, H., & Wang, Z.: "An epidemiologic study of boys' pubertal onset in Shanghai." *Chinese Journal of Child Care*, 20, pp.975-978(2012)

³⁸ Hampel, P., & Petermann, F.: "Age and gender effects on coping in children and adolescents." *Journal of Youth and Adolescence*, 34, pp.73-83(2005)

³⁹ Matud, M. P.: "Gender differences in stress and coping styles." *Personality and Individual Differences*, 37, pp.1401-1415(2004)

⁴⁰ Hampel, P., & Petermann, F.: "Perceived stress, coping, and adjustment in adolescents." *Journal of Adolescent Health*, 38, pp.409-415(2006)

⁴¹ Rudolph, K. D., & Hammen, C.: "Age and gender as determinants of stress exposure, generation, and reactions in youngsters: A transactional perspective." *Child Development*, 70, pp.660-677(1999)

⁴² Safford, S. M., Alloy, L. B., Abramson, L. Y., & Crossfield, A. G.: "Negative cognitive style as a predictor of negative life events in depression-prone individuals: A test of the stress generation hypothesis." *Journal of Affective Disorders*, 99, pp.147-154(2007)

⁴³ Shih, J. H., Eberhart, N. K., Hammen, C. L., & Brennan, P. A.: "Differential exposure and reactivity to interpersonal stress predict sex differences in adolescent depression." *Journal of Clinical Child and Adolescent Psychology*, 35, pp.103-115(2006)

⁴⁴ Compas, B. E., Malcarne, V. L., & Fondacaro, K. M.: "Coping with stressful events in older children and young adolescents." *Journal of Consulting and Clinical Psychology*, 56, pp.405-411(1988)

⁴⁵ Donaldson, D., Prinstein, M. J., Danovsky, M., & Spirito, A.: "Patterns of children's coping with life stress: Implications for clinicians." *American Journal of Orthopsychiatry*, 70, pp.351-359(2000)

⁴⁶ Frydenberg, E., & Lewis, R.: "Boys play sport and girls turn to others: Age, gender and ethnicity as determinants of coping." *Journal of Adolescence*, 16, pp.253-266(1993)

⁴⁷ Hampel, P., & Petermann, F.: "Perceived stress, coping, and adjustment in adolescents." *Journal of*

3-dimensional model have also shown that girls scored significantly higher than boys on the emotional and avoidance coping styles and lower on rational and detachment coping⁴⁸. Socialization patterns may explain this difference by restricting men from freely accepting and expressing their emotion and hindering women from undertaking proactive problem-solving strategies. Unequal social status may also limit women from perceiving their full resources for coping⁴⁹. As to the interaction between puberty and gender, studies have shown that girls in early adolescence are a high-risk population because they apply less adaptive and more maladaptive coping in response to common stressors⁵⁰.

As to the association between stress, coping style, maladjustment and psychiatric disorders, previous studies have shown that adaptive coping styles were negatively related to emotional and behavioral problems, whereas perceived stress and maladaptive coping were positively related to adjustment problems⁵¹. Other studies have also suggested that although the type of stressor was not consistently associated with adolescent symptomatology, using an avoidant coping style was a significant predictor of adolescent symptomatology at all times⁵². It is important to specify the influence of all these factors on adolescent mental health in order to make proper interventional plan.

In summary, the main purpose of the present study is to perform the following tasks:

1. To investigate the role of pubertal stages and gender on the occurrence of maladjustment and psychiatric disorders, perceived stress in reaction to both non-interpersonal and interpersonal stressors, and coping styles in Chinese adolescence. With respect to the effects of puberty, we hypothesized that there will be less problem-focused and cognition-focused coping and that there will be more evidence of avoidant coping, maladjustment and psychiatric disorders as puberty progresses. Regarding the effects of gender, it is predicted that girls will show a higher rate of internalizing problems, interpersonal stress, psychiatric disorders, cognition-focused coping and avoidant coping, whereas boys will show a higher rate of externalizing problems, non-interpersonal stress and problem-focused coping.

2. To examine the associations between stress, coping style, maladjustment and psychiatric disorders in adolescence. We predict that problem-focused and cognition-focused coping styles are negatively related to maladjustment and psychiatric disorders, whereas both interpersonal and non-interpersonal stress, and avoidant coping will have the opposite effect. Among all these factors, avoidant coping is predicted to be the most influential factor to maladjustment and psychiatric disorders.

2. Methods

2.1 Ethics Statement

Adolescent Health, 38, pp.409-415(2006)

⁴⁸ Matud, M. P.: "Gender differences in stress and coping styles." *Personality and Individual Differences*, 37, pp.1401-1415(2004)

⁴⁹ Matud, M. P.: "Gender differences in stress and coping styles." *Personality and Individual Differences*, 37, pp.1401-1415(2004)

⁵⁰ Compas, B. E., Orosan, P. G., & Grant, K. E.: "Adolescent stress and coping: implications for psychopathology during adolescence." *Journal of Adolescence*, 16, pp.331-349(1993)

⁵¹ Hampel, P., & Petermann, F.: "Perceived stress, coping, and adjustment in adolescents." *Journal of Adolescent Health*, 38, pp.409-415(2006)

⁵² Seiffge-Krenke, I.: "Causal links between stressful events, coping style, and adolescent symptomatology." *Journal of Adolescence*, 23, pp.675-691(2000)

Institutional Review Board (IRB) of the school of social development and public policy, Fudan University, has approved this study. Human participants owned the right of refusal and the right to be informed. Oral informed consent have been obtained from the participants. The current research has received oral informed consent from students' parents, care takers or guardians through the parent-teacher meetings held by middle and high schools, and parents, care takers or guardians did have the right to raise their opinions about the research or ask to be excluded from the research. Because of the relatively large sample size, it is difficult to collect written consent from all the participants, thus verbal consent were chosen instead. However, the psychological teachers (mainly in charge of teaching lessons about mental health and organizing school activities promoting students' mental health) and head teachers of every school were in charge of the tests and made records of the whole process of preparation and data collecting within their own school. Since current research was supported by Shanghai government, the official ethnic committee of Shanghai Yangpu Teacher Training Institute approved this consent procedure.

2.2 Sample

The participants in the present study consisted of 9565 adolescents who were recruited from 38 middle schools and 16 high schools in Shanghai, China. The subjects ranged in age from 10 to 20 years old ($M=13.33$, $SD=1.72$, 4827 boys, 4738 girls). The students from the middle schools were in the sixth grade ($n=2142$, 1131 boys, 1011 girls, $M=11.40$, $SD=0.53$ years), seventh grade ($n=2119$, 1082 boys, 1037 girls, $M=12.37$, $SD=0.55$ years), eighth grade ($n=2120$, 1067 boys, 1053 girls, $M=13.38$, $SD=0.53$ years) and ninth grade ($n=1792$, 869 boys, 923 girls, $M=14.37$, $SD=0.56$ years). The high school students were in the tenth grade ($n=481$, 240 boys, 241 girls, $M=15.42$, $SD=0.57$ years), eleventh grade ($n=478$, 227 boys, 251 girls, $M=16.39$, $SD=0.56$ years), and twelfth grade ($n=426$, 206 boys, 220 girls, $M=17.42$, $SD=0.69$ years). Students from all grades participated in the research, where 2 classes each grade in every middle school and 1 class each grade in every high school were chosen. This study divided all the samples into three groups: sixth grade as the pre-puberty group ($n=2142$, 1131 boys, 1011 girls, $M=11.40$, $SD=0.53$ years), seventh to ninth grade as the early puberty group ($n=5883$, 3018 boys, 3013 girls, $M=13.32$, $SD=0.97$ years), and tenth to twelfth grade as the late puberty group ($n=1385$, 673 boys, 712 girls, $M=16.37$, $SD=1.00$ years). A chi-square test conducted on gender by grade indicated an equal distribution of sample size ($X^2(2) = .36$, ns). All the participants were native Chinese speakers who lived in urban region of China. The research was under the supervision of Chinese Government. The students were asked to complete the measures while in class under teacher supervision, and they owned the right of refusal and the right to be informed. Oral informed consent have been obtained from the participants.

2.3 Measures

2.3.1 Stress

Stress was measured by the Adolescent Self-Rating Life Event Check List (ASLEC) (Xin & Yao, 2015), which is used to obtain the self-rating of negative events. The ASLEC consists of 6 subscales with 27 items, and has been demonstrated to have good reliability and validity. Adolescents first indicated whether or not the events had occurred in the past year. If they had not experienced the targeted events, "0=never happened" was chosen. If the specific event had occurred, the students then indicated the impact of the event on a

5-point Likert scale (1= no impact; 2= slight impact, 3= moderate impact; 4= heavy impact; and 5= extremely severe impact). In the present sample, a factor analysis of the items supported the assignment of items to six factors: interpersonal conflicts, poor health, emergency, academic stress, parental stress, and negative family events. The six factors explained a combined 71% of the total variance. Internal consistency measured by Cronbach's alpha was .78 for the interpersonal conflicts factor, .82 for poor health, .84 for emergency, .77 for academic stress, .76 for parental stress, and .79 for negative family events.

Interpersonal stress consisted of 2 factors (interpersonal conflicts and parental stress), and non-interpersonal stress consisted of 4 factors (poor health, emergency, academic stress, and negative family events). Cronbach's alpha for interpersonal stress and non-interpersonal stress was .85 and .93, respectively.

2.3.2 Coping style

Coping styles were assessed by the Simplified Coping Style Questionnaire (SCSQ) (Wang & Zhang, 2014). The SCSQ consists of 2 subscales that measure positive coping and negative coping based on 20 coping items. In this self-reported measure, adolescents indicated on a 4-point Likert scale (1= never applied; 2= occasionally applied; 3= sometimes applied; and 4= frequently applied) the likelihood of each coping response used. Instead of the original 2-dimension model, an exploratory factor analysis was applied. Principle component factor analyses provided three higher-order factors with Eigenvalues greater than 1.00 that explained 43% of the total variance. Based on Hampel and Petermann (2006) and on the renaming of emotion-focused coping to cognition-focused coping, the three factors were labeled "problem-focused coping" (e.g., I search for several methods to address the situation), "cognition-focused coping" (e.g., I try to view the problem as not so serious) and "avoidant coping" (e.g., I try to forget about the problem). Cronbach's alpha for the problem-focused, cognition-focused, and avoidant coping factors was .79, .70 and .73, respectively.

2.3.3 Maladjustment and psychiatric disorders

The Self-report Inventory for Shanghai Middle School Students (SISMSS) (Li & Yu, 2006) uses a total of 140 items and two parts, adaptive testing and illness diagnostic tests. The adaptive testing section assesses 8 concepts: active study, steady and optimistic emotion, self-cognition, sense of duty, achievement motivation, communication ability, sex-cognition, sense of duty, achievement motivation, communication ability, sex consciousness, and self-control ability. The illness diagnostic test section includes 7 sub-tests: sub-schizophrenia, sub-depression, mania, obsessive-compulsive disorder, anxiety, phobia, and hysteria. For better comprehensibility, the terms used in adaptive testing were changed to "low study motivation", "poor emotional stability", "negative self-cognition", "lack of sense of duty", "low achievement drive", "unsociability and withdrawal behavior", "underdeveloped sex-cognition" and "poor self-control ability"; in addition, the term "hysteria" that was used in the illness diagnostic test was changed to "somatization". According to Li and Yu, all these items assessed negative symptoms, but higher raw scores indicated worse symptoms. Thus, these items' names were inverted to facilitate further statistical analyses and discussion. Moreover, to control the length of the scales, the 6 polygraph items were reduced to 2.

Adolescents indicated the degree to which their present condition matched the 136

items on a 4-point Likert scale (1= not at all; 2= not very likely; 3= very likely; 4= exact match). Previous research has shown that the internal consistency of SISMS was .91, and its coefficient of correlation with the SCL-90 and MHT was .58 and .73, respectively (Li & Yu, 2006). In the present research, the internal consistencies measured by Cronbach’s alpha for the adaptive testing and illness diagnostic test were .91 and .96, respectively.

2.4 Statistical analyses

Multiple analyses of variance (MANOVAs) were performed for stress, coping styles, maladjustment and psychiatric disorders using the puberty group (pre-puberty group, early puberty group, and late puberty group) and gender (male and female) as between-subjective factors. The effects on the two types of stress and on the three coping styles were examined by univariate tests. To investigate the association between stress and coping styles and maladjustment and psychiatric disorders, Pearson correlations and linear regressions were employed. Based on the supposed substantial effects of gender on stress, coping style and regression models, the effects of gender were also examined (Hampel & Petermann, 2006).

3. Results

3.1 Puberty and gender differences

3.1.1 Stress

A MANOVA revealed significant main effects of gender and puberty group, and the interaction effects were also statistically significant (Pillai’s $F_{\text{gender}} = 50.51, p < .001$; Pillai’s $F_{\text{puberty}} = 50.20, p < .001$; Pillai’s $F_{\text{gender by puberty}} = 3.83, p < .01$). Univariate tests were then performed. With respect to gender, i.e., the main effect of gender on non-interpersonal stress, boys reported higher non-interpersonal stress in all grade levels. With respect to puberty group, puberty’s main effects on both interpersonal and non-interpersonal stress were also reported. Post-hoc Student’s t-tests showed that the pre-puberty group reported significantly lower stress levels for both interpersonal and non-interpersonal stress and that the early puberty group only reported significantly lower non-interpersonal stress than late puberty group. Means and SDs for the main effects of gender and puberty group are depicted in Table 1.

Table 1. Means (Ms) and standard deviations (SDs) of the main effects of gender and puberty group on stress and coping style.

	Gender		Puberty Group						Factor				
	Male (n=4827)		Female (n=4738)		Pre-puberty (n=2142)		Early Puberty (n=5883)		Late Puberty (n=1385)		Gender	Puberty	Interaction
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>F</i>	<i>F</i>
IS	18.19	9.31	18.22	8.84	16.37	9.33	18.74	9.03	18.75	8.52	0.54	56.64***	1.44
NS	25.57	19.77	22.26	17.16	19.92	17.57	24.57	18.71	27.34	18.59	46.87***	80.01***	5.28***
PC	18.95	4.88	19.48	4.33	19.66	4.8	19.09	4.59	19.05	4.43	31.45***	13.58***	2.74
CC	19.78	4.54	20.07	4.04	19.82	4.37	19.91	4.3	20.15	4.17	10.35**	2.37	1.65
AC	12.04	4.05	11.67	3.69	11.28	3.86	12	3.92	12.13	3.65	21.02***	32.22***	0.65

IS = Interpersonal Stress; NS = Non-interpersonal Stress

PC = Problem-focused Coping; CC = Cognition-focused Coping; AC = Avoidant Coping

* $p < .05$; ** $p < .01$; *** $p < .001$

3.1.2 Coping Style

A MANOVA revealed the significant main effects of gender and puberty group on

coping styles, but the interaction effect was not statistically significant (Pillai's $F_{\text{gender}} = 21.27, p < .001$; Pillai's $F_{\text{puberty}} = 20.95, p < .001$; Pillai's $F_{\text{gender by puberty}} = 1.42, \text{ns}$). Univariate tests were then conducted. The main effect of gender on all three coping styles was significant ($F_{\text{problem-focused coping}} = 30.45, p < .001$; $F_{\text{cognition-focused coping}} = 10.35, p < .01$; $F_{\text{Avoidant coping}} = 21.02, p < .001$) Compared with boys, girls employed more problem-focused and cognition-focused coping and less avoidant coping in all grades. The participant's grade had main effects on problem-focused coping and avoidant coping. The pre-puberty group showed significantly more problem-focused coping and less avoidant coping than both groups, whereas there was no significant difference between the early and late puberty groups. The means and SDs for the main effects of gender and puberty group are depicted in Table 1.

3.1.3 Maladjustment

A MANOVA revealed significant main effects of gender and puberty group on maladjustment, but the interaction effect was not statistically significant (Pillai's $F_{\text{gender}} = 31.57, p < .001$; Pillai's $F_{\text{puberty}} = 73.67, p < .001$; Pillai's $F_{\text{gender by puberty}} = 1.52, \text{ns}$).

Univariate tests were then performed. The main effects of gender on "low study motivation", "negative self-cognition", "lack of sense of duty", "low achievement drive" and "poor self-control ability" were significant. Boys reported lower study motivation, less sense of duty, a lower achievement drive, and worse self-control than girls. Girls reported more negative self-cognition than boys. The main effects of puberty group were evident in all the items. Post-hoc Student's t-tests found that the pre-puberty group had the significantly lowest scores on all the factors and that the early puberty group scored significantly lower than the late puberty group on "low study motivation" but higher on "negative self-cognition" and "low achievement drive."

The interaction effect was statistically significant for "Unsociability and Withdrawal Behavior". In the pre-puberty and late puberty groups, boys scored higher than girls on the "Introversion and Unsociability" variable, but girls scored higher than boys on this variable in the early puberty group. The scores of the boys continued to increase with age and was the highest in late puberty, whereas the girls' scores increased from pre-puberty to early puberty and then decreased, thus reaching their highest value in early puberty.

The means and SDs for the main effects of gender and puberty group are presented in Table 2.

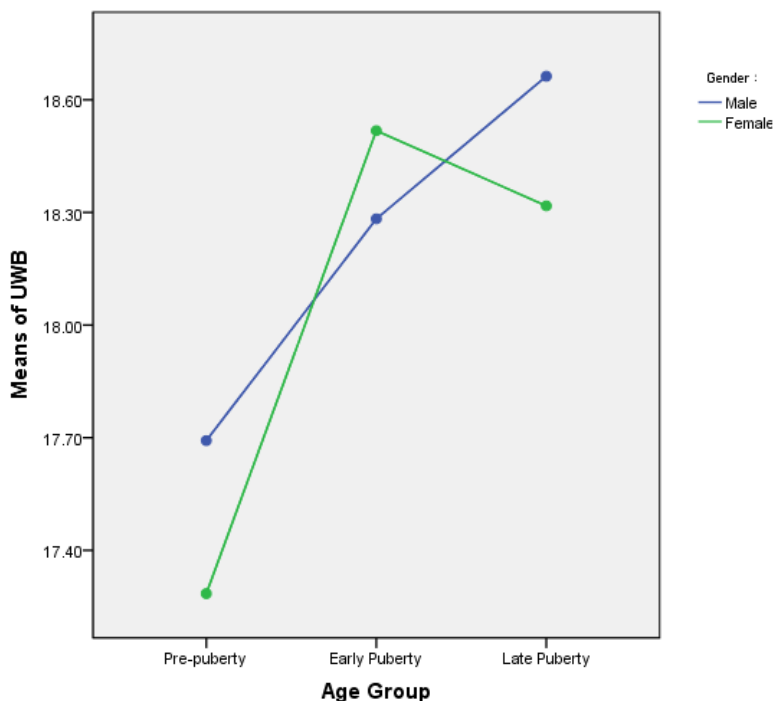
Table 2. Means (M) and standard deviations (SD) of the main effects of gender and puberty group on maladjustment.

	Gender		Puberty Group						Factor				
	Male (n=4827)		Female (n=4738)		Pre-puberty (n=2142)		Early Puberty (n=5883)		Late Puberty (n=1385)		Gender	Puberty	Interaction
	M	SD	M	SD	M	SD	M	SD	M	SD	F	F	F
LSM	22.8	5.13	22.2	5.25	20.5	5.36	22.89	5.08	23.9	4.57	31.35***	242.18***	1.38
PES	17.67	3.48	17.91	3.69	17.05	3.7	17.98	3.56	18.11	3.39	2.79	60.56***	1.97
NS	31.04	7.17	31.73	7.36	29.96	7.36	31.91	7.25	31.3	6.93	9.56**	57.32***	1.22
LSD	15.53	3.9	14.65	3.52	14.39	3.89	15.31	3.74	15.24	3.38	99.49***	53.30***	0.9
LAD	16.12	3.93	15.13	3.88	15.01	3.93	15.75	3.76	16.05	3.59	130.01***	44.86***	0.94
UWB	18.2	5.48	18.22	5.1	17.5	5.35	18.4	5.26	18.49	5.27	1.77	25.78***	3.82*
US	13.85	3	13.79	2.7	14.71	2.76	13.79	2.78	12.53	2.84	0.01	256.93***	0.73
PSA	25.62	6.68	25.35	6.34	23.73	6.67	25.95	6.51	26.19	5.75	7.47**	105.86***	2.95

LSM = Low Study Motivation; PES = Poor Emotional Stability; NS = Negative Self-cognition; LSD = Lack of Sense of Duty; LAD = Low Achievement Drive; UWB = Unsociability and Withdrawal Behavior; US = Under-developed Sex-cognition; PSA = Poor Self-control Ability

* $p < .05$; ** $p < .01$; *** $p < .001$

And the interaction effect on “Unsociability and Withdrawal Behavior” is depicted in Graph 1.



Graph 1. Interaction effect of gender and grade level on the means of UWB (Unsociability and Withdrawal Behavior).

3.1.4 Psychiatric Disorders

A MANOVA revealed significant main effects of gender and puberty group on psychiatric disorders, and the interaction effect was statistically significant (Pillai’s $F_{\text{gender}} = 25.57, p < .001$; Pillai’s $F_{\text{puberty}} = 31.29, p < .001$; Pillai’s $F_{\text{gender by puberty}} = 3.20, p < .001$).

Univariate tests were then conducted. The main effects of gender on “Sub-depression”, “Mania”, “Anxiety”, and “Phobia” were significant. The girls reported higher levels on all four items than the boys. Puberty had a significant main effect on all the items. Post-hoc Student’s *t*-tests suggested that the pre-puberty group scored significantly lower than the older groups on all the items and that the early puberty group scored significant lower than the late puberty group on “Sub-depression,” but higher on “Mania”, “Obsessive Compulsive Disorders”, “Phobia” and “Somatization.”

The interaction effect was statistically significant for “Mania”, “Anxiety”, “Phobia” and “Somatization.” Both girls and boys scored higher in early puberty than in pre-puberty, but the difference was greater for girls than for boys. For mania and phobia, both girls and boys scored lower in late puberty than in early puberty, but the difference for girls was once again greater. Regarding anxiety and somatization, the late puberty group had the highest score for the boys, whereas the girls scored the highest in the early puberty group. The girls only scored lower than the boys in the late puberty group for somatization; for all three of the other items, the girls scored higher than the boys in all puberty groups.

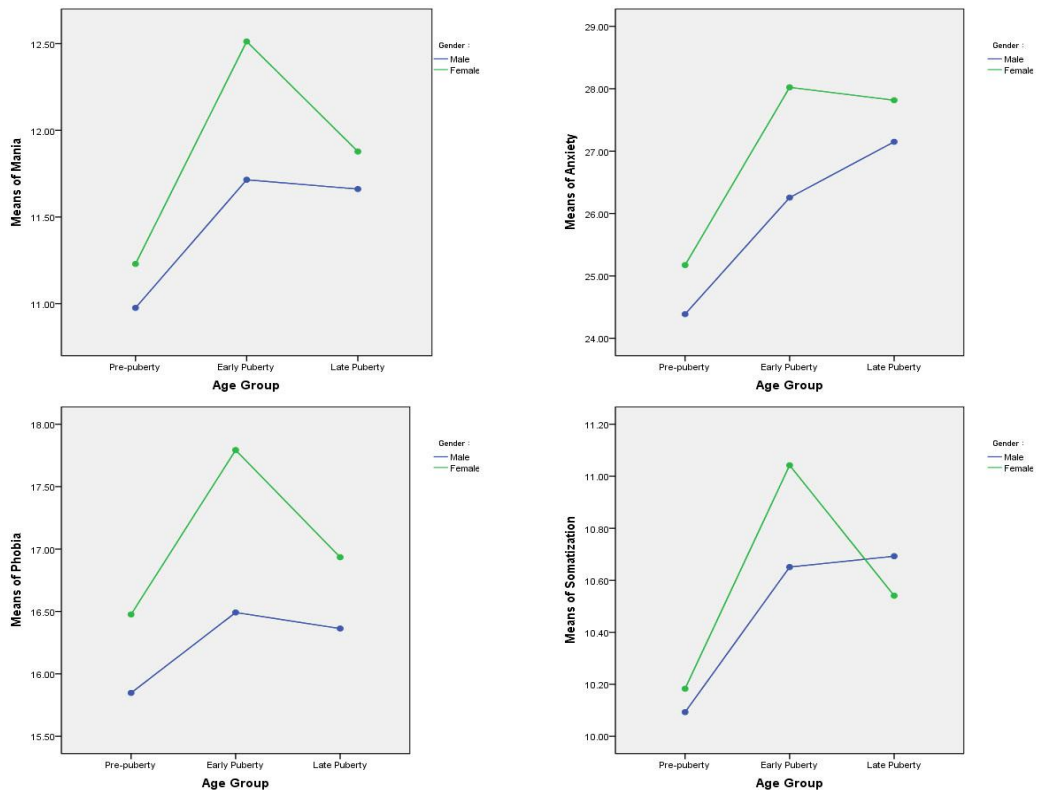
The means and SDs for the main effects of gender and puberty group are presented in Table 3, and the interaction effect on “Mania”, “Anxiety”, “Phobia” and “Somatization” is depicted in Graph 2.

Table 3. Means (M) and standard deviations (SD) of the main effects of gender and puberty group on psychiatric disorders.

	Gender				Puberty Group						Factor		
	Male (n=4827)		Female (n=4738)		Pre-puberty (n=2142)		Early Puberty (n=5883)		Late Puberty (n=1385)		Gender	Puberty	Interaction
	M	SD	M	SD	M	SD	M	SD	M	SD	F	F	F
SS	19.17	5.77	19.51	5.56	17.94	5.73	19.71	5.66	19.87	5.23	1.04	86.02***	2.64
SD	24.39	6.44	25.5	6.05	23.43	6.34	25.28	6.29	25.81	5.72	38.75***	83.61***	1.2
Mania	11.53	4.06	12.15	4.02	11.1	4.11	12.11	4.1	11.77	3.58	18.32***	50.09***	5.38***
OCD	18.48	5.42	18.81	5.32	17.52	5.46	19.04	5.4	18.64	4.85	3.11	63.63***	0.88
Anxiety	25.94	7.82	27.38	7.49	24.76	7.9	27.14	7.67	27.49	7	33.10***	85.47***	5.12**
Phobia	16.32	4.52	17.38	4.45	16.14	4.7	17.14	4.53	16.66	4.03	57.80***	39.69***	6.75**
Somatization	10.52	3.38	10.78	3.21	10.14	3.35	10.85	3.31	10.61	3.07	1.86	36.85***	4.62*

SS = Sub-schizophrenia; SD = Sub-depression; OCD = Obsessive Compulsive Disorders

* p < .05; ** p < .01; *** p < .001



Graph 2. Interaction effects of gender and grade on the means of “Mania”, “Anxiety”, “Phobia” and “Somatization”.

3.2 Association between stress and coping styles and maladjustment and psychiatric disorders

Pearson correlations were calculated, and the results of the associations between stress

and coping styles and maladjustment are presented in Table 4. Interpersonal stress, non-interpersonal stress and avoidant coping were positively related to maladjustment and psychiatric disorder, while problem-focused coping and cognition-focused coping were negatively related to both aspects of mental health.

Table 4. Associations between Stress and Coping Styles and Maladjustment.

	IS	NS	PC	CC	AC
Maladjustment	0.42***	0.37***	-0.36***	-0.22***	0.37***
Psychiatric Disorders	0.44***	0.36***	-0.12***	-0.01***	0.38***

IS = Interpersonal Stress; NS = Non-interpersonal Stress

PC = Problem-focused Coping; CC = Cognition-focused Coping; AC = Avoidant Coping

* p < .05; ** p < .01; *** p < .001

Correlations with p < .001 are significant after Bonferroni correction

Because of the potential difference between gender groups, linear regressions were conducted by each gender, and the results are showed in Table 5. As to maladjustment, avoidant coping, interpersonal stress, problem-focused and cognition-focused coping were effective; while only avoidant coping, interpersonal stress and problem-focused coping could significantly affect psychiatric disorders. The regression models of boys and girls were almost the same. Though statistically non-interpersonal stress in both maladjustment and psychiatric disorders and cognition-focused coping in psychiatric disorders were significant, their β s were relatively too small to be meaningful ($\beta < 0.5$).

Table 5. The Linear Regression Models of Both Gender on Maladjustment and Psychiatric Disorders.

	Male				Female			
	Maladjustment	95% CI	Psychiatric Disorders	95% CI	Maladjustment	95% CI	Psychiatric Disorders	95% CI
<i>Constant</i>	161.74***	[158.91, 164.56]	86.56***	[82.73, 90.40]	168.07***	[164.80, 171.34]	92.77***	[88.31, 97.23]
<i>Interpersonal Stress</i>	0.62***	[0.53, 0.71]	1.18***	[1.10, 1.27]	0.70***	[0.61, 0.79]	1.22***	[1.10, 1.34]
<i>Non-interpersonal Stress</i>	0.09***	[0.05, 0.13]			0.10***	[0.06, 0.15]	0.07*	[0.00, 0.13]
<i>Problem-focused Coping</i>	-1.67***	[-1.81, -1.52]	-0.90***	[-1.07, -0.74]	-1.77***	[-1.93, -1.62]	-0.92***	[-1.12, -0.71]
<i>Cognition-focused Coping</i>	-0.63***	[-0.80, -0.47]			-0.82***	[-0.99, -.66]	-0.24*	[-0.46, -0.01]
<i>Avoidant Coping</i>	2.46***	[2.31, 2.61]	2.49***	[2.29, 2.70]	2.31***	[2.15, 2.47]	2.78***	[2.57, 3.00]
R ²	0.4		0.26		0.42		0.34	
F	638.65***		572.59***		696.81***		484.46***	

* p < .05; *** p < .001

4. Discussion

The present study evaluated the effects of puberty and gender on stress, coping style, maladjustment and psychiatric disorders and examined the associations between stress, coping style, maladjustment and psychiatric disorders during adolescence.

Regarding the effects of puberty group on stress model, the pre-puberty group reported the lowest stress levels in both interpersonal and non-interpersonal stress. The late puberty group scored higher than the early puberty group on total stress scores and non-interpersonal stress, there was no statistically significant

difference for interpersonal stress. The late puberty group have been shown to perceive significantly high overall academic stress, not interpersonal stress. These results support previous studies that have found that stress increases with age⁵³ and that the significant increase in non-interpersonal stress was mainly due to extremely high academic stress, particularly the stress related to entrance exams in China⁵⁴. We also found a decreasing use of problem-focused coping and an increasing use of avoidant coping as an individual puberty status. These findings are consistent with previous studies that suggest that problem-focused coping mainly develops in early childhood and is applied more in early and late adolescents but less in middle adolescents. Our results also support the notion that early and middle adolescents have not developed comprehensive abilities to effectively cope with substantial amounts of stressors^{55,56}. Moreover, the present study also highlighted that even late adolescents lacked the capacity to cope with increasing amounts of stressors.

As to adolescent mental health, regarding maladjustment, the pre-puberty group had the significantly lowest scores on all the factors, and the early puberty group scored significantly lower than the late puberty group on “low study motivation” but higher on “negative self-cognition” and “low achievement drive.” As we also observed that older participants showed decreasing adaptive coping and increasing avoidant coping, these findings are consistent with the literature suggesting that maladaptive patterns are accompanied by enhanced internalizing and externalizing problems⁵⁷.

In terms of psychiatric disorders, the pre-puberty group scored significantly lower on all the items than both of the older groups, which confirms the notion that pubertal status is associated with the onset of psychiatric disorders^{58,59}.

The early puberty group scored significant lower than the late puberty group on “Sub-depression” but higher on “Mania”, “Obsessive Compulsive Disorders”, “Phobia” and “Somatization”, which suggests that both early and late adolescence are vulnerable periods for youth.

In regard to gender effect on coping, in contrast to other studies, the boys in the present study showed higher non-interpersonal stress than the girls, and the gender difference in interpersonal stress failed to reach statistical significance. The interaction effects of

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⁵⁴ Jiang, C., Wang, Z., & Yan, Z.: “The causes and coping strategies of academic stress in middle school setting.” *Teachers*, 8, pp.26-29(2014)

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⁵⁷ Cohen, P., Cohen, J., Kasen, S., Velez, C. N., Hartmark, C., Johnson, J., Streuning, E. L.: “An epidemiological study of disorders in late childhood and adolescence—I. Age- and gender-specific prevalence.” *Journal of Child Psychology and Psychiatry*, 34, pp.851-867(1993)

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⁵⁹ Wesselhoeft, K. M.: “Review of Muslim childhood: Religious nurture in a European context.” *Journal of Religion*, 95, pp.280-282(2015)

puberty and gender were significant regarding non-interpersonal stress. These results are partially consistent with previous research^{60,61}.

The indifference in interpersonal stress levels of boys and girls may be due to the different racial and cultural backgrounds of the participants, as Chinese adolescents have been shown to perceive significantly higher overall academic stress arising from self-expectations than adolescents in the US⁶². This distinction may have led to the weaker emphasis on interpersonal relationships exhibited in this study. Since adolescent girls show better academic performance than boys in Chinese society⁶³, boys may received higher non-interpersonal stress, especially academic-related stress, than girls. Regarding participants' coping styles, we unexpectedly found that girls employed more problem-focused and cognition-focused coping and less avoidant coping than boys in all the grades.

Our results contradicted previous findings that girls applied more maladaptive coping than boys, but our findings supported those studies suggesting that girls turn to rational problem-solving and cognition-adjusting methods as well as—and even better than—boys^{64,65,66}.

The results regarding the gender factor related to maladjustment indicated that boys reported less motivation to study, less sense of duty, a lower achievement drive, and worse self-control than girls, whereas girls reported greater negative self-cognition. These findings are consistent with previous studies that have found that girls were prone to develop internalizing problems, whereas boys were prone to develop externalizing problems⁶⁷.

The higher level of stress and less use of rational and adaptive coping styles seemed to lead to increasing externalizing problems among boys, whereas the negative self-cognition may be explained by girls' greater concerns about self-image in social relationship⁶⁸. Regarding psychiatric disorders, the girls reported higher levels of sub-depression, mania, anxiety, and phobia than boys, which supports the preponderance of emotional disorders reported by previous studies in females through childhood and

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⁶⁸ Rudolph, K. D.: "Gender differences in emotional responses to interpersonal stress during adolescence." *Journal of Adolescent Health*, 30, pp.3-13(2002)

adolescence^{69,70,71}. These studies have suggested that women's greater reliance on emotion-focused coping, which was included in cognition-focused coping in our study, is associated with a higher incidence of major depression and anxiety disorders⁷². However, because of the relatively low association between cognition-focused coping and psychiatric disorders as shown through correlations, it is unclear whether more explanations from the perspective of environmental and biological factors are necessary to explain the gender difference⁷³. According to Wesselhoeft (2015), emotional disorders such as depression and anxiety seem to prevail in males before the age of 12 and in females thereafter, which might be explained by a gender-associated vulnerability or by gender-specific risk and resilience factors in both genetic and environmental pathways.⁷⁴

The results of the interaction effects in the present study indicate that early puberty girls and late puberty boys are more prone to unsociability and withdrawal behavior. Furthermore, we found that early puberty girls were more prone to mania, anxiety, phobia and somatization, which suggests that early adolescent girls are at high risk of developing psychiatric disorders. Moreover, unexpectedly, there was no significant interaction effect on sub-depression. Perhaps it is because of the psychosocial and cultural interpretation between samples of different ethnic groups⁷⁵. Additionally, studies in the Chinese context have suggested that there is no significant difference in the depression ratio between adolescent girls and boys⁷⁶. The present study's sample—urban students in Shanghai—may provide an alternate explanation, as some research has found that a higher prevalence of depression in girls than boys was only found in Chinese suburbs⁷⁷.

The results regarding the association between stress, coping style, maladjustment and psychiatric disorders in adolescence supported the idea that interpersonal stress, non-interpersonal stress and avoidant coping are all positively related to maladjustment and psychiatric disorders, whereas both problem-focused and cognition-focused coping are negatively related to maladjustment and psychiatric disorders. These findings support the

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assumption that stress and avoidant coping style are risk factors in the development of maladjustment and psychiatric disorders, whereas adaptive coping styles are protective factors^{78,79,80}.

In this paper, only β that were higher than 0.5 are discussed because of the relatively large sample employed in the present study. Confirming the results from earlier studies, interpersonal stress rather than non-interpersonal stress was associated with maladjustment and psychiatric disorders, suggesting that interpersonal vulnerability is quite common in adolescence⁸¹; avoidant coping was proved to be the most influential factor to maladjustment and psychiatric disorders⁸². The present study also found that both adaptive coping style were negatively associated with maladjustment, which proved the negative effects of the adaptive coping style on emotional and behavioral problems⁸³. However there was no significant association between cognition-focused coping and psychological disorders. Since cognitive-behavior therapy is one of the most important interventions applied with adult patients, this result may be due to that positive adjustment, particularly cognitive adjustment, is relatively demanding for adolescents. Although adolescents have realized its necessity, it is relatively difficult for them to adjust because of their limited comprehension^{84,85}. All items except non-interpersonal stress were related to maladjustment in adolescence, whereas only interpersonal stress and the use of problem-focused and avoidant coping were relevant to psychiatric disorders. Since there was no significant gender difference, it could be inferred that negative behavioral copings and concerns on interpersonal relationship are both influencing factors in regard to adolescent mental health.

The results of the present study highlight the importance of prevention programs in adolescence that consider both puberty status and gender differences in participants. Adolescent boys should be included in interventions targeting externalizing problems, whereas interventions with adolescent girls, particularly those in early puberty, should be tailored to their vulnerability regarding internalizing and psychiatric disorders. Interpersonal stress and non-interpersonal stress, particularly the academic stress of Chinese boys, should be emphasized as well. The specific characteristic of adolescents is concerning because of their relatively limited ability to apply positive copings, which

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⁸² Seiffge-Krenke, I.: "Causal links between stressful events, coping style, and adolescent symptomatology." *Journal of Adolescence*, 23, pp.675-691(2000)

⁸³ Compas, B. E.: "Coping with stress during childhood and adolescence." *Psychological Bulletin*, 101, pp.393-403(1987)

⁸⁴ Compas, B. E.: "Coping with stress during childhood and adolescence." *Psychological Bulletin*, 101, pp.393-403(1987)

⁸⁵ Donaldson, D., Prinstein, M. J., Danovsky, M., & Spirito, A.: "Patterns of children's coping with life stress: Implications for clinicians." *American Journal of Orthopsychiatry*, 70, pp.351-359(2000).

emphasized the interventions targeting on interpersonal relationships and behavioral coping strategies.

Additionally, the present study suggests that there is a substantial difference between sixth grade students and seventh to ninth grade students due to their puberty status, which may suggest that including sixth graders in middle schools, as is the custom in Shanghai to reduce academic stress and imitate western settings, may be unsuitable in the Chinese context. However, the results of this study are limited in several respects. First, the puberty groups in the present study were divided based on the average pubertal timing in China instead of an actual evaluation of participants' body symptoms. Since boys go into puberty later than girls, this cut-off may have led to an underestimation of the results. Therefore, future research should adopt specific evaluations of body conditions in both genders. Second, the study sample was limited to urban students in Shanghai, and future studies with more diverse samples are necessary to better understand the results. Third, longitudinal studies are required to draw causal connections as well as to better understand the implications of our findings for adult well-being.

5. Conclusion

This study demonstrated the effects of puberty on increasing stress levels, and particularly on boys' non-interpersonal stress levels, in a Chinese context. Puberty was also related to the use of less adaptive but more avoidant coping styles, although girls of all puberty status engaged more adaptive coping styles than the boys. Moreover, puberty was associated with the onset of maladjustment and psychiatric disorders. Regarding maladjustment, boys reported significant lower motivation to study, less sense of duty, a lower achievement drive, and worse self-control than girls, whereas girls reported more negative self-cognition than boys. The results concerning psychiatric disorders found that girls reported significantly higher levels of sub-depression, mania, anxiety, and phobia than boys. In this Chinese setting, interpersonal stress, and the use of problem-focused, cognition-focused and avoidant coping style were related to maladjustment in adolescence, whereas only interpersonal stress and the use of problem-focused and avoidant coping were relevant to psychiatric disorders. All these findings emphasized the importance of making more specific interventional programs considering gender, puberty, stress type and coping strategies.

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Mengqian Shen: Data analysis, Paper writing

Xiaoru Li: Idea, Preparation for investment, Data Collection, Data analysis

Guohong Wu: Idea, Preparation for investment

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