



Educational Stress among Chinese Adolescents: Measurement, Risk Factors and Associations with Mental Health

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Abstract

Academic pressure among adolescents is a major risk factor for poor mental health and suicide and other harmful behaviours. While this is a worldwide phenomenon, it appears to be especially pronounced in China and other East Asian countries. Despite a growing body of research into adolescent mental health in recent years, the multiple constructs within the ‘educational stress’ phenomenon have not been clearly articulated in Chinese contexts. Further, the individual, family, school and peer influencing factors for educational stress and its associations with adolescent mental health are not well understood. An in-depth investigation may provide important information for the ongoing educational reform in Mainland China with a special focus on students’ mental health and wellbeing.

The primary goal of this study was to examine the relative contribution of educational stress to poor mental health, in comparison to other well-known individual, family, school and peer factors. Another important task was to identify significant risk factors for educational stress. In addition, due to the lack of a culturally suitable instrument for educational stress in this population, a new tool – the Educational Stress Scale for Adolescents (ESSA) was initially developed in this study and tested for reliability and validity.

A self-administered questionnaire was used to collect information from convenient samples of secondary school students in Shandong, China. The pilot survey was conducted with 347 students (grades 8 and 11) to test the psychometric properties of the ESSA and other scales or questions in the questionnaire. Based on factor analysis and reliability and validity testing, the 16-item scale (the ESSA) with five factors showed adequate to good internal consistency, 2-week test-retest reliability, and satisfactory concurrent and predictive validity. Its factor structure was

further demonstrated in the main survey with a confirmatory factor analysis illustrating a good fit of the proposed model based on a confirmatory factor analysis. The reliabilities of other scales and questions were also adequate to be used in this study.

The main survey was subsequently conducted with a sample of 1627 secondary school (grades 7-12) students to examine the influencing factors of educational stress and its associations with mental health outcomes, including depression, happiness and suicidal behaviours. A wide range of individual, family, school and peer factors were found to have a significant association with the total ESSA and subscale scores. Most of the strong factors for academic stress were school or study-related, including rural school location, low school connectedness, perceived poor academic grades and frequent emotional conflicts with teachers and peers. Unexpectedly, family and parental factors, such as parental bonding, family connectedness and conflicts with parents were found to have little or no association with educational stress.

Educational stress was the most predictive variable for depression, but was not strongly associated with happiness. It had a strong association with suicide ideation but not with suicide attempts. Among five subscales of the ESSA, 'Study despondency' score had the strongest associations with these mental health measures. Surprising, two subscales, 'Self-expectation' and 'Worry about grades' showed a protective effect on suicidal behaviours. An additional analysis revealed that although academic pressure was the most commonly reported reason for suicidal thinking, the occurrence of problems in peer relationships such as peer teasing and bullying, and romantic problems had a much stronger relationship with actual attempts.

This study provides some insights into the nature and health implications of educational stress among Chinese adolescents. Findings in this study suggest that interventions on educational stress should focus on school environment and academic factors. Intervention programs focused on educational stress may have a high impact on the prevalence of common mental disorders such as depression. Efforts to increase perceived happiness however should cover a wider range of individual, family and school factors. The importance of healthy peer relationships should be adequately emphasised in suicide prevention. In addition, the newly developed scale (the ESSA) demonstrates sound psychometric properties and is expected to be used in future research into academic-related stress among secondary school adolescents.

Keywords: Academic stress; Mental health; Depression; Suicidal behaviour; Adolescents; China;

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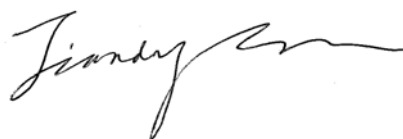
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Statement of Original Authorship

The work contained in this thesis has not been previously submitted for a degree or diploma at any other higher education institute. To the best of my belief, this thesis contains no material previously published or written by other person except where due reference is made.

Signed:



Jiandong Sun

Date:

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Chapter 1. Introduction and Literature Review

Preamble

There is an increasing concern regarding study pressure and its relationships with mental health problems among school children and adolescents in China. Youth suicide cases have been frequently reported in mass media and many were alleged to be related to academic pressure or failures in exams, especially among secondary school students. One day in October 2008, a grade 12 boy attending a key upper secondary school in Guangdong Province, China, twice attempted to kill himself at home (People's Daily Online, 2008). He firstly tried to hang himself using a rope but the rope was broken and he fell on the ground. Then he went to the bathroom and switched on the natural gas. He was lucky to be found by his parents and immediately sent to nearby hospital. Poor academic grade and problems with cyber love were confessed to be the reasons for his suicide attempts by the victim. Another 16-year old boy was not so lucky (Sohu News, 2008). Xiao was an academically advanced grade-10 student from a rural family in Hubei Province before he hanged himself on 8 June, 2008, after receiving less-than-ideal results from a test, which was speculated as the major trigger for this tragedy.

Globally, academic matters are well known as a major source of stress among school students (Brown, Teufel, Birch, & Kancherla, 2006; Christie & MacMullin, 1998; Dodds & Lin, 1993; Gallagher & Millar, 1996; Huan, See, Ang, & Har, 2008; Tang & Westwood, 2007). Recent data indicates that students in China and other East Asian countries may bear a heavier burden of learning and thus experience more stress than their Western counterparts (Ang, Huan, & Braman, 2007; Crystal *et al.*, 1994; Lee & Larson, 2000; Lei, Sun, Li, Guo, & Zhang, 2007; Zhao, Zhu, & Ma,

2009), which may be related to the dominant Confucian culture and the strict educational system (Ang & Huan, 2006a; Bossy, 2000; Lin & Chen, 1995; Lu, 2008). Confucian respect for academic learning has influenced many societies in East Asia for thousands of years. Many parents insist that a higher degree is essential for their child's future employment and social status. In China, entrance into a higher educational institution is almost exclusively determined by the results from one single and very competitive exam (the National College Entrance Examination), the preparation for which places enormous pressure on secondary school students and their families.

Previous studies from developed countries have identified that educational stress among students attending secondary schools is high and has significant associations with mental health problems, such as depression, anxiety and suicidal ideation (Anderman, 2002; Ang & Huan, 2006b; Bjorkman, 2007b; Field, Diego, & Sanders, 2001; Kouzma & Kennedy, 2000). In China, research into this topic has mainly focused on some individual academic-related factors such as poor academic grades (Li & Zhang, 2008; Liu & Tein, 2005; Shen *et al.*, 2005; Su *et al.*, 2002; Yang, 2002; Zhang, Tao, & Zeng, 2001) and relatively little is known about the magnitude and health effects of overall educational stress or its constituent factors, which may be partly due to the lack of a reliable and comprehensive measure to examine this complex phenomenon in a Chinese context.

Traditionally, mainly following Confucian philosophy, education in China has been teacher- and exam-centred. As a result, Chinese students often achieve high academic grades (Mervis, 2010) but at a cost of higher burden and related pressure (Lei, *et al.*, 2007; Zhao, *et al.*, 2009). Currently there is educational reform underway in China with an important goal to lighten students' study burden (China Ministry of

Education, 2009; Shandong Provincial Education Department, 2009). Strategies include an increase in non-exam-oriented classes (such as gymnastics and music), a reduction in the amount of homework, and a cessation of the whole-of-class ranking of students' academic grades (to reduce peer competition). However, such policies may not be well implemented easily given enormous pressure to retain the status quo. Changes may be achieved in part by research into the severity and health implications of educational stress and dissemination of findings to parents and school personnel. Therefore, it is of great necessity and urgency to investigate educational stress and its relationships with mental health problems in this population.

The current study aimed to examine the nature of the construct 'educational stress' among Chinese adolescents attending secondary schools. One key task in this study was to assess the relationships with and relative contribution to mental health in comparison to other well-known individual, family, school and peer correlates. To provide evidence for stress intervention, common correlates of educational stress were also examined, as well as their relative importance. To achieve the above goals, a new instrument for educational stress – the Educational Stress Scale for Adolescents (ESSA) was initially developed and tested for psychometric properties in this project.

Overview of this Thesis

There are nine chapters in this thesis. In Chapter 1, some background information and the aims of this project were introduced. Existing literature both in English and Chinese was reviewed, and research questions and hypotheses were then clarified in the same chapter. Chapter 2 describes the development of this PhD project and results from the pilot study. Five journal articles are subsequently presented as Chapters 4-8, with each accomplishing a major task of this study.

Specifically, in the first paper (Chapter 4), the development and validation of the new scale (the ESSA) are reported. The examination of influencing factors for educational stress is presented in the second paper (Chapter 5). The associations between educational stress and mental health measures (depression and happiness, Chapter 6) and suicidal behaviours (Chapter 7) were analysed, respectively. Finally, an additional analysis on the reasons for suicidal thinking is documented in Chapter 8. The last chapter (Chapter 9) provides a summary discussion of the results from this study with an emphasis of some new and interesting findings, implications and contributions. Materials used in this study including the questionnaire and working forms and some additional results are included as appendixes at the end of this document.

Stress and Academic Stress in Adolescents

Adolescence is a transitional stage from childhood to adulthood and is a time for major changes in all areas of functioning. Children and adolescents can experience various life stress ranging from catastrophic or traumatic life events (such as death of a parent or onset of severe disease), persistent strain (such as family poverty, environmental degradation, or chronic bullying) and daily hassles (such as conflict with peers or siblings) (Hess & Copeland, 2006). Academic matters are among the most important sources of chronic and sporadic stress for young people in both western (Brown, *et al.*, 2006; Christie & MacMullin, 1998; Gallagher & Millar, 1996; Kouzma & Kennedy, 2004) and Asian countries (Dodds & Lin, 1993; Huan, *et al.*, 2008; Tang & Westwood, 2007).

The importance of academic stress can be illustrated with several referential examples. Among 3983 post-primary students aged 13-19 years in Northern Ireland,

Millar and Gallagher (1996) found that school work was the most common source of worry, followed by money matters, social efficacy and choosing a job or course. In a study from the United States of America, Brown and colleagues (2006) found school grades were the most frequently reported daily worry among 1004 early adolescents (aged 9-13 years), followed by looks/appearance, problems at home, being liked/fitting in, being out of shape/overweight, the future, being a failure/disappointing loved ones, and friends and their problems. Worry about school grades every day was reported by 42% of the participants and most of the others also worried occasionally (weekly, monthly, or once in a while).

Likewise, a study from Australia indicates that school-related situations are the main sources of stress in final-year high school students, with examinations and study outcomes nominated most often, followed by too much to do, worry about future, making choices about career, the large amount to learn, need to do well imposed by others, and self-imposed need to do well (Kouzma & Kennedy, 2004).

In China, the National Juvenile Internet Use Survey conducted in 10 provinces in 2007 (China Youth Social Service Center, 2008) showed that “too much academic pressure” was perceived as the most stressful experience by 66.7% of the participated students who attend primary and secondary schools. The proportion was far higher than for other common stressors, including “having too little recreation time” (30.3%) and “there are too few people understand me” (27.6%). Accordingly, the “most desired thing” was reported as “to improve academic achievement” by 83.5% of the participants, followed by “to have more independence in life” (39.3%) and “to make more friends” (34.1%).

Research into academic stress in students has suffered some conceptual and methodological problems (Putwain, 2007). In his review of the literature, Putwain

(2007) pointed out three types of confusion in research into academic stress. First, there is a lack of precision in the terminology used. Many researchers use the term “stress”, “anxiety” and “worry” interchangeably, and the domains of “examination stress” and “academic stress” are not clearly defined. Second, what the term “stress” refers to is not clear in the literature. Some use it to refer to the external stimulus (such as the failure in an examination) while others to the subjective experience of distress. Third, there are inconsistencies in the research towards the quantification of academic stress. This is also largely originated from the conceptual issue of whether stress refers to a cause or an effect (Putwain, 2007).

Similar to research into general stress, there have been mainly two ways to define and study academic stress or educational stress among adolescents. Many researchers have focused on stressful life events that are related to study, i.e., the stressors or objective stress, such as low academic grades, heavy workload and poor school conditions (Burnett & Fanshawe, 1997; Kohn & Frazer, 1986; Kouzma & Kennedy, 2004). However, although these studies can identify the most prevalent and most important stressors, they may not have the capacity to examine the true stress that students experience, because the appraisal process and coping ability of individuals may be ignored (Lazarus & Folkman, 1984). For example, a B grade in an important exam may be stressful to those who have a higher hope but may be welcomed by others.

Some researchers have developed instruments to study the perceived stress (or subjective stress) arising from academic matters (Ang & Huan, 2006a; Ang & Huan, 2006b; Bjorkman, 2007b). Consistent with this approach, Verma and Gupta (1990) defined academic stress as mental distress related to anticipated frustration associated with academic failure, anticipation of such failure, or even an awareness of the

possibility of failure. One limitation is that this definition focuses exclusively on academic failure and neglects other sources of academic stress, such as heavy academic workload and high pressure from parents and teachers on students' performance. In the present study, we expanded this definition to include multiple aspects of academic learning.

Instruments to measure academic stress

To investigate academic stress and its relationships with students' health, the first question that needs to be answered is how to measure it. A number of self-report instruments have been developed to assess the level of academic stress and associations with health problems among adolescents (Table 1.1). These include the Academic Stress Questionnaire (ASQ) (Abouserie, 1994), Student Stress Inventory (SSI) (Zeidner, 1992), Academic Stress Scale (ASS) (Kohn & Frazer, 1986), Lakaev Academic Stress Response Scale (LASRS) (Lakaev, 2009), Student-life Stress Inventory (SSI) (Gadzella, 1994, 2001), Academic Pressure Scale for Adolescents (APSA) (Coney & West, 1979; West & Wills, 1982), Academic Expectation Stress Inventory (AESI)(Ang & Huan, 2006a; Ang & Huan, 2006b), High School Stressor Scale (HSSS)(Burnett & Fanshawe, 1997), and Survey of Academic Stress (SAS)(Bjorkman, 2007b). Among these tools, the ASQ (Abouserie, 1994), SSI (Zeidner, 1992), ASS (Kohn & Frazer, 1986), LASRS (Lakaev, 2009) and the SSI (Gadzella, 1994) were originally developed with college or university students, and only four have been used in surveys with secondary school students. All but the AESI (Ang & Huan, 2006a; Ang & Huan, 2006b) were developed and validated in western countries.

Among the three instruments used in secondary school settings, the HSSS (Burnett & Fanshawe, 1997) was developed with a sample of Australian students

(year 8 through 12). It includes 35 items and 9 latent variables. One problem about this scale is the psychometric properties are less than satisfactory. For example, the Goodness of Fit Index (GFI, .85) and Adjusted Goodness of Fit Index (AGFI, .82) based on the Confirmatory Factor Analysis (CFA) are below the threshold of an adequate fit (.90). The internal consistency for some factors has been found to be below the threshold of a sufficient reliability (.70) for a new scale (Hinkin, 1998). The SAS (Bjorkman, 2007) is a 23-item scale developed with a US sample of junior high school students. However, its factor structure is problematic. For example, one of the four factors contains only 2 items which is less than the recommended minimum number of 3 (Costello & Osborne, 2005). The APSA is a 35-item scale developed with US samples more than 30 years ago (Coney & West, 1979). Its factor structure is less stable and varies between samples and over time (Coney & West, 1979; Jones & Hattie, 1991a; West & Wills, 1982). Additionally, its psychometric properties, such as results of confirmatory factor analysis and internal reliability analysis have not been adequately reported.

The AESI (Ang & Huan, 2006a) was developed with a sample of Chinese students in Singapore to measure the level of stress arising from academic expectations of both the students and significant others. Its psychometric profile has been well established and cross-cultural validity has also been tested with both Chinese and Hispanic students (Ang & Huan, 2006a, 2006b). However, the AESI authors acknowledged that the scale was limited to measurement of stress due to academic expectations.

Table 1.1. Self-report instruments for academic stress

Instrument	Source	Country	Participants	Number of items	Factor structure	Reliability
Academic Stress Questionnaire (ASQ)	(Abouserie, 1994)	UK	College/university students	34	N/A	Alpha coefficient=0.915; Split half =0.746
Student Stress Inventory (SSI)	(Zeidner, 1992)	Israel	College/university students	53	N/A	Internal-consistency reliability Alpha: 0.93-0.94
Academic Stress Scale (ASS)	(Kohn & Frazer, 1986)	US	College/university students	35	N/A	N/A
Lakaev Academic Stress Response Scale (LASRS)	(Lakaev, 2009)	Australia	College/university students	21	4 factors: affective, behavioural, physiological, and cognitive	Internal consistency ranging from .63 to .92
Student-life Stress Inventory (SSI)	(Gadzella, 1994, 2001)	US	College/university students	51	N/A	N/A
Academic Pressure Scale for Adolescents	(Coney & West, 1979; Jones & Hattie, 1991a; West & Wills, 1982)	US & Australia	Secondary school students	35	Ten factors in the original study (West & Wills, 1982). Four factors in Australia study (Jones & Hattie, 1991a): peer pressure, parent pressure, importance at school, and fear of failure.	Test-retest reliability of the Academic Pressure Scale for Adolescents is 0.78

Note. N/A = Not available

Table 1.1. Self-report instruments for academic stress (continued)

Instrument	Source	Country	Participants	Number of items	Factor structure	Reliability
High School Stressor Scale (HSSS)	(Burnett & Fanshawe, 1997)	Australia	Secondary school students	35	Nine factors: Teaching Methods, Student-Teacher Relationships, School Workload, School Environment, Feeling Vulnerable, Personal Organization, Achieving Independence, Anxiety about the Future, Relationship with Parents)	The internal consistencies ranged from 0.79 to 0.45 with a mean of 0.68
Academic Expectation Stress Inventory (AESI-9 item)	(Ang & Huan, 2006a; Ang & Huan, 2006b)	Singapore	Secondary school students	9	Two factors: Expectations of Parents/Teachers (five items) and Expectations of Self (four items)	Cronbach's alpha: 0.83-0.87; 2-week test-retest reliability coefficient: 0.77-0.85
Survey of Academic Stress (SAS)	(Bjorkman, 2007b)	US	Secondary school students	23	Four factors identified and named Struggling Stress, Overwhelmed Stress, External Stress, and Internal Stress	The internal consistency coefficient for the entire scale was .95. The coefficient alpha for the four subscales ranged from 0.63-0.92
A scale for learning stress	(Ge, 2008)	PR China	Junior secondary school students	13	Unidimensional	N/A

Note. N/A = Not available

Some researchers in China have developed questions or scales to examine the perceived level of academic pressure. For example, Zhao and Yuan (2006) and Xie (2007) have estimated the level of academic pressure among secondary school students using a single question, “How do you rate your level of academic pressure?” A postgraduate student in Educational Psychology developed a 13-item unidimensional scale to study the level of learning stress with a small sample of 187 junior secondary school students (grade 7 to 9) in Jilin Province using (Ge, 2008). However, the psychometric profiles of these instruments have not been well established or reported, and some conceptual concerns exist, such as whether stress or pressure was measured in these studies were unaddressed.

As reviewed above, although there are a number of instruments currently available, none of them is considered to be suitable for the current study. A primary purpose of this project was to extend the range of factors that contribute to the construct of educational stress and to develop a culturally suitable instrument to measure academic stress with Chinese students. Apart from self-expectation and expectations from significant others such as parents and teachers, negative attitudes towards study, pressure from study, heavy study burden and difficulties in study are all considered to be important sources of student stress (Lin & Chen, 1995; Lu, 2008). Therefore a new tool tapping into these factors could have the potential to more comprehensively measure overall stress due to academic matters.

Individual, family, school and social correlates of academic stress

To identify the possible determinants of adolescent stress may provide evidence for stress prevention and mental health promotion. Some demographic factors, such as gender, ethnicity and socioeconomic status have been found to be related to students’ educational stress. Females usually report more academic stress than males (Jones & Hattie, 1991b; Xie, 2007; Zhao & Yuan, 2006b). One reason for this is that females are more likely to regard

school performance as very important, and therefore they worry more about academic failure (Jones & Hattie, 1991b).

In western countries, students from ethnic minority groups, especially those with Asian backgrounds may be more stressed by academic learning than others (Coney & West, 1979; Jones & Hattie, 1991b). Students with socially disadvantaged backgrounds have also been found to experience higher educational pressure (Coney & West, 1979; Li, Feng, Mei, & Yao, 2007; Moshe, 1992). In a sample of 538 Chinese junior high school students, Li (2007) found the level of academic pressure was significantly associated with low family income. Another study (Moshe, 1992) among Jewish and Arab college undergraduates revealed that students from low social-economical status families and Arab communities experienced higher academic stress than their upper-class and Jewish counterparts.

Generally, students in higher school years experience more academic stress (Jones & Hattie, 1991b; Li, *et al.*, 2007; Zhao & Yuan, 2006b). In both junior and senior secondary school divisions in China, students in their final year (grade 9 in junior school and grade 12 in senior school) report more pressure than non-final year students (Li, *et al.*, 2007; Zhao & Yuan, 2006b). This is related to the fact that at the end of grade 9 and 12, students have to face the two most important examinations, i.e., the transitional examination to enter senior school (*Zhong Kao*) and the National Unified College and University Entrance Exam.

Another important factor for educational stress is poor academic performance. Generally students with low academic grades are more likely to be stressed (Bjorkman, 2007b; Li, *et al.*, 2007). Bjorkman (2007b) found a strong correlation ($r = -0.42$) between total grade point average (GPA) and perceived level of academic stress among 268 grades 6-8 students in the US. Among 538 Chinese junior high school students, Li and colleagues (2007) found that students with lower grades reported significantly more academic pressure than those with middle or higher academic achievement.

Despite the identification of above factors, the nature and causes of educational stress are far less than clear (Putwain, 2007). Ecological system theory (Bronfenbrenner, 1979) has been frequently used to examine the risk factors for many health problems among children and adolescents (Krug, Mercy, Dahlberg, & Zwi, 2002). According to the ecological model (Krug, *et al.*, 2002) (Figure 1.1), children are viewed to live within a series of systems that are inter-connected or inter-nested. Potential factors are nested in four different levels from the innermost to the outermost as the individual, relationships (family, school and peers), the community and the macro-system of the society (Figure 1.1). Educational stress is a type of distress among students and is rooted in the cultural and system-level contexts. Therefore it is safe to hypothesise that apart from academic factors such as poor academic performance and heavy school workload, many individual, family, school and peer factors for poor mental health, such as self-efficacy, parental bonding, family and school connectedness, inter-personal conflicts and peer popularity would have an effect on students' academic stress. This is to be examined in the present study.

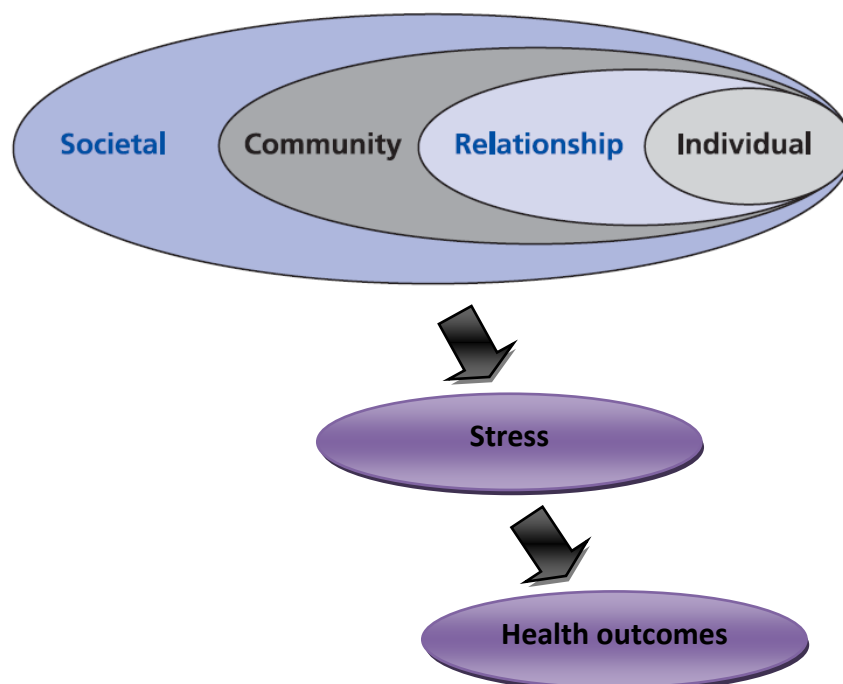


Figure 1.1. Ecological model for understanding educational stress (Krug, et al., 2002)

The contribution of academic stress to mental health problems among adolescents

Mental health is defined by the World Health Organization (WHO)(2005c) as “a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community”. Mental and behavioural disorders comprise a broad range of problems with different symptoms but are generally characterized by some combination of abnormal thoughts, emotions, behaviours and relationships with others, such as mood disorders, anxiety disorders, suicidal behaviour, substance-related disorders and eating disorders. These disorders affect all groups of people around the world and cause a substantial amount of disease burden. According to WHO, neuropsychiatric disorders, mostly due to the chronically disabling nature of depression and other common mental disorders, alcohol-use and substance-use disorders, and psychoses, has made up about 14% of the global burden of disease (Prince *et al.*, 2007). In addition to the huge burden of mental disorders themselves, they increase the risks for both communicable and non-communicable diseases, and contribute to unintentional and intentional injuries, and thus the WHO proposed the fundamental concept of “no health without mental health” (Prince, *et al.*, 2007).

Mental health problems have becoming a major public health concern among children and adolescents. Mounting epidemiological data suggest that approximately 20% of children and adolescents suffer from a mental disorder to some extent; and up to 50% of all adult mental disorders have their onset in adolescence (Belfer, 2008; WHO, 2005b). Globally, suicide is the second leading cause of death in the 10-24 years age group, exceeded only by traffic accidents (WHO, 2008). WHO’s Global Burden of Disease (GBD) study shows that in people aged 12-24 years, unipolar depressive disorders, schizophrenia, bipolar disorder, alcohol use, and self-inflicted injuries are among the top 10 causes of the disease burden together accounting for 22% of all disability-adjusted life years (DALYs) lost (Gore *et al.*,

2011) However, according to WHO, the development of policies and programs for child and adolescent mental health have considerably lagged behind those for adult mental disorders (WHO, 2005a). Current resources and programs on child and adolescent mental health are cantered mainly in affluent western countries (e.g. the North America, Europe and Australia). There remain substantial gaps in program development, policy making, data gathering, and provision of social services in developing countries, which underscores the need for enhanced data collection, refinement of the economic argument for care, and need for innovative training approaches (Belfer, 2008; Bruckner *et al.*, 2011; Gore, *et al.*, 2011; WHO, 2005a).

Stress is an important contributor to the development and course of psychopathology in children and adolescents (Ingram & Luxton, 2005; McMahon, Grant, Compas, Thurm, & Ey, 2003), while academic matters are an important source of stress among young students (e.g., Brown, Teufel, Birch, & Kancherla, 2006; Dodds & Lin, 1992; Millar & Gallagher, 1996; Huan, See, Ang, & Har, 2008; Tang & Westwood, 2007). Not surprisingly, many academic related factors, such as academic underachievement, long home work hours and failure in an exam have been found to be associated with depression and behavioural problems (such as suicidal behaviour) among adolescents (Anderman, 2002; Chen & Lu, 2009b; Field, *et al.*, 2001; Lee & Larson, 2000; Lee, Wong, Chow, & McBride-Chang, 2006; Liu & Tein, 2005).

In a sample of 1108 secondary school students in Singapore, Ang and colleagues (2006b) found that academic stress from expectations of self and significant others was significantly associated with both depression and suicidal ideation. In a US sample of grade 6 through 8 students, Bjorkman (2007b) found that academic stress was positively correlated with both internalizing (anxiety, depression, and somatization) and externalizing behaviors (aggression, hyperactivity, and conduct problems), and negatively correlated with academic

grades and support from parents, teachers and classmates. The strongest correlations were observed between academic stress and depression ($r=0.59$) and anxiety ($r=0.57$).

Although the link between academic stressors and adolescent mental health appears to be commonsense and has been supported by research, many significant questions remain unanswered. There seems to be a lack of research into perceived stress by students, especially in developing countries. In addition, most observed relationships have been bivariate in nature, and the factors that mediate or moderate these associations are not clear. For example, some psychosocial factors, such as poor family environment may result in both elevated academic stress and mental health problems (such as depression), and the association between academic stress and psychological problems may or may not exist when these factors are controlled for. Further, most studies include only negative mental health outcomes (such as depression, anxiety and suicidal ideation) and very few have examined the relationships between academic stress and positive outcomes (such as happiness and quality of life).

High Academic Stress among Asian Adolescents

As mentioned earlier, children and adolescents in Asian countries, in particular China, appear to bear heavier study burden than their western counterparts. First, they spend more time at school. In western countries, such as the USA and Australia, primary and secondary school students usually spend 6-7 hours at school (with one hour lunch time) from Monday to Friday. According to a recent national survey conducted by the Chinese Youth and Children Research Center (CYCRC), Chinese children and adolescents on average spend 8.6 hours a day at school, with some spending 12 hours a day in the classroom, usually six days a week (Anonymous, 2007; China Youth Social Service Center, 2008). Among senior high school students, 78% of Chinese and 57% of Korean students spend 8 hours or more at school while very few of their USA counterparts do so (Zhao, *et al.*, 2009).

Additionally, Chinese students spend large amount of time doing homework. The All-China Women's Federation (2008) conducted a national survey on juvenile family education status in 2008 with a sample of 5040 adolescents and 6552 parents in 10 provinces. Almost all students (97.5%) were found to do some homework every day, with half (49.1%) spending at least 2 hours per day for homework assigned by their teachers or parents. As revealed by an ongoing project between Chinese, Japanese, Korean and US high school students, more than half (56.7%) of the Chinese sample spend two hours or more for homework per day, while only 20.5%, 15.4% and 24.7% of Japanese, Korean and US students do so (Lei, *et al.*, 2007; Zhao, *et al.*, 2009). Similarly in Chinese Taiwan, more than 40% of grade 11 students spend at least two hours each day on homework (Chen & Lu, 2009a). In another study, Korean students (grade 12) were found to spend twice the time completing homework compared to their American counterparts while the latter spend twice as much time on socialisation and leisure activities (Lee & Larson, 2000). Apart from school and homework hours, Asian students more often participate in extra classes after school and private tutoring to enhance their academic grades than US students do (Zhao, *et al.*, 2009).

Asian parents usually have high expectations on their children's academic performance. In a cross-cultural sample of 1386 American, 1633 Chinese (Taiwan), and 1247 Japanese eleventh-grades students, Crystal, Chen, Fuligni, and Stevenson (1994) found that Asian students experienced higher levels of parental expectation and lower levels of parental satisfaction concerning academic achievement than their American peers. A recent multicultural survey (Lei, *et al.*, 2007; Zhao, *et al.*, 2009) found that Chinese students have the highest academic pressure among four participating countries. Nearly ninety percent (86.6%) of the Chinese participants feel high or very high pressure, while 69%, 74.8% and 67.1% of Japanese, Korean and US students perceive the same. (Beijing Evening, 2010; Jia, 2010). Ang and Huan (2006a) compared the levels of perceived academic stress measured by

the Academic Expectation Stress Inventory (AESI) between 191 Hispanic adolescents aged 14-19 years in the USA and 211 Singapore Chinese adolescents aged 14-17 years, and found the mean score for overall academic expectation stress for Singapore Chinese adolescents was significantly higher than US Hispanic adolescents when controlling for age. Academic stress arising from expectations of oneself was also found to be significantly higher among Singapore Chinese adolescents.

The above literature clearly shows that, although not unique, educational pressure and stress seem to be more pronounced in China and other Asian countries, such as Singapore, Korea, Japan and Chinese Taiwan, than western countries (Ang, *et al.*, 2007; Crystal, *et al.*, 1994; Lee & Larson, 2000; Lei, *et al.*, 2007; Zhao, *et al.*, 2009). Since stress originating from academic study is associated with many physical, psychological and behavioural problems (Ang & Huan, 2006b; Bjorkman, 2007b), it is therefore necessary to examine this phenomenon in more depth in adolescents, especially in East Asian countries.

Cultural and educational context of academic pressure in China

According to Confucianism, which has dominated Chinese society for thousands of years, education is highly valued as a means to climb up the social ladder. This is reflected by a Chinese saying “All are low but reading (learning)”. Established in 603 AD during the Sui Dynasty, the Civil Examination system was used as the noblest way to select government officials for nearly fourteen hundred years. (Lin & Chen, 1995; OECD, 2010). Candidates who went through this fiercely competitive yet efficient system and successfully passed the multi-tier examinations were given titles, power, prestige and lands. Although education is also valued by other cultures, people could promote their social status by many other alternative ways, such as the knights in Europe and samurais in Japan. Most stories about individual success in traditional China entail many years of concentrated academic learning. The Civil Examination system was abandoned in 1905 and there have been other substantial

changes in the past century. However, the culture of respect for education remains influential in contemporary China (OECD, 2010).

Confucian ideology extends beyond this purely academic sphere. Filial piety is one of the core virtues and an integrated part of Chinese culture. It refers to the extreme respect that Chinese children are expected to show their parents, ancestors and other elders. One important component of filial piety is to realise their parents' expectations and bring honour to them and the extended family (Ang & Huan, 2006a). High expectations from parents can therefore easily pass on to the children and become a significant source of pressure. This could in part explain the higher parental expectations perceived by Chinese students than in their American counterparts (Crystal, *et al.*, 1994). Many Chinese and Korean students consider their parents' high expectation to be a leading source of their academic pressure (Lei, *et al.*, 2007; Zhao, *et al.*, 2009).

There is also a close relationship between the high academic pressure and the educational system. Currently in China, similar to in Western countries, children usually need to go through 12 years at school before reaching the tertiary education, including 6 years in primary, 3 years each in junior and senior high schools (Education Encyclopaedia, 2010; OECD, 2010) (Figure 1.2). One feature of the education system is the implementation of "Nine-Year Compulsory Education" which covers the primary and junior high school phase and is free to all children. However, at the end of year 9, there is a transitional exam (*Zhong Kao*) in place, the results of which largely determine the chance to enter a good senior high school. Three years later, year-12 students have to face the most important examination, the annual National Unified College and University Entrance Exam (*Gao Kao*) which serves as virtually the only standard for a college / university admission. Therefore, education for secondary school students is strongly focused on the preparation for very competitive examinations.

In the early 1990s, only four percent of the students in China could have the chance to obtain higher education (Huang, 1992). According to data from the Ministry of Education of the PR China (2011), the Gross Enrolment Ratio (GER) for tertiary education increased dramatically from less than 4% in 1991 to 24% in 2009, close to the world average of 27% as published by the United Nations Educational, Scientific and Cultural Organisation (UNESCO Institute for Statistics, 2011). However, the *Gao Kao* is still highly competitive because its dominant role in college enrolment has changed little and many students fight for good universities which requires higher scores from this exam. Although the education system in China has been undergoing significant reforms for some years with a focus on allaying the burden of students and calling for “quality education” in replace of “exam-oriented education”, nothing much has been changed in the academic pressure among young students today (Lin & Chen, 1995; Lu, 2008).

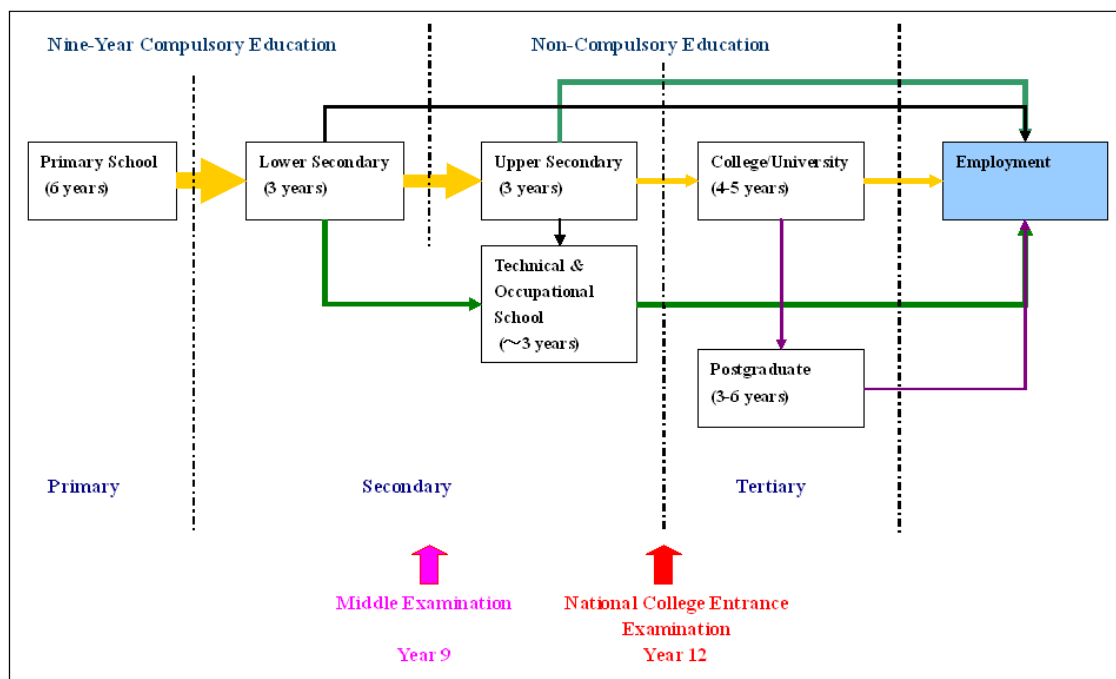


Figure 1.2. The education system and student flow in China

Research into Academic Stress in China

Mental health among children and adolescents has become a major public health concern in China in recent years. Many research studies have examined the magnitude of some mental health problems and their risk factors among children and adolescents in China. For example, depending upon the measurement used, the prevalence of self-reported depressive symptoms among Chinese adolescents was found to range from 12% to 55% (Shen, *et al.*, 2005; Stewart, Betson, Lam, Chung, & Chung, 1999), which is similar to the range of prevalence estimates in Western countries (22% - 60%) (Kubik, Lytle, Birnbaum, Murray, & Perry, 2003). Some evidence indicates that Chinese students may experience more depression than their counterparts in western countries (Greenberger, Chen, Tally, & Dong, 2000; Stewart, *et al.*, 1999).

Suicide is the fifth leading cause of death overall in China but the leading cause of death in persons aged 15-34 years (Phillips, Li et al. 2002). A large-scale national survey on adolescent health-risk behaviours was conducted among 181,832 secondary school students (year 7 to 12) aged 12-19 years in eighteen provinces in China in 2005 (Ji & Chen, 2009). More than one-fifth of the participants (16.7% of the males and 24.3% of the females) reported having seriously thought about committing suicide during the previous 12 months, 5.6% and 7.7% of the male and female students have made a plan for committing suicide, and the rates for suicidal attempts were reported to be 2.9% and 3.0% in boys and girls respectively. Suicidal ideation and planning were found to be more common in females than in males in each grade. There was however no significant gender difference of suicidal attempts. Adolescents in China seem to report more suicide ideation than their US counterparts. According to the US YRBS 2007 data, the percentage of reporting suicidal ideation among US secondary school students was 10.3% for males and 18.7 for females, respectively (Eaton *et al.*, 2008).

A wide range of individual and environmental (family, school and peer) factors have been identified as correlates or contributors to adolescent mental and behavioural problems. Among them, many are academic related, such as poor school grades and perceived academic pressure. Underachievement in academic grades has been consistently found to be an important risk factor for depression, anxiety, fear and suicidal behaviour among secondary school students (Greenberger, *et al.*, 2000; Li & Zhang, 2008; Liu & Tein, 2005; Shen, *et al.*, 2005; Su, *et al.*, 2002; Yang, 2002; Zhang, *et al.*, 2001). Compared to US students, the association between academic grades and ill mental health may be stronger among Chinese students (Greenberger, *et al.*, 2000).

Liu and Tein (2005) examined the risk factors for suicidal behavior in a sample of 1362 Chinese adolescents attending secondary schools (grade 7-11, age range: 12-18 years) in a rural prefecture in Eastern China. A list of 26 negative life events were measured in this study, covering four domains: family (e.g., beaten by parents), school (e.g., failure in an exam), interpersonal (e.g., break up with a close friend), and individual (e.g., serious illness). Most events measured in this study were found to be related to an elevated risk for suicidal ideation and attempts. Six of them were significantly associated with a three-fold higher risk for suicidal attempts and four of these were school related stressors (pressure to enter a better school/college, transfer to a new school, failure in an exam, and too much homework). The other two were being frightened and beaten or scolded by parents (Liu & Tein, 2005). However, this research only investigated the students from rural area and did not include the final and most stressful years of secondary school. A further limitation is that Liu and Tein (2005) focused only on life events and did not concurrently estimate the impact of structural factors (e.g., family demographics), adolescent connectedness to family and school, and other important covariates of both life events and mental health.

Research into academic stress in China has been centred on the magnitudes and health effects of perceived pressure from academic learning (Ge, 2008; Xie, 2007; Zhao & Yuan, 2006a). For example, a study among 519 secondary school students (grades 7-12) in Tianjin City found that 42% of participants felt high or very high pressure and only 3% reported none or very low academic pressure (Zhao & Yuan, 2006b). A wide range of school (such as pressure to enter a higher level school or university, too much school work and too much homework), family (parents compare their grades with others, too high parental expectations and being scolded by parents due to poor grades) and social factors (such as fierce competition in future employment, the importance of degree or diploma in employment market and heavy air pollution) were found to be related to high academic pressure (Zhao & Yuan, 2006b). High levels of learning pressure was found to be positively correlated with test anxiety and negatively associated with self-efficacy. However, these studies are subject to high measurement bias (i.e., the tools were not validated) and conceptual confusions (i.e., the definition of the phenomenon being measured was unclear).

Research Questions and Hypotheses

To sum up, existing literature clearly indicates that academic-related stress is a common and frequent experience for adolescents and makes a significant contribution to mental and behavioural problems. Asian students, in particular Chinese students seem to bear more academic burden and pressure due to cultural and education system-related influence. However, the psychosocial correlates of academic stress have not been addressed in detail so far which may provide valuable information for stress prevention and intervention programs. In addition, current research into academic stress is mainly from English-speaking countries and there remains a significant gap in developing world. Although a considerable number of instruments have been developed to examine this phenomenon, the majority were developed and validated in Western countries, and none of the existing scales

is considered to be suitable for the present study to measure the multidimensional nature of academic stress among secondary school adolescents in China.

Although adolescent mental health and academic burden in China have been drawing more attention among researchers as well as government agencies in recent years, much of this research has been descriptive social epidemiology that focuses on describing the scale of the problem. Although many academic related factors (such as poor grades) and perceived pressure arising from academic matters have been intensively studied, due to the lack of a well-established instrument and conceptual confusions, the construct of educational stress among Chinese adolescents has not been examined in depth, let alone its risk factors and associations with mental health. From the public health perspective, there appears to be a urgent need to examine the associations between educational stress and adolescent mental health and influencing factors for this type of stress. To address these issues, the development of a culturally appropriate instrument for academic stress among Chinese students is essential. Specifically, the current project is designed to address the following research questions:

- What are the associations between academic stress and mental and behavioral problems among Chinese adolescents?
- What are the psychosocial correlates of educational stress among Chinese adolescents?
- What are the psychometric properties of the new scale for educational stress among Chinese adolescents?

Based on results from studies measuring academic stress with other populations (Ang & Huan, 2006a; Ang & Huan, 2006b; Bjorkman, 2007b) and previous efforts made by Chinese scholars (Ge, 2008; Xie, 2007), it is anticipated that a sound instrument could be developed to measure the multi-factorial nature of academic stress with Chinese students.

Based on the review of existing instruments (Table 1.1) and literature about educational stress among Chinese students (e.g., (Lin & Chen, 1995; Lu, 2008), six inter-correlated domains of educational stress were hypothesised, including negative attitudes towards study and grades, perceived pressure, study burden, expectations from others, self-expectation and difficulties in study (Figure 1.3).

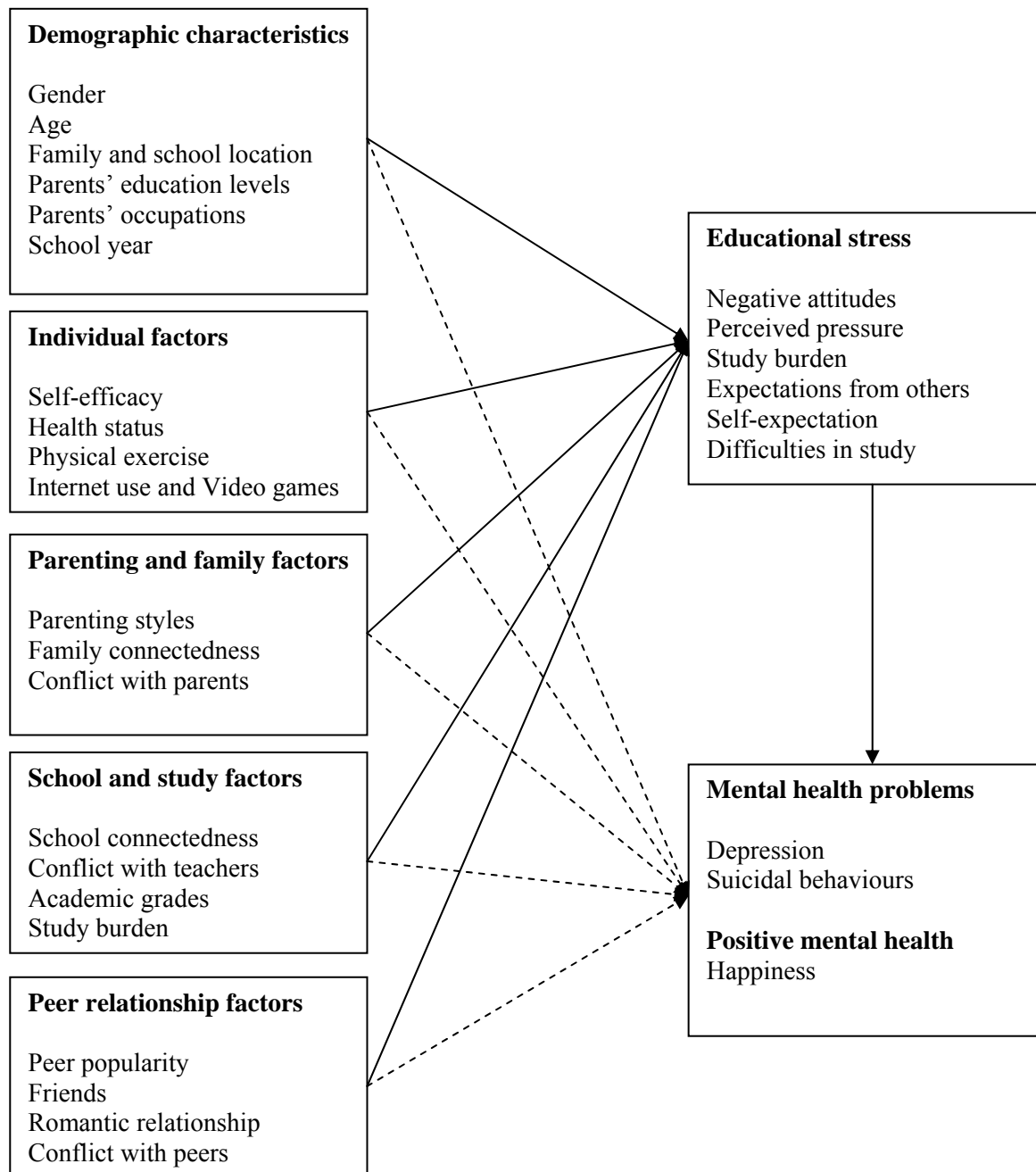


Figure 1.3. The conceptual model for educational stress (solid lines indicate the key relationships tested; dashed lines indicate relationships used as control in this study)

Research into the correlates of educational stress may provide evidence for mental health promotion. Similar to the Job Demand-Control-Support (JDCS) model among working individuals (Johnson & Hall, 1988; Van der Doef & Maes, 1999), heavy study workload, low self-efficacy and poor relationships with parents, teachers and peers have significant effects on the level of academic stress among students. Previous research from European countries found that educational stress is linked to the pressure to achieve and fear of failure, and is associated with a wide range of cognitive and educational factors (Meijer, 2007; Putwain, 2009). Some newly emerged factors in recent years, such as internet use and video gaming have drawn increasing attention among Chinese parents and teachers regarding their potential harmful effects on students' grades and mental health (Lin, 2002; Zhang, Zhang, Jin, Han, & Ye, 2009). Based on previous research, and following the general framework of ecological system theory (Bronfenbrenner, 1979), we hypothesised that a wide range of individual, family, school and peer factors would have an effect on educational stress (Figure 1.3).

Previous studies clearly indicate significant relationships between academic-related factors, pressure or academic stress and mental health problems in adolescent populations regardless of cultural diversity (Ang & Huan, 2006a; Ang & Huan, 2006b; Bjorkman, 2007b; Liu & Tein, 2005). It is therefore postulated there would be positive correlations between high academic stress and mental and the occurrence of behavioural problems even when other factors are taken into account. Previous studies mainly focused on negative mental health (e.g., depression and suicidal behaviour) and very few have examined the positive mental health (e.g., happiness). Perceived happiness was therefore included in outcome indicators in this study along with depression, suicidal behaviours (thoughts, plans and attempts) and substance use (smoking and drinking) (Figure 1.3).

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Chapter 2. Project Development and Pilot Study

Study Design and Overall Research Plan

A cross-sectional survey was designed to address the research questions developed based on the review of existing literature (see Chapter 1). There are some considerations for choosing this type of study. First, questionnaire survey is probably the most commonly used method to collect data in social science and psychology. Second, a cross-sectional survey would have the potential to answer these research questions. The key interests of this study include the development and initial validation of a new instrument for educational stress and the identification of statistically significant associations between educational stress and selective factors and mental health outcomes. Although implications may be drawn, the direction of causation cannot be established. Third, given the time limit of a PhD project, a longitude study would not have been feasible.

This project is divided into three major phases: project development and preparation, pilot survey and the main study (Fig 2.1). Main research activities in different phases are listed in the boxes in the middle with solid lines and corresponding objectives presented in the boxes with dashed lines (Fig 2.1). In Phase 1, research questions were defined based on literature review and extensive discussions with stakeholders. A draft questionnaire was also developed and logistic preparations (funding, ethics approval and partnership) were made. Phase 2 includes open-ended discussions with students and school teachers to critically assess the length and cultural suitability of the questionnaire, and a pilot study to validate measurement tools (especially the newly developed scales) and to estimate the sample size for the main survey. Phase 3 was the major survey to address research questions.

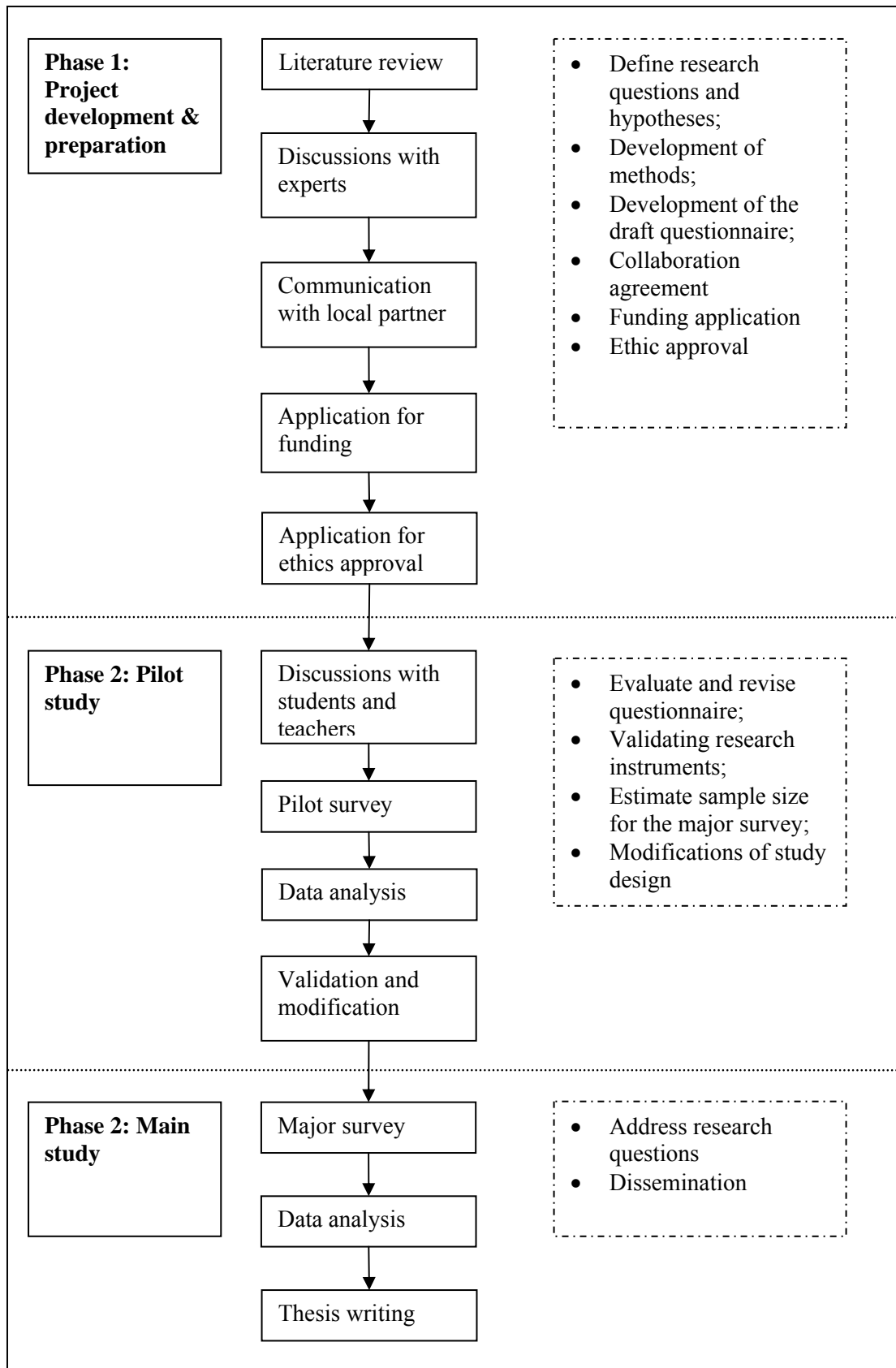


Fig 2.1 The flow chart of research plan

Research Population, Sites and Study Samples

The population in this study is Chinese adolescents attending general secondary schools. Adolescents are defined by the WHO as young people aged 10-19 years (WHO, 2002). In China, most of this age group are students attending junior (grades 7-9) or senior secondary schools (grades 10-12). According to the latest official statistics from the Ministry of Education, in 2009 the gross enrolment rates for junior and senior secondary schools among adolescents aged 12-14 and 15-17 years reached 99% and 79%, respectively (Ministry of Education of PR China, 2010). In total there were more than one hundred million secondary school students in various types of schools and most of them (99% of junior and 53% of senior school attendees) were in general secondary schools (with a focus of educating candidates for higher education in comparison to technical or vocational secondary schools with a main task of producing skilled workers for employment). The study population did not include those who attend technical or vocational secondary schools and school drop-outs because of the special focus of educational stress of this project.

Shandong province, situated in the eastern part of the North China and the lower reaches of the Yellow River, covering an area of 157 thousand square kilometres was chosen to conduct this study. It is the second most populous province in China with a total population of 94.7 million in 2009 (Shandong Provincial Bureau of Statistics, 2010). In 2009, there were a total of 5.0 million students attending general secondary schools and 1.6 million attending technical middle school and vocational schools (Shandong Provincial Bureau of Statistics, 2010). Shandong is a typical Chinese province in terms of ethnicity profile (dominated by ethnic *Han* Chinese) as well as social and cultural lifestyle patterns.

To ensure geographic and socioeconomic diversity, three research sites were selected, including one urban district (Huaiyin) of the capital city (Jinan) of the province, one small city (Shouguang) and a rural town (Tianliu of Shouguang City). In China, some secondary

schools consist of both junior and senior divisions while others contain one division only. In each survey site, two general secondary schools (one junior and one senior) or one school with both senior or junior divisions were approached by the staff from the local Centres for Disease Control and Prevention (CDCs) and a written permit (see Appendix 4) was obtained from the school principal or vice principal. In total, five schools (one school has both divisions) were selected and all are public schools. The number of students ranges from 1200 to 8000 in these schools. There are approximately 50 students in each class and at least 5 classes in every grade in selected schools.

Two samples of clusters (classes) were drawn for the pilot and main survey separately. First, in the pilot study, in each survey site, one grade-8 and one grade-11 classes were selected, resulting in a total number of classes of six. All students in selected classes were invited. The sample for the main survey was drawn from the remaining classes in the same schools, including students of all school years (7-12). The sample size and sampling frame were determined based on the preliminary results of the pilot study and were detailed in following sections.

Questionnaire Development

This study used a self-administered, anonymous questionnaire to collect data. This form of data collection has been widely used in similar studies on adolescent mental health (Ang & Huan, 2006b; Chen & Li, 2000; Davis, Tang, & Ko, 2002; Field, *et al.*, 2001; Lee & Larson, 2000; Liu & Tein, 2005). Although many of the scales and questions in the questionnaire were adopted from existing questionnaires, the combination and arrangement of this questionnaire were tailored specifically to the present study in accordance with the research questions (Appendix 5-11). There were several steps to develop and finalise this questionnaire.

First, based on extensive review of literature and regular discussions with experts, a list of variables along with their measurement scales and proposed questions or scales were defined (Table 2.1) and a draft questionnaire was constructed. The key variable of this study was educational stress. The mental health indicators of interest included depression, happiness, suicidal behaviour and substance use (Table 2.1). Other variables, including demographic variables, individual factors, family factors, school and study-related factors and peer relationships were selected based on their known or expected relationships with academic stress and mental health. Expected completion time (30-40 minutes), students' understanding ability and cultural suitability were taken into consideration in the design phase. All questions/items had a response format of multiple choice or short answer and no open questions were used.

Items were initially created in English or adopted from other English-language scales. The Chinese version was then generated using the backward translation technique. Specifically, two bilingual persons with Chinese background based at the Queensland University of Technology (QUT) independently translated the items into Chinese. The two Chinese copies were then sent to another bilingual professional based at Shandong University, China for review and translation into English. The back-translated scale was reviewed by an English native speaker at QUT to confirm its equivalence with the original. Revisions were made in the Chinese translation based on comments from the final reviewer. For scales that have already been validated with Chinese samples, such as the CES-D and GSES, the Chinese versions were adopted directly.

In the second step, the preliminary Chinese version of the questionnaire was reviewed by two professionals in adolescent mental health and four secondary school teachers in China for the wording and cultural suitability. The feedback was generally positive and no question / item was dropped or added but some wording changes were made to suit Chinese culture

and secondary school context. The revised questionnaire was then distributed to six volunteers (grade 8 and 11 students) to complete independently under examination conditions in a classroom, and a small discussion was followed to further check the appropriateness in wording, arrangement of questions, and sensitivity issues. All students completed the questionnaire within 30 minutes. All considered that the length of the questionnaire was acceptable and all questions were clear in meaning. Questions on suicidal behaviours were viewed as the most sensitive items in this questionnaire but were acceptable given the anonymous nature of the survey. No further change in the questionnaire was made based on the discussions with this group of students.

In the final step, the questionnaire was tested in the pilot study. To minimise repetition in this thesis, the psychometric properties of the questionnaire are not elaborated here but are fully described in the following sections and Chapter 4. After further revisions especially for the newly developed instrument, the Educational Stress Scale for Adolescents (ESSA), the finalised questionnaire was used in the main survey.

Logistic Preparation

During the design stage in early 2009, frequent communications were made between the PhD student and Shandong Provincial Centre for Disease Control and Prevention (CDC) and an official agreement for this project was reached. Local CDCs of three survey sites were coordinated by Shandong CDC. Potential participating schools were then contacted and permission letters were obtained.

Several small grants from QUT were secured in mid 2009 including a Research Development Grant, and a QUT Grant-in-Aid. In kind assistance was received from Shandong CDC and local CDCs during the data collection period.

Table 2.1. List of Variables, Measurement Scales and Instruments to Obtain Information in the Survey Questionnaire

Variables	Measurement scale	Question or scale
Demographic variables		
Sex	Categorical, dichotomous	MCQ
Age	Interval	Short answer question
Grade (School year)	Interval	Short answer question
School location	Categorical, nominal	MCQ
Family residence type	Categorical, nominal	MCQ
Father's education	Categorical, nominal	MCQ
Mother's education	Categorical, nominal	MCQ
Father's occupation	Categorical, nominal	MCQ
Mother's occupation	Categorical, nominal	MCQ
Mother's occupation	Categorical, nominal	MCQ
Individual variables		
Self-efficacy	Continuous	GSES
Height and weight	Continuous	Short answer question
Perceived health status	Categorical, ordinal	MCQ
Internet use	Categorical, ordinal	MCQ
Video game playing	Categorical, ordinal	MCQ
Physical exercise	Categorical, ordinal	MCQ
Family variables		
Parental bonding	Continuous	PBI
Family connectedness	Continuous	FCS
Conflict with parents	Categorical, ordinal	MCQs
School and study related variables		
School connectedness	Continuous	SCS
Conflict with teachers	Categorical, ordinal	MCQs
Academic grade level	Categorical, ordinal	MCQ
Home work hours	Categorical, ordinal	MCQ
Private tutoring	Categorical, ordinal	MCQ
Cramming classes	Categorical, ordinal	MCQ
Peer relationships		
Peer popularity	Categorical, ordinal	MCQ
Social isolation	Categorical, ordinal	MCQ
Girl or boy friend	Categorical, ordinal	MCQ
Conflict with peers	Categorical, ordinal	MCQs

Table 2.1. List of Variables, Measurement Scales and Instruments to Obtain Information in the Survey Questionnaire (Continued)

Variables	Measurement scale	Question or scale
Educational stress	Continuous	ESSA
Academic expectation stress	Continuous	AESI
Mental health manures		
Depression	Continuous	CES-D
Happiness	Continuous	Self-developed scale
Suicidal behaviour	Categorical, ordinal	MCQs
Substance use	Categorical, ordinal	MCQs

Note. MCQ = multiple choice questions; GSES = Generalized Self-Efficacy Scale (Zhang & Schwarzer, 1995); PBI = Parenting Bonding Inventory (Pedersen, 1994); FCS = family connectedness scale (Hall-Lande, Eisenberg, Christenson, & Neumark-Sztainer, 2007); SCS = School connectedness scale (Resnick, et al, 1997); ESSA = Educational Stress Scale for Adolescents; AESI = Academic Expectation Stress Scale (Ang & Huan, 2006a); CES-D = Center for Epidemiological Studies – Depressed Scale (Radloff, 1977; Liu, 1999).

Ethics Approval

In September 2009, this project obtained ethics approval from the University Human Research Ethics Committee of Queensland University of Technology, Australia (Ethics No. 0900000635) and the Preventive Medicine Ethics Committee of Shandong Center for Disease Control and Prevention, China (Ethics No. 2009-2).

Pilot Study

Objectives

The aims of the pilot study were to examine the psychometric properties of the questionnaire, especially for the newly developed scale (ESSA) and to estimate sample size for the main survey.

Sample

The pilot survey was conducted with a convenience sample of grade 8 and 11 students from six classes of selected secondary schools in Shandong, China in September 2009. All

students ($N = 364$) in these classes were invited but ten of them were excluded from the survey based on parental refusal or self-refusal. Seven incomplete ($>10\%$ of questions unanswered) questionnaires were further excluded and data analysis was undertaken for 347 questionnaires. The overall response rate was 95.3% ($347/364$).

A subset of this sample (two classes, $N=148$) was selected to participate in a repeated survey two weeks later to assess the test-retest reliability of the questionnaire. Completed questionnaires were obtained from 135 students resulting in a response rate of 91.2% ($135/148$). Among them, 84 (62.2%) were grade-8 and 51 (37.8%) were grade-11 students. Females accounted for 45.7% of this sample.

Measures

The questions and scales used in the pilot study were the same as in the main survey except the ESSA scale and minor wording changes in some demographic questions. Detailed information on the development and finalisation of ESSA is reported in Chapter 4 and on other instruments is reported in the following chapters.

Procedure

Students in selected classes were firstly introduced by their head teachers to the purpose and procedure of the survey and were asked to take a letter home to their parents (Appendix 3). The letter was written on behalf of the school principal to provide parents information on this survey and obtain their consent. A passive consent form was attached to this letter and parents who did not want their children to participate in this survey would sign the form and send or asked the student to bring back to school.

On the days of the pilot survey, a trained investigator entered the classroom and explained the purpose and instructions to the students. An information sheet (Appendix 1) and a consent form (Appendix 2) were provided to each student. After gathering consent forms, students who refused to take part by signing and those whose parents refused by

returning the signed passive consent form (Appendix 3) were allowed to leave or stay in the classroom as their wish. The survey questionnaire was then distributed to those who consented.

All survey sessions were conducted in classrooms on normal school days. The questionnaire is anonymous. Participation in this survey was completely voluntary. Participants were also advised that they could withdraw at any time, and that refusal or withdraw would have no negative effect on them.

The repeated survey for the test-retest reliability assessment was conducted following the technique introduced by Brener and colleagues (1995; 2002). First, a unique number was printed on each pair of questionnaires. In the first survey, students were provided with two identical questionnaires and one empty envelope. Before the survey session began, they were asked to write down their names on the envelope and return the envelope with a blank questionnaire in it to the investigator. Two weeks later, these students were given the questionnaire in the envelope with their name on it. The envelope, with identifiable information (student name) on it, was then disposed by students after the second session without returning. Paired data from the same student were then matched by the unique number on each pair of questionnaires; while maintaining anonymity.

Data analysis

Double data entry using Epidata Entry software (Lauritsen JM. (Editor)) was performed by university students and then checked by the researcher for accuracy. Entered data were then transformed into SPSS format and were analysed with SPSS software (SPSS, version 17.0, Chicago, IL). Analysis of Moment Structure software (AMOS, version 17.0) was also used for Confirmatory Factor Analysis (CFA). Analysis on the pilot data included three parts, descriptive analysis, psychometric property analysis and identification of potential associations between academic stress and other variables. All statistical tests used a

significance level of $\alpha < 0.05$. The detailed results of psychometric properties for the ESSA were separately reported in Chapter 4.

Factor structure of the ESSA

A series of Exploratory Factor Analysis (EFA) was conducted to explore the factor structure of the ESSA. Five factors, namely Pressure from study, Workload, Worry about grades, Self-expectation, and Despondency were extracted. The detailed results on these analyses were reported in Chapter 4.

Descriptive results

The demographic characteristics of the sample in the pilot study are shown in Table 2.2. In this sample ($N = 347$), 44.8% were female and all were from the *Han* Chinese ethnic group. The age ranged from 12 to 18 with a mean of 15.37 (standard deviation (SD) = 1.69). Students from urban and rural families accounted for 43.2% and 56.8% of the sample, respectively. With regard to parental occupation, farming was the most common one for both fathers and mothers. Most fathers and mothers had achieved secondary education (from junior to senior secondary school, Table 2.2).

The counts and percentages of other categorical variables are presented in Table 2.3; and the means (Ms) and SDs of continuous variables are presented in Table 2.4. In this sample of healthy school students, more than half (57.8%) considered themselves to be in good or very good health. The recent experience of internet use and computer or video gaming was common and was reported by 61-82% of participants. Most students had engaged in some amount of physical exercise in the past month (Table 2.3). Quarrels were the most frequently reported form of student-parent conflict while emotional punishment was the most common one for student-teacher conflict. Physical punishments by teachers were more common than from by parents. Verbal and emotional conflicts between peers were also more common than physical conflict (Table 2.3).

Table 2.2. Demographic characteristics of participants in the pilot study (N=347)

Variables	Count	%	Variables	Count	%
Sex			Father education		
Male	190	55.23	College or above	54	15.56
Female	154	44.77	Senior high/Technical	111	31.99
Age			Junior high	144	41.50
12	2	0.58	Primary or lower	20	5.76
13	47	13.62	Don't know or NA	18	5.19
14	95	27.54	Mother education		
15	44	12.75	College or above	26	7.49
16	32	9.28	Senior high/Technical	95	27.38
17	86	24.93	Junior high	140	40.35
18	39	11.30	Primary or lower	65	18.73
Family residence			Don't know or NA	21	6.05
Urban	150	43.23	Family income		
Rural	197	56.77	Low	28	8.12
Father occupation			Middle	257	74.49
Government & Professional	71	20.46	High	60	17.39
Manual worker	53	15.27	Grade		
Self-employed	75	21.61	Grade 8	193	55.62
Farmer	125	36.02	Grade 11	154	44.38
Unemployed	6	1.73	School location		
Others	17	4.90	Major city	83	23.92
Mother occupation			County City	147	42.36
Government & Professional	47	13.54	Rural town	117	33.72
Manual worker	44	12.68			
Self-employed	59	17.00			
Farmer	143	41.21			
Unemployed	45	12.97			
Others	9	2.59			

Note. Sample size for each variable was not identical due to missing data. NA: Not applicable

The findings indicate a heavy burden from academic activities. More than one-third (36.4%) spent at least two hours every day for their homework and another one-third (34.4%) usually spent 1-2 hours daily. One-fifth (20.7%) have ever had private tutor(s) to help them with academic learning and more than forty percent (41.5%) have ever attended extra classes outside school hours. Twenty percent (19.9%) of students reported that they had ever seriously considered attempting suicide; 7.8% had made a plan; and 0.9% had committed suicidal actions in the past 12 months (Table 2.3).

Table 2.3. Description of categorical variables in the pilot study (N=347)

	<i>N</i>	<i>n (%)</i>		<i>N</i>	<i>n (%)</i>
Perceived health status	346		Home work hours	346	
Poor		29 (8.4)	None or <1 hour		101 (29.2)
Moderate		117 (33.8)	1-2 hours		119 (34.4)
Good or very good		200 (57.8)	2 hours or more		126 (36.4)
Internet use (yes)	347	259 (74.6)	Peer popularity	347	
Video game playing (yes)	347	210 (60.5)	Low		11 (3.2)
Physical exercise (yes)	347	285 (82.1)	Moderate		153 (44.1)
Conflict with parents			High or very high		183 (52.7)
Quarrels with parents (yes)	347	184 (53.0)	Social isolation (yes)	346	28 (8.1)
Parents' emotional punishments (yes)	347	142 (40.9)	Girl or boy friend (yes)	347	116 (33.6)
Parents' physical punishments (yes)	347	23 (6.6)	Conflict with peers		
Conflict with teachers			Quarrels with peers (yes)	347	240 (69.2)
Quarrels with teachers (yes)	347	41 (11.8)	Peer physical fighting (yes)	346	89 (25.7)
Teachers' emotional punishments (yes)	346	129 (37.3)	Peer emotional bullying (yes)	347	114 (32.9)
Teachers' physical punishments (yes)	347	95 (27.4)	Peer physical bullying (yes)	347	46 (13.3)
Academic grade level	347		Suicidal thoughts (yes)	347	69 (19.9)
Poor		78 (22.5)	Suicidal plans (yes)	347	27 (7.8)
Middle		156 (45.0)	Suicidal attempts (yes)	346	3 (0.9)
Good or very good		113 (32.6)	Smoking (yes)	347	21 (6.1)
Private tutoring (yes)	347	72 (20.7)	Drinking (yes)	346	93 (26.9)
Cramming classes (yes)	347	144 (41.5)			

Note. *N* = number of participants

Sample size for each variable was not identical due to missing data.

Table 2.4. Description of continuous variables in the pilot study (N=347)

	<i>N</i>	<i>M (SD)</i>		<i>N</i>	<i>M (SD)</i>
Self-efficacy	343	26.42 (5.48)	ESSA total	334	54.14 (9.32)
BMI	336	19.88 (3.57)	Pressure from study	342	13.99 (3.56)
PBI			Workload	345	9.51 (2.90)
Father care	344	11.45 (2.43)	Worry about grades	345	11.38 (2.70)
Father control	343	5.26 (2.88)	Self-expectation	343	9.91 (2.56)
Mother care	347	12.14 (2.30)	Despondency	345	9.31 (2.83)
Mother control	344	5.37 (3.02)	AESI total	340	30.61 (6.46)
Family connectedness	344	3.77 (0.66)	Expectations from others	343	17.22 (3.86)
School connectedness	342	14.18 (3.93)	Self expectations	343	13.38 (3.30)
CES-D	325	15.34 (8.93)	Happiness	342	5.23 (1.27)

Note. *N* = number of participants; *M* = mean; *SD* = standard deviation; BMI = Body Mass Index; PBI = Parental Bonding Inventory; CES-D = Centre for Epidemiological Studies – Depression Scale; ESSA = Academic Stress Scale for Adolescents; AESI = Academic Expectation Stress Inventory.

Sample size for each variable was not identical due to missing data.

Internal consistency of scales

The Cronbach's alpha was calculated to assess the internal consistency for all multi-item scales. It is generally accepted that a Cronbach's alpha of .70 or higher indicates acceptable reliability (Robinson, Shaver, & Wrightsman, 1991). As shown in Table 2.5, most scales and subscales used in this study obtained an acceptable internal consistency.

Table 2.5. Internal consistency for multi-item scales in the pilot study (N=347)

	Number of items	Sample size	Cronbach's α
GSES	10	343	.86
PBI			
Father care	5	344	.67
Father control	5	343	.68
Mother care	5	347	.65
Mother control	5	344	.71
Family connectedness	4	344	.74
School connectedness	5	342	.80
ESSA total	16	334	.81
Pressure from study	4	342	.74
Workload	3	345	.75
Worry about grades	3	345	.71
Self-expectation	3	343	.66
Despondency	3	345	.66
AESI total	9	340	.85
Expectations from others	5	343	.81
Self expectations	4	343	.73
CES-D	20	325	.87
Happiness	3	342	.73

Note. GSES = General Self-Efficacy Scale; PBI = Parental Bonding Inventory; ESSA = Academic Stress Scale for Adolescents; AESI = Academic Expectation Stress Inventory; CES-D = Centre for Epidemiological Studies – Depression Scale

Sample size for each measure was not identical due to missing data.

Test-retest reliability

The Intraclass Correlation Coefficient (ICC) and 95% confidence interval (CI) were used to assess the test-retest reliability for continuous variables. An ICC of .20 and lower indicates “poor”; .21 - .40 “fair”; .41 - .60 “moderate”; .61-.80 “good”; and .81 or higher as “almost perfect” reliability (Kho et al., 2008; Landis & Koch, 1977). For categorical variables, a Kappa value and 95% CI were calculated following the method suggested by Landis and Koch (1977). A Kappa value of .20 and lower indicates “poor”; .21 - .40 “fair”; .41 - .60 “moderate”; .61 - .80 “good”; and .80 or higher as “almost perfect” reliability (Landis & Koch, 1977). Both ICCs and Kappas were calculated with SPSS software (SPSS, version 17.0, Chicago, IL).

The results for ICCs and Kappas are presented in Table 2.6 and 3.7, respectively. Almost all continuous variables reached a “good” to “almost perfect” reliability in terms of the ICC value (.61 or higher, Table 2.6). Very high reliability ($>.80$) were found for age, GSES, mother control and CES-D. Only two variables (Self-expectation of ESSA and Self-expectations of AESI) had an ICC below but close to the threshold of a “good” reliability.

In terms of Kappa value, all categorical variables except internet use had a “moderate” or higher ($>.40$) reliability and most reached a “good” to “almost perfect” level ($>.60$, Table 2.7). Demographic variables were more likely to have high test-retest reliability (Table 2.7). It should be noted that self-reported quarrels with teachers and parental physical punishment had relatively low Kappas.

The findings regarding internal consistency and test-retest reliability analyses suggest that overall the questionnaire is reliable in this population. Importantly, all multi-item scales used in this study obtained relatively good internal and test-retest reliability.

Table 2.6. Intraclass Correlation Coefficients (ICCs) and 95% confidence intervals (CIs) for continuous variables in the test-retest reliability analysis (N=135)

	ICC	95% CI
Age	.98	.97-.99
BMI	.71	.61-.78
GSES	.95	.93-.96
PBI		
Father care	.67	.57-.76
Father control	.78	.71-.84
Mother care	.66	.55-.75
Mother control	.82	.76-.87
Family connectedness	.75	.66-.81
School connectedness	.73	.61-.81
ESSA total	.78	.72-.85
Pressure from study	.75	.65-.81
Workload	.61	.52-.71
Worry about grades	.70	.58-.79
Self-expectation	.59	.48-.67
Despondency	.62	.51-.72
AESI total	.70	.55-.80
Expectations from others	.68	.57-.77
Self expectations	.58	.43-.70
CES-D	.84	.78-.88
Happiness	.79	.71-.84

Note. GSES = General Self-Efficacy Scale; PBI = Parental Bonding Inventory; ESSA = Academic Stress Scale for Adolescents; AESI = Academic Expectation Stress Inventory; CES-D = Centre for Epidemiological Studies – Depression Scale
Sample size for each measure was not identical due to missing data.

Table 2.7. Kappa value and 95% confidence intervals (CIs) for categorical variables in the test-retest reliability analysis (N=135)

	Kappa	95%CI		Kappa	95%CI
Demographics			School and study variables		
Sex	.98	.95-1.00	Quarrels with teachers	.44	.21-.66
Grade (School year)	1.00	-	Teachers' emotional punishments	.52	.36-.67
School location	1.00	-	Teachers' physical punishments	.51	.34-.68
Family location	.92	.85-.98	Academic grade level	.75	.66-.84
Father's education	.80	.70-.91	Home work hours	.48	.33-.63
Mother's education	.76	.67-.85	Private tutoring	.58	.43-.73
Father's occupation	.86	.80-.93	Cramming classes	.74	.63-.84
Mother's occupation	.84	.77-.90			
Family income	.75	.64-.86			
Individual variables			Peer variables		
Perceived health status	.63	.52-.74	Peer popularity	.50	.37-.62
Internet use	.39	.26-.53	Social isolation	.63	.52-.74
Video game playing	.58	.47-.69	Girl or boy friend	.75	.64-.86
Physical exercise	.53	.41-.64	Quarrels with peers	.47	.33-.60
			Peer physical fighting	.64	.49-.80
			Peer emotional bullying	.63	.49-.77
			Peer physical bullying	.61	.37-.84
Family variables			Mental health variables		
Quarrels with parents	.56	.43-.69	Suicidal thoughts	.84	.72-.95
Parents' emotional punishments	.54	.39-.68	Suicidal plans	.63	.40-.87
Parents' physicals punishments	.41	.11-.70	Suicidal attempts	.49	.11-1.00
			Smoking	.53	.26-.87
			Drinking	.62	.47-.78

Associations between academic stress and other variables

The associations between demographic variables and ESSA score are presented in Table 2.8. Overall, male and female students experienced similar amounts of academic stress. Parental education level and family income also had no statistically significant effect on students' stress. Students from rural families and whose parents were farmers reported significantly higher ESSA scores than their urban counterparts and those whose parents were in non-farming occupations. Higher age students experienced more stress than younger ones.

Additionally, grade 11 students and students in rural or county schools were more likely to report high ESSA scores (Table 2.8).

Table 2.8. ESSA total score across demographic variables in the pilot study ($N = 347$)

	<i>N</i>	<i>M (SD)</i>		<i>N</i>	<i>M (SD)</i>
Sex			Mother occupation ^a		
Male	182	54.19 (9.21)	Farming	141	55.74 (8.60) **
Female	149	54.12 (9.55)	Others	193	52.97 (9.66)
Age			Father education		
12-13	47	51.21 (9.94) **	Junior or lower	162	55.17 (9.26)
14	87	51.83 (10.60)	Senior or higher	154	53.39 (9.36)
15	42	53.76 (8.16)	Mother education		
16	32	55.06 (6.96)	Junior or lower	198	54.79 (9.10)
17	85	56.05 (8.69)	Senior or higher	116	52.68 (9.77)
18	39	58.59 (7.30)	School location		
Family location			Major city	80	51.46 (10.20) *
Urban	140	51.95 (9.50) **	County City	141	54.70 (9.47)
Rural	194	55.72 (8.88)	Rural town	113	55.34 (8.10)
Family income			School year level		
Low	27	56.26 (12.05)	Grade 8	181	52.15 (9.80) **
Middle	250	54.24 (8.87)	Grade 11	153	56.50 (8.14)
High	55	52.42 (9.60)			
Father occupation ^a					
Farming	124	55.96 (8.27) **			
Others	206	53.06 (9.74)			

Note. N = number of participants; M = mean; SD = standard deviation

Sample size for each variable was not identical due to missing data.

Comparisons between groups were tested using independent t -test or one way ANOVA

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

The correlation coefficients (Pearson correlation coefficients for continuous variables; Point-biserial correlation coefficients for dichotomous variables and Spearman's r for ordinal variables) between ESSA score and respective variables are presented in Table 2.9. A significant bivariate association was found for most variables with academic stress score. However, these associations may be related to each other and confounding effects may exist, but the sample size in the pilot study ($N = 347$) is too small to examine the multivariable relationships, which necessitates the main study with a larger sample.

Table 2.9. Correlation coefficients between study factors and ESSA total score in the pilot study ($N = 347$)

Variable	Value	N	r
Individual variables			
Self-efficacy	Continuous	331	-.25**
Body Mass Index	Continuous	324	-.06
Perceived health status ^a	1=poor; 2=middle; 3=good or very good	333	-.18**
Internet use	0 = no; 1 = yes	334	.08
Video game playing	0 = no; 1 = yes	334	-.01
Physical exercise	0 = no; 1 = yes	334	-.15**
Family variables			
Parental bonding			
Father care	Continuous	331	-.16**
Father control	Continuous	334	-.11*
Mother care	Continuous	330	.29**
Mother control	Continuous	331	.28**
Family connectedness	Continuous	331	-.22**
Quarrels with parents	0 = no; 1 = yes	334	.17**
Parents' emotional punishments	0 = no; 1 = yes	334	.09
Parents' physical punishments	0 = no; 1 = yes	334	-.05
School and study related variables			
School connectedness	Continuous	330	-.28**
Quarrels with teachers	0 = no; 1 = yes	334	.08
Teachers' emotional punishments	0 = no; 1 = yes	333	.22**
Teachers' physical punishments	0 = no; 1 = yes	334	.20**
Academic grade level ^a	1=poor; 2=middle; 3=good or very good	334	-.20**
Home work hours ^a	1=none or <1 hr; 2=1- 2 hrs; 3=>2 hrs	333	-.11*
Private tutoring	0 = no; 1 = yes	334	-.03
Cramming classes	0 = no; 1 = yes	334	-.06
Peer relationships			
Peer popularity ^a	1=poor; 2=middle; 3=good or very good	334	-.13**
Social isolation	0 = no; 1 = yes	333	.15**
Girl or boy friend	0 = no; 1 = yes	333	.22**
Quarrels with peers	0 = no; 1 = yes	334	.15**
Peer physical fighting	0 = no; 1 = yes	333	.17**
Peer emotional bullying	0 = no; 1 = yes	334	.13*
Peer physical bullying	0 = no; 1 = yes	334	.06
Mental health measures			
Depression score	Continuous	314	.47**
Happiness score	Continuous	329	-.28**
Suicidal thoughts	0 = no; 1 = yes	334	.17**
Suicidal plans	0 = no; 1 = yes	334	.09
Suicidal attempts	0 = no; 1 = yes	334	-.07
Smoking	0 = no; 1 = yes	334	.12*
Drinking	0 = no; 1 = yes	334	.18**

Note. ESSA = Educational Stress Scale for Adolescents

Pearson correlation coefficients for continuous variables; Point-biserial correlation coefficients for dichotomous variables and Spearman r for ordinal variables (^a). * $p < .05$; ** $p < .01$

Summary of the Pilot Survey and Implications for the Main Study

Psychometric property of the questionnaire

One primary objective of the pilot study was to test the psychometric properties of the questionnaire. The reliability analyses in this Chapter and Chapter 4 indicate that most of the questions and scales had good internal reliability (for multiple item scales only) and 2-week test-retest reliability. The Cronbach's alpha for GSES (10 items), four subscales of PBI (5 items each), family connectedness (4 items), school connectedness (5 items), ESSA (16 items), CES-D (20 items) and happiness scale (3 items) were .86, .65-.71, .74, .80, .81, .87 and .73, respectively. These multi-item instruments were used in the main survey. The ICC for these scales were .95, .66-.82, .75, .73, .78, .84 and .79, respectively. The Kappa value for single-item questions ranged from .39 to 1 with most having a value above .60.

Concerns regarding the questionnaire and changes made

Several concerns regarding the questionnaire emerged in the pilot survey. First, some questions were found not to cover all possible options, including items on parents' occupation and education level. A new option "I have no father/mother" was added. Second, the original questionnaire used tick-box design for all questions/scales. The participants were asked to tick the suitable box for each item. However, it was found difficult for data entry because the investigator had to transform the box into the corresponding number before data entry. Furthermore, the original title of the questionnaire, "Survey on Adolescent Mental Health and Behaviours" was found to be sensitive to some adolescents and school teachers, because they relate "mental health problems" to severe psychiatric disorders, which might have a negative effect on the compliance of participants. Apart from the major change of ESSA scale after the pilot which reports in detail in Chapter 4, some minor revisions for the questionnaire were made in the main survey:

- A new option, “I have no father/mother” was added to questions about parents’ occupation and education;
- The original tick-box design in the questionnaire was replaced by numbers;
- The word “*Mental*” has been removed from the title of the questionnaire to reduce sensitivity;
- The format has been revised to be more user-friendly.

Calculation of the sample size for the main survey

Another primary objective of the pilot study was to determine the minimum sample size for the main survey. The primary focus of the study is to understand the association between academic stress and mental health problems, in particular depression controlling for possible confounding factors, including gender, age, school year, school location, family residence, father and mother’s occupation, father and mother’s education level, parental marriage status and family income level. The sample size for the main survey was calculated following the method suggested by Maxwell (2000) based on the pilot results for this primary focus.

Three parameters are needed in the estimation, i.e., statistical power, number of predictors, and expected correlation coefficient of the model. First, a multiple regression analysis was conducted based on the pilot data, showing that the standardised regression coefficients (β) for the ESSA score being 0.44 ($t = 8.81, p < .001$). Conservatively assuming a coefficient of .4, together with an expected power of 80% at $\alpha=0.05$ significance level and the number of independent variables (12), the minimum sample was estimated to be 1434. Considering 5% non-response rate and 5% missing rate observed in the pilot study, a minimum of 1578 students are necessary. Adopting a conservative estimate of 45 students per class, thirty-six classes (at least 1620 students) were selected to participate in the main survey. The 11 demographic variables were treated as confounders in the main study.

Therefore the target sample size was considered to be sufficient to detect a significant association in a 12-independent-variable (academic stress and 11 potential confounders) multiple regression model with academic stress as the key interest.

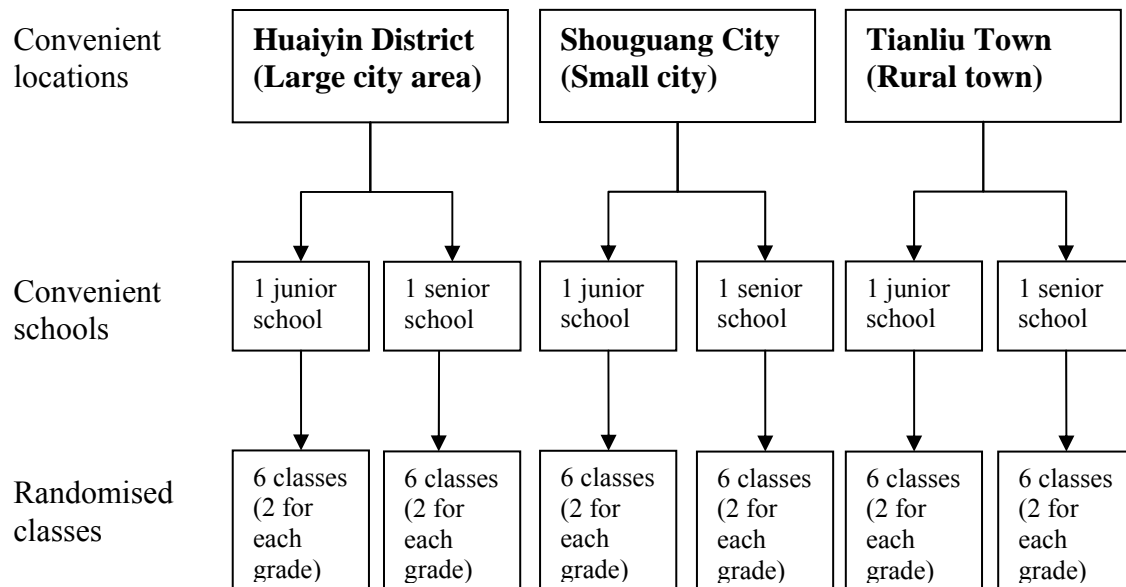


Fig 2.2. Three-stage sampling frame for the main survey

The sampling frame for the main survey is displayed in Fig 2.2. It can be broken down into three stages. In the first stage, three survey sites were purposely selected: one major city, one county city, and a rural town to assure geographic and demographic diversity. In the second stage, two schools including one junior and one senior high were chosen because they were accessible to the researchers.. In the third stage, two classes were randomly selected for each grade in each school. All students in the selected classes were invited to participate in the main study.

Improvement of the Survey procedure

The survey procedure in the main study largely followed the pilot study with several minor modifications. First, in the pilot study, some students finished the questionnaire very quickly and left the classroom. This might have a negative effect on other students who were

relatively slow and hence reduce response quality. In the main survey, all participating students were required not to leave classroom until 30 minutes after the questionnaire was distributed even if they completed the questionnaire earlier. In addition, the timing of survey was slightly changed in the main survey. Some pilot surveys were conducted using the time allocated for “less important” classes, such as gymnastics. Nonetheless, some students complained to the researcher that the survey ruined their precious relaxation time. This might be a potential threat to reduce the participating compliance. In the main study, all data collection was conducted during self-study classes to minimize the interruption to the regular school schedules and student sport/recreation time to enhance participating compliance.

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Chapter 3. Paper 1: Educational Stress Scale for Adolescents: Development, Validity, and Reliability with Chinese Students

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Abstract

This article describes the development and initial validation of a new instrument to measure academic stress -- the Educational Stress Scale for Adolescents (ESSA). A series of cross-sectional questionnaire surveys were conducted with more than 2000 Chinese adolescents to examine the psychometric properties. The final 16-item ESSA contains five latent variables: Pressure from study, Workload, Worry about grades, Self-expectation, and Despondency, which together explain 64% of the total item variance. Scale scores showed adequate internal consistency, 2-week test-retest reliability, and satisfactory concurrent validity. A confirmatory factor analysis suggested the proposed factor model fits well in a different sample. For researchers who have a particular interest in academic stress among adolescents, the ESSA promises to be a useful tool.

Keywords

ESSA, validity, reliability, academic stress, Chinese adolescents

Introduction

Academic learning is among the most important sources of stress among young students worldwide and appears to be quite severe in Asian countries (Brown, Teufel, Birch, & Kancherla, 2006; Christie & MacMullin, 1998; Dodds & Lin, 1992; Gallagher & Millar, 1996; Huan, See, Ang, & Har, 2008; Tang & Westwood, 2007). Asian students usually have high academic burden (Lee & Larson, 2000), low satisfaction regarding their academic performance, and high expectations (Crystal *et al.*, 1994), and may suffer more academic stress (Ang & Huan, 2006a; Ang, Huan, & Braman, 2007) than their counterparts in English speaking countries. Academic stress is a significant contributor to a variety of mental and behavioral disorders, such as depression, anxiety and suicidal behavior (Ang & Huan, 2006b; Bjorkman, 2007).

In China, there has been a growing recognition of academic burden and its health impact among students as a public health and educational concern. A national survey conducted with 5040 adolescents and 6552 parents by the All-China Women's Federation (2008) reported that nearly half (49.1%) of the students in secondary schools spend at least 2 hours per day for homework assigned by their teachers. Another national survey (China Youth Social Service Center, 2008) found that most children and adolescents (66.7%) considered academic pressure as the biggest stress in their lives. Academic related factors, such as underachievement, pressure from transitional examinations and study workload are associated with poor mental health among Chinese adolescents (Li & Zhang, 2008; Liu & Tein, 2005; Zhang, Tao, & Zeng, 2001). High academic pressure may also lead to physical violence and many developmental problems (Lin & Chen, 1995).

A number of self-report instruments have been developed to assess the level of academic stress and associations with health problems among adolescents. These include the

Academic Stress Questionnaire (ASQ, Abouserie, 1994), Student Stress Inventory (SSI, Zeidner, 1992), Academic Stress Scale (ASS, Kohn & Frazer, 1986), Lakaev Academic Stress Response Scale (LASRS, Lakaev, 2009), Student-life Stress Inventory (SSI, Gadzella, 2001), High School Stressor Scale (HSSS, Burnett & Fanshawe, 1997), Academic Expectation Stress Inventory (AESI, Ang & Huan, 2006a), and Survey of Academic Stress (SAS, Bjorkman, 2007). Most of these scales were designed and used to measure academic stress among college or university students and only three have been used in surveys with secondary school students. All but the AESI (Ang & Huan, 2006a, 2006b) were developed and validated in western countries.

Among the three instruments used in secondary school settings, the HSSS (Burnett & Fanshawe, 1997) was developed with a sample of Australian students (year 8 through 12). It includes 35 items and 9 latent variables. One problem for this scale is the psychometric properties are less than satisfactory. For example, the GFI (.85) and AGFI (.82) based on the Confirmatory Factor Analysis (CFA) are below the threshold of an adequate fit (.90). The internal consistency for some factors was well below the threshold of a sufficient reliability (.70) for a new scale (Hinkin, 1998). The SAS (Bjorkman, 2007) is a 23-item scale developed with a US sample of junior high school students. However, its factor structure is problematic. For example, one of the four factors contains only 2 items which is less than the recommended minimum number of 3 (Costello & Osborne, 2005).

The AESI (Ang & Huan, 2006a) is the only one among the reviewed instruments that has been used in Asian countries. It was developed with Singapore students to measure the level of stress arising from academic expectations of both the students and significant others. Its psychometric profile has been well established and cross-cultural validity has also been tested with both Chinese and Hispanic students (Ang & Huan, 2006a, 2006b). However, the AESI authors acknowledged that the scale was limited to measurement of stress due to

academic expectations. The purpose of the present study was to extend the range of factors that contribute to the construct of educational stress.

In Chinese context, apart from high expectations, heavy burden of school work and homework, negative attitudes towards learning, such as dissatisfaction with grades, loss of interest, and difficulties in studying may also be important sources of pressure and stress among students (Lin & Chen, 1995; Lu, 2008). Thus, a more comprehensive tool seems necessary to study the nature and health effects of educational stress. Extensive review of both English and Chinese literature found no instrument that measures the multifactorial nature of academic stress among high school students in Asian countries.

Methods

Design

This study consisted of three cross-sectional questionnaire surveys with convenience samples of students (grades 7-12) from six secondary schools in three sites (the capital city, one county city and one rural town) in Shandong Province, China. These surveys were conducted in September and October 2009. The objective of the first survey was to explore the factor structure, internal consistency, concurrent validity and predictive validity of the draft ESSA scale. The second survey was to assess the test-retest reliability. The third survey was to evaluate the robustness of the factor structure established in the first survey.

Participants

Scale development sample. The first sample contained 364 grade 8 and 11 students. Data analysis was conducted with 347 students with a response rate of 95.3%. Of them, 44.8% were female and all were from the *Han* Chinese ethnic group. The age of the sample ranged from 12 to 18 ($Mean=15.37$, $SD=1.69$). Students from urban and rural families accounted for 43.2% and 56.8% of the sample, respectively.

Test-retest reliability sample. Two weeks later, a subset of the first sample (two classes, $N=148$) participated in a second survey with the same questionnaires. Data analysis on test-retest reliability was done with 135 (91.2%) respondents. The demographic characters were similar to the first sample.

CFA sample. A total of 1740 eligible participants (grades 7 through 12) from 36 classes were invited to participate in the third survey. Complete data were obtained from 1670 (95.8%) students and were included in the analysis. Of them, 44.6% were female and almost all (99.3%, 1659/1670) were ethnically *Han* Chinese. The age of the respondents ranged from 11 to 20 ($Mean=15.44$, $SD=1.85$). Urban and rural students accounted for 42.2% and 57.8% of the sample, respectively.

Measures

Educational stress. The preliminary version of the ESSA was used in the first two surveys. It contained 30 items derived from extensive review of both the English and Chinese literature and discussions with professionals in both public health and education in China. Six domains of stress consisting of five items each were predefined, including attitudes towards study and grades (such as “I am very dissatisfied with my academic grades”), perceived pressure (such as “I feel a lot of pressure in my daily studying”), perceived burden (such as “I feel that there is too much school work”), expectations from others (such as “I feel that I have disappointed my parents when my test/exam results are poor”), and self-expectation (such as “I feel stressed when I do not live up to my own standards”). Seven items were adapted from the AESI (Ang & Huan, 2006a) to form the last two dimensions. The response format used a 5-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*) with a higher score indicating greater stress.

Items were initially created in English or adopted from other English scales. The Chinese version was then generated using the backward translation technique. Specifically,

two bilingual persons with Chinese background based at the Queensland University of Technology (QUT) independently translated the items into Chinese. The two Chinese copies were then sent to another bilingual professional based at Shandong University, China for review and translation into English. The back-translated scale was reviewed by an English native speaker at QUT to confirm its equivalence with the original. Revisions were made in the Chinese translation based on comments from the final reviewer.

After pilot testing, the scale was revised and a final 16-item version was used in the main survey. In the final scale, 5 items (item 9, 10, 14, 15, 16, Table 1) were adapted from the AESI (Ang & Huan, 2006a) with minor wording changes.

Academic expectation stress. The original (English) AESI (Ang & Huan, 2006a) was translated into Chinese following the same procedure for the ESSA and was used in this study. This 9-item scale has two subscales, Expectations of Parents/Teachers (five items) and Expectations of Self (four items). Respondents rated each statement on a 5-point Likert scale ranging from 1 (*never true*) to 5 (*almost always true*). The possible total score ranges from 9 to 45, with higher scores indicating greater stress. It gained good internal consistency (Cronbach's $\alpha = .89$ for the total scale, .84-.85 for two factors) in the original study (Ang & Huan, 2006a).

Depressive symptoms. The Chinese version of Centre for Epidemiological Studies – Depression Scale (CCES-D, Radloff, 1977; Liu, 1999) is a 20-item self-report instrument for depressive symptoms. Items were rated using a 4-point scale from *Rarely or none of the time (less than 1 day)* to *Most or all of the time (5-7 days)* during the past week and were scored either 0-3 or 3-0, with a total range of 0-60, where higher scores indicate greater frequency and number of symptoms. It has 4 separate factors: depressive affect, somatic symptoms, positive affect, and interpersonal relations. The CES-D has good internal consistency with alphas of .85 for the general population and .90 for a psychiatric population (Radloff, 1977).

Suicidal thoughts. Suicidal thoughts were measured using one question “In the past 12 months, have you ever seriously considered attempting suicide?”, adopted from the youth risk behaviour survey (YRBS) questionnaire (Eaton *et al.*, 2008). Students who responded “Yes” to this question were defined as having suicidal thoughts. This question has been widely used in the US (Brenner *et al.*, 2002, Eaton *et al.*, 2008), China (Chen, Dunne, & Han, 2006) and elsewhere.

Academic grades. Participants were asked to rank their average grades during the past 12 months into one of the five categories: *Very poor*, *Poor*, *Middle*, *Good*, and *Very good*. In data analysis, the first two and last two groups were combined as *Very poor/Poor* and *Good / Very good*, respectively, resulting in three categories coded from 1 to 3.

Procedure

All surveys were conducted in schools during self-study sessions. A brief introduction was given by the investigator and followed by the distribution of assent forms and information sheets. The survey questionnaire was then administered to the students who signed assent forms. On average, it took 30 minutes for the students to complete the questionnaires. For the test-retest survey, a technique reported by Brenner and colleagues (1995; 2002) was followed to assure anonymity and obtain matching data from participants.

Data Analyses

Analyses were conducted using SPSS for Windows 17.0 (SPSS Inc, Chicago, IL) and Amos 7.0 (SPSS Inc, Chicago, IL). All statistical tests were two-sided and significance level was defined as $\alpha=.05$.

Ethics Approval

This project obtained ethics approval from the University Human Research Ethics Committee of QUT and the Preventive Medicine Ethics Committee of Shandong Provincial Centre for Disease Control and Prevention (CDC). Participation was entirely voluntary and

anonymous. Before the data collection, a written approval was given by the principal/vice principal of each participating school and a standard assent was gained from each student. Passive consent was also obtained from parents.

Results

EFA

The factor structure of the preliminary 30-item ESSA was identified using Exploratory Factor Analysis (EFA) with Principal Axis Factoring (PAF) as the extraction method. The Promax method was used for rotation because the factors were thought to be correlated. The Kaiser–Meyer–Olkin's measure (KMO) of sampling adequacy (acceptable level $>.50$) (Kaiser, 1970) and Bartlett's test of sphericity (Bartlett, 1950) were calculated to verify the appropriateness of an EFA. The number of factors was determined using Parallel Analysis (PA) performed with SPSS syntax developed by O'Connor (2000). Only items with a strong loading ($.50$ or higher) on one factor and $<.30$ on any other factors were retained to form latent variables because large loadings on factors other than the primary factor could result in serious flaws in the factor structure (Costello & Osborne, 2005).

The EFA with data from the 30-item ESSA scale indicated that the sample and correlation matrix were appropriate for factor analysis (KMO index = $.88$, and Bartlett's test of Sphericity was significant ($\chi^2(435, N = 347) = 3675.80, p < .001$). Five factors were extracted based on PA analysis that cumulatively accounted for 52.1% of the total variance. However, several items were found to have a poor loading ($<.5$) on all factors or had crossed loadings (loading $\geq .3$ in two or more factors). These items were then dropped and a repeated EFA was conducted with remaining items using the same method. This procedure was replicated until all retained items met the criteria. Finally, a 16-item scale was generated with all items having a strong loading but on the primary factor, but not on the other factors (Table 1).

The appropriateness of the EFA for the revised 16-item ESSA scale was again justified (KMO = .81; Bartlett's test: $\chi^2 (120, N = 347) = 1495.83, p < .001$). The number of factors remained the same based on a repeated PA. Each factor contained at least 3 items (Table 1). The initial eigenvalues of five factors were 4.26, 2.30, 1.31, 1.22, and 1.07. The post-rotation traces were 3.20, 2.25, 1.96, 2.06 and 2.36, respectively. These latent variables explained 26.6%, 14.4%, 8.2%, 7.6%, and 6.7% of variance respectively, and together 63.6% of the total variance. Interfactor correlations ranged from .04 to .57. After carefully examining the meaning, these factors were labelled as Pressure from study, Workload, Worry about grades, Self-expectation, and Despondency (Table 1).

Reliability

The internal consistency reliability was assessed using Cronbach's alpha and average inter-item correlation. A Cronbach's alpha of .70 or higher, or an average inter-item correlation of .30 or higher indicates acceptable reliability (Robinson, Shaver, & Wrightsman, 1991). The test-retest reliability was assessed with Intraclass Correlation Coefficients (ICCs, Koch, 1982). An ICC of .2 and lower indicates "poor"; .21-.40 "fair"; .41-.60 "moderate"; .61-.80 "good"; and .80 or higher as "almost perfect" reliability (Landis & Koch, 1977).

Based on the data from the first survey ($N = 347$), the Cronbach's alpha for the total 16-item ESSA scale was .81 indicating good internal consistency. The coefficient alpha for each factor ranged from .66 - .75 and most were above the criteria for an acceptable level of reliability (Table 2). The average inter-item correlations for the five factors were .47, .50, .47, .39, and .39.

Using the data from the second sample ($N = 135$), the ICC for the total ESSA score was .78, and for the five factors was .75, .61, .70, .59, and .62, respectively, with the majority suggesting good test-retest reliability. The ICC for each of the 16 items varied from .44 to .67 suggesting moderate to good reliability over two weeks.

Table 1

Rotated Factor Loadings and Communalities (h^2) for the ESSA in the EFA (N=347) and Factor Loadings in the CFA (N = 1670)

	EFA					h^2	CFA
	Factor loadings						Factor loadings
	1	2	3	4	5		
6. I feel a lot of pressure in my daily studying.	.77	-.01	-.02	-.09	.03	.56	.80
11. There is too much competition among classmates which brings me a lot of academic pressure.	.76	.06	.03	.05	-.21	.51	.66
4. Future education and employment bring me a lot of academic pressure.	.68	-.09	-.02	.04	.08	.51	.72
5. My parents care about my academic grades too much which brings me a lot of pressure.	.54	.13	.04	-.08	.14	.36	.64
3. I feel there is too much homework.	.06	.81	-.08	.06	-.07	.68	.70
2. I feel that there is too much school work.	-.11	.70	.10	-.07	.15	.52	.68
7. I feel that there are too many tests /exams in the school.	.07	.59	.04	.03	-.02	.39	.69
10. I feel that I have disappointed my teacher when my test/exam results are not ideal.	-.10	.09	.93	-.09	-.10	.74	.67
9. I feel that I have disappointed my parents when my test/exam results are poor.	.15	.01	.59	.15	.04	.56	.85
8. Academic grade is very important to my future and even can determine my whole life.	.13	-.13	.53	.12	.14	.37	.52
14. I feel stressed when I do not live up to my own standards.	-.02	.08	-.10	.84	.01	.66	.71
15. When I fail to live up to my own expectations, I feel I am not good enough.	-.01	.01	.05	.59	-.06	.35	.56
16. I usually cannot sleep because of worry when I cannot meet the goals I set for myself.	-.04	-.08	.10	.52	.08	.32	.58
12. I always lack confidence with my academic scores.	.04	.03	-.03	-.04	.68	.49	.52
1. I am very dissatisfied with my academic grades.	-.15	-.01	.04	.05	.66	.37	.68
13. It is very difficult for me to concentrate during classes.	.17	.08	-.08	.00	.51	.39	.67

Note. ESSA = Educational Stress Scale for Adolescents; EFA = Exploratory Factor Analysis; CFA = Confirmatory Factor Analysis; Factor 1= Pressure from study; Factor 2 = Workload; Factor 3 = Worry about grades; Factor 4 = Self-expectation; Factor 5 = Despondency; h^2 = Communalities

Factors loadings in the CFA are the standardised regression weights for each item with the corresponding factor.

Table 2

Mean (SD), Alpha Coefficients and Inter-variable Correlation Coefficients in the First Survey (N=347)^a

	<i>M (SD)</i>	α^b	1	2	3	4	5	6	7	8	9	10	11	12
1. ESSA total	54.14 (9.32)	.81	1											
2. Pressure from study	13.99 (3.56)	.74	.81**	1										
3. Workload	9.51 (2.90)	.75	.58**	.39**	1									
4. Worry about grades	11.38 (1.25)	.71	.57**	.34**	.05	1								
5. Self-expectation	9.91 (2.56)	.66	.55**	.27**	.04	.35**	1							
6. Despondency	9.31 (2.83)	.66	.67**	.44**	.33**	.14**	.19**	1						
7. AESI total	30.61 (6.46)	.85	.51**	.29**	-.03	.52**	.83**	.07	1					
8. AESI-Other expectations	17.22 (3.86)	.81	.41**	.26**	-.06	.53**	.58**	.01	.92**	1				
9. AESI-Self expectations	13.38 (3.30)	.73	.52**	.26**	-.01	.39**	.96**	.13*	.88**	.62**	1			
10. CES-D (Depression)	15.34 (8.93)	.87	.47**	.38**	.25**	.15**	.24**	.44**	.19**	.13*	.22**	1		
11. Suicidal thoughts	N/A	N/A	.17**	.12*	.13*	.04	.03	.21**	.01	.02	.04	.42**	1	
12. Academic grades	N/A	N/A	-.20**	.10	-.13*	.03	.02	-.43**	.16**	.21**	.07	-.17**	-.07	1

Note. *M* = Mean; *SD* = Standard deviation; ESSA = Academic Stress Scale for Adolescents; AESI = Academic Expectation Stress Inventory; CES-D = Centre for Epidemiological Studies – Depression Scale; N/A = Not applicable

^a Pearson correlation coefficients for continuous variables; Point-biserial correlation coefficients for correlations between suicidal thoughts and others; Spearman *r* for relationships between academic grades and others.

^b Cronbach's α coefficient

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

Concurrent and Predictive Validity

The AESI (Ang & Huan, 2006a) served as a criterion measure to assess the concurrent validity of the ESSA. Scores from the two scales were hypothesised to be correlated because expectations are an important source of academic stress among adolescents. Academic grades were also hypothesized to be associated with educational stress with lower level students having more stress. To assess predictive validity, depression (CES-D score) and suicidal thoughts were used as criterion measures because of their known associations with academic stress (Ang & Huan, 2006b; Bjorkman, 2007; Liu & Tein, 2005). The expected relationships were analysed using Pearson correlation for continuous variables, point-biserial correlation for associations between ESSA scores and suicidal thoughts, and Spearman correlation for relationships between academic grades and others.

As expected, the ESSA total score was significantly correlated with the AESI scores (Table 2). Three ESSA factors, i.e., Pressure from study, Worry about grades and Self-expectation were also significantly correlated with AESI total and subscales (Table 2). However, there were no significant correlations between other two ESSA factors (Workload and Despondency) and AESI scores (Table 2).

The overall ESSA score was negatively correlated with academic grades (Spearman $r = -.20, p < .001$), indicating that students with low academic achievements have more stress. However, only two of the five factors (Workload and Despondency) showed significant correlations with self-reported academic grades (Table 2).

Total academic stress and all factors were positively correlated with CES-D score (Table 2). The coefficient for overall stress (.47) approached a moderate effect size according to Cohen's (1988) criteria ($r = .5$). There were also significant correlations between suicidal thoughts and total ESSA score and two of the factors (Pressure from study and Despondency, Table 2).

CFA

Using Amos 7.0 (SPSS Inc, Chicago, IL), a CFA was conducted to assess the fit of the exploratory model to the data from the third sample ($N=1670$). The maximum likelihood method was used to estimate these parameters (Byrne, 1994). Missing data were rare (all items $<1\%$) and assumed to be missing at random. A set of goodness of fit indices were calculated, including the traditional chi-square fit index, comparative fit index (CFI), Bentler-Bonett normed fit index (NFI), incremental fit index (IFI), goodness-of-fit index (GFI), root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). A value of .90 or higher for CFI, NFI, IFI, and GFI, a RMSEA of .06 or lower, and a SRMR of .05 or lower were served as the indicators for an adequate fit (Byrne, 1994; Hu & Bentler, 1999; MacCallum, Brown, & Sugawara, 1996).

According to the results of the traditional Chi-square fit index ($\chi^2(94, N = 1670) = 604.59, p < .001$), the observed model was significantly different from the expected model. However, this may be related to the large sample size. All other indices, including the CFI (.93), NFI (.92), IFI (.93), GFI (.96), RMSEA (.06) and SRMR (.05) suggested an adequate fit to the original factor structure. The factor loading for each item on the corresponding factor in the CFA were similar to the results from the EFA and all were above .50 (Table 1).

Considering the large correlation between the overall score and each subscale (Table 2), there is likely a second-order factor. We thus conducted a repeated CFA to test the alternative model including a second-order factor. Compared to the first model, all indices slightly changed and some of those fell below the adequacy criteria (Chi-square fit index: $\chi^2(99, N = 1670) = 815.57, p < .001$; CFI = .90; NFI = .89; IFI = .90; GFI = .94; RMSEA = .07; and SRMR = .07). However, three indices, CFI, IFI and GFI were still above the criteria for an adequate fit. The factor loadings for the five first-order factors on the second-order factor were .97, .64, .40, .44 and .73, respectively.

Discussion

A new instrument for academic stress was developed and validated in this study with over 2000 adolescents from urban and rural areas of Shandong, China. The final scale contains 16 items and five latent variables, i.e., Pressure from study, Workload, Worry about grades, Self-expectation and Despondency. Scores from this scale exhibit satisfactory psychometric properties in terms of internal and test-retest reliability and concurrent and predictive validity.

Application of a relatively high criterion to retain items in the final scale (Costello & Osborne, 2005) resulted in nearly half (14 items) of the initial items being dropped because of poor loading on the primary factor and high loadings on the other factors. By doing this, there may be a risk that the subscales suffer from construct underrepresentation, which might also be related to the slightly low internal consistency of some factors. However, given that the application of this instrument is for school or community based survey of students to examine the magnitude and health associations of academic stress, rather than for clinical diagnostic purposes, a brief scale with clear factor structure may be preferable than a lengthy but more accurate one. The relatively low Cronbach's alphas for some factors are likely to be caused by the small numbers of items per scale. The average inter-item correlations for all factors are well above the criterion ($\geq .30$) for an acceptable internal consistency (Robinson, Shaver, & Wrightsman, 1991), indicating the items within each subscale are highly correlated. In addition, the number of items in each factor meets the minimum number of 3 items for best practice in factor analysis (Costello & Osborne, 2005). More importantly, the number of factors determined using Parallel Analysis did not change even after dropping poor or cross loaded items, indicating minimal change to the factor structure.

Confirmatory factor analysis is essential in the development of a new scale and should be conducted with data from in a different sample from the EFA (Hinkin, 1998). Using a

large, separate sample ($N=1670$), we tested the fit of the factor model of the 16-item ESSA and found an adequate fit according to a range of indices. All indices except the chi-square fit index meet the recommended thresholds for an adequate fit. The high value of the chi-square index is likely related to the large sample size ($N=1670$). Although all indices negatively changed in a repeated CFA involving a second-order factor, there is still evidence to suggest that the revised model has adequate fit and the construction of an aggregated ESSA total score is appropriate. However, the factor loadings for two first-order factors, i.e., Worry about grades and Self-expectation are relatively low (.40 and .44), suggesting further analysis is necessary to examine the convergent and discriminant validity of the ESSA scale.

Academic expectations are an important source of stress among Asian students (Ang & Huan, 2006a). As expected, the ESSA score was significantly correlated with the AESI score, indicating a satisfactory concurrent validity. Two factors in the ESSA, Worry about grades and Self-expectation obtained relatively high correlation coefficients with the AESI-Other expectations and AESI-Self-expectations ($r=.53$ and $.96$, Table 2). This is because two items (item 9 and 10, Table 1) of Worry about grades and all items (items 14-16, Table 1) were adapted from the AESI with minor changes, although the response format (from *Strongly disagree* to *Strongly agree*) differs from the AESI (from *Never true* to *Almost always true*). Two other factors, Despondency and Workload are not captured by the AESI which supports the value of development of a new multifactorial scale.

Academic stress is recognized as a risk factor for depression and suicidal behavior (Ang & Huan, 2006b; Bjorkman 2007). In this study, the ESSA scores show significant associations with these health problems. Compared to the AESI, the ESSA scores appear to be more predictive of depression and suicidality (Table 2). This is probably because the ESSA captures more elements of academic stress than the AESI. In relation to the Suicidal thoughts and Academic grades, the ESSA scales have relatively poor predictive validity (see

Table 2). One explanation is that academic stress is only one of the correlates that are associated with these two variables. Many other factors, such as loss of loved ones, conflicts with parents, teachers and peers and significant physical diseases may have important effects on adolescent suicidality (Liu & Tein, 2005). Similarly, while poor academic grades generally predict high educational stress, the discrepancy between expected and actual grades may play a more important role in the development of psychological distress and other mental health problems (Lin *et al.*, 2008). In addition, this could be also related to the poorly measured criterion variables, as suicidal thoughts does not include an academic component and academic grades was not very precise given its subjective nature. More suitable criterion measures should be used in future research.

This study has some implications for educational policy and practice, including school counseling. A brief tool with sound psychometric properties could be used to examine the nature and magnitude of the phenomenon in many educational contexts, to inform the design and implementation of interventions to reduce educational stress in schools. Students' mental health and wellbeing has been drawing increasing attention in China where school counseling has been made available only in recent years. School Counselors should have a good understanding of the multifactorial nature of educational stress and its links to common mental and behavioral problems among students to inform best practice in counseling.

This study has some limitations. First, the development of the items in the ESSA was mainly based on review of recent Chinese and English literature plus informal discussions with experts. No attempt was made to more comprehensively map the construct using grounded theory to explore an underlined model. Second, despite the identification of five factors with just 16 items, the ESSA cannot capture all facets of educational stress. More work should be done to further investigate the multidimensional nature. Third, the ESSA was only tested with Chinese adolescents in Shandong and cross-cultural suitability is yet to be

established. Therefore, this work should be viewed as a starting point of a continuous process of validation and revision. Fourth, we used a single question to measure self-report academic grades but we do not know if there are disparities between perceived grades and actual grades. Actual scores are ideal but very difficult to obtain in a self-report anonymous survey. Further research is needed to examine the difference between self-report and actual grades and their relationships with stress and other outcomes. Sixth, information in this study was collected solely relying upon self-report of students and hence some recall bias cannot be avoided.

Nevertheless, this newly developed scale demonstrates satisfactory psychometric properties and is suitable to be used in further research into academic-related stress among secondary school adolescents. The ESSA promises to be a useful tool at least with Chinese populations and in other Asian countries, and possibly useful in different social and cultural contexts.

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Chapter 4. Paper 2: Educational Stress among Chinese Adolescents: Individual, Family, School and Peer Influences

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Abstract

Educational stress is common among school children and adolescents, especially in Asian countries. This study aims to identify factors associated with perceived educational stress among students in China. A cross-sectional questionnaire survey was conducted with 1627 students (grades 7-12) from six secondary schools in rural and urban areas of Shandong Province. A wide range of individual, family, school and peer factors were associated with stress measured using the Educational Stress Scale for Adolescents (ESSA). Rural school location, low school connectedness, perceived poor academic grades, female gender, older age and frequent emotional conflicts with teachers and peers were among the strongest correlates, and most of them are school or study-related. Unexpectedly, family and parental factors were found to have little or no association with children's perceived educational stress. These findings may offer directions for interventions in secondary school settings.

Keywords: educational stress, risk factor, adolescents, secondary school students, China

Introduction

Education has been highly valued in traditional Chinese culture for thousands of years and is seen as the major pathway to social success. This could be reflected by a Chinese saying “All are low but reading (learning)”. Although there have been substantial changes in the past century, the culture of respect for education remains influential in contemporary China (OECD, 2010). Education for secondary school students is strongly focused on preparation for examinations, especially for the National College Entrance Examination (*Gao Kao*). In part due to the cultural influence and methods employed in the educational system, Chinese students often achieve high academic outcomes. For example, the results of the 2009 OECD Programme for International Student Assessment (PISA) showed that Chinese (Shanghai) students outperformed their counterparts from all other surveyed countries or regions in terms of reading, mathematics and science (Mervis, 2010).

However, high achievement often comes at a personal cost. Chinese students appear to have a heavy academic burden. An ongoing project led by the Chinese Youth and Children Research Center (CYCRC) has conducted surveys since 2005 to compare many aspects of students’ life between Chinese, Japanese, Korean and US high school students (Lei, Sun, Li, Guo, & Zhang, 2007; Zhao, Zhu, & Ma, 2009). The preliminary results of the most recent survey with 1868 Chinese, 1314 Japanese, 3379 Korean, and 1020 American high school students was published on the official website of the Central People’s Government of the People’s Republic of China (2010) and other media (Beijing Evening, 2010), showing that Chinese students have the highest academic burden and pressure among the participating countries. Nearly ninety percent (86.6%) of the Chinese participants felt high or very high pressure because of academic matters and nearly half (45.2%) reported spending two hours or more per day completing homework. Similarly in Taiwan, more than 40% of grade 11 students spend at least two hours each day on homework (Chen & Lu,

2009). Although academic matters have been found to be a major source of stress among adolescents worldwide (Brown, Teufel, Birch, & Kancherla, 2006; Christie & MacMullin, 1998; Dodds & Lin, 1993; Gallagher & Millar, 1996; Owen-Yeates, 2005; Huan, See, Ang, & Har, 2008; Tang & Westwood, 2007), this phenomenon seems to be more pronounced in China and other Asian countries, such as Singapore, Korea, Japan and Taiwan (Ang, Huan, & Braman, 2007; Crystal *et al.*, 1994; Lee & Larson, 2000; Lei, *et al.*, 2007; Zhao, *et al.*, 2009).

Research into the nature and impact of perceived academic stress in students has been hampered by some conceptual and methodological problems (Putwain, 2007). For example, what the term “stress” refers to is not clear in the literature, with some referring it to the external stimulus or stressors (such as low grades in an examination) while others to the subjective experience of mental distress. The accumulated number of stressors may not represent the level of perceived stress because the latter is moderated by the appraisal process and coping ability of individuals (Lazarus & Folkman, 1984). A methodological concern is that the domain of “examination stress” which focuses exclusively on (usually important) examinations and “academic stress” which relates to a broader range of school activities are not clearly defined (Putwain, 2007). Similar to other studies on the same topic (Ang & Huan, 2006; Bjorkman, 2007; Jones & Hattie, 1991), in this study we defined academic stress as subjective psychological distress originated from multiple aspects of academic learning rather than the sum of stressful life events. Our measure relates to perceived pressure, burden, worry, dissatisfaction with grades and other difficulties. The terms “academic stress” and “educational stress” are used interchangeably in this study.

Perceived stress or pressure from academic activities varies across gender, ethnic background, and socio-economic status. Females usually report more stress or pressure than males (Jones & Hattie, 1991; Xie, 2007; Zhao & Yuan, 2006). One reason may be that females are more likely to regard school performance as very important, and worry about

academic failure (Jones & Hattie, 1991). In western countries, students from ethnic minority groups, especially those with Asian backgrounds, are more likely to be stressed by academic learning than others (Coney & West, 1979; Jones & Hattie, 1991). Students with disadvantaged backgrounds have also been found to experience higher educational pressure (Coney & West, 1979; Li, Feng, Mei, & Yao, 2007; Moshe, 1992).

Generally, students in higher school years experience more subjective academic stress (Jones & Hattie, 1991; Li, *et al.*, 2007; Zhao & Yuan, 2006). In both junior and senior secondary schools in China, students in their final years (grade 9 in junior schools and grade 12 in senior schools) report more pressure than non-final year students (Li, *et al.*, 2007; Zhao & Yuan, 2006), which is considered to be related to the two most important transitional examinations. Another important factor for educational stress is poor academic performance, where students with low Grade Point Average (GPA) scores or a low ranking in academic grades often experience higher levels of perceived stress or pressure (Bjorkman, 2007; Li, *et al.*, 2007).

Research into the determinants of adolescent stress may provide evidence for preventive intervention and mental health promotion. Educational stress among students may be similar to occupational stress among working adults which has been extensively studied for many decades. According to the Job Demand-Control-Support (JDCS) model (Johnson & Hall, 1988; Van der Doef & Maes, 1999), stress increases when the demand is high, self-control is low and social support is poor. The corollary here may be that heavy study workload, low self-efficacy and poor relationships with parents, teachers and peers have significant effects on the level of academic stress among students. Previous research from European countries found that educational stress is linked to the pressure to achieve and fear of failure, and is associated with a wide range of cognitive and educational factors (Meijer, 2007; Putwain, 2009). Ecological system theory (Bronfenbrenner, 1979) is commonly used

in research into risk factors. It is generally believed that many characteristics of students and their environments including family, school and peers may have an effect on stress.

Although learning burden among children and adolescents is becoming a prominent concern in China (Lin & Chen, 1995; Lu, 2008) and is widely covered in mass media (Beijing Evening, 2010; Jia, 2010), little is known about the nature of perceived educational stress, its social correlates and health effects in the Chinese context. Recent research in East Asia indicates that authoritarian parenting focused on the child's academic achievement has negative effects on their behavioural and emotional well-being (Hesketh *et al.*, 2010; Yang & Shin, 2008; Zhou *et al.*, 2008), but a converse and controversial position is that such parenting has many advantages for child development (Chua, 2011). However, much of this recent debate has not based on empirical research.

This study aims to identify key risk factors for high academic stress perceived by Chinese adolescents attending secondary schools, and to examine their relative importance, in order to provide evidence for intervention programs. We examined the effects of some individual, family, school and peer factors in an exploratory manner, based on known or expected relationships with adolescent mental health, such as self-efficacy, parental control, family dysfunction, school connectedness, and inter-personal conflicts.

Methods

Design and Participants

A cross-sectional survey with a self-report questionnaire was conducted in Shandong, the second most populous province in China, in September and October 2009. Three sites were chosen to ensure geographic and socioeconomic diversity, including the capital city of the province, a county city and a rural town. From each site, one junior school (grade 7-9) and one senior school (grade 10-12) were selected with principal's approval. Two classes per grade from each of the six participating schools were then randomly chosen. In all, 1,740

students in 36 classes were invited to participate in the survey, of whom, 1690 (97.1%) agreed to participate.

Measures

Demographics

Ten questions sought information on demographic characteristics, including gender, age, school year (7-12), school location (capital city/ county city/ rural town), family location (urban / rural), self-reported family income level (low/ middle/ high), father and mother's occupation (farming / non-farming), and father and mother's education level (junior school or lower / senior school or higher).

Academic Stress

The Educational Stress Scale for Adolescents (ESSA, (Sun, Dunne, Hou, & Xu, 2011) was used to estimate the level of perceived academic stress. It contains 16 statements rated on a 5-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). The total score ranges from 16 to 80 with higher scores indicating greater perceived stress. This scale has five factors. 'Pressure from study' (four items about the perceived pressure from daily learning, from parents, peer competition and students' concern about the future), 'Workload' (three items regarding perceived burden of homework, school work and examinations), 'Worry about grades' (three items regarding stressful emotions due to dissatisfaction with academic grades), 'Self-expectation stress' (three items about stressful feelings when self-expectations fail to be met) and 'Despondency' (three items about dissatisfaction and lack of confidence and concentration in academic study). This instrument has adequate internal consistency in this sample with Cronbach's $\alpha = .82$ for the total scale, and $\alpha = .79$, $\alpha = .73$, $\alpha = .69$, $\alpha = .65$, and $\alpha = .64$ for the five factors, respectively.

Individual Factors

Variables measured included self-efficacy, health status, Body Mass Index (BMI), and history of physical exercise, internet use, and playing video games in the past 30 days. Health status was categorised as *poor, moderate, and good*. BMI was calculated as weight (Kg) / height (m)², based on self-reported weight and height data. Three questions with a *yes/no* response format were used to examine the experience of regular physical exercise, internet use and video game playing in the past 30 days.

Self-efficacy. The Chinese version of the Generalized Self-Efficacy Scale (GSES) (Zhang & Schwarzer, 1995) was used. Participants rated each of the 10 items on a 4-point Likert scale ranging from one (*Not at all true*) to four (*Exactly true*). Example items include "I can always manage to solve difficult problems if I try hard enough" and "If someone opposes me, I can find the means and ways to get what I want". The total score varies from 10 to 40 with higher scores indicating higher levels of self-efficacy. The GSES has been shown to have high internal consistency with Cronbach alpha ranging from $\alpha=.75$ to $\alpha=.94$ across a number of different language versions (Schwarzer & Jerusalem, 1995). The Cronbach's alpha calculated on this scale in the present study was $\alpha=.88$.

Parenting and Family-related Factors.

Parental bonding. The short form (n=20 items) of the Parenting Bonding Instrument (PBI) (Pedersen, 1994) was used to measure both maternal and paternal parenting style. Participants rate each statement on a four-point Likert scale ranging from *Very like*, *Moderately like*, *Moderately unlike*, to *Very unlike* regarding how well the statements describe their relationships with mothers and fathers respectively. Each item is scored from 0 to 3. The shortened PBI has four factors: father/mother care and father/mother control (each with 5 items). Example items for parental care are "My father/mother did not heal me as much as I needed" (reverse coded) and "My father/mother appeared to understand my problems and worries". Higher scores on the care scale suggest warmth and understanding;

while lower scores indicate “coldness” and rejection. Example items for parental control are "My father/mother liked me to make my own decisions" (reverse coded) and "My father/mother tried to control everything I did". Higher scores on the control scale indicate overprotection; while lower scores suggest parents allowing personal independence. The Cronbach's alpha of mother's care, mother's control, father's care, and father's control) were found to range from .69 to .78 in the original study (Pedersen, 1994). Unfortunately, when translated into Chinese, the response format was found to be problematic in the pilot study for the current project, with many students commenting that it was “ambiguous” or “confusing”. Therefore, the response format was changed to *Never*, *Sometimes*, *Often* and *Always*. In this study, the modified PBI achieved a Cronbach's alpha from $\alpha = .66$ to $\alpha = .70$ for the four subscales, respectively.

Family connectedness. Family connectedness was measured using a 4-item scale (Hall-Lande, Eisenberg, Christenson, & Neumark-Sztainer, 2007). Participants were asked “How much do you feel your mother cares about you?”, “How much do you feel your father cares about you?”, “Do you feel that you can talk to your mother about your problems?” and “Do you feel that you can talk to your father about your problems?” Answers were given on a five-point Likert scale ranging from 1 (*Not at all*) to 5 (*Very much*). Scores were averaged to create an overall connectedness score ranging from 1 to 5, with higher scores indicating greater connectedness to family. In this study, the Cronbach's alpha for the translated scale was $\alpha = .75$.

Conflicts with parents. Three types of conflicts with parents were estimated using the respective questions “Have you ever had a serious quarrel with your parents or other guardians in the past 12 months?”, “Have you ever been scolded, threatened, or humiliated by your parents or other guardians in the past 12 months?” and “Have you ever been physically punished (such as being forced to stand for some time, being beaten with fist or other objects,

or being kicked) by your parents or other guardians in the past 12 months?” Three response options, i.e., “*Never*”, “*Sometimes*”, and “*Often*” were employed. Students who responded “*Sometimes*” or “*Often*” to these questions were categorised as having experienced quarrels with parents, parents’ emotional punishment and parents’ physical punishment, respectively.

School and Study-related Factors.

School connectedness. This was measured using a 5-item instrument created by Resnick and colleagues (1997) from the National Longitudinal Study on Adolescent Health in the USA. It includes statements regarding students’ feelings about their school and teachers: 1) “I feel safe in my school”, 2) “The teachers at this school treat students fairly”, 3) “I am happy to be at this school”, 4) “I feel like I am part of this school” and 5) “I feel close to people at this school”. This scale uses a 5-point response format ranging from 0 (*Strongly Disagree*) to 4 (*Strongly Agree*). The total score varies from 0 to 20 where higher scores indicate higher level of school connectedness. In this study, the scale obtained very good internal consistency ($\alpha = .83$).

Conflicts with teachers. Similar to conflicts with parents, three types of conflict with and punishment by teachers were measured using three individual questions: “Have you ever had a serious quarrel with your teachers or other staff at school in the past 12 months?”, “Have you ever been scolded, threatened, or humiliated by your teachers or other staff at school in the past 12 months?”, and “Have you ever been physically punished (such as being forced to stand for some time, being beaten with fist or other objects, or being kicked) by your teachers or other staff at school in the past 12 months?” Responses to these questions and categorisation method were the same as questions about conflict with parents.

Study-related factors. Several study related factors were assessed using individual questions, including perceived academic achievement (low / moderate / high), average homework hours per day (less than 1 hour / 1-2 hours / more than 2 hours), attendance at

extra-curricular classes and private tutoring in the past 12 months. For attendance at extra-curricular classes and engaging a private tutor, a dichotomous *yes/no* response was used.

Peer Factors

There were seven peer relationship factors including perceived popularity, social isolation, romantic relationship and four conflict variables (quarrels with peers, physical fighting, emotional bullying victimisation and physical bullying victimisation). Participants were asked to rate their perceived popularity among peers with three response options: *low*, *medium* and *high*. Students who responded “*none*” to the question “Do you have one or more close friends you can talk to about your problems?” were defined as socially isolated with regard to peers (Hall-Lande, *et al.*, 2007). The experience of romantic relationship was defined based on the “*yes*” answer to the question “Have you ever had a boyfriend or girlfriend?” Four types of peer conflicts were measured using four individual questions: “Have you ever had a serious quarrel with your fellow students at school in the past 12 months?”, “Have you ever been involved in physical fighting with your fellow students at school in the past 12 months?” , “In the past 12 months, have any of your fellow students ever bullied you emotionally at school, such as insulting you, calling your names, teasing you, threatening you, and humiliating you?”, and “In the past 12 months, have any of your fellow students ever bullied you physically at school in any kind?” The response format and categorisation method were the same as the questions of conflicts with parents and teachers.

Statistical Analysis

Means (*Ms*) and standard deviations (*SDs*) for ESSA factor and item scores were calculated and potential differences between junior and senior sectors were tested using independent sample *t*-test. Expected associations between ESSA scores and study factors were tested using correlation analysis, with Pearson’s *r* for continuous factors (such as age and self-efficacy score), Point-biserial correlation coefficients for dichotomous factors (such

as gender), and Spearman correlation for categorical variables with more than two levels (such as school location and health status), respectively. To assess the relative influence of factors on educational stress, all variables significant in bivariate analyses were included in multiple linear regression models for the total ESSA score as well as for all five subscales. All analyses were conducted using SPSS for Windows 17.0 (SPSS Inc, Chicago, IL) and statistical tests were two-tailed with a significance level of $p < .05$.

Ethics Clearance

This study was granted ethics approval by the Human Research Ethics Committee of Queensland University of Technology (QUT), Australia and the Preventive Medicine Ethics Committee of Shandong Centre for Disease Control and Prevention (CDC), China. Participation was entirely voluntary and anonymous. Written consent to participation was given by each of the participating schools. Only students who signed a consent form were included in the survey.

Results

Sample Description

Data analysis was undertaken with 1627 students which accounted for 93.5% (1627/1740) of all eligible participants and 96.3% (1627/1690) among those who returned a questionnaire. Sixty-three questionnaires (3.7%) were excluded due to incomplete response. The demographic characters of the sample are shown in Table 1. The ages ranged from 11 to 20 with a mean of 15.47 years (standard deviation (SD) = 1.85). Almost all students (99.5%, 1618/1627) were ethnic *Han* Chinese, which is consistent with the total population in Shandong province (Shandong Provincial Bureau of Statistics, 2007).

ESSA Scores

The total ESSA score ranged from 18 to 80 with a mean of 53.80 (SD = 9.91) and is normally distributed (Skewness = -0.46, Kurtosis = 0.39). Scores of all subscales also

followed normal distribution (Skewness ranges -0.01- 0.74, Kurtosis ranges -0.05 - 0.52).

The ESSA mean scores (SDs) across demographic variables are presented in Table 2. The mean scores and *SDs* by school sector (junior and senior) for ESSA factors and items are presented in Table 2. For almost all factors/items except Worry about grades, senior school students (years 10-12) reported significantly higher scores than did junior school students (years 7-9).

Table 1. Demographic Characters of the Sample (N = 1627)

Frequency (%)		Frequency (%)	
Sex		Father education ^a	
Male	890 (55.4)	Junior high or lower	822 (53.4)
Female	717 (44.6)	Senior high or higher	718 (46.6)
Age		Mother education ^a	
11-13	283 (17.5)	Junior high or lower	979 (63.5)
14	243 (15.0)	Senior high or higher	564 (36.5)
15	280 (17.3)	Family income	
16	254 (15.7)	Low	157 (9.7)
17	309 (19.1)	Middle	1138 (70.2)
18-20	246 (15.2)	High	326 (20.1)
Family location		School location	
Urban	679 (42.0)	Major city	451 (27.7)
Rural	939 (58.0)	County City	585 (36.0)
Father occupation ^a		Rural town	591 (36.3)
Farming	575 (35.6)	School year level	
Others	1039 (64.4)	7-9 (junior)	805 (49.5)
Mother occupation ^a		10-12 (senior)	822 (50.5)
Farming	657 (40.8)		
Others	955 (59.2)		

Note. The sample size for each category did not necessarily equal because of missing. Missing data were not presented in this table.

^a Responses of “*Don’t know*” or “*Not applicable*” were treated as missing.

Table 2. Mean Scores (SDs) of ESSA Factors and Items (N = 1627)

	<i>Ms (SDs)</i>		
	Junior school students (Years 7-9)	Senior school students (Years 10-12)	Total
Factor 1: Pressure from study	13.11 (4.09)**	14.91 (3.33)	14.02 (3.83)
I feel a lot of pressure in my daily studying	3.19 (1.29)**	3.64 (1.07)	3.42 (1.20)
There is too much competition among classmates which brings me a lot of academic pressure	3.35 (1.22)**	3.74 (1.06)	3.55 (1.16)
Future education and employment bring me a lot of academic pressure	3.54 (1.34)**	4.08 (1.03)	3.81 (1.22)
My parents care about my academic grades too much which brings me a lot of pressure	3.03 (1.33)**	3.46 (1.21)	3.25 (1.28)
Factor 2: Workload	9.11 (3.29)**	9.69 (2.57)	9.41 (2.96)
I feel there is too much homework	3.10 (1.38)*	3.26 (1.06)	3.18 (1.23)
I feel that there is too much school work	3.01 (1.29)	3.08 (1.10)	3.05 (1.20)
I feel that there are too many tests /exams in the school	2.99 (1.32)**	3.35 (1.13)	3.18 (1.24)
Factor 3: Worry about grades	11.60 (2.96)*	11.29 (2.60)	11.45 (2.79)
I feel that I have disappointed my teacher when my test/exam results are not ideal	3.77 (1.19)**	3.51 (1.07)	3.64 (1.14)
I feel that I have disappointed my parents when my test/exam results are poor	4.15 (1.05)*	4.25 (0.91)	4.20 (0.98)
Academic grade is very important to my future and even can determine my whole life	3.68 (1.40)*	3.54 (1.37)	3.61 (1.39)
Factor 4: Self-expectation	9.57 (2.65)**	10.02 (2.40)	9.79 (2.53)
I feel stressed when I do not live up to my own standards.	3.26 (1.16)**	3.50 (1.08)	3.38 (1.12)
When I fail to live up to my own expectations, I feel I am not good enough.	3.54 (1.07)**	3.80 (0.94)	3.67 (1.01)
I usually cannot sleep because of worry when I cannot meet the goals I set for myself.	2.76 (1.20)	2.73 (1.12)	2.74 (1.16)
Factor 5: Study despondency	8.51 (2.96)**	9.74 (2.59)	9.13 (2.85)
I always lack confidence with my academic scores	2.41 (1.26)**	2.86 (1.23)	2.64 (1.27)
I am very dissatisfied with my academic grades	3.20 (1.23)**	3.51 (1.19)	3.36 (1.22)
It is very difficult for me to concentrate during classes	2.91 (1.32)**	3.37 (1.12)	3.14 (1.24)
Total ESSA	51.90 (10.67)**	55.65 (8.73)	53.80 (9.91)

Note. *M* = mean; *SD* = standard deviation; ESSA = Academic Stress Scale for Adolescents.

* $p < .05$; ** $p < .01$ (Independent sample *t*-test for differences between junior and senior school students)

Table 3. Bivariate Correlation Coefficients between Study Factors and ESSA Scores (N = 1627)^a

	Value or <i>M (SD)</i> ^b	Pressure from study	Work- load	Worry about grades	Self- expecta- tion	Despon- dency	Total ESSA
Demographics							
Sex	(1=male, 2=female)	.03	-.02	.06*	.07**	.01	.04
Age	15.47 (1.85)	.30**	.15**	-.05*	.11**	.27**	.25**
Family location	1=urban, 2=rural	.15**	.06*	.15**	.10**	.06*	.16**
Family income	1=low, 2=middle, 3=high	-.11**	.01	-.04	-.03	-.12**	-.10**
Father occupation	0=others, 1=farming	.11**	.05	.12**	.03	.05	.11**
Mother occupation	0=others, 1=farming	.12**	.04	.12**	.04	.04	.12**
Father education	0=high, 1=low	.07**	.01	.06*	.00	.06*	.07**
Mother education	0=high, 1=low	.07**	.00	.04	-.02	.06*	.05*
School location	1=major city, 2=county city, 3=rural	.14**	.09**	.19**	.11**	.02	.18**
School year	1-6 indicates grades 7-12	.27**	.14**	-.12**	.09**	.27**	.23**
Individual factors							
Self-efficacy	26.91 (5.95)	-.26**	-.13**	-.01	-.06*	-.28**	-.24**
BMI	19.88 (3.72)	.02	.01	-.04	-.04	.05	.00
Health status	1=poor, 2=medium, 3=good	-.17**	-.12**	-.01	-.08**	-.21**	-.19**
Physical exercise	0=no, 1=yes	-.12**	-.11**	-.05*	-.06*	-.10**	-.14**
Internet use	0=no, 1=yes	.08**	.14**	-.11**	-.03	.13**	.07**
Video games	0=no, 1=yes	-.02	.09**	-.11**	-.10**	.08**	-.01
Parenting and family							
Father care	11.44 (2.57)	-.25**	-.19**	.09**	.02	-.30**	-.21**
Mother care	12.18 (2.33)	-.19**	-.17**	.11**	.02	-.23**	-.15**
Father control	5.08 (2.79)	.22**	.18**	.02	.06*	.20**	.22**
Mother control	5.35 (2.86)	.26**	.24**	.00	.02	.22**	.24**
Family connectedness	3.79 (0.68)	-.23**	-.22**	.13**	.02	-.30**	-.20**
Quarrels with parents	0=no, 1=yes	.20**	.16**	-.08**	.06*	.22**	.18**
Parents' emotional punishments	0=no, 1=yes	.17**	.13**	-.06*	.02	.19**	.15**
Parents' physical punishments	0=no, 1=yes	.08**	.06*	-.07**	-.03	.07**	.04
School and study							
School connectedness	14.25 (4.11)	-.30**	-.44**	.13**	-.05*	-.36**	-.33**
Quarrels with teachers	0=no, 1=yes	.08**	.13**	-.08**	.03	.15**	.10**
Teachers' emotional punishments	0=no, 1=yes	.19**	.26**	-.03	.02	.19**	.20**
Teachers' physical punishments	0=no, 1=yes	.12**	.26**	-.06*	-.07**	.13**	.13**
Perceived academic grades	1=poor, 2=medium, 3=good	-.12**	-.14**	.06*	.03	-.39**	-.19**
Homework hours	1=less than 1 hr, 2=1-2 hrs, 3=more than 2 hrs	-.08**	-.18**	.03	-.04	-.09**	-.12**
Tutor	0=no, 1=yes	.03	.07**	.00	.02	.11**	.07**
Extra classes	0=no, 1=yes	.01	.00	.04	.00	-.02	.01
Peer relationships							
Peer popularity	1=low, 2=middle, 3=high	-.11**	-.04	.02	-.01	-.15**	-.09**
Social isolation	0=no, 1=yes	.05*	.07**	.02	.02	.11**	.08**
Girl/Boy-friend	0=no, 1=yes	.16**	.19**	-.08**	.04	.19**	.16**
Quarrels with peers	0=no, 1=yes	.15**	.14**	.06*	.04	.11**	.16**
Peer physical fighting	0=no, 1=yes	.08**	.13**	-.02	-.01	.12**	.10**
Peer emotional bullying	0=no, 1=yes	.19**	.14**	.04	.11**	.21**	.21**
Peer physical bullying	0=no, 1=yes	.09**	.11**	.00	.04	.08**	.10**

Note. *M* = mean; *SD* = standard deviation; ESSA = Academic Stress Scale for Adolescents; BMI = Body Mass Index.

^a Pearson's *r* for continuous factors; Point-biserial correlation coefficients for dichotomous factors, and Spearman correlation for categorical variables with more than two levels

^b value and coding for categorical variables and *M (SD)* for continuous variables

* $p < .05$; ** $p < .01$ for correlation coefficients

Table 4. Standardised Regression Coefficients (β) in Multiple Regressions for Academic Stress Scores (N = 1627)

Independent variables	Pressure from study	Work-load	Worry about grades	Self-expectation	Despondency	Total ESSA
Demographics						
Sex (female)	.09**	.08**	.03	.04	.10**	.11**
Age group (high)	.22**	-.05	-.02	.09	.07	.11*
Family location (rural)	.03	.01	.13**	.06	.02	.07*
Family income (high)	.02	.09**	-.04	.02	.01	.03
Father occupation (farming)	-.01	.07	.04	-.02	-.02	.01
Mother occupation (farming)	.05	-.02	-.04	-.05	.05	.00
Father education (low)	.03	.00	.03	.02	.01	.03
Mother education (low)	-.02	.00	-.04	-.05	.02	-.03
School location (rural)	.12**	.07*	.08*	.15**	.06*	.15**
School level (senior)	.04	.10*	-.01	.02	.09*	.07
Individual factors						
Self-efficacy (high)	-.11**	.02	-.01	.00	-.09**	-.06*
Health status (good)	-.02	-.07**	-.04	-.01	-.06**	-.06*
Physical exercise (yes)	-.03	-.06*	-.04	-.04	.00	-.05*
Internet use (yes)	.07*	.07*	.03	.05	.05	.08**
Video games (yes)	-.03	.01	-.03	-.09**	.03	-.03
Parenting and family						
Father care (high)	-.06	.00	-.02	.07	-.09**	-.04
Mother care (high)	.03	-.01	.08*	-.03	.04	.03
Father control (high)	.05	.02	.03	.08*	.04	.07*
Mother control (high)	.10**	.11**	.03	-.05	.05	.08*
Family connectedness (high)	.00	-.01	.07*	.03	-.06*	.01
Quarrels with parents (high)	.07*	.02	-.03	.05	.05	.05
Parents' emotional punishments (yes)	.02	-.01	.02	.01	.01	.02
Parents' physical punishments (yes)	.02	-.01	-.03	-.04	-.01	-.01
School and study						
School connectedness (high)	-.08**	-.29**	.11**	-.02	-.13**	-.13**
Quarrels with teachers (yes)	-.03	-.04	-.03	.03	.00	-.03
Teachers' emotional punishments (yes)	.08**	.06*	.05	.07*	.05*	.10**
Teachers' physical punishments (yes)	.00	.11**	-.05	-.12**	-.01	-.02
Perceived academic grades (high)	-.06*	-.11**	.02	.03	-.32**	-.13**
Homework hours (high)	.01	-.07**	.00	-.01	.02	-.01
Tutor (yes)	.00	.04	.03	.02	.07**	.04
Extra classes (yes)	.09**	.02	.05	.03	.01	.07*
Peer relationships						
Peer popularity (high)	.00	.07*	.02	.02	.01	.04
Social isolation (yes)	.00	.01	.04	.01	.03	.03
Girl/Boy-friend (yes)	.02	.03	-.03	-.01	.03	.01
Quarrels with peers (yes)	.05*	.03	.09**	.02	-.01	.06*
Peer physical fighting (yes)	.02	-.02	-.01	.00	.04	.01
Peer emotional bullying (yes)	.06*	.01	.06	.12**	.07**	.09**
Peer physical bullying (yes)	.07*	.06*	.00	.03	.02	.06*

Note. ESSA = Academic Stress Scale for Adolescents. The sample size for each regression was not necessarily identical due to missing.

* $p < .05$; ** $p < .01$ (t -test for multiple regression coefficients)

Bivariate Associations

The bivariate correlations between study factors and ESSA scores are displayed in Table 3. All factors except BMI and whether attending extra classes had a significant correlation with at least one of the scores. For ESSA total score, school connectedness had the highest coefficient (Pearson's $r = .33$), followed by age ($r = .25$), self-efficacy ($r = .24$) and mother control ($r = .24$).

Multivariate Analysis

All significant factors identified in bivariate analysis were included in the multiple regression analysis. Considering its perceived importance on academic burden, whether attending extra classes was also included despite the non-significance in the bivariate analysis. Table 4 shows the results of multiple regressions for each type of educational stress with all demographic, individual, family, school and peer factors as independent variables. All models were statistically significant. For total ESSA score (Adjusted $R^2 = .28$, $F(38, 1374) = 14.85$, $p < .001$), 16 factors were found to be statistically significant (Table 4). For Pressure from study (Adjusted $R^2 = .27$, $F(38, 1374) = 14.11$, $p < .001$) and Workload (Adjusted $R^2 = .27$, $F(38, 1374) = 14.46$, $p < .001$), each had 14 significant variables; for Worry about grades (Adjusted $R^2 = .07$, $F(38, 1374) = 3.89$, $p < .001$) and Self-expectation (Adjusted $R^2 = .06$, $F(38, 1374) = 3.13$, $p < .001$), only 6 variables remained significant; and for Despondency (Adjusted $R^2 = .36$, $F(38, 1374) = 21.60$, $p < .001$), 11 variables were significant (Table 4).

For the total ESSA score, school location ($\beta = .15$), school connectedness ($\beta = .13$), academic grades ($\beta = .13$), gender ($\beta = .11$), age ($\beta = .11$), teacher's emotional punishments ($\beta = .10$), and peer emotional bullying ($\beta = .09$) were among the strongest independent variables (Table 3). Female gender, rural school location, low school connectedness, teacher's emotional punishment, low academic grades and peer emotional bullying were also

significantly associated with high scores of three or more factors of the ESSA, except for the relationship between school connectedness and Worry about grades score in which a reversed connection was observed. Despite their significant bivariate associations, nine variables, including father and mother's occupation, father and mother's education level, parents' emotional and physical punishments, social isolation, whether having a girl/boy-friend and peer physical fighting showed no relationship with any of the subscales of the ESSA when other factors were taken into account (Table 4).

There were differences between subscales in terms of the relative importance of independent variables. For example, the most influential factor for Pressure from study was age ($\beta = .22$), for Workload score was school connectedness ($\beta = .29$), for Worry about grades was family location ($\beta = .13$), for Self-expectation score was School location ($\beta = .15$), and for Study despondency was academic grades ($\beta = .32$, Table 4). For Worry about grades and Self-expectation score, fewer factors were significant and the explanatory power of the model is much lower than for other subscales.

Discussion

In an exploratory manner, we have examined a wide range of factors that may be related to perceived educational stress among a large sample of secondary school students in China. Most variables examined had a statistically significant relationship with ESSA total score or some subscales. Some have been identified in previous studies, such as female gender, older age, high school year, low family income, and perceived poor academic grades (Bjorkman, 2007; Coney & West, 1979; Jones & Hattie, 1991; Li, *et al.*, 2007; Moshe, 1992; Xie, 2007; Zhao & Yuan, 2006). Some were taken into consideration for the first time regarding educational stress in Asia, such as family connectedness, school connectedness and parental bonding. Importantly, the relative contribution of these variables has been assessed by multiple regressions to minimise confounding due to inter-correlation. For example,

gender was not significantly associated with ESSA total score in the bivariate analysis. However, when controlled for all other factors, gender became one of the most important variables for ESSA total score and for three of the subscales (Table 3).

Rural school location had the strongest association with overall stress and Self-expectation stress, and was significantly correlated with all other sub-dimensions of educational stress. In addition to school location, students from rural families experienced significantly more overall educational stress and specially, worry about grades. Although school and family location are highly correlated (In this sample, students from rural families make up 18%, 48% and 98% of all participants attending major city, county city and rural town schools respectively), the multivariate analyses suggest the two factors have independent effects on stress arising from academic learning.

There are several plausible cultural and system-level explanations. First, although academic learning is widely considered to a major path to social success by Chinese communities, this appears to be more pronounced in rural families (Ang & Huan, 2006; Lin & Chen, 1995; Lu, 2008). Rural students may have extra pressure to perform as a key element of the family's drive to promote their social and economic status in comparison to their urban counterparts. Second, there has been a huge disparity in educational resources between urban and rural areas in China (Bao, 2006). Rural schools are usually in poorer condition in terms of both infrastructure and teacher resources. Post-school training opportunities in rural areas are less than in cities, and therefore competition is greater. These factors may drive both schools and students to work harder. Moreover, rural schools may be more likely to conduct "cramming teaching" rather than quality teaching and this may pose an additional burden (Bao, 2006). Third, although education departments have developed policies to reduce the learning burden of students (China Ministry of Education, 2009;

Shandong Provincial Education Department, 2009), it may be more difficult for these policies to be applied to rural areas due to resource limitations.

Favourable family environment, parenting style and parent-child relationship strongly influence mental health and well-being of children and adolescents (Bhatia & Bhatia, 2007; Greenberger, Chen, Tally, & Dong, 2000; Hall-Lande, *et al.*, 2007; Pedersen, 1994). The present data show that parents' education level and occupation, parental bonding (except parental control), family connectedness and conflict with parents are not strongly related to educational stress. In this study, we defined educational stress as stress arising from academic matters, which occur mainly at the school rather than family. Family factors may have strong effects on the overall stress but not this particular form of stress. Further, in countries like China in which filial piety to parents is specially valued, most students may feel obliged to realise the expectations of their parents on their school performance and thus might not be stressed specially by parental pressure. Further, secondary school students spend most of their daytime at school (Anonymous, 2007; China Youth Social Service Center, 2008) and some even live in school dormitories. The lack of time at home and with their parents may to some degree reduce the familial or parental influence on their stress level,

It is noteworthy that all of the top seven correlates of overall perceived educational stress, except gender and age, are school or study-related (school location, school connectedness, academic grades and emotional conflicts with teachers) or mainly occurred in the school (peer emotional bullying), indicating schools or the education system may be largely responsible for students' stress and the family pressure may be only a secondary concern. This emphasises the importance of new policies and school-based intervention programs as these factors are to some extent preventable or controllable. For example, the gap in educational resources and teaching style between urban and rural schools could be

diminished by increased investment to rural schools. Improvement of school facilities and teaching resources may in turn promote school connectedness, which appears to be protective.

It is generally believed in China that heavier workload leads to more perceived stress. Homework intensity has been used as an indicator of academic burden and related pressure in many large-scale surveys (All-China Women's Federation, 2008; China Youth Social Service Centre, 2008; Lei, *et al.*, 2007; Zhao, *et al.*, 2009). Interestingly, this study identified an inverse association between homework hours and academic stress, especially the stress arising from perceived workload. It seems that the more time students spend on homework, the lighter the burden they perceived from workload. Students who have a positive attitude towards homework or have a conducive home environment may be willing to spend more time on this task and completion of the work may alleviate stress. These findings indicate that homework hours per se might not be appropriate to serve as a reliable proxy measure of study burden, at least among Chinese students. However, other workload measures, including private tutoring and attending extra classes were positively associated with higher levels of some aspects of educational stress. In contrast to homework hours, such extra work is often determined by parents and some students may feel coerced to do so and thus may become more stressed.

The identification of risk factors for perceived educational stress could provide evidence for policy-making and assist the design of intervention programs. In recent years, many official documents have been issued by the Ministry of Education and provincial education departments calling for quality education and efforts to lighten the burden on students (China Ministry of Education, 2009; Shandong Provincial Education Department, 2009). According to this study, such policies should include a special focus on rural schools and female students should be the priority target group. Schools should pay more attention to

students' physical and psychological development rather than solely on their academic grades. Further efforts to prevent emotional and physical corporal punishments by teachers and peer bullying could effectively reduce students' academic stress.

This study has limitations. First, the information was collected relying on self-report and thus some recall bias cannot be avoided. Second, the relationships between factors cannot be interpreted causally because of the cross-sectional nature of this study. Third, the sample was chosen conveniently and the findings cannot be generalised to the population, although it should be noted that the demographic characters of our sample were similar to the whole population of similar ages in Shandong province in terms of gender, ethnicity, and family location (Shandong Provincial Bureau of Statistics, 2007). In addition, the factors examined in this study only account for a modest proportion of the total variance in academic stress scores, especially into factors that influence worry about grades and self-expectation stress. Another important limitation is the lack of adequate theorising for some variables included in this study, especially for individual factors such as health status, BMI and internet use. The main reason to include them is that these factors have recently become a major concern among young students in China (Lin, 2002; Zhang, Zhang, Jin, Han, & Ye, 2009). Therefore findings regarding these factors may provide clues for more in-depth investigations.

Despite these limitations, this study for the first time comprehensively examined a wide range of social risk factors for perceived academic stress with a large sample of Chinese students and identified some important correlates. The findings should contribute to the development of theory in this field and also suggest priority areas for mental health promotion for adolescents in China. Future research should cover more factors for educational stress and examine its influence on adolescents' mental health and well-being, as well as intervention strategies.

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Chapter 5. Paper 3: Associations between Academic Stress and Depression and Happiness among a Sample of Chinese Adolescents

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Abstract

This study aims to examine the associations between academic stress and mental health among Chinese adolescents. A cross-sectional questionnaire survey was conducted with a sample of 1627 secondary school (grades 7-12) students in Shandong province. Academic stress as measured by the Educational Stress Scale for Adolescents (ESSA) was found to be significantly associated with depression ($r = .46$) and inversely with happiness score ($r = -.27$). A multiple regression model for depression was fitted (Adjusted $R^2 = .41$) with one of the ESSA scores (Study despondency) having the strongest association ($\beta = .24, p < .001$). Self-efficacy ($\beta = .21, p < .001$) and school connectedness ($\beta = .20, p < .001$) also had strong connections with depression. In the multiple regression model for happiness (Adjusted $R^2 = .36$), school connectedness ($\beta = .28, p < .001$), self-efficacy ($\beta = .14, p < .001$), family connectedness ($\beta = .13, p < .001$) and father care ($\beta = .13, p < .001$) showed the strongest effects. Only one of the ESSA scores (Study despondency) had significant but modest association with happiness ($\beta = -.09, p = .001$). School-based interventions on educational stress may have the potential to substantially reduce the prevalence of depression but limited effects on increasing happiness.

Keywords: academic stress, mental health, depression, happiness, adolescents, China

Introduction

There is abundant evidence demonstrating that educational matters, such as heavy study burden and failures in tests and examinations are a major source of stress among children and adolescents (Brown, Teufel, Birch, & Kancherla, 2006; Christie & MacMullin, 1998; Dodds & Lin, 1993; Gallagher & Millar, 1996; Huan, See, Ang, & Har, 2008; Tang & Westwood, 2007). This phenomenon seems especially pronounced in East Asian countries where fierce competition exists and education is highly valued by the traditional culture. Asian students tend to have high academic burden (Lee & Larson, 2000), low satisfaction regarding their academic performance, and high parental or personal expectation of success (Crystal et al., 1994). Consequently, students from Asian countries may suffer more academic stress than their peers in English speaking countries (Ang & Huan, 2006a; Ang, Huan, & Braman, 2007).

Adolescent mental health is recognised as a major public health concern worldwide. Epidemiological data suggests that approximately 20% of children and adolescents suffer to some extent from a disabling mental illness; and up to 50% of all adult mental disorders have their onset in adolescence (Belfer, 2008). The correlations between life stressors and the onset of mental illness have been extensively studied. For example, most individuals with a depressive disorder experience episodes of severe stress prior to onset (Goodyer, 2001; Hankin, 2006). A causal relationship has also been established between stressful life events and major depression (Kendler, Karkowski, & Prescott, 1999). Although these phenomena may be universal, most evidence is derived from western countries, with comparatively little research from China and other Asian societies. The lack of research may be partly due to a general shortage of professional capacity in low and middle income countries (Belfer, 2008; Bruckner *et al.*, 2011; WHO, 2005).

Research into the specific effects of educational stress reveals a complex picture (Anderman, 2002; Ang & Huan, 2006b; Bjorkman, 2007; Field, Diego, & Sanders, 2001; Kouzma & Kennedy, 2000). For example, Kouzma and Kennedy (2000) found high academic stress was significantly associated with somatic symptoms (such as sleep disorder, gastrointestinal problems, and musculoskeletal problems) and mood disturbances (such as anxiety, depression, anger, fatigue, and confusion) in female Australian students. Bjorkman's PhD study (2007) revealed strong positive associations between academic stress and internalizing (anxiety, depression, and somatisation) and externalizing behaviours (aggression, hyperactivity, and conduct problems) in a US sample of grade 6-8 students. Similarly, positive correlations between academic stress and depression and suicidal ideation were found by Ang and Huan (2006b) in a sample of 1108 Chinese students in Singapore.

Research into child and adolescent mental health has been focusing on negative indicators (i.e., various psychological disorders) despite a growing attention to positive measures, such as perceived level of happiness. In a recent study among college students, Schiffrin and Nelson (2010) identified an inverse relationship between perceived life stress and several measures of happiness. Another study with a sample of Chinese students in Taiwan found that those who have high academic grades, who receive adequate teacher support and who are satisfied with school environment report significantly higher levels of happiness than those who did not (Chen & Lu, 2009). Although lacking of direct evidence, these findings suggest the construct 'educational stress' may also have a negative effect on students' happiness, as educational matters are a major source of overall stress among adolescents. However, more evidence on positive psychology is clearly needed given the substantial gap compared to that for negative measures and these relationships should be investigated in more depth and in different populations.

Apart from educational stress, many individual and environmental factors are known to have a significant effect on children and adolescents' mental health. For example, self-efficacy as defined as an individual's belief about their capacity to succeed in specific situations (Banduras, 1977), is often inversely related to the risk for depression and anxiety (Ehrenberg & Cox, 1991; Muris, 2002). Negative parenting styles are another important risk factor for poor mental health. Typically, authoritarian parenting has negative effects on children's behavioural and emotional well-being while high parental care or warmth is associated with better mental health (Heaven, Newbury, & Mak, 2004; Martin, Bergen, Roeger, & Allison, 2004; Yang & Shin, 2008; Zhou *et al.*, 2008). Increased connectedness with family and school has a significant protecting effect on the onset of many psychological disorders, such as depression and anxiety (McGraw, Moore, Fuller, & Bates, 2008; Thompson, Iachan, Overpeck, Ross, & Gross, 2006). In addition, female gender, older age and poor socioeconomic status are generally linked to an escalated risk for ill mental health in this population (Bhatia & Bhatia, 2007; Hankin, 2006). Despite the identification of a wide range of risk factors, their relative contribution to the illness is not always clear because most of the previous studies included only a particular group of factors and the multivariable analysis is often limited by small sample size.

Chinese students are well-known not only for their excellent academic achievement (Mervis, 2010) but also for the enormous pressure in pursuing ideal grades. Results from an ongoing project led by the Chinese Youth and Children Research Center (CYCRC) (Lei, Sun, Li, Guo, & Zhang, 2007; Zhao, Zhu, & Ma, 2009) show that Chinese students have the highest academic burden among students in all participating countries (China, Japan, South Korea and the USA). Nearly ninety percent (86.6%) of the Chinese participants have high or very high pressure because of academic matters and nearly half (45.2%) report spending two hours or more per day completing homework (Jia, 2010). However, the Chinese research to

date has been limited not only in number and scale, but also by the narrow conceptualisation of educational stress. Although some specific academic factors, such as grades are known to have a relationship with some mental health problems (Li & Zhang, 2008; Shen *et al.*, 2005; Su *et al.*, 2002; Yang, 2002; Zhang, Tao, & Zeng, 2001), the link between perceived academic stress and psychopathology has not been well established in China through empirical research.

This study aimed to investigate the associations between educational stress and mental health among Chinese adolescents. Two outcome measures, depression and happiness were included to indicate negative and positive psychology given their perceived importance in this population. Based on existing literature, it may be safe to foresee a positive association with depression while a negative one with happiness in this study. However, we conducted a more in-depth analysis on the relative contribution to the mental health measures of educational stress in comparison with some well-known risk factors. In addition, we further examined the relative importance of different components or dimensions of educational stress. Findings from this study may provide more in-depth information for stress intervention and mental health promotion.

Methods

Design and Participants

A cross-sectional questionnaire survey was conducted in September and October 2009 in Shandong, the second most populous province in China. Three sites were chosen to ensure geographic and socioeconomic diversity, including the capital city of the province, a county city and a rural town. From each site, one junior school (grades 7-9) and one senior school (grades 10-12) were purposively selected and a written approval was given by the principal or vice-principal. Finally, two classes from each of the school years from each of the six schools were randomly chosen and a total of 1,740 students were invited to participate.

Measures

Demographic Variables. Ten variables including gender, age, family location (urban / rural), self-reported family income level (low/ middle/ high), father and mother's occupation (farming / non-farming), father and mother's education level (junior school or lower / senior school or higher), school location (capital city/ county city/ rural town) and school year level (junior / senior) were measured using single questions.

Academic stress. The Educational Stress Scale for Adolescents (ESSA, Sun, Dunne, Hou, & Xu, 2011a) was used to estimate the level of academic stress. It contains 16 statements rated on a 5-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). The total score ranges from 16 to 80 with higher scores indicating greater stress. This scale has five factors. 'Pressure from study' (four items about the perceived pressure from daily learning, from parents, peer competition and students' concern about the future), 'Workload' (three items regarding perceived burden of homework, school work and examinations), 'Worry about grades' (three items regarding stressful emotions due to dissatisfaction with academic grades), 'Self-expectation stress' (three items about stressful feelings when self-expectations fail to be met) and 'Despondency' (three items about dissatisfaction and lack of confidence and concentration in academic study). This instrument has satisfactory to good internal consistency in this sample with Cronbach's $\alpha = .82$ for the total scale, and $\alpha = .79$, $\alpha = .73$, $\alpha = .69$, $\alpha = .65$, and $\alpha = .64$ for the five factors, respectively. The 2-week test-retest reliability is also satisfactory with an Intraclass Correlation Coefficient (ICC) ranging from .59 to .75 for the five factors and an ICC of .78 for the total scale (Sun, *et al.*, 2011a).

Depression. The Chinese version of Centre for Epidemiological Studies – Depression Scale (CES-D, Radloff, 1977; Liu, 1999) was used. It is a 20-item self-report instrument for depressive symptoms experienced in the past week prior to the survey. Items

were rated using a 4-point scale from *Rarely or none of the time (less than 1 day)* to *Most or all of the time (5-7 days)* and were scored either 0-3 or 3-0, with a total range of 0-60, where higher scores indicate greater frequency and number of symptoms. It has 4 separate factors: depressive affect, somatic symptoms, positive affect, and interpersonal relations. The CES-D has good internal consistency with alpha values of .85 for the general population and .90 for a psychiatric population (Radloff, 1977). It also gained good internal reliability in the present study (Cronbach's $\alpha = .88$).

Happiness. Perceived happiness was measured using a 3-item scale developed for this study. The items were 1) "How happy do you feel about your family environment?" 2) "How happy do you feel about your school life?" and 3) "How happy do you feel in general?" Participants were asked to rate their degree of happiness on a 7-point Likert scale ranging from 1 (*Least happy*) to 7 (*Extremely happy*). A total happiness score was generated by averaging the sum of item scores and ranged from 1 to 7 with higher scores indicating higher levels of happiness. This unidimensional construct showed good internal consistency (Cronbach's $\alpha = .77$; inter-item correlations: .40 - .63). This scale also gained good 2-week test-retest reliability with an Intraclass Correlation Coefficient (ICC) ranging from .71 to .84 for the three items and an ICC of .79 for the total scale in the pilot study.

Self-efficacy. The Chinese version of the Generalized Self-Efficacy Scale (GSES) (Zhang & Schwarzer, 1995) was used. Participants rated each of the 10 items on a 4-point Likert scale ranging from one (*Not at all true*) to four (*Exactly true*). The total score varies from 10 to 40 with higher scores indicating higher levels of self-efficacy. The GSES has been shown to have high internal consistency with Cronbach alpha ranging from $\alpha=.75$ to $\alpha=.94$ across a number of different language versions (Schwarzer & Jerusalem, 1995). The Cronbach's alpha calculated on this scale in the present study was $\alpha=.88$.

Parental bonding. The short form (n=20 items) of the Parenting Bonding Instrument (PBI) (Pedersen, 1994) was used to measure both maternal and paternal parenting style. Participants rate each statement on a four-point Likert scale ranging from *Very like*, *Moderately like*, *Moderately unlike*, to *Very unlike* regarding how well the statements describe their relationships with mothers and fathers respectively. Each item is scored from 0 to 3. The shortened PBI has four factors: father/mother care and father/mother control (each with 5 items). Higher scores on the care scale suggest warmth and understanding; while lower scores indicate “coldness” and rejection. Higher scores on the control scale indicate overprotection; while lower scores suggest that parents allow personal independence. The Cronbach’s alpha of mother care, mother control, father care and father control ranged from .69 to .78 in the original study (Pedersen, 1994). Unfortunately, when translated into Chinese, the response format was found to be problematic in the pilot study for the current project, with many students commenting that it was “ambiguous” or “confusing”. Therefore, the response format was changed to *Never*, *Sometimes*, *Often* and *Always*. In this study, the modified PBI achieved a Cronbach's alpha from $\alpha = .66$ to $\alpha = .70$ for the four subscales, respectively.

Family connectedness. Family connectedness was measured using a 4-item scale (Hall-Lande, Eisenberg, Christenson, & Neumark-Sztainer, 2007). Participants were asked “How much do you feel your mother cares about you?”, “How much do you feel your father cares about you?”, “Do you feel that you can talk to your mother about your problems?” and “Do you feel that you can talk to your father about your problems?” Answers were given on a five-point Likert scale ranging from 1 (*Not at all*) to 5 (*Very much*). Scores were averaged to create an overall connectedness score ranging from 1 to 5, with higher scores indicating greater connectedness to family. In this study, the Cronbach's alpha for the translated scale was $\alpha = .75$.

School connectedness. This was measured using a 5-item instrument created by Resnick and colleagues (1997) from the National Longitudinal Study on Adolescent Health in the USA. It includes statements regarding students' feelings about their school and teachers: 1) "I feel safe in my school", 2) "The teachers at this school treat students fairly", 3) "I am happy to be at this school", 4) "I feel like I am part of this school" and 5) "I feel close to people at this school". This scale uses a 5-point response format ranging from 0 (*Strongly Disagree*) to 4 (*Strongly Agree*). The total score varies from 0 to 20 where higher scores indicate higher level of school connectedness. In this study, the scale obtained good internal consistency ($\alpha = .83$).

Statistical Analysis

Analyses were conducted using SPSS for Windows 17.0 (SPSS Inc, Chicago, IL). All statistical tests were two-sided and significance level was set at $\alpha=.05$. Bivariate relationships between ESSA scores and other variables were tested using Pearson correlation analysis. Two sets of multiple hierarchical linear regression models were fitted to examine the relative contribution of ESSA components to depression and happiness, respectively. Specifically, for each outcome variable, ten demographic variables were entered in the first block. In the second block, scores of seven known risk factors including self-efficacy, father care, mother care, father control, mother control, family connectedness and school connectedness were included into the model. Finally, five subscale scores of educational stress were entered in the third block. Changes of R-square values were reported and standardised regression coefficients were calculated to indicate the strength of the adjusted associations.

Ethics Clearance

This study obtained ethics approval from the Human Research Ethics Committee of the Queensland University of Technology (QUT), Australia and the Preventive Medicine

Ethics Committee of Shandong Centre for Disease Control and Prevention (CDC), China. Participation was entirely voluntary and anonymous. Before the data collection, a written approval was given by the principal/vice principal of each participating school and a standard assent was gained from each student. Passive consent was also obtained from parents, who were advised of their option to withdraw their child from the study.

Results

Sample Description

A total of 1740 students in the selected classes were invited to participate in the survey. Data analysis was conducted with 1627 (93.5%) students. Others were excluded because of written refusal (4.0%) or incomplete response (3.5%). The age of the sample ranged from 11 to 20 ($Mean=15.47$, $SD=1.85$). Almost all (99.5%, 1618/1627) were ethnically *Han* Chinese. The detailed demographic characteristics of the sample are displayed in Table 1.

Correlation Analysis

The results of zero-order correlations between the main variables are presented in Table 2. Significant relationships ($p < .01$) were observed between overall academic stress (total ESSA score) and all individual and environmental variables as well as mental health measures. For the total ESSA score, the strongest association was found to be the one with depression ($r = .46$) except for those with the subscales. A negative correlation was found between overall stress and happiness ($r = -.27$). Educational stress were also positively related to father and mother control and negatively related to self-efficacy, father and mother care, and family and school connectedness (Table 2).

All five sub scores of ESSA had significant correlations ($p < .05$) with two mental health measures. Among the five dimensions, the score of Study despondency had the strongest correlations with both depression ($r = .50$) and happiness ($r = -.33$). The weakest

but statistically significant correlation with depression was found for the score of Worry about grades ($r = .06$) and the weakest one with happiness was found for the score of Self-expectation ($r = -.05$). Interestingly, Worry about grades score had positive correlations with both depression and happiness while all other sub scales had a negative correlation with the happiness score (Table 2).

Multiple Hierarchical Regression for Depression

The results of multiple hierarchical regression for depression are displayed in Table 3. All models were statistically significant ($p < .01$). Initially, age ($\beta = .27, p < .001$) and family income ($\beta = -.12, p < .001$) had strong correlations with the dependent variable, with older age and lower family income being predictive of more depressive symptoms. However, these effects disappeared when the main variables were entered, indicating a mediating effect of some of the main factors on the relationships between background factors and mental health.

The inclusion of the five ESSA scores into the final model (adjusted $R^2 = .41, F(22, 1332) = 44.43, p < .001$) caused a significant increase in the explanatory power of the model (R^2 change = .10, $p < .001$). However, only two subscores (Study despondency and Self-expectation) had significant positive effects on the depression score. The former showed the strongest association with depression among all independent variables ($\beta = .24, p < .001$). Self-efficacy ($\beta = .21, p < .001$) and school connectedness ($\beta = .20, p < .001$) also had strong connections with depression. Other significant variables in the final model included mother care score ($\beta = -.07, p = .027$) and family connectedness ($\beta = -.07, p = .014$, Table 3).

Multiple Hierarchical Regression for Happiness

Similar to the analysis for depression, the strong associations with happiness of older age ($\beta = -.31, p < .001$), high family income ($\beta = .15, p < .001$) and senior school level ($\beta = .13, p = .008$) disappeared or drastically reduced after the main variables entering into the model (Table 4). The inclusion of ESSA scores resulted in a modest but significant increase

in the explanatory power (R^2 change = .01, $p = .009$). In the final model (adjusted $R^2 = .36$, $F(22, 1319) = 35.50$, $p < .001$), only one ESSA subscale (Study despondency) was significantly related to the dependent variable ($\beta = -.09$, $p = .001$). School connectedness ($\beta = .28$, $p < .001$), self-efficacy ($\beta = .14$, $p < .001$), family connectedness ($\beta = .13$, $p < .001$) and father care ($\beta = .13$, $p < .001$) had much stronger effects on perceived happiness than any type of educational stress. High family income ($\beta = .07$, $p = .005$), rural school location ($\beta = .09$, $p = .009$) and mother care ($\beta = .07$, $p = .023$) were also significant variables (Table 4)

Discussion

Among adolescents in Shandong, China, educational stress is positively associated with depression, and negatively with happiness. These findings are generally consistent with previous research in the US, Australia and Singapore (Anderman, 2002; Ang & Huan, 2006b; Bjorkman, 2007; Field, *et al.*, 2001; Kouzma & Kennedy, 2000; Schiffrin & Nelson, 2010). These data add to a growing body of work that suggests academic stress is an important risk factor for poor mental health worldwide and the efforts to close the gap in mental health research in children and adolescents in developing countries. Although prior research in China has identified that academic factors such as poor grades increase the risk for mental health problems (Li & Zhang, 2008; Liu & Tein, 2005; Shen, *et al.*, 2005; Su, *et al.*, 2002; Yang, 2002; Zhang, *et al.*, 2001), this is the first study to examine the effects of educational stress on both negative and positive mental health with a large sample of Chinese students. More importantly, this study assessed the relative contribution of educational stress in comparison to selected well-known risk factors and attempted to identify what dimensions of educational stress play a more important role in relation to adolescent mental health.

Depressive symptoms are common among children and adolescents. Based on some common thresholds, the prevalence of depression in our sample ranges from 10.4% (CES-D ≥ 28), 18.2% (≥ 24) and 28.1% (≥ 20) to 41.8% (≥ 16), which is similar to previous studies

with Chinese samples (Lin et al., 2008; Zhang, Tao, & Zeng, 2001). However, the mean CES-D score (15.58, SD=9.36) in this study appears to be much higher than the results from the US samples (12.2, SD=0.15; Rushton, Forcier, & Schectman, 2002). There is additional evidence suggesting a higher prevalence of depression among Chinese students compared to their western counterparts (Chan, 1995; Stewart, Betson, Lam, Chung, & Chung, 1999). Further, it is known that Chinese students have higher academic burden and pressure (Lei, *et al.*, 2007; Zhao, *et al.*, 2009). This raises the question of whether the higher prevalence of depression is caused by the extra burden in education in this population. The strong correlation between educational stress and depression observed in this study provides supporting evidence for this hypothesis although further cross-cultural tests are warranted.

Clearly, depression is a top priority in mental health promotion in adolescents in China and internationally. We developed a comprehensive model that explains a considerably large amount of variance (41%) in depression scores which may provide important information for mental health promotion. According to our model, the most important strategies in depression prevention in this population include reducing educational stress, boosting self-efficacy and increasing school connectedness. School-based intervention programs may substantially reduce academic burden and stress and increase the level of connectedness with school. Self-efficacy can be raised through special training and activities (Uchida & Mori, 2008). One particularly important approach in Chinese students is to educate parents and teachers to offer more encouragement while less punishment; because encouragement has a proven beneficial effect on children's self-efficacy (Tuckman & Sexton, 1991) and Chinese parents and teachers traditionally tend to use punishment rather than encouragement in parenting and teaching students (Chan, 1999; Xu *et al.*, 2005). These potential changes may translate to a significant reduction in the prevalence of depressive symptoms in this population.

Based on results for depression (Table 3), there seems to be a pattern that the onset of depressive symptoms in this population is mainly influenced by school and academic factors rather than by parental and family factors. As discussed above, certain types of educational stress and school connectedness have strong relationships with this disorder, while parental bonding scores and family connectedness, as well as parental or family background variables have no or small effects. This is consistent with our previous analysis on correlates of educational stress (Sun, Dunne, Hou, & Xu, 2011b). Collectively, these findings highlight that interventions on educational stress should be an essential part of depression prevention among Chinese adolescents and schools should be the major setting for these programs.

Among all five elements of educational stress, Study despondency has the strongest associations with both mental health measures. The subscale measures perceived level of stress derived specially from the lack of confidence in achieving or maintaining ideal academic grades, dissatisfaction with current grades and the difficulties to concentrate in academic learning (Sun, Dunne, Hou, & Xu, 2011a, 2011b). Self-expectation score also has a strong relationship with depression (Table 3) which indicates the level of stress due to unmet expectations for good grades. Unexpectedly, the Workload score reflecting the amount of school and homework has no effect on either depression or happiness. These data suggest that it is subjective stress rather than objective stress that play an important role in relation to students' mental health. Efforts to lighten students' study burden that are incorporated into the educational reform in China (China Ministry of Education, 2009; Shandong Provincial Education Department, 2009) may not be effective if students' internal feelings are ignored. Apart from the tangible strategies, such as reducing the amount of homework and school work (including the number of tests), education authorities and schools should conduct special education programs that aim to help students develop positive attitudes towards academic grades and future education, and to provide an adequate

psychological counselling service to those who are at a high risk for educational stress and related mental health problems. Students who have despondency feelings should be paid more attention because of the strong association with depression observed in this study.

The association between educational stress and happiness is considerably weaker than the relationship between stress and depression. Connectedness with school and family, self-efficacy and parental care (especially father care) have much stronger effects on happiness. It seems that happiness among adolescents is not the mere absence of stress, but more importantly derived from good family and school environments. Indeed, happiness and stress may be two orthogonal dimensions with some maybe have both emotions simultaneously (Tellegen & Watson, 1985). These findings suggest that programs aiming to increase the level of happiness should be more comprehensive than interventions on mental disorders, and should include both school and family components and a focus on boosting self-efficacy. More attention should be paid to students from low-income families and those who attend rural schools because they currently experience lower levels of happiness even when all other characteristics are equal (Table 4).

One additional contribution of this study is that we developed and preliminarily validated a brief instrument for measuring perceived happiness in this population. This unidimensional 3-item scale has good internal consistency (Cronbach's $\alpha = .77$) and test-retest reliability (ICC = .79). There is evidence showing that one single item would be reliable and viable to measure subjective happiness (Abdel-Khalek, 2006). Our brief scale captures feelings towards two major settings (family and school) of students' life and could be easily incorporated into public health surveys. The relatively strong correlation with depression ($r = -.52, p < .001$) is consistent with existing knowledge (Wood, Taylor, & Joseph, 2010) which suggests a sound predictive validity. However, its concurrent validity and psychological property with other populations need further exploration.

This study has many limitations. First, information was collected solely by self-report of students and thus a certain amount of recall bias cannot be avoided. However, this is probably the most widely used method to collect information in psychology and social behavioural research in adolescent populations. Second, this study is based on a convenience sample in a province in China and thus it is difficult to generalise the findings in this study to other populations, especially to those with different cultures and education systems. Third, the associations are cross-sectional in nature and cannot be interpreted as causal. The associations between educational stress and mental health could be interpreted in both ways. On the one hand, students may be depressed because of high educational pressure and stress. On the other hand, some who have developed depressive symptoms due to other problems may have greater difficulties academically and in turn result in more educational stress. Longitude studies may be necessary to further test these relationships. Fourth, although our models for depression and happiness explain a considerable amount of variance, many important factors (e.g., childhood maltreatment) are not included due to ethical, time and financial restraints. Last but not least, some instruments were newly developed in this study, including the ESSA and happiness scale and this may affect the comparability with other findings using different tools. Although sound psychometric properties were observed for these scales, they should be further validated with other populations and in different cultures.

Despite these limitations, this study for the first time in certain depth examined the phenomenon of educational stress with a multi-dimensional tool (ESSA) and its associations with both negative and positive mental health among Chinese students. Educational stress is the most predictive variable for depression, but is not strongly associated with happiness. Among five subtypes of educational stress, study despondency shows the strongest associations with both mental health measures. These findings are expected to provide

important evidence for policy-making and mental health interventions in China and countries with similar culture and education system.

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Table 1

Demographic Characters of the Sample (N = 1627)

	Frequency (%)		Frequency (%)
Sex		Father education ^a	
Male	890 (55.4)	Junior high or lower	822 (53.4)
Female	717 (44.6)	Senior high or higher	718 (46.6)
Age		Mother education ^a	
11-13	283 (17.5)	Junior high or lower	979 (63.5)
14	243 (15.0)	Senior high or higher	564 (36.5)
15	280 (17.3)	Family income	
16	254 (15.7)	Low	157 (9.7)
17	309 (19.1)	Middle	1138 (70.2)
18-20	246 (15.2)	High	326 (20.1)
Family location		School location	
Urban	679 (42.0)	Major city	451 (27.7)
Rural	939 (58.0)	County City	585 (36.0)
Father occupation ^a		Rural town	591 (36.3)
Farming	575 (35.6)	School year	
Others	1039 (64.4)	7-9 (junior)	805 (49.5)
Mother occupation ^a		10-12 (senior)	822 (50.5)
Farming	657 (40.8)		
Others	955 (59.2)		

Note. The sample size for each category did not necessarily equal because of missing data. Missing data were not presented in this table.

^a Responses of “*Don’t know*” or “*Not applicable*” were treated as missing.

Table 2

Mean Scores (SD) and Inter-variable Correlation Coefficients in this Sample (N = 1627) ^a

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Total ESSA	53.80 (9.91)	1														
2. Pressure from study	14.02 (3.83)	.84**	1													
3. Workload	9.41 (2.96)	.62**	.48**	1												
4. Worry about grades	11.45 (2.79)	.53**	.31**	.01	1											
5. Self-expectation	9.79 (2.53)	.56**	.30**	.08**	.34**	1										
6. Study despondency	9.13 (2.85)	.69**	.50**	.39**	.12**	.22**	1									
7. Self-efficacy	26.91 (5.95)	-.24**	-.26**	-.13**	-.01	-.06*	-.28**	1								
8. Father care	11.44 (2.57)	-.21**	-.25**	-.19**	.09**	.02	-.30**	.25**	1							
9. Mother care	12.18 (2.33)	-.15**	-.19**	-.17**	.11**	.02	-.23**	.19**	.68**	1						
10. Father control	5.08 (2.79)	.22**	.22**	.18**	.02	.06*	.20**	-.13**	-.23**	-.26**	1					
11. Mother control	5.35 (2.86)	.24**	.26**	.24**	.00	.02	.22**	-.14**	-.23**	-.27**	.64**	1				
12. Family connectedness	3.79 (0.68)	-.20**	-.23**	-.22**	.13**	.02	-.30**	.24**	.64**	.56**	-.18**	-.22**	1			
13. School connectedness	14.25 (4.11)	-.33**	-.30**	-.44**	.13**	-.05*	-.36**	.24**	.30**	.23**	-.15**	-.17**	.33**	1		
14. Depression	15.58 (9.36)	.46**	.39**	.30**	.06*	.24**	.50**	-.40**	-.36**	-.32**	.23**	.24**	-.36**	-.42**	1	
15. Happiness	5.28 (1.33)	-.27**	-.27**	-.27**	.07**	-.05*	-.33**	.32**	.42**	.36**	-.18**	-.20**	.42**	.46**	-.52**	1

Note. The sample size for each correlation did not necessarily equal because of missing.

M = Mean; *SD* = Standard deviation

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

Table 3

*Hierarchical Regression for Depression on Educational Stress, Individual and**Environmental Factors and Demographic Variables (N = 1354)*

	Model 1	Model 2	Model 3
Demographic variables			
Sex (female)	.05 [*]	.04	.03
Age group (high)	.27 ^{**}	.07	.02
Family Address (rural)	-.03	-.02	-.02
Family Income (high)	-.12 ^{**}	-.04	-.04
Father occupation (farming)	-.07	-.07	-.05
Mother occupation (farming)	.04	.08	.08
Father education (low)	.00	-.02	-.03
Mother education (low)	.02	-.02	-.01
School location (rural)	-.03	-.04	-.06
School level (senior)	-.09	-.04	-.06
Individual and environmental factors			
Self-efficacy	—	-.25 ^{**}	-.21 ^{**}
Father care	—	-.08 [*]	-.06
Mother care	—	-.06	-.07 [*]
Father control	—	.06 [*]	.03
Mother control	—	.06	.03
Family connectedness	—	-.09 ^{**}	-.07 [*]
School connectedness	—	-.26 ^{**}	-.20 ^{**}
Educational stress			
Pressure from study	—	—	.04
Workload	—	—	-.01
Worry about grades	—	—	.02
Self-expectation	—	—	.15 ^{**}
Study despondency	—	—	.24 ^{**}
Model statistics			
R^2	.06	.33	.42
Adjusted R^2	.06	.32	.41
F	8.86 ^{**}	38.48 ^{**}	44.43 ^{**}
ΔR^2	.06	.27 ^{**}	.10 ^{**}

* Coefficient or model is significant at the .05 level.

** Coefficient or model is significant at the .01 level.

Table 4

*Hierarchical Regression for Happiness on Educational Stress, Individual and Environmental**Factors and Demographic Variables (N = 1341)*

	Model 1	Model 2	Model 3
Demographic variables			
Sex (female)	.04	.03	.03
Age group (high)	-.31**	-.07	-.06
Family Address (rural)	.07	.06	.06
Family Income (high)	.15**	.07**	.07**
Father occupation (farming)	.00	.00	.00
Mother occupation (farming)	.03	-.02	-.01
Father education (low)	-.01	.01	.01
Mother education (low)	.01	.03	.03
School location (rural)	-.07	-.08*	-.09**
School level (senior)	.13**	.04	.05
Individual and environmental factors			
Self-efficacy	—	.16**	.14**
Father care	—	.14**	.13**
Mother care	—	.07*	.07*
Father control	—	-.03	-.02
Mother control	—	-.01	.00
Family connectedness	—	.14**	.13**
School connectedness	—	.30**	.28**
Educational stress			
Pressure from study	—	—	-.03
Workload	—	—	.00
Worry about grades	—	—	.04
Self-expectation	—	—	-.01
Study despondency	—	—	-.09**
Model statistics			
R^2	.08	.37	.37
Adjusted R^2	.07	.36	.36
F	11.51**	44.67**	35.50**
ΔR^2	.08**	.29**	.01

* Coefficient or model is significant at the .05 level.

** Coefficient or model is significant at the .01 level.

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Chapter 6. Paper 4: Suicidal Behaviours among a Sample of Chinese Adolescents: Associations with Educational Stress

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Abstract

Suicidal behaviour among children and adolescents is a major public health concern. Educational stress is common in young people worldwide but appears to be especially pronounced in China. This cross-sectional questionnaire study with a convenience sample of students in Shandong, China examined the relationships between the multi-dimensional construct 'educational stress' and suicidal behaviours. Data analysis was conducted with 1614 adolescents attending secondary schools (Mean age = 15.47 years, *SD* = 1.85). After adjusting for demographic characteristics, the overall educational stress was strongly associated with increased risk for suicidal thinking and planning but had no significant effect on suicidal attempts. Different dimensions or types of educational stress had different influences on adolescent suicidality, with two dimensions, 'self-expectation' and 'worry about grades' unexpectedly showing a protecting effect. These findings are expected to increase the understanding of adolescent suicidology and provide useful information for public health interventions to promote mental health in this population. More in-depth research into the nature and socially modifiable determinants of youth suicidality is warranted.

Key words: Educational stress, suicidal behaviour, adolescents, China

Introduction

Suicide behaviour is a major public health concern and seems more pronounced in young people. According to data from the 2004 Global Burden of Disease (GBD) study, self-inflicted injuries causes 1.4% of the total mortality and 1.3% of the total disease burden as measured by the Disability-Adjusted Life Years (DALYs) (Mathers *et al.*, 2008). Among young people aged 10-24 years, however, suicide is the fourth cause of mortality (7.7% of all deaths) and eighth cause of disease burden (3.5% of the total burden) (Gore *et al.*, 2011; Patton *et al.*, 2009). More recent WHO data shows that suicide has become the second largest cause of mortality in the 10-24 age group, second only to traffic accidents (WHO, 2009).

Research into nonfatal suicide behaviour, including contemplation, planning and attempts may provide valuable information for early intervention. Previous research reveals these behaviours are common among children and adolescents. In the United States, the prevalence of suicidal thinking, planning and attempts among secondary school students in the past 12 months is 15%, 11% and 7% respectively, with females rates being about twice as high as those for boys (Eaton *et al.*, 2008). A national survey in South Korean secondary school students shows a higher prevalence of suicidal ideation (23%) while a similar prevalence of suicidal attempts (5%) (Han, Kim, Ryu, Kang, & Park, 2009). Similar rates are also observed among Chinese students. A national survey of 181,832 secondary school students (years 7 to 12) in 2005 found the unadjusted rates for the three suicidal behaviours were 21% (17% and 24% for males and females, respectively), 7% (6% for males and 8% for females) and 3% (same for both genders) (Ji & Chen, 2009).

The determinants of suicidal behaviours have been extensively studied with Chinese adolescents and academic factors are frequently identified as an important risk factor. For example, poor academic grades and low satisfaction with academic grades are often related to

a higher risk for suicidal ideation and attempts (Chang, Yang, Lin, Ku, & Lee, 2008; Hesketh, Ding, & Jenkins, 2002; Liu, Tein, Zhao, & Sandler, 2005; Wang, Deng, Wang, Wang, & Xu, 2010). In a sample of 1108 secondary school students in Singapore, academic stress from expectations of self and significant others was found to be significantly associated with both depression and suicidal ideation (Ang & Huan, 2006). With a sample of 1362 adolescents in Mainland China, Liu and Tein (2005) examined a wide range of negative life events in relation to suicidal behaviour. Among the six most predictive variables for suicidal attempts, four were school or study related including pressure to enter a better school/college, transfer to a new school, failure in an exam and homework burden. The remaining two were being frightened and beaten / scolded by parents (Liu & Tein, 2005). In addition, many youth suicide cases reported in mass media are alleged to be related to academic pressure or failures in exams, especially among secondary school students (People's Daily Online, 2008; Sohu News, 2008).

Although the heavy academic burden and pressure among adolescents in China and other East Asian countries have been widely recognised (Ang, Huan, & Braman, 2007; Crystal *et al.*, 1994; Lee & Larson, 2000; Lei, Sun, Li, Guo, & Zhang, 2007; Zhao, Zhu, & Ma, 2009), educational stress as a multidimensional construct has not yet been well studied. Further, most of the previous studies on the correlates of suicidal behaviour have only included some individual academic factors or events (such as poor academic grades and failure in an exam) and few have examined the effects on mental health of subjective educational stress. Additionally, it is not clear whether educational stress has equal effect on different suicidal behaviours and which type or dimension of educational stress has a stronger association with student suicidality. Considering the high prevalence of suicidal behaviours among young people and heavy academic pressure experienced by Chinese students, it is of

great importance to examine their relationships in depth. This may provide valuable information for both public health interventions and education practice.

The nature and health effects of educational stress was investigated by surveying over 2000 adolescents in urban and rural areas of Shandong China, using a newly developed tool – the Educational Stress Scale for Adolescents, ESSA (Sun & Dunne, 2011; Sun, Dunne, Hou, & Xu, 2011a, 2011b). This paper reports the associations between educational stress and suicidal behaviours. Based on prior research, we hypothesised there would be significant associations between educational stress levels and risk for suicidal behaviours. Importantly, this study attempted to discover which suicidal behaviours are more likely to be influenced by educational stress, and which type of educational stress has a stronger relationship with suicidal behaviours in Chinese adolescents. Another task of the current study was to examine the prevalence of these behaviours and the potential differences across demographic variables.

Methods

Design and Participants

We conducted a cross-sectional questionnaire survey in September and October 2009 in Shandong, the second most populous province in China. Three sites were chosen to ensure geographic and socioeconomic diversity, including the capital city of the province, a county city and a rural town. From each site, one junior school (grades 7-9) and one senior school (grades 10-12), or a school with both junior and senior sections were purposively selected and a written approval was given by the principal or vice-principal. Finally, two classes from each of the school years from each of the six schools were randomly chosen and a total of 1,740 students were invited to participate.

Measures

Demographic Variables. Ten variables including gender, age, family location (urban / rural), self-reported family income level (low/ middle/ high), father and mother's occupation (farming / non-farming), father and mother's education level (junior school or lower / senior school or higher), school location (capital city/ county city/ rural town) and school year level (junior / senior) were included in this analysis. Age was categorised into three groups (<15, 15-16 and ≥ 17 years) in the main analysis.

Academic stress. The Educational Stress Scale for Adolescents (ESSA, Sun, Dunne, Hou, & Xu, 2011b) was used to estimate the level of academic stress. It contains 16 statements rated on a 5-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). The total score ranges from 16 to 80 with higher scores indicating greater stress. This scale has five factors: 'Pressure from study' (four items about the perceived pressure from daily learning, from parents, peer competition and students' concern about the future), 'Workload' (three items regarding perceived burden of homework, school work and examinations), 'Worry about grades' (three items regarding stressful emotions due to dissatisfaction with academic grades), 'Self-expectation stress' (three items about stressful feelings when self-expectations fail to be met) and 'Study despondency' (three items about dissatisfaction, lack of confidence and low concentration in academic study). This instrument has satisfactory to good internal consistency in this sample with Cronbach's $\alpha = .82$ for the total scale, and $\alpha = .79$, $\alpha = .73$, $\alpha = .69$, $\alpha = .65$, and $\alpha = .64$ for the five factors, respectively. The 2-week test-retest reliability is also satisfactory with an Intraclass Correlation Coefficient (ICC) ranging from .59 to .75 for the five factors and an ICC of .78 for the total scale (Sun, *et al.*, 2011b). The ESSA total and subscale scores were normally distributed (Sun, *et al.*, 2011a). In order to quantify the increased or decreased risks of suicidal ideation and attempts in students with higher levels of educational stress compared to a reference group (low stress

level students), original ESSA scores were categorised into four levels using roughly equal intervals in this analysis (Table 1).

Suicidal behaviours. Three types of suicidal behaviour were measured using items from the Youth Risk Behavior Survey (YRBS) (CDC, 2009; Eaton, *et al.*, 2008). These items have been frequently used in Chinese samples (Chen, Dunne, & Han, 2006; Chen, Dunne, & Han, 2004). Suicidal thoughts, plans and attempts were measured using the following questions: “During the past 12 months, have you ever seriously considered attempting suicide?”, “During the past 12 months, have you ever made a plan about how you would attempt suicide?”, and “During the past 12 months, have you ever committed suicide action?” Participants who responded “Yes” to these questions were defined as having suicidal thoughts, plans or attempts.

Statistical Analysis

Prevalence was calculated as proportions of those who reported a specific type of suicidal behaviour among all who responded. The differences in prevalence rates between different demographic groups were tested using two-side Chi-square test or Fisher’s exact method when appropriate. Associations between educational stress level and the risk for different types of suicidal behaviour were analysed in multiple logistic regressions where demographic variables were controlled. The strength of associations was indicated by odds ratios (*ORs*) and 95% confidence intervals (*CI*s). To examine the relative importance of ESSA dimensions, one logistic regression model with all ESSA subscales and demographics as independent variables was fitted for each type of suicidal behaviour. All analyses were done using SPSS for Windows 17.0 (SPSS Inc, Chicago, IL). All statistical tests were two-sided and the significance level was set as $\alpha=.05$.

Ethics Clearance

This study obtained ethics approval from the University Human Research Ethics Committee of Queensland University of Technology (QUT), Australia and the Preventive Medicine Ethics Committee of Shandong Centre for Disease Control and Prevention (CDC), China. Participation was entirely voluntary and anonymous. Before the data collection, a written approval was given by the principal/vice principal of each participating school and a standard assent was gained from each student. Passive consent was also obtained from parents, who were advised of their option to withdraw their child from the study.

Results

Response Rates and Sample Description

Among the 1740 students who were invited, 1690 (97.1%) agreed to participate in the survey. Data analysis was conducted with 1614 (96.7% of all responded and 92.7% of all eligible) students and others ($n=76$) were excluded because incomplete responses in either suicide questions ESSA scales. The age of the sample ranged from 11 to 20 ($Mean=15.47$, $SD=1.85$). Almost all (99.4%, 1605/1614) were ethnically *Han* Chinese. The detailed demographic characteristics of the sample are displayed in Table 2.

Suicidal Behaviours and Demographics

The prevalence of the three types of suicidal behaviour was 20.6%, 10.0% and 1.8%, respectively. Comparisons of these rates between demographic groups are presented in Table 2. Female students reported significantly higher rates for suicidal thoughts ($\chi^2(1, N = 1594) = 17.05, p < .001$) and suicidal plans ($\chi^2(1, N = 1594) = 6.19, p = .013$) than males. Rural family and school location, parental occupation as farming and low parental education level were generally associated with a lower risk for suicidal behaviours. Low income level was significantly related to a higher risk for planning ($\chi^2(1, N = 1608) = 6.61, p = .037$) and attempted suicide ($\chi^2(1, N = 1608) = 15.00, p = .001$). There were no significant differences in these prevalence rates across age group and school level.

Overall Educational Stress and Suicidal Behaviours

The prevalence of suicidal behaviours by educational stress level is demonstrated in Figure 1. A clear dose-response relationship can be seen for both ideation and planning regardless of gender but not for attempts. The results of logistic regressions on overall stress level and demographic variables (Table 3) further confirmed this pattern. The ORs for suicidal thinking and planning increased substantially with the rise in stress level. Compared to those with the lowest level of stress, students who reported an overall ESSA score within the range of 65-80 had a 6.7 (95%CI: 3.9-11.8) and 3.8 (95%CI: 1.9-7.3) times higher odds of suicidal thinking and planning, respectively (Table 3).

Some demographic variables remained significant in these multivariable models (table 3). Similar to the bivariate analysis, male gender, rural family and school location, father farming occupation and high family income showed a protecting effect on these suicidal behaviours. A significant association between age and suicidal attempts was also observed with older age generally indicative of a higher risk.

Dimensions of Educational Stress and Suicidal Behaviours

Among the five ESSA subscales, study workload, study despondency and pressure from study were positively related to the risk for suicidal ideation while the remaining two had no significant effect (Table 4). For suicidal planning, pressure from study and study despondency were positively associated. Only one subscale (self-expectation) was found to be significant for suicidal attempts. Unexpectedly, high level of worry about grades and self-expectation were significantly associated with reduced risk for suicidal planning and attempts, respectively (Table 4). Overall, these subscales were more likely to have a significant association with suicidal thinking and planning but not with attempts.

Discussion

The prevalence of suicidal behaviours in this study (21%, 10% and 2% for suicidal thoughts, plans and attempts, respectively) are largely consistent with the national data (Ji & Chen, 2009; Xing *et al.*, 2010). Compared to adolescents in the USA (15%, 11% and 7%, respectively) (Eaton, *et al.*, 2008), Chinese students tend to report more suicidal thinking. Suicidal ideation is an important symptom of major depressive disorder (Belmaker & Agam, 2008), which makes the largest contribution to the overall disease burden among young people (Gore, *et al.*, 2011). Therefore the higher prevalence of suicidal ideation may be indicative of a poorer mental health status in Chinese students. There is supporting evidence for this hypothesis which suggests a higher prevalence of depressive symptoms among Chinese students compared to Western students (Chan, 1995; Stewart, Betson, Lam, Chung, & Chung, 1999). The important finding of the strong association between educational stress and suicidal ideation in this study, together with the existing evidence that Chinese students experience more academic burden and pressure (Lei, *et al.*, 2007; Zhao, *et al.*, 2009), collectively indicate that the cultural differences in the prevalence of suicidal ideation and depression is to a great extent related to the excessive pressure from academic activities in Chinese adolescents. However, these relationships need to be further investigated in cross-cultural studies.

A novel finding in this study is that educational stress is strongly associated with suicidal ideation and planning but not with attempts. Although previous research has identified significant correlations between some academic factors and suicide attempts in the same population (Hesketh, *et al.*, 2002; Liu & Tein, 2005; Liu, *et al.*, 2005), this study measured different dimensions of stress.. We defined educational stress as a type of subjective stress originating from multiple problems or difficulties in academic learning, rather than a particular negative life event (Sun, *et al.*, 2011a, 2011b). Numerous studies have

found that acute adverse life events, especially interpersonal conflicts are an important risk factor for suicide attempts in young people (Beautrais, 2003; Beautrais, Joyce, & Mulder, 1997; King *et al.*, 2001; Sandin, Chorot, Santed, Valiente, & Joiner, 1998). In contrast, chronic academic stress is often related to suicidal ideation rather than attempts (Ang & Huan, 2006). This supports our findings and suggest that educational stress should be a key focus in public health interventions targeting depressive symptoms including suicidal ideation, however appears less important for the prevention of suicide attempts and deaths.

This study revealed an interesting pattern that different types or dimensions of educational stress have opposite effects on suicidal behaviours. Study workload, despondency and pressure from study are positively while the other two types of stress are negatively associated with suicidal behaviours. Similar to the overall educational stress, these three factors only have positively relationships with suicidal thinking and planning but not suicidal attempts. This highlights the important areas to target educational stress interventions for the purpose of mental health promotion rather than suicide prevention. A possible explanation for the unexpected negative associations for self-expectation and worry about grades is that in contrast to the other subscales, these factors are related to a high level of family and school support (Sun & Dunne, 2011), which may prevent stressed students from suicidal contemplation and attempts. This data indicates the complexity of the phenomenon of ‘educational stress’ and supports an in-depth analysis on these relationships. The inconsistencies between ESSA dimensions also raise concerns about the convergent validity of this newly developed scale. Further research should be conducted to examine the psychometric properties in different populations.

Despite the higher prevalence of suicidal thinking, Chinese students report less suicide attempts than US students (Eaton, *et al.*, 2008). It is unknown that to what extent this lower prevalence represents a real pattern or is simply related to different definitions of

suicide attempt or low sensitivity of the screening tool. Some cultural factors, such as the strong family bond that is highly valued by Asian communities (Lang, 2008), may prevent young people from committing self-harm even when they are stressed or depressed. Although there may be more suicide deaths among young people in China (Phillips, Li, & Zhang, 2002), this is likely to be associated with a higher fatality rate rather than a higher incidence of suicide attempts (Eddleston & Gunnell, 2006). Another possible explanation is that students in Asian societies may be more reluctant to report suicidal attempts due to social stigma (Milner & De Leo, 2010). More robust definition and tools should be used in future research into suicide attempts and their determinants among young people.

Data from other countries generally indicates higher rates of suicidal ideation and attempts among female adolescents compared to males (Afifi, Cox, & Katz, 2007; Eaton, *et al.*, 2008; Han, *et al.*, 2009). Among Chinese adolescents however, gender difference in suicidal attempts is often non-significant despite increased risk for suicidal thinking and planning for females, when the same questions are used to identify suicidal behaviours. In addition to the results in this study (Table 2 and 3), this pattern has been observed in national data (Ji & Chen, 2009) and other regional studies (Liu, *et al.*, 2005; Wang, *et al.*, 2010). These findings seem to contradict unique rates of completed suicide in China, which are higher among young females (15-34 years old) than young males. This is in contrast to rates in the Western world, where the male-female ratio is almost always higher than 2:1 (Phillips, *et al.*, 2002). One plausible explanation for this pattern is that female attempts are more fatal than male attempts. Another is the prevalence of suicidal attempts is underestimated in females due to a difference in the definition between males and females. Both of these explanations have not been scientifically assessed and more research into adolescent suicidology is clearly needed. This data also suggests a potential difference in the

sensitivity and specificity of these screening questions originally developed in the US (Eaton, *et al.*, 2008) which should be further investigated.

Another interesting finding from this study is that rural background (family or school location) is related to a lower risk for suicidal behaviours, many of which remain significant in the multiple variable analysis. This finding is largely unexpected because previous analyses demonstrated that students with a rural background experience more educational stress and depressive symptoms than urban students (Sun & Dunne, 2011; Sun, *et al.*, 2011a). Additionally, this is in contradiction to the findings from mortality studies in China where a 3-4 times higher suicide rate was observed in rural communities (Phillips, *et al.*, 2002; Yang *et al.*, 2005). This phenomenon has also been reported by another Chinese study, in which a higher prevalence of depression and lower prevalence of suicide ideation and attempts were observed among rural students (Hesketh, *et al.*, 2002). Again, there are two possible explanations. On the one hand, there may be protective factors in rural communities, such as the strong family bond which is highly valued by the traditional Chinese culture, which may moderate the relationship between depression and suicidal behaviour. The higher rate in completed suicide may be as a result of a higher fatality rate. On the other hand, the prevalence of non-fatal suicidal behaviours among rural students may be considerably underestimated due to a more strict definition or more social stigma over these sensitive issues. These issues should be addressed in future research.

The findings from this study are subject to many limitations. To name a few, first, the observed associations between educational stress and other factors and suicidal behaviours cannot be interpreted as causal due to the cross-sectional design of this study. In fact, many relationships could be interpreted in both ways. For example, students may develop depressive symptoms including suicidal ideation because of heavy pressure in pursuing ideal academic grades. On the other hand, those who are depressed due to other problems, such as

physical diseases or inter-personal problems may experience more difficulties in study and thus have more educational stress. Second, some recall bias cannot be avoided because information was collected solely by self-report of students although this method is widely used in research in educational psychology and social behavioural. Nevertheless, this limitation is unlikely to have a strong effect on our observations because the bias should not differ systematically for different questions and across demographic variables. Third, the generalisability of our findings is limited by the convenience feature of the sample. Also the sample size is not always adequate in multiple analyses for suicidal attempts due to small numbers. However, the results in this study are largely consistent with existing literature and precise estimates of the prevalence of suicidal behaviours are not the focus of this study. Fourth, there are limitations in the validity of the instruments for educational stress and suicidal behaviours used in this study, which may reduce the comparability of our findings with other studies using different tools. The psychometric property of the newly developed scale, the ESSA, needs to be further established. The practical implications of these self-reported attempts based on a single screening question may be low because the majority of them end up with no self-injury or medical attention (Meehan et al., 1992; Sayer, Stewart, & Chipps, 1996). Additionally, the categorisation of the ESSA score into four approximately equal groups was somewhat arbitrary and would lead to loss of statistical power. However, this is a common practice in epidemiological studies in order to increase ease of interpretation of parameter estimates, especially to less statistically-minded public health professionals (Turner, Dobson, & Pocock, 2010).

Despite these limitations, this study has for the first time investigated the relationships between the multi-dimensional construct ‘educational stress’ and suicidal behaviours in Chinese adolescents. Despite similarities with the existing literature, some interesting patterns were observed. Overall educational stress is strongly related to suicidal thinking and planning

but has no significant effect on suicide attempts. Different dimensions or types of educational stress have different influences on adolescent suicidality, with some unexpectedly demonstrating a protecting effect. These findings are expected to help understand adolescent suicidology and provide useful information for public health interventions to promote mental health in this population. More in-depth research into the nature and socially modifiable determinants of youth suicidality, such as academic burden and stress is warranted.

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Table 1

Categorisation of ESSA Original Scores and Distributions by Stress Levels (N = 1614)

Categorisation	N (%)	Categorisation	N (%)
ESSA total		Worry about grades	
18-44	264 (16.4)	3-7	94 (5.8)
45-54	559 (34.6)	7-9	290 (18.0)
55-64	577 (35.7)	10-12	575 (35.6)
65-80	214 (13.3)	13-15	655 (40.6)
Pressure from Study		Self-expectation	
4-8	151 (9.4)	3-7	142 (8.8)
9-12	354 (21.9)	7-9	628 (38.9)
13-16	668 (41.4)	10-12	604 (37.4)
17-20	441 (27.3)	13-15	240 (14.9)
Study workload		Study despondency	
3-7	260 (16.1)	3-7	304 (18.8)
7-9	551 (34.1)	7-9	557 (34.5)
10-12	564 (34.9)	10-12	557 (34.5)
13-15	239 (14.8)	13-15	196 (12.1)

Table 2

Demographic Characters of the Sample and Prevalence of Suicidal Behaviours (N = 1614)

	N (%)	Prevalence of suicidal behaviours (n (%))		
		Suicidal ideation	Suicidal planning	Suicidal attempts
Total	1614 (100)	333 (20.6)	162 (10.0%)	29 (1.8)
Sex				
Male	880 (55.2)	150 (17.0)**	74 (8.4)*	15 (1.7)
Female	714 (44.8)	182 (25.5)	87 (12.2)	14 (2.0)
Age				
<15	523 (32.6)	98 (18.7)	49 (9.4)	10 (1.9)
15-16	527 (32.9)	123 (23.3)	60 (11.4)	12 (2.3)
≥17	552 (34.5)	110 (19.9)	52 (9.4)	7 (1.3)
Family location				
Urban	672 (41.9)	164 (24.4)**	95 (14.1)**	19 (2.8)**
Rural	933 (58.2)	169 (18.1)	67 (7.2)	10 (1.1)
Father occupation ^a				
Others	1030 (64.3)	236 (22.9)**	122 (11.8)**	23 (2.2)
Farming	571 (35.7)	92 (16.1)	38 (6.7)	6 (1.1)
Mother occupation ^a				
Others	945 (59.1)	214 (22.6)*	114 (12.1)**	22 (2.3)
Farming	654 (40.9)	116 (17.7)	47 (7.2)	7 (1.1)
Father education ^a				
Senior high or higher	709 (46.4)	160 (22.6)	78 (11.0)	16 (2.3)
Junior high or lower	818 (53.6)	156 (19.1)	79 (9.7)	13 (1.6)
Mother education ^a				
Senior high or higher	561 (36.7)	137 (24.4)**	71 (12.7)*	14 (2.5)
Junior high or lower	969 (63.3)	182 (18.8)	86 (8.9)	14 (1.4)
Family income				
Low	156 (9.7)	41 (26.3)	24 (15.4)*	8 (5.1)**
Middle	1129 (70.2)	223 (19.8)	102 (9.0)	12 (1.1)
High	323 (20.1)	68 (21.1)	36 (11.1)	9 (2.8)
School location				
Major city	450 (27.9)	108 (24.0)	58 (12.9)**	14 (3.1)**
County City	575 (35.6)	119 (20.7)	63 (11.0)	12 (2.1)
Rural town	589 (36.5)	106 (18.0)	41 (7.0)	3 (0.5)
School year				
7-9 (junior)	798 (49.4)	160 (20.1)	82 (10.3)	18 (2.3)
10-12 (senior)	816 (50.6)	173 (21.2)	80 (9.8)	11 (1.3)

Note. The sample size for each category did not necessarily equal because of missing. Missing data were not presented in this table.

^a Responses of “Don’t know” or “Not applicable” were treated as missing.

* $p < .05$; ** $p < .01$ (Chi-square test or Fisher’s exact test)

Table 3

Results (ORs and 95%CI) of Logistic Regressions for Suicidal Ideation, Planning and Attempts on Educational Stress Level and Demographic Variables ^a

	Suicidal Ideation	Suicidal planning	Suicidal attempts
Sex (female)	1.6 (1.2-2.1)	1.5 (1.0-2.1)	1.3 (0.6-2.8)
Age			
<15	1	1	1
15-16	1.3 (0.9-2.0)	1.6 (1.0-2.7)	3.4 (1.2-9.5)
≥17	1.3 (0.7-2.2)	1.6 (0.8-3.4)	2.5 (0.5-12.3)
Family Address (rural)	0.7 (0.5-1.1)	0.4 (0.2-0.8)	0.7 (0.2-2.8)
Father occupation (farming)	0.6 (0.4-1.0)	0.6 (0.3-1.3)	0.7 (0.1-5.6)
Mother occupation (farming)	1.3 (0.8-2.3)	1.4 (0.6-3.0)	2.2 (0.2-19.5)
Father education (low)	0.9 (0.7-1.3)	1.2 (0.8-1.8)	0.9 (0.4-2.4)
Mother education (low)	0.8 (0.6-1.2)	0.8 (0.5-1.2)	0.8 (0.3-2.0)
Family income			
Low	1	1	1
Middle	0.7 (0.5-1.1)	0.5 (0.3-0.8)	0.1 (0.0-0.4)
High	0.8 (0.4-1.3)	0.5 (0.3-1.0)	0.3 (0.1-1.0)
School location			
Major city	1	1	1
County City	0.8 (0.6-1.1)	0.9 (0.6-1.4)	0.7 (0.3-1.8)
Rural town	0.9 (0.5-1.4)	0.8 (0.4-1.7)	0.1 (0.0-0.6)
School level (senior)	0.8 (0.5-1.2)	0.6 (0.4-1.1)	0.3 (0.1-0.9)
ESSA score			
18-44	1	1	1
45-54	2.3 (1.3-3.8)	1.4 (0.8-2.6)	1.1 (0.4-3.5)
55-64	3.7 (2.2-6.2)	2.4 (1.3-4.5)	1.2 (0.4-3.8)
65-80	6.7 (3.9-11.8)	3.8 (1.9-7.3)	0.8 (0.2-3.8)

Note. OR = odds ratio; CI = confidence interval; ESSA = Educational Stress Scale for Adolescents.

^a These multiple logistic regressions were conducted for three dependent variables separately. Significant associations are indicated in bold.

Table 4

Results (ORs and 95%CI) of Logistic Regressions for Suicidal Ideation, Planning and Attempts on Educational Stress Subscales^a

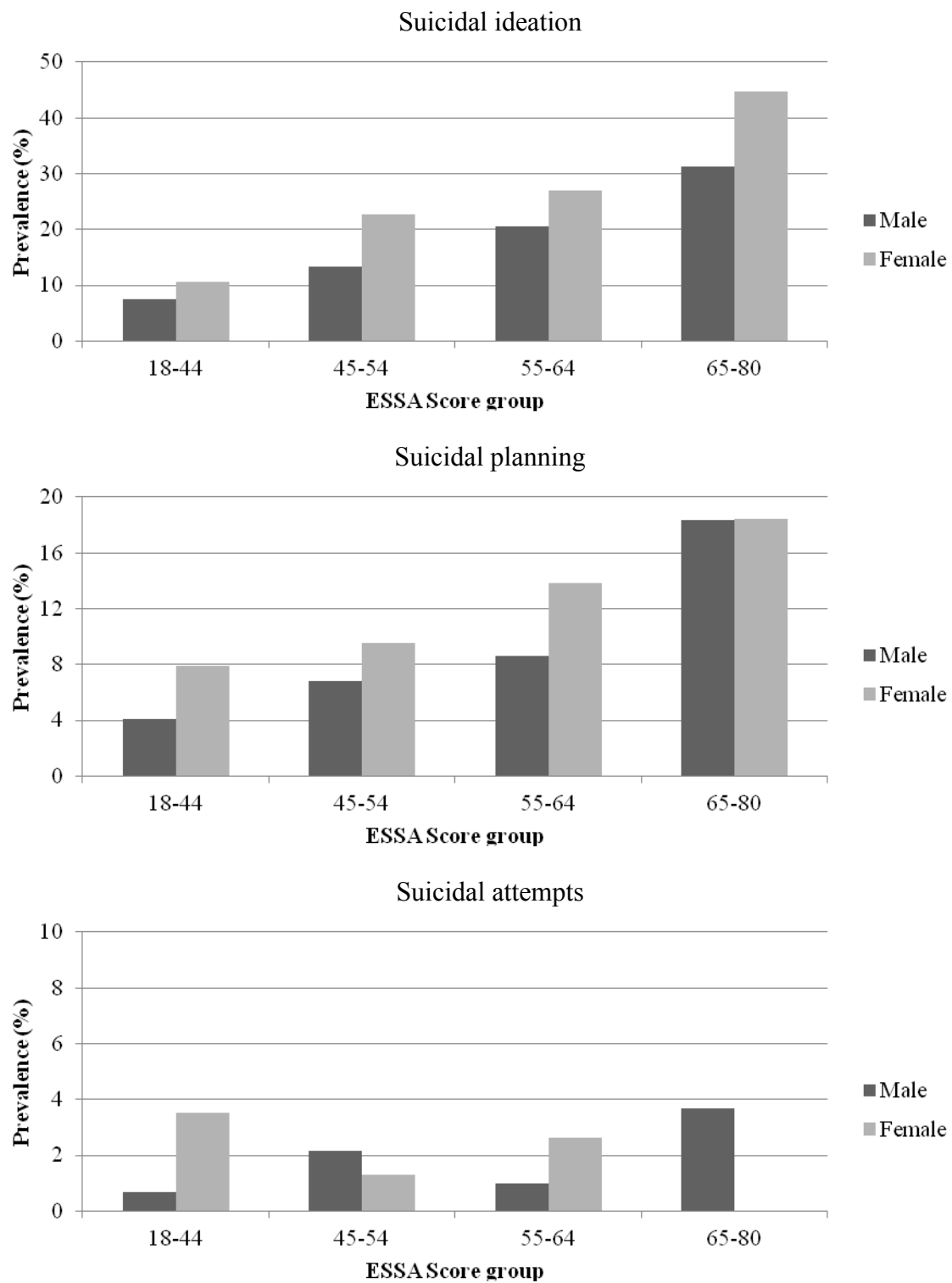
	Suicidal Ideation	Suicidal planning	Suicidal attempts
Pressure from study			
4-8	1	1	1
9-12	1.4 (0.7-2.9)	2.7 (0.9-8.3)	-
13-16	1.9 (0.9-3.9)	4.2 (1.4-12.9)	-
17-20	2.3 (1.0-4.9)	4.0 (1.2-12.8)	-
Study workload			
3-6	1	1	1
7-9	2.1 (1.2-3.6)	1.4 (0.7-2.8)	1.3 (0.2-6.6)
10-12	2.3 (1.3-4.0)	1.4 (0.7-2.9)	1.3 (0.2-7.1)
13-15	2.5 (1.3-4.6)	1.8 (0.8-3.9)	1.5 (0.2-10.0)
Worry about grades			
3-6	1	1	1
7-9	0.7 (0.4-1.4)	0.7 (0.3-1.7)	1.0 (0.2-4.0)
10-12	0.7 (0.3-1.3)	0.6 (0.3-1.3)	0.3 (0.1-1.4)
13-15	0.6 (0.3-1.1)	0.3 (0.1-0.7)	0.3 (0.1-1.5)
Self-expectation			
3-6	1	1	1
7-9	1.0 (0.6-1.7)	0.8 (0.4-1.7)	0.3 (0.1-1.0)
10-12	1.0 (0.6-1.7)	0.8 (0.4-1.6)	0.2 (0.1-0.7)
13-15	1.4 (0.8-2.6)	1.8 (0.8-3.9)	0.4 (0.1-1.8)
Study despondency			
3-6	1	1	1
7-9	1.2 (0.8-2.0)	1.0 (0.5-1.9)	1.3 (0.3-5.5)
10-12	1.8 (1.1-2.9)	1.4 (0.7-2.6)	1.8 (0.4-7.9)
13-15	3.5 (2.0-6.0)	3.2 (1.6-6.6)	2.2 (0.4-12.7)

Note. OR = odds ratio; CI = confidence interval; ESSA = Educational Stress Scale for Adolescents.

^a These multiple logistic regressions were conducted for three dependent variables separately. Demographic variables were also included in these models but the results were not presented as they were similar to the results in Table 2. Significant associations are indicated in bold.

Figure 1

Educational Stress Level and Prevalence (%) of Suicidal Ideation, Planning and Attempts by Gender



Note. ESSA = Educational Stress Scale for Adolescents.

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Chapter 7. Paper 5: Perceived Reasons for Suicidal Behaviour among a Sample of Chinese Adolescents

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Abstract

Backgrounds: Reasons for suicide contemplation among Chinese adolescents are unclear. The purpose of this study is to identify perceived reasons that trigger suicidal thinking and to assess the severity of these reasons in terms of their associations with the risk of subsequent suicidal planning and attempts.

Methods: A cross-sectional questionnaire survey was conducted among a sample of secondary school students in Shandong, China. Data for suicidal behaviours and perceived reasons was analysed with 320 respondents ($Mean = 15.6$ year, $SD = 1.7$) who had seriously considered committing suicide in the past year. Logistic regression models were fitted to assess the associations between the presence of a particular reason and subsequent planning and attempts.

Results: The most commonly reported reasons for suicide contemplation were ‘too much academic pressure’, ‘parent-child conflict’ and ‘loneliness because of no friends’. Romantic problems, peer bullying and peer teasing in males, and peer bullying and peer teasing in females were significantly associated with higher risk for suicidal attempts.

Conclusions: Educational pressure appears to be an important reason for suicidal contemplation but rarely caused suicide attempts. Although less prevalent, serious interpersonal problems seem to have a stronger relationship with subsequent attempts.

Keywords: suicide behaviour, reason, educational pressure, adolescents, China

1. Introduction

Suicide is a major public health problem across the globe. According to the World Health Organisation (WHO), each year approximately one million individuals die of suicide and 10-20 million attempt suicide worldwide (Hendin et al., 2008, Beautrais, 2006). Suicide seems to be more pronounced in young people being the second largest cause of mortality in the 10-24 age group, second only to traffic accidents (WHO, 2009). In China, suicide is the fifth leading cause of death overall and the leading cause of death in persons aged 15-34 years (Phillips et al., 2002, Yang et al., 2005).

Suicidal behaviours cover a wide range of events from suicidal thoughts or ideation, planning of attempts, aborted attempts, to nonfatal self-inflicted poisoning or injury and completed suicide. Previous suicide attempts are one of the strongest predictors for complete suicide along with major depressive disorder and recent acute stress (Hawton and van Heeringen, 2009, Phillips et al., 2002). It is estimated that every 50-100 attempts among adolescents results in one complete suicide (Shain and the Committee on Adolescence, 2007). Research into non-fatal suicide behaviours may help identify high-risk groups for suicide prevention and design and implement strategies of early interventions.

Epidemiological data shows that suicidal contemplation and non-fatal behaviours are common among children and adolescents. In the US, the 2007 Youth Risk Behavior Surveillance (YRBS) data shows that 14.5% of middle and high school students had seriously considered attempting suicide during the preceding 12 months, and 11.3% and 6.9% had made a plan or had attempted, respectively (Eaton et al., 2008). The prevalence of suicidal thoughts seems to be higher in students in East Asian countries, although the rate of suicidal attempts is similar or even lower compared to the USA (Han et al., 2009, Ji and Chen, 2009). In a national survey among 181,832 secondary school students aged 12-19 years in eighteen

provinces of China, suicidal thoughts, plans and attempts were reported by 16.7%, 5.6% and 2.9% of male students, and 24.3%, 7.7% and 3.0% of females, respectively (Ji and Chen, 2009). A South Korean national survey with 70,486 students (age range: 12-19 years) yielded slightly higher overall rates for suicidal thinking and attempts than Chinese data (23.3% and 5.3% for suicidal thoughts and attempts, respectively) (Han et al., 2009).

Reasons for suicidal behaviours are often complex and may involve both genetic disposition factors and psychosocial characteristics (Statham et al., 1998, Li et al., 2011, Shain and the Committee on Adolescence, 2007). A twin study from Australia shows that approximately 45% of the variance in suicidal thoughts and behaviour is attributed to genetic factors (Statham et al., 1998). Among Chinese adolescents, many socio-environmental factors, such as low family cohesion, poor relationships with parents, lack of teacher and peer support, and more family conflicts were found to be associated with suicidal ideation and attempts with self-esteem and depression as mediating factors (Sun et al., 2006). With a sample of 1362 Chinese adolescents in Shandong province, Liu and Tein (2005) identified a wide range of negative life events that are related to suicidal thinking and attempts. In order of importance, the top six risk factors for suicidal ideation were dissatisfaction with school, high parental expectations, transfer to a new school, being beaten or scolded by parents, major change of routines, and inter-parental conflict; for suicidal attempts the strongest predictors included the pressure to enter a better school/college, being frightened, transfer to a new school, being beaten or scolded by parents, failure in an exam, and having too much homework (Liu and Tein, 2005).

According to vulnerability-stress models (Ingram and Luxton, 2005), suicidal behaviour, as well as other mental and behavioural problems are joint consequences of long-term vulnerability factors and recent acute stress or triggers. Although perceived reasons for suicide thinking and act are often limited to acute negative life events while ignore many

underlying environmental factors, such as poor mental health and poor socio-economic status, they are important for comprehending the complex phenomenon and for suicide prevention. However, despite extensive research into risk factors for suicidality, there is little data in the literature about self-report reasons for suicidal behaviours.

Research in western countries has identified some common reasons or motives for suicide attempts or self-harm among adolescents, including to die, to escape and to obtain relief (Haliburn, 2000, Scoliers et al., 2009, Boergers et al., 1998). Among adolescents in Norway, inter-personal conflict, including conflict with parents, siblings, partner or friends, is the most commonly reported triggering reasons for suicide attempts by both males (55%) and females (33%) (Dieserud et al., 2010). Other common triggers included emotional crisis, psychotic symptoms and problems at work and school. One-fifth of youth suicide attempts are triggered by multiple reasons (Dieserud et al., 2010). In China, most suicide deaths are preceded with one or more forms of acute stress which are often viewed as the reasons for suicide act by the family of the victim. According to Chinese national data, the most common negative life events include financial problems, serious physical illness and marital discord, occurring in 35-30% of suicide deaths (Yang et al., 2005). Based on interviews with family members of suicide victims, about 60% of suicide deaths in Shandong province of China are allegedly caused by family relationship problems (Zhang et al., 2007).

It is noted that all these findings of perceived reasons have been for either attempted or completed suicide and none has examined the reasons for suicidal contemplation, which may provide useful information for interventions at an earlier stage. Despite the high prevalence, most adolescents with suicidal thinking end up with none subsequent attempts to kill themselves. According to the national data in China, only one in seven participants with suicidal ideation are accompanied by one or more suicide attempts (Ji and Chen, 2009). Therefore, there are likely differences in the severity between reasons that trigger suicidal

thinking, i.e., some may cause contemplation only while others lead to both thinking and action. However, this hypothesis has not been examined in empirical research.

The purpose of this exploratory study is to identify the common reasons that trigger suicidal contemplation among Chinese adolescents, and to examine the severity of different reasons in terms of their associations with the risk of subsequent suicidal planning and attempts. Gender differences in the prevalence of suicidal contemplation and attempts have been widely recognized with much higher rates among females (Eaton et al., 2008, Han et al., 2009, Afifi et al., 2007). Among Chinese adolescents, however, the prevalence of suicide attempts seems to be equal despite a higher rate of ideation and planning among females (Ji and Chen, 2009). In this study, we are also interested to identify possible gender differences in the prevalence and severity of common reasons for adolescent suicidality.

2. Methods

2.1. Design and participants

This paper reports results from a PhD project on mental health among Chinese adolescents (Sun et al., 2011b, Sun et al., 2011a). This cross-sectional questionnaire survey was conducted in September and October 2009 in Shandong Province, China. A sample of secondary schools from multiple locations (the capital city of the province, a county city and a rural town) was chosen and a total of 1,740 students (grades 7-12) were invited to participate in the survey. Of them, 1655 (95.1%) returned questionnaires with usable information.

A total of 337 students (20.4%) reported having seriously considered suicide in the past 12 months prior to the survey. Among them, 17 did not respond to the question about reasons for suicidal thinking and 1 did not provide gender information. These questionnaires were further excluded and data analysis was conducted with 320 participants (55.3% were

females). The age of this sample ranged from 12 to 19 years with a mean of 15.6 (SD = 1.7). The proportions of participants in different age groups (12-14, 15-16 and 17-19) were 29.6%, 37.0% and 33.4%, respectively. Students from urban and rural families accounted for 49.0% and 51.0% of the sample.

2.2. Measures

2.2.1. Suicidal behaviours

Three types of suicidal behaviour were assessed using items from the Youth Risk Behavior Survey (YRBS) (Eaton et al., 2008, CDC, 2009). These items have been frequently used in Chinese samples (Chen et al., 2006, Chen et al., 2004). Suicidal thoughts, plans and attempts were measured using the following questions: “During the past 12 months, have you ever seriously considered attempting suicide?”, “During the past 12 months, have you ever made a plan about how you would attempt suicide?”, and “During the past 12 months, have you ever committed a suicide action?” Participants who responded “Yes” to these questions were defined as having suicidal thoughts, plans or attempts.

2.2.2. Reasons for suicidal thoughts

Under the instruction question: “If you have thought about suicide in the past 12 months, what were your main reasons?”, students were asked to rate a checklist of ten possible reasons in a “yes/no” format. These reasons include: 1) suffering from severe physical diseases, 2) family financial hardship, 3) loss of family member(s), 4) being bullied by peers, 5) conflicts with parents, 6) being punished by teacher(s), 7) too much academic pressure, 8) problems in romantic relationship(s), 9) loneliness because of no friends, and 10) being teased by others.

The list of reasons was developed based on review of the literature on perceived reasons or risk factors for adolescent suicide (Dieserud et al., 2010, Liu and Tein, 2005, Liu et al., 2005). An open choice ("*Others, please specify* : ____") was also provided to enable students to add reasons that are not included in the list.

2.3. Data analysis

All analyses were conducted using SPSS for Windows 17.0 (SPSS Inc, Chicago, IL). All statistical tests were two-sided and the significance level was defined as $\alpha=.05$. The prevalence (%) of various reasons and their 95% confidence intervals (*CI*s, Wilson method) (Wilson, 1927) were calculated for both males and females, respectively. Significant gender differences were indicated if the 95% *CI*s had no overlap ($p < .05$). Chi-square test was also used to compare the prevalence rates between male and female respondents.

The associations between the presence of a reason and the risk of suicidal planning or attempts were tested using logistic regression analysis for males and females separately. The odds ratios (*OR*s) and 95% *CI*s were calculated. A multiple logistic regression model was also developed to test the relative contribution of each reason to triggering subsequent suicidal behaviours while controlling for gender, age group (12-14, 15-16 and 17-19 years) and family location (urban / rural).

2.4. Ethics approval

This study was granted ethics approval by the University Human Research Ethics Committee of Queensland University of Technology and the Preventive Medicine Ethics Committee of Shandong Provincial Centre for Disease Control and Prevention (CDC). Participation was entirely voluntary and anonymous. Written approval was given by the principal or vice principal of each participating school and an informed written consent was

gained from each student. Passive consent from parents was also obtained in which parents were advised of their option to withdraw their child from the study.

3. Results

3.1 Common reasons for suicidal thinking

Among this sample of young people who had seriously considered attempting suicide in the past year ($N = 320$), the most frequently cited reason for suicidal thinking was “too much academic pressure”, followed by “conflict with parents” and “loneliness because of no friends” (Table 1).

Nearly half (47.8%) reported more than one reasons and more than one quarter (25.9%) reported three or more reasons, while 8.4% did not choose any of the reasons from the list nor gave additional reasons.

The pattern of common reasons was similar for males and females. For all reasons except “conflict with parents”, the prevalence was higher among males but statistically significant difference was observed only for “punishments by teachers” (Table 1). The proportion of reporting multiple reasons was also similar between males (49.0%) and females (46.9%).

3.2. Associations between perceived reasons and suicidal planning

Among these adolescents reporting suicidal ideation, nearly half (46.9%) reported suicidal planning at least once in the past year. This prevalence was similar among male (47.7%) and female (45.9%) respondents ($p > .05$, Chi-square test).

The results of logistic regressions for each reason respectively are presented in Table 2. In males, the presence of romantic problems was significantly associated with a higher likelihood of reporting suicidal planning ($OR = 2.1$, 95%*CI*: 1.1-6.7). In females, it was loneliness that was significantly related to higher risk for suicidal planning ($OR = 2.1$,

95%CI: 1.0-4.3). The top two reasons, high academic pressure and conflict with parents, on the other hand, had no significant effect on the occurrence of planning in both male and female participants.

When all reasons were included into a logistic model simultaneously, together with gender, age group and family residence (urban / rural), none of the independent variables was found to have a significant relationship with the risk for suicidal planning.

3.3 Associations between perceived reasons and suicidal attempts

In this sample of students who reported suicidal ideation, twenty-five (7.8%) also reported suicidal attempts at least once in the same period of time. Again, gender difference was not significant ($p > .05$, Chi-square test) with a prevalence of 8.5% and 7.1% for males and females, respectively.

The results of logistic regressions for each reason respectively are presented in Table 3. In males, romantic problems ($OR = 9.9$, 95%CI: 2.9-33.5), peer bullying ($OR = 6.7$, 95%CI: 1.9-24.0) and peer teasing ($OR = 5.0$, 95%CI: 1.5-16.4) were significantly associated with higher risk for suicidal attempts. In females, peer bullying ($OR = 4.6$, 95%CI: 1.1-19.5) and peer teasing ($OR = 3.8$, 95%CI: 1.0-13.8) were significant (Table 3).

When adjusted for gender, age group, family residence type (urban / rural), and all other reasons, problems in romantic relationships (Adjusted $OR = 5.6$, 95%CI: 2.0-16.0) and peer bullying (Adjusted $OR = 4.2$, 95%CI: 1.2-14.6) maintained significant associations with suicidal attempts. Peer teasing was no longer statistically significant despite the relatively large effective size (Adjusted $OR = 2.8$, 95%CI: 0.8-9.6). Similar to results for suicidal planning, the three most common reasons for suicidal thinking showed no significant association with suicide attempts in both bivariate and multiple models.

4. Discussion

To the best of our knowledge, this is by far the first study to examine perceived reasons for suicide contemplation or ideation among adolescents in China. The top three reasons include ‘too much academic pressure’, ‘conflicts with parents’ and ‘loneliness because of no friends’, with at least one quarter of all suicide contemplations considering these reasons. Other common reasons include peer teasing, romantic relationship problems, punishments by teachers and peer bullying, occurring in about one-tenth to 15% of suicide contemplations. Suicidal ideation is an important symptom of major depressive disorder (Belmaker and Agam, 2008) and a precursor of suicide attempt (Shain and the Committee on Adolescence, 2007). Therefore, these findings are expected to provide evidence for both mental health promotion and suicide prevention in this population. Unlike reasons for completed suicide in China (Yang et al., 2005), severe physical illness and family financial problems are less common to trigger suicidal thinking in young students, probably because this is a physically healthy population and family economic status is not a major concern for them. This may also indicate that suicidal contemplations may be a different population from those who complete suicide.

It is well-known that Chinese students experience high academic pressure and stress (Lei et al., 2007, Zhao et al., 2009, China Youth Social Service Centre, 2008). For example, nearly ninety percent (86.6%) of Chinese students feel high or very high pressure because of academic matters, which is comparatively higher than the proportion in Japanese, Korean and US students (Lei et al., 2007, Zhao et al., 2009). Academic pressure and difficulties have been identified as contributing factors for suicidal ideation and attempts among Chinese adolescents (Liu and Tein, 2005). This study adds some new insight to the existing knowledge about this relationship, that pressure from study is also the number one reason for suicide contemplation perceived by students themselves. These findings may in part explain

the high prevalence of suicidal thoughts in this population (Ji and Chen, 2009). Based on this study, the ongoing educational reform with a focus of lightening the academic burden and pressure among students (China Ministry of Education, 2009, Shandong Provincial Education Department, 2009).should be enforced because of the potential to reduce suicidal contemplation.

An interesting finding in this study is that nearly half (48%) respondents reported two or more reasons and more than one quarter (26%) reported at least three reasons for suicidal thinking. Similar pattern was also found in research into the reasons for suicide attempts (Dieserud et al., 2010). These data suggest that suicidal behavior among adolescents is likely to be a consequence of the accumulation of many life problems or difficulties. Comprehensive strategies covering multiple domains of students' life, such as family, school, study and peer relationships are therefore recommended in mental health promotion and suicide prevention programs. Because it may take considerable amount of time to accumulate the stress before serious mental and behavioral problems appear, this finding also indicates the feasibility and potential effectiveness of early interventions.

Despite the higher prevalence of suicidal thinking and planning among female students (Ji and Chen, 2009), the gender difference appears to be small in the pattern of perceived reasons. The order of prevalence of these reasons, especially of the most common ones is virtually identical in males and females, indicating same problems should be targeted for both genders in intervention programs. Although not statistically significant, the prevalence of the vast majority of the reasons is higher among males. In addition, the prevalence of reporting three or more reasons is also higher among males. These data suggest that more stress or a greater number of stressful events may be needed to trigger suicidal behavior in males than in females, which may in part explain the higher prevalence among females (Sun and Dunne, 2011b). Punishment from teachers is the only reason with a significant higher prevalence

among males, while conflict with parents is the only one with a higher female rate. These gender differences suggest that special attention should be paid on the teacher-student relationship in boys and parent-child relationship in girls.

Problems in peer relationships, such as being frightened by peers and being involved in physical fight have been identified as important risk factors for suicide attempts in Chinese adolescents (Liu and Tein, 2005, Wang et al., 2010). In this study, we also found that this type of reasons may be of the highest severity among all selected reasons. The presence of these reasons is significantly related to increased risk for suicidal attempts, while other reasons, such as too much academic pressure and conflicts with parents are likely to cause suicidal thinking only and may be not severe enough to trigger suicidal acts. Peer relationships problems, such as romantic difficulties and peer bullying and victimization should be of more importance in suicide prevention than other reasons despite the low prevalence. These findings also suggest both prevalence and severity should be carefully assessed before the priority areas of intervention are defined.

Our previous analysis revealed strong relationships between the multi-dimensional construct 'educational stress' and depression and suicidal ideation but not with suicide attempts (Sun and Dunne, 2011a, Sun and Dunne, 2011b). Together with findings from this analysis, it is suggested that educational stress or pressure among Chinese adolescents is a key contributor to poor mental health but not to behavioral problems such as suicidal attempts. Prevention on suicide and attempted suicide should focus on more severe factors such as problems in peer relationships.

Apart from the triggering reasons, background factors such as childhood traumatic experience and poor family socio-economic status, are also related to increased risk for suicidal attempts among young people (Dube et al., 2001). However, the identification of

these perceived reasons may be more meaningful in public health prevention because they are more socially modifiable. For example, school-based intervention programs on peer relationships and bullying may have a potential to reduce the incidence of suicidal attempts. In addition to the severity of suicidal reasons, there may be factors that prevent the translation from suicidal ideation to attempts. For example, Chinese students appear to report more suicidal ideation but fewer attempts compared to their US counterparts (Ji and Chen, 2009, Wang et al., 2010, Eaton et al., 2008). Among Chinese students, females often report more ideation but similar even fewer attempts than do males (Ji and Chen, 2009, Wang et al., 2010). To explore these protecting factors in the future may provide further information for suicide prevention.

Results from this study are subject to at least three types of limitation. First, we only provide a list of ten reasons for students to choose. Although an open choice is given in order to capture unexpected answers, some may be reluctant to give additional information due to the inconvenience of writing rather than simply ticking. However, the main purpose of this study is to examine the prevalence and severity of these given reasons rather than to yield a comprehensive list of possible reasons. An in-depth interview may be more effective to explore as many reasons as possible, although the anonymity of the present survey may have advantages in that adolescents may be more open to revealing sensitive matters than they would be in a one-to-one interview. Also, in cases when multiple reasons are selected, we do not know which one is perceived to be more important than others, which may to some extent affect the accuracy of our findings.

Second, suicidal behaviours were only measured using individual screening questions and there is no contextual information about the extent or severity of their intention. We used “Yes/No” format for these experiences in the past year and therefore the frequency of these behaviours was not assessed. It is also unknown whether the reported reasons were for a

single or multiple events of suicidal thinking. However, considering suicidal behaviour, especially attempt is relatively rare in this population, we assume that for most respondents the reasons are given for a single experience which may or may not involve an attempt.

Third, due to the cross-sectional nature of this study, the relationships between the presence of a particular reason and suicidal attempts cannot be interpreted as causal. A longitude follow-up study may have the power to test these assumptions. Further, there may be considerable recall bias in the results because the data were collected merely relying on students' self report.

Despite limitations, this study discovered an interesting pattern of common reasons for suicidal thinking among Chinese adolescents. Too much academic pressure, parent-child conflict and loneliness because of no friends are the top three reasons for suicide contemplation. Although less common, serious interpersonal problems including romantic difficulties and peer bullying and teasing may appear to have the strong relationships with subsequent attempts. Academic pressure or stress and parent-child relationship seem to be a key area for mental health promotion while peer relationship problems should be focused in suicide prevention.

Table 1

Prevalence (%) and 95% confidence intervals (CIs) of common reasons for suicidal ideation among a sample of Chinese students attending secondary schools in Shandong, China, who had thought about suicide in the past 12 months (N = 320).

	Males (N = 143)	Females (N=177)	Both sexes (N=320)
Academic pressure	50.3 (42.3-58.4)	47.5 (40.2-54.8)	48.8 (43.3-54.2)
Conflict with parents	38.5 (30.9-46.6)	46.3 (39.1-53.7)	42.8 (37.5-48.3)
Loneliness	24.5 (18.2-32.1)	22.6 (17.1-29.3)	23.4 (19.1-28.4)
Peer teasing	17.5 (12.1-24.5)	13.0 (8.8-18.7)	15.0 (11.5-19.3)
Romantic problems	18.2 (12.7-25.3)	10.7 (7.0-16.2)	14.1 (10.7-18.3)
Punishments by teachers*	19.6 (13.9-26.8)	8.5 (5.2-13.5)	13.4 (10.1-17.6)
Peer bullying	11.2 (7.0-17.4)	7.9 (4.8-12.8)	9.4 (6.6-13.1)
Loss of family member	6.3 (3.3-11.5)	4.0 (1.9-7.9)	5.0 (3.1-8.0)
Physical diseases	7.7 (4.3-13.2)	2.3 (0.9-5.7)	4.7 (2.9-7.6)
Family financial problems	5.6 (2.9-10.7)	1.7 (0.6-4.9)	3.4 (1.9-6.0)
Other reasons	6.3 (3.3-11.5)	5.1 (2.7-9.4)	5.6 (3.6-8.7)
Number of reasons			
None	5.6 (2.9-10.7)	10.2 (6.5-15.5)	8.1 (5.6-11.6)
One	45.5 (37.5-53.6)	42.9 (35.9-50.3)	44.1 (38.7-49.5)
Two	16.8 (11.5-23.8)	26.0 (20.1-32.9)	21.9 (17.7-26.7)
Three or more	32.2 (25.1-40.2)	20.9 (15.6-27.5)	25.9 (21.4-31.0)

Note. N=number of respondents

* Comparisons between genders, $p < .05$ (Fisher's exact test)

Table 2

Associations (ORs and 95% CIs) between the presence of a reason the risk for suicidal planning among a sample of Chinese students attending secondary schools in Shandong, China, who had thought about suicide in the past 12 months (N = 320).

	Males (N = 143)	Females (N=177)
Academic pressure	1.2 (0.6-2.2)	0.9 (0.5-1.6)
Conflict with parents	1.6 (0.8-3.1)	0.9 (0.5-1.6)
Loneliness	1.5 (0.7-3.2)	2.1 (1.0-4.3)
Peer teasing	2.0 (0.8-5.0)	1.3 (0.6-3.2)
Romantic Problems	2.7 (1.1-6.7)	1.7 (0.7-4.5)
Punishments by teachers	1.8 (0.8-4.1)	1.0 (0.4-3.0)
Peer bullying	1.8 (0.6-5.3)	1.2 (0.4-3.6)
Other reasons	1.2 (0.5-2.6)	1.2 (0.5-3.0)

Note. OR= odds ratio; CI= confidence interval

Significant ORs are indicated in bold.

Table 3

Associations (ORs and 95% CIs) between the presence of a reason the risk for suicidal attempts among a sample of Chinese students attending secondary schools in Shandong, China, who had thought about suicide in the past 12 months (N = 320).

	Males (N = 143)	Females (N=177)
Academic pressure	0.8 (0.3-2.7)	0.8 (0.2-2.6)
Conflict with parents	1.4 (0.4-4.4)	1.2 (0.4-3.8)
Loneliness	1.4 (0.4-4.9)	2.6 (0.8-8.7)
Peer teasing	5.0 (1.5-16.4)	3.8 (1.0-13.8)
Romantic Problems	9.9 (2.9-33.5)	3.1 (0.8-12.5)
Punishments by teachers	1.9 (0.6-6.8)	1.0 (0.1-8.1)
Peer bullying	6.7 (1.9-24.0)	4.6 (1.1-19.5)
Other reasons	1.1 (0.3-4.2)	1.4 (0.3-7.0)

Note. OR: odds ratio; CI: confidence interval

Significant ORs are indicated in bold.

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Contributors

This study is part of the PhD project for JS who designed the study and conducted data collection, analysis and manuscript writing. MPD supervised the whole study from project conceptualization to data dissemination and reviewed the final version of this manuscript.

Conflict of interest

We declare that we have no conflict of interest.

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Chapter 8. General Discussion and Conclusions

Academic burden and related problems have become a serious public health and educational concern worldwide and seems especially pronounced in the Chinese context where education of children and adolescents is highly emphasised by the traditional culture and fierce competition exists in the educational system. However, to date there is limited knowledge about the nature and health effects of this type of stress in China. In recent years, there have been studies about the multi-dimensional phenomenon of ‘academic stress’ conducted in some adolescent populations (Ang & Huan, 2006; Bjorkman, 2007). However, research into this topic in China has been limited not only in number but also by a narrow conceptualisation of educational stress. It has been focused mainly on individual factors, such as academic grades and perceived pressure, rather than the separate or combined influence of multiple dimensions of stress in relation to mental health problems (Li & Zhang, 2008; Liu & Tein, 2005; Shen *et al.*, 2005; Su *et al.*, 2002; Yang, 2002; Zhang, Tao, & Zeng, 2001).

To the best of the author’s knowledge, this PhD project is the first study to investigate this phenomenon in depth in Mainland China. With surveys of approximately 2000 students, a new instrument for measuring educational stress has been developed and validated, and the risk factors for educational stress and its relationships with adolescent mental health have been examined. The findings contribute to understanding of the mental health implications of educational stress and provide useful information for public health intervention programs. The main results of this project have been presented and discussed separately in the previous chapters, and are not repeated here. Instead, the purpose of this chapter is to discuss some

new and unexpected findings, and to consider the significance, implications and limitations of this study as a whole.

Summary of New Findings

Although it is not surprising to observe a positive relationship between educational stress and poor mental health, this study revealed some interesting subtleties in these relationships. First, among all potential determinants in this survey, educational stress makes the largest contribution to depression but only has marginal effect on perceived happiness. These findings highlight that educational matters are indeed a key source of stress in this population and provide further evidence about the relationship between depression and stress (Goodyer, 2001; Hankin, 2006). The relatively weak association with happiness suggests that happiness may be a much broader concept than the mere absence of stress and other problems. Many positive individual and environmental factors, such as self-efficacy, school and family connectedness may be more important in relation to the happiness level than is educational stress. Research into positive psychology is still in its very early stages in China and significant correlates of happiness identified in this study suggest directions for further investigation. Another interesting finding in the relationships with mental health is the different effects of educational stress upon suicidal contemplation and attempts. Educational stress was found to have a strong association with suicidal thinking and planning but not with attempts. Educational stress appears to be an important risk factor for internalised mental problems such as depression, but perhaps not for behavioural problems such as attempted suicide. A useful insight from this study is that problems in peer relationships, such as romantic difficulties, peer bullying and victimisation were quite strongly associated with self-reports of suicide acts. The lack of statistical significance in the relationship between stress and suicidal attempts may be to some extent related to the relative small number of suicidal attempts. The sample in this study is healthy school-going students rather than a clinical

sample; thus one would not expect to see a large number of suicide attempts. Further investigation into these relationships, probably with larger or different samples is clearly needed to address these concerns.

The relationships with mental health measures were different for different subscales of the ESSA, with the 'Study despondency' having the strongest associations. Interestingly, the subscales 'Worry about grades' and 'Self-expectation' scores showed negative associations with suicidal planning and attempts. A possible explanation is that these types of stress may suggest a strong orientation to the future in students' personality which may have some protecting effects on mental and behavioural problems. Unfortunately, personality was not measured in this study mainly because of the focus on public health rather than psychology. Further, these two dimensions of educational stress were found to be related to high levels of school connectedness and parental care (Chapter 4), which may in turn prevent stressed students from suicidal contemplation and attempts. The inconsistencies between ESSA dimensions also raise concerns about the convergent validity of this newly developed scale. Further research should be conducted to examine the psychometric properties in more depth.

Although a wide range of individual, family, school and peer factors are significantly associated with educational stress, academic grades and school environment seem to have the largest contribution to this type of stress. Unexpectedly, family factors, such as parents' education level and occupation, the extent of parental care, family connectedness and conflict with parents had little or no effect in the multiple regression analysis. This is to some extent in contradiction to commonly held beliefs that parents and family environment play a critical role in their child's stress, as students' academic performance is a major parental concern (Yang & Shin, 2008; Zhou *et al.*, 2008). Additionally, many Chinese students consider high parental expectation to be the number one source of academic pressure, followed by self-

expectations and peer competition (Lei, Sun, Li, Guo, & Zhang, 2007; Zhao, Zhu, & Ma, 2009). The novel observation here is likely to be related to the nature of educational stress, which is defined as a type of subjective stress originating mainly from academic problems and difficulties which occur at school rather than in the family.

Indeed, there were strong bivariate associations between many family factors (such as parental bonding, family connectedness and conflicts with parents) with educational stress (Chapter 4). The disappearance of these relationships in multivariable analyses may suggest statistical mediating effects of school factors on the relationships between poor family environment and educational stress. Another contributing factor to this observation is that secondary school students spend most of their daytime at school (China Youth Social Service Centre, 2008) and many even live in school dormitories. The lack of time at home and with their parents may to some degree reduce the familial or parental influence on their stress level. Despite the need for a further investigation of underlying reasons, these findings suggest the school should play a predominant role in efforts to reduce educational stress in children and adolescents in China.

Another new and interesting finding in this study is the inverse association between after-school study hours and educational stress. Analyses show unexpectedly that more hours are significantly related to less depressive symptoms (Spearman's $\rho = -.10, p < .01$), higher levels of happiness ($\rho = .14, p < .01$) and fewer suicidal thinking ($\rho = -.07, p < .01$). The hours measured in this study reflect the total amount of time spent on all study activities outside school hours, including both time for after-school work assigned by teachers or parents and time for voluntary study. Conventionally, the amount of after-school work assigned by teachers is the same for each child in the class and parent-assigned work is not common in this population (as many of them live in the school). Therefore, most of the variation in after-school hours is more likely to be determined by time dedicated to voluntary

study rather than the time for assigned homework. One plausible explanation for these observed relationships is that students who have a positive attitude towards homework, or have a stronger motive to study voluntarily, or have a conducive home or dormitory environment may be willing to spend more time on this task without causing much stress.

This apparently positive effect of after-school hours on adolescent mental health contradicts the prevailing view that excessive workload causes more stressful feelings and psychological problems. In fact, the time required for homework has been frequently used in many national and international surveys as an indicator of academic burden (All-China Women's Federation, 2008; China Youth Social Service Centre, 2008; Lei, *et al.*, 2007; Zhao, *et al.*, 2009). However, the underlying reasons for this widespread use has not been investigated. There may be differential effects on mental health of assigned versus voluntary after-school study, which should be explored in further research. Importantly, the positive effect of after-school hours and negative effects of educational stress (ESSA score) on mental health may suggest that perceived pressure and stress rather than absolute burden causes psychological problems.

Significance of the Research

The present research makes a number of original contributions to existing knowledge and gives some directions for future research and practice. First, this study has developed and tested two new instruments for psychological measurement. The Educational Stress Scale for Adolescents (ESSA) was found to be reliable in terms of internal consistency and test-retest reliability. Additionally, this instrument contains only 16 items with a commonly used response format (from “*Strongly disagree*” to “*Strongly agree*”) and can be easily incorporated in questionnaire surveys in public health and educational research. The ESSA has recently been used in one study in Vietnam and yielded good psychometric profiles (Truc *et al.*, 2011). A brief scale with only three 3 items for happiness was also developed and

preliminarily validated in this study. This unidimensional tool also showed good internal consistency and test-retest reliability. Research into positive psychology still lags behind that for negative psychology. The development of this new instrument may contribute some to the advancement of this field.

Second, this study provides evidence to challenge some common practices and perceptions. For example, as discussed earlier, the use of homework hours as an indicator of academic burden in self-report surveys may be misleading and should be reconsidered. The common belief that more academic workload causes more stress and mental health problems is not supported by this study. Programs to promote students' mental health should focus on subjective stress rather than objective study burden. Stress is widely recognised as an important contributor to poor mental health and behavioural problems. However, this study observed inverse relationships between some types of educational stress (Self-expectation and Worry about grades) and suicidal behaviour. A possible explanation is that in contrast to the other subscales, these factors are related to a high level of orientation to the future, which may in turn prevent stressed students from suicidal attempts. These data indicate the complexity of the phenomenon of 'educational stress' and support an in-depth analysis of these relationships. On the other hand, the inconsistencies between ESSA dimensions also raises concerns about the convergent validity of this newly developed scale and further psychometric validation seems necessary.

The third contribution of this study is the identification of a comprehensive model for depression and the strong relationship with educational stress. Depression is a top priority in mental health promotion for adolescents in China and internationally. The model explains a large amount of variance (41%) in depression and includes six significant variables which are largely modifiable. Considering the high prevalence of depressive symptoms in this population and the huge number of Chinese students, the development of this model could

have high public health significance. Based on this model, the most important strategies in depression prevention include reducing educational stress, boosting self-efficacy and increasing school connectedness. In addition, the identification of important contributing factors for educational stress also provides important evidence for the design and implementation of interventions to reduce stress, which in turn may have a high impact on lowering the prevalence of depression.

Implications for Practice and Research

Implications from this study are many, and can be broken down into four broad areas: raising public awareness, providing information for policy-making, guiding mental health intervention and setting up priority areas for future research. Although educational pressure among children and adolescents is drawing increasing attention in China, there has been little scientific evidence about the nature and health consequences of this phenomenon at a population level. Based on results from the present study, parents and schools should be made aware that educational stress is common and at high levels among Chinese adolescents, is influenced by factors from multiple domains with school being the most important one, and is associated with severe mental health problems such as depression. To raise the awareness among parents and school staff is the first key step to the successful implementation of mental health promotion programs. An important message from this study to parents and teachers is that it is likely perceived pressure and stress rather than objective burden such as study hours causes mental health problems. Accordingly, more attention should be paid to identify students' emotional status through better communication and possibly psychological interviews rather than to focus merely on the absolute workload.

Although national and provincial education departments have issued official recommendations calling for quality teaching and lowering study burden in recent years (China Ministry of Education, 2009; Shandong Provincial Education Department, 2009), the

implementation is suboptimal, especially in rural areas. For example, openly disclosing the ranking of students' grades is not allowed in all public primary and secondary schools, but nonetheless remains a common practice in many schools. Another example is that self-study sessions in the evening are still common in many rural senior secondary schools despite official bans. According to this study, such policies should be reinforced especially in rural areas. This study also raises a concern whether lessening study hours of students can effectively reduce their perceived pressure and stress as an inverse relationship between after-school hours and educational stress was observed. It should be emphasised that merely reducing students' learning burden (e.g., homework hours) is clearly not sufficient for lowering students' stress level because of its subjective nature and because it is influenced by a wide range of factors. Apart from reducing study workload, educational authorities should encourage schools to conduct more recreation activities (such as physical exercises), improve teacher-student relationships, prevent school bullying, and provide better mental health service to students. According to this study, the priority groups for stress intervention should include females, older students and those who are from rural families.

Given the strong relationship between educational stress and depression, programs targeting internalised mental health problems should have a focus on educational stress, and should be school-based as both stress and depression are influenced mainly by school factors. Another important implication for public health stems from the finding that educational stress is strongly related to suicidal ideation but not with attempts. It is therefore suggested that educational stress should be a priority in mental health interventions on depressive symptoms including suicidal ideation but not in suicide prevention because of the lack of significant association. Strategies to build resilience in handling the problems in interpersonal peer relationships, such as romantic difficulties and peer bullying, on the other hand should be a priority in suicide prevention.

This study provides some directions for future research. First, educational stress has many sources and manifestations. Although this study developed and preliminarily tested the new scale (ESSA) and satisfactory psychometric properties were identified, the comprehensiveness and cross-cultural/population validity need to be further explored. The development of this scale is suboptimal because the items were drawn mainly relying on literature review. Refinement of the scale could draw upon qualitative interviews with young people, and perhaps parents and teachers. These interviews should explore Chinese students' experience of stress and their ideas about the origins of stress. Second, variance explained by the multiple regression model for educational stress is relatively small ($R^2 = .28$). One obvious explanation is that most factors were included into this study based on their known relationships with depression rather than educational stress. The influencing factors for educational stress are largely unknown because there has been no study comprehensively examining this phenomenon in this population. Indeed, a weakness of the current study is that it was atheoretical; the conceptual model was based mainly on commonsense rather than empirical data from strong prior research. Many other factors that may have a relationship with perceived stress, such as personality and coping strategies should be included in further studies focusing on educational stress. Similarly, the nature of the associations with educational stress should be explored across a wider range of common mental health problems (such as anxiety) and emotional well-being (such as quality of life). Third, given the interesting finding that more after school hours is negatively related to the occurrence of mental health problems, the widespread use of this measure as an indicator of study burden in surveys with Chinese adolescents should be reconsidered. More research is clearly needed to further examine the differential effects on adolescent mental health of different dimensions of students' life, including the extent of parental coercion and vigilance, parental rewards, pressure from peers and / or teachers, and voluntary learning from internal motivation.

Limitations

The findings in this study are subject to at least three types of limitations. First, there are limitations in the measurement of variables. As mentioned earlier, the development of the ESSA scale is limited because the items were created or adapted mainly based on review of recent Chinese and English literature, plus informal discussions with experts. No attempt was made to more comprehensively map the construct using grounded theory to explore an underlying model. Despite the identification of five important dimensions, this instrument cannot capture all facets of educational stress and therefore some qualitative work exploring the experience of educational stress among Chinese students should be included in the revision of this tool. It may be that the dimensions identified in EFA and confirmed via CFA have an underlying validity but this does not mean that the items used to measure these dimensions are adequate to form a reliable sub-scale (with most subscales containing only 3 items). The relationships between educational stress and other variables identified in this study may be to some extent biased by the measurement errors because some of them were measured using a single question and some using multi-item scales. Despite these limitations in the development of the ESSA scale, the main focus of this study was to identify significant relationships between educational stress and mental health problems from a public health perspective, rather than to create a sophisticated psychometric tool for emotional distress. These limitations in measurement are unlikely to pose a major threat to the main findings in this study, such as the patterns in relation to different mental health problems and influencing factors for this type of stress. Additionally, there are also limitations in the measurement of other variables. For example, we used a single question to measure self-report academic grades but we do not know if there are disparities between perceived grades and actual grades. The sample was drawn from different settings (rural and urban) and across different

schools. There may be different academic standards across different schools within and across settings which may in turn affect students' actual and/or reported grades.

The second type of limitation is derived from the study design. This study is cross-sectional in nature and therefore any associations identified cannot be interpreted as causal. In fact, many relationships could be interpreted in both ways. For example, while most students are likely to be depressed because of high educational pressure and stress, some may have depressive symptoms due to other problems which may in turn cause great difficulties academically and subsequently induce more educational stress. Despite this limitation, analysis of these relationships may provide clues for further examination in longitudinal studies or other study designs. The information was collected relying solely on self-report and a certain amount of recall bias cannot be avoided. However, the relatively good results from the test-retest analysis suggest that this bias is minimal and should not introduce significant error into main findings.

Third, the representativeness of the sample is limited because it was conveniently rather than randomly chosen. Selection bias is possible even if (as we found) there were a great deal of similarities between the sample and school-based population in the province in the same age. It should be noted that the differences in educational stress and mental health problems between rural and urban/city schools may be related to the potential sampling bias as only one survey site with two schools was selected to represent a geographic level (urban / city / rural). This concern should be addressed in further studies with random sampling methods.

Conclusions

Although limited by study design, potential measurement errors and sampling, this study comprehensively examined the nature, influencing factors and mental health consequences of educational stress with a relatively large sample of secondary school

students in a province of China. Some interesting patterns were identified in the relationships between educational stress and adolescent mental health and other factors. For example, school and study factors, such as rural school location, low school connectedness and perceived poor academic grades are among the strongest risk factors for high educational stress. This type of stress has strong associations with depression and suicidal contemplation, but was not strongly associated with happiness and suicidal attempts. According to this study, efforts to reduce educational stress should be a key strategy in mental health intervention. Programs targeting stress and depression among Chinese adolescents should be school-based. Education departments and schools should pay more attention to perceived pressure and stress apart from the efforts to lower the absolute workload in study. Strategies to build resilience in coping with problems in peer relationships should be a focus in suicide prevention. More research is clearly needed to examine the relationships between educational stress and adolescent mental health with rigorous designs and sampling methods in the near future.

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Appendix

Appendix 1: Information for Participants

Information for Participants

The aims of this research project are to investigate the perceived academic stress and its impact on mental health and wellbeing among adolescents in Shandong Province. The findings may be used to raise awareness of mental health of students in China and develop long-term programs to promote mental health in this section of the population.

We invite students to complete a questionnaire that includes questions on:

- You and your family, such as age, gender, family structure, parent-child relationship;
- School and academic factors, such as academic grade, academic burden, and teacher-student relationship;
- Peer and friends, such as how many friends, and your relationship with your fellow students;
- Mental health and wellbeing, such as your recent feelings and behaviours, how do you deal with challenges, and how happy you are.

The questionnaire will take 30-40 minutes to complete. All students will be seated so that others cannot see the answers, and the class teacher will not be present. When the anonymous questionnaire is completed, it is placed in a blank envelope then put into a box by the person who completes it.

All of the personal information provided will be completely anonymous. There will be no names on the questionnaire and no-one – including your teachers, parents or other students – will know what you have written. Any information you may provide would not

influence your grades or any other aspect of your studies. The information will only be used for this research project and all analysis of data will be at group level only. The completed forms will be kept in secure storage and in password protected computer files, and only the research team will have access to the questionnaires. Any publications resulting from the study will report the information anonymously.

Some of the questions in this survey are quite sensitive, and there is a chance you might feel distress either during or after participation. If you feel that you would like to talk to someone about this distress, please contact the researchers or your teacher-in-charge. They can assist you to contact a free counsellor.

This project has been reviewed and approved by the Ethics Committee of Shandong Centre for Disease Control and Prevention (CDC) and the Human Research Ethics Committee of the Queensland University of Technology. If you have any complaint concerning the manner in which this research project has been conducted, then you should notify one of the people named below. Alternatively, you could contact the Human Research Ethics Committee at Queensland University of Technology, George Street, Brisbane Queensland 4000 Australia (email: d.wiseman@qut.edu.au, or phone: +617 3138 2091) or the Research Ethics Committee at Shandong Center for Disease Control and Prevention, 72 Jingshi Road, Jinan 250014 (Phone: 0531-82069694).

If you have any questions about this research please contact the researcher or his supervisor at any time:

Researcher: **Jiandong Sun**, on 13645319930, Shandong Center for Disease Control and Prevention (CDC), 72 Jingshi Road, Jinan 250014

Supervisor: **Prof. Michael Dunne**, on +61 3128 3928 at School of Public Health, Queensland University of Technology, Australia

If you have any problem with your mental health please contact the following counsellors or institutions:

Dr Xiaolei Guo, on +86 531 82069691 for free counselling, Shandong Center for Disease Control and Prevention (CDC), 72 Jingshi Road, Jinan 250014. Available time: 9 am – 4 pm, Monday to Friday

Weifang Mental Health Center, hot lines on 0536-6787920, 6787921, 6787922, for free counselling. Available time: 24 hours a day, 7 days a week.

Shandong Youth Hotline, on 0531-160111139 or 2016048 for free counselling. Available time: 2 pm – 10 pm, Monday to Friday

Please keep this information for future reference.

Now, if you agree to participate, please complete the consent form. Do NOT place the signed consent form in the envelope. It will be collected and stored separately from the questionnaires.

Appendix 2: Information for Parents (Passive Consent Form)

Dear parent/guardian

Shandong Centre for Disease Control and Prevention (CDC) and Queensland University of Technology (QUT) are to conduct a questionnaire survey at you children's school. The aims of this study are to determine the prevalence of mental and behavioural problems and their determinants among adolescents in Shandong Province. The findings may be used to raise awareness of mental health of students in China and develop long-term programs to promote mental health in this section of the population. Your child is invited to participate in this research.

The questions in the questionnaire cover following domains:

- General information about students and their families, such as age, gender, family structure, parent-child relationship;
- School environment and academic performance, such as academic grade, academic burden, and teacher-student relationship;
- Peer and friends, such as how many friends, and your relationship with your fellow students;
- Mental health and wellbeing, such as your recent feelings and behaviors, how do you deal with challenges, and how happy you are.

The questionnaire will take between 35-40 minutes to complete. All of the personal information provided will be completely anonymous and will be kept confidential. The information will only be used for this research project and all analysis of data will be at group level only. No personal information will ever been seen by your child's teachers or other staff at the school. Any publications resulting from the study will report the information

anonymously. Any student who does not participate will be excluded from this survey without any penalty.

Some of the questions in this survey are quite sensitive, such as questions related to recent mental health, and there is a chance your child might feel distress either during or after participation. However, there will be on-site consultation available to address potential distress. The student will also have the chance to speak to a free professional after the survey if they want to do so.

If you have any questions or concerns about the research, please feel free to contact the principle researcher, Mr. Jiandong Sun on 13645319930, Shandong Centre for Disease Control and Prevention (CDC), 72 Jingshi Road, Jinan 250014. If you do not want your child to participate in this survey based on any reason, please sign the following part and return to our school. We will exclude him/her from the survey.

Thank you very much.

I do not allow my child _____ to participate this survey.

Signature: _____ .

Date: _____ .

Appendix 3: Students Consent Form

Dear student,

You are invited to participate in a survey conducted by Shandong Center for Disease Control and Prevention in collaboration with Queensland University of Queensland. The aim of this survey is to investigate the magnitude of perceived academic pressure and the mental health status of secondary school students in Shandong.

If you have any questions or concerns about the research, please feel free to contact the principle researcher, Mr. Jiandong Sun on 13645319930, Shandong Centre for Disease Control and Prevention (CDC), 72 Jingshi Road, Jinan 250014.

If you volunteer to participate in this survey, we would ask you to fill out a self-administered, anonymous questionnaire and then place it into the box provided by the researcher at your classroom. It would take you 30-40 minutes to complete.

A few questions in the questionnaire could be sensitive, and there will be a chance you might feel uncomfortable or distress during or after participation. If you would like to talk to someone about this distress, please contact the researcher or the other concerned people listed on the Information Sheet. You can also stop to answer any question at any time if you wish. Although there is no direct benefit for you to participate in this survey, your information can help us to better understand your mental health status and guide development and implementation of prevention programs. We highly encourage you to participate in this survey.

Declaration

I have read and understand the information sheet and the purpose of this survey. I understand that:

- I am participating in this research of my own free will
- I can refuse to answer any question if I wish
- I understand that all of my answers are kept private and confidential. Nobody including parents or the school staff will know who answers these questions.

I agree / do not agree to participate in this survey.

Signature : _____

Date : ____/____/____

Appendix 4: Permission of School Principal (example)

同 意 函

我们同意山东省疾病预防控制中心和寿光市疾病预防控制中心的工作人员孙建东和刘俊凤到我校开展中学生健康和行为的问卷调查，我们会积极配合他们的工作，但调查工作应在学生自愿和不影响学校正常秩序的前提下进行。

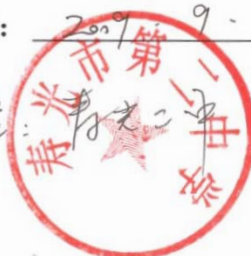
签名： 丁清源

职务： 政教主任

联系电话： 15866536633

日期： 2019.9.18

单位：



Appendix 5: Survey Questions – Demographics

5.1. Your gender:

- 1 Male
- 2 Female

5.2. Your age in years: _____

5.3. Your grade at school: _____

5.4. Your school location:

- 1 Capital city
- 2 County city
- 3 Rural town

5.5. Your family residence type:

- 1 City
- 2 Town
- 3 Village
- 4 Others (Please specify): _____

5.6. The occupation of your natural father/step father/adoptive father:

- 1 Government employee
- 2 Professional (Doctor, nurse, teacher, engineer, etc.)
- 3 Manual worker
- 4 Self-employed business
- 5 Farmer
- 6 Unemployed
- 7 Others (Please specify): _____
- 8 I have no father or male guardian

5.7. The occupation of your natural mother/step mother/adoptive mother:

- 1 Government employee
- 2 Professional (Doctor, nurse, teacher, engineer, etc.)
- 3 Manual worker
- 4 Self-employed business
- 5 Farmer

6 Unemployed

7 Others (Please specify): _____

8 I have no father or male guardian

5.8. The highest level of education achieved by your natural father/step father/adoptive

father:

1 University/college degree or higher

2 Senior high/Technical

3 Junior high

4 Primary school

5 Never go to school

6 Do not know

7 I have no father or male guardian

5.9. The highest level of education achieved by your natural mother/step mother/adoptive

mother:

1 University/college degree or higher

2 Senior high/Technical

3 Junior high

4 Primary school

5 Never go to school

6 Do not know

7 I have no father or male guardian

5.10. The level of your family income among your fellow students' families:

1 Very low

2 Low

3 Moderate

4 High

5 Very high

Appendix 6: Survey Questions & Scales – Individual Factors

6.1. General Self-Efficacy Scale (GSES, Zhang & Schwarzer, 1995)

Instruction: The following questions are asking your attitude and how confident in deal with problems. Please circle or tick the most suitable number.

		Not at all true	Hardly true	Moder- ately true	Exactl y true
1)	I can always manage to solve difficult problems if I try hard enough	1	2	3	4
2)	If someone opposes me, I can find the means and ways to get what I want	1	2	3	4
3)	It is easy for me to stick to my aims and accomplish my goals	1	2	3	4
4)	I am confident that I could deal efficiently with unexpected events	1	2	3	4
5)	Thanks to my resourcefulness, I know how to handle unforeseen situations	1	2	3	4
6)	I can solve most problems if I invest the necessary effort	1	2	3	4
7)	I can remain calm when facing difficulties because I can rely on my coping abilities	1	2	3	4
8)	When I am confronted with a problem, I can usually find several solutions	1	2	3	4
9)	If I am in trouble, I can usually think of a solution	1	2	3	4
10)	I can usually handle whatever comes my way	1	2	3	4

6.2. What are your current height in centimetre (cm) and weight in kilogram (Kg)?

Height: _____ (cm); Weight: _____ (Kg)

6.3. What do you think about your overall health status?

1 Very poor

2 Poor

3 Moderate

4 Good

5 Very good

6.4. In the past 30 days, have you ever used the Internet?

1 Never

2 Sometimes

3 Often

6.5. In the past 30 days, have you ever played computer games?

1 Never

2 Sometimes

3 Often

6.6. In the past 30 days, how often do you do physical exercises or sports?

1 Never

2 Sometimes

3 Often

Appendix 7: Survey Questions – Family Environment

7.1. Parenting Bonding Instrument (PBI, Pedersen, 1994)

Instruction: The following questions are asking your attitude and how confident in deal with problems. Please circle or tick the most suitable number.

Your father...		Never	Sometimes	Often	Always
1)	Did not help me as much as I needed	1	2	3	4
2)	Appeared to understand my problems and worries	1	2	3	4
3)	Was affectionate to me	1	2	3	4
4)	Did not seem to understand what I needed or wanted	1	2	3	4
5)	Did not talk with me very much	1	2	3	4
6)	Liked me to make my own decisions	1	2	3	4
7)	Tried to control everything I did	1	2	3	4
8)	Let me decide things for myself	1	2	3	4
9)	Tended to baby me	1	2	3	4
10)	Was overprotective of me	1	2	3	4

Your mother...		Never	Sometimes	Often	Always
1)	Did not help me as much as I needed	1	2	3	4
2)	Appeared to understand my problems and worries	1	2	3	4
3)	Was affectionate to me	1	2	3	4
4)	Did not seem to understand what I needed or wanted	1	2	3	4
5)	Did not talk with me very much	1	2	3	4
6)	Liked me to make my own decisions	1	2	3	4
7)	Tried to control everything I did	1	2	3	4
8)	Let me decide things for myself	1	2	3	4
9)	Tended to baby me	1	2	3	4
10)	Was overprotective of me	1	2	3	4

Note. The response format was modified (originally was from *Very unlike* to *Very like*).

7.2. Family connectedness (including 4 questions, Hall-Lande, Eisenberg, Christenson, & Neumark-Sztainer, 2007).

1)	How much do you feel your mother cares about you?	1 Not at all	2 A little	3 Some-what	4 Quite a bit	5 Very much
2)	How much do you feel your father cares about you?	1 Not at all	2 A little	3 Some-what	4 Quite a bit	5 Very much
3)	Do you feel that you can talk to your mother about your problems?	1 Not at all	2 A little	3 Some-what	4 Quite a bit	5 Very much
4)	Do you feel that you can talk to your father about your problems?	1 Not at all	2 A little	3 Some-what	4 Quite a bit	5 Very much

7.3. Conflict with parents (three respective questions)

1)	Have you ever had a serious quarrel with your parents or other guardians in the past 12 months?	1 Never	2 Sometimes	3 Often
2)	Have you ever been scolded, threatened, or humiliated by your parents or other guardians in the past 12 months?	1 Never	2 Sometimes	3 Often
3)	Have you ever been physically punished (such as standing punishment, beat by fist or other objects, or kicked) by your parents or other guardians in the past 12 months?	1 Never	2 Sometimes	3 Often

Appendix 8: Survey Questions – School and Study

8.1. School connectedness (5-item scale, Resnick,*et al*, 1997)

Instruction: The following statements are about your perception toward your school and people in the school. Please choose the best answer and tick the proper number.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1) I feel safe in my school	1	2	3	4	5
2) The teachers at this school treat students fairly	1	2	3	4	5
3) I am happy to be at this school	1	2	3	4	5
4) I feel like I am part of this school	1	2	3	4	5
5) I feel close to people at this school	1	2	3	4	5

8.2. Conflict with teachers (three respective questions)

1) Have you ever had a serious quarrel with your teachers or other staff at school in the past 12 months?	1 Never	2 Sometimes	3 Often
2) Have you ever been scolded, threatened, or humiliated by your teachers or other staff at school in the past 12 months?	1 Never	2 Sometimes	3 Often
3) Have you ever been physically punished (such as standing punishment, beat by fist or other objects, or kicked) by your teachers or other staff at school in the past 12 months?	1 Never	2 Sometimes	3 Often

8.3. How was your average grade in your class in the past 12 months?

1 Very poor

2 Poor

3 Moderate

4 Good

5 Very good

8.4. On average, how many extra hours per day did you spend on studying after school in the past 12 months?

1 Almost none

2 Less than an hour

3 1-2 hours

4 2-3 hours

5 More than 3 hours

8.5. Did you ever have personal tutor(s) to help you for your study in the past 12 months?

1 Never

2 Yes, I had one.

3 Yes, I had more than one

8.6. Did you ever attend supplementary classes during weekends or holidays in the past 12 months?

1 Never

2 Yes, I attended one class

3 Yes, I attended more than one

Appendix 9: Survey Questions – Peer Relationships

9.1. How do you consider your popularity among your peers?

- 1 Very low
- 2 Low
- 3 Moderate
- 4 High
- 5 Very high

9.2. Do you have one or more close friends you can talk to about your problems?

- 1 None
- 2 Only one
- 3 A few
- 4 Many

9.3. Have you ever had girlfriend or boyfriend?

- 1 Never
- 2 Yes, I have now
- 3 Yes, I used to have, not now

9.4. Conflict with peers (four respective questions)

1)	In the past 12 months, have you ever had serious quarrels with your fellow students at school?	1 Never	2 Some-times	3 Often
2)	In the past 12 months, have you ever been involved in physical fighting with your fellow students at school?	1 Never	2 Some-times	3 Often
3)	In the past 12 months, have any of your fellow students ever bullied you emotionally at school, such as insulting you, calling your names, teasing you, threatening you, and humiliating you?	1 Never	2 Some-times	3 Often
4)	In the past 12 months, have any of your fellow students ever bullied you physically at school in any kind? It is not bullying when two students of about the same strength or power fight each other.	1 Never	2 Some-times	3 Often

Appendix 10: Survey Questions – Academic Stress

10.1. The original 30-item Educational Stress Scale for Adolescents (ESSA) and predefined dimensions used in the pilot study

Dimension 1: Attitudes towards study and grades

- 1. I am very dissatisfied with my academic grades. *
- 5. I am always worrying that my exam results may not be ideal.
- 7. I feel that studying is my duty, but not something I like to do.
- 16. I don't know what I can do in the future if I can't get into an ideal college or university.
- 17. Academic grade is very important to my future and even can determine my whole life. *

Dimension 2: Perceived pressure

- 6. Future education and employment bring me a lot of academic pressure. *
- 8. My parents care about my academic grades too much which brings me a lot of pressure. *
- 9. I feel a lot of pressure in my daily studying. *
- 11. I feel a lot of pressure from teachers urging me to study.
- 20. There is too much competition among classmates that brings me a lot of academic pressure. *

Dimension 3: Perceived burden

- 2. I feel that there is too much school work. *
- 4. I feel there is too much homework. *
- 10. I almost have no time to do other things except studying.
- 15. I feel that there are too many tests /exams in the school. *
- 25. I feel that study is a very heavy burden for me.

Dimension 4: Expectations from others

- 18. I feel that I have disappointed my parents when my test/exam results are poor. *
- 19. I feel that I have disappointed my teacher when my test/exam results are not ideal. *
- 14. It would be embarrassing among classmates if I did not get an ideal score in a test/exam.
- 26. I blame myself when I cannot live up to my parents' expectations of me.
- 13. My parents never stop nagging me that I don't study hard enough.

Dimension 5: Self-expectations

- 12. I am always blaming myself because I feel I did not try my best in studying.
- 27. I feel stressed when I do not live up to my own standards. *
- 28. When I fail to live up to my own expectations, I feel I am not good enough. *
- 29. I usually cannot sleep and worry when I cannot meet the goals I set for myself. *
- 30. When I do not do as well as I could have in an examination or test, I feel stressed.

Dimension 6: Difficulties in study

- 3. I have no interest in study.
- 21. I feel that school work is very hard for me.
- 22. I always lack confidence with my academic scores. *
- 23. I always feel very nervous during tests/exams.
- 24. It is very difficult to concentrate during classes. *

* Items retained in the revised scale after the pilot study

10.2. The revised 16-item ESSA used in the main study (Sun, Dunne, Hou, & Xu, 2011)

Instruction: The following statements are about your feelings and attitudes towards your academic achievement and study. For each statement please select the level of agreement that suits you the best.

		Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1)	I am very dissatisfied with my academic grades	1	2	3	4	5
2)	I feel that there is too much school work	1	2	3	4	5
3)	I feel there is too much homework	1	2	3	4	5
4)	Future education and employment bring me a lot of academic pressure	1	2	3	4	5
5)	My parents care about my academic grades too much which brings me a lot of pressure	1	2	3	4	5
6)	I feel a lot of pressure in my daily studying	1	2	3	4	5
7)	I feel that there are too many tests /exams in the school	1	2	3	4	5
8)	Academic grade is very important to my future and even can determine my whole life	1	2	3	4	5
9)	I feel that I have disappointed my parents when my test/exam results are poor	1	2	3	4	5
10)	I feel that I have disappointed my teacher when my test/exam results are not ideal	1	2	3	4	5
11)	There is too much competition among classmates which brings me a lot of academic pressure	1	2	3	4	5
12)	I always lack confidence with my academic scores	1	2	3	4	5
13)	It is very difficult for me to concentrate during classes	1	2	3	4	5
14)	I feel stressed when I do not live up to my own standards.	1	2	3	4	5
15)	When I fail to live up to my own expectations, I feel I am not good enough.	1	2	3	4	5
16)	I usually cannot sleep because of worry when I cannot meet the goals I set for myself.	1	2	3	4	5

10.3. Academic Expectation Stress Inventory (Ang & Huan, 2006).

Instruction: Following statements are about your feelings on the academic expectation from others and yourself. Please choose the best answer and circle/tick the proper number.

	Never true	Seldom true	Sometimes true	Often true	Almost always true
Factor 1: Expectations of Parents/Teachers					
1). I blame myself when I cannot live up to my parents' expectations of me.	1	2	3	4	5
2). I feel I have disappointed my teacher when I do badly in school.	1	2	3	4	5
3). I feel I have disappointed my parents when I do poorly in school.	1	2	3	4	5
4). I feel stressed when I know my parents are disappointed in my exam grades.	1	2	3	4	5
5). I feel lousy when I cannot live up to my teacher's expectations.	1	2	3	4	5
Factor 2: Expectations of Self					
6). I feel stressed when I do not live up to my own standards.	1	2	3	4	5
7). When I fail to live up to my own expectations, I feel I am not good enough.	1	2	3	4	5
8). I usually cannot sleep and worry when I cannot meet the goals I set for myself.	1	2	3	4	5
9). When I do not do as well as I could have in an examination or test, I feel stressed.	1	2	3	4	5

Appendix 11: Mental Health Measures

11.1. Depression: the Centre for Epidemiological Studies – Depression Scale (CES-D,

Radloff, 1977; Liu, 1999)

Instruction: The following statements are about your feelings during the last week. Please circle or tick the most suitable number

		Rarely or none of the time (<1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of the time (3-4 days)	Most or all of the time (5-7 days)
1)	I was bothered by things that don't usually bother me.	1	2	3	4
2)	I did not feel like eating; my appetite was poor.	1	2	3	4
3)	I felt that I could not shake off the blues even with the help of my family or friends.	1	2	3	4
4)	I felt that I was just as good as other people.	1	2	3	4
5)	I had trouble keeping my mind on what I was doing.	1	2	3	4
6)	I felt depressed.	1	2	3	4
7)	I felt everything I did was an effort.	1	2	3	4
8)	I felt hopeful about the future.	1	2	3	4
9)	I thought my life had been a failure.	1	2	3	4
10)	I felt fearful.	1	2	3	4
11)	My sleep was restless.	1	2	3	4
12)	I was happy.	1	2	3	4
13)	I talked less than usual.	1	2	3	4
14)	I felt lonely.	1	2	3	4
15)	People were unfriendly.	1	2	3	4
16)	I enjoyed life.	1	2	3	4
17)	I had crying spells.	1	2	3	4
18)	I felt sad.	1	2	3	4
19)	I felt that people disliked me.	1	2	3	4
20)	I could not get "going".	1	2	3	4

11.2. Happiness scale (newly developed in this study)

Instruction: The following questions ask your feeling of happiness about your family, school, and your whole life in general. Please circle or tick the suitable number where 1 indicates Least happy and 7 means Extremely happy.

1)	How happy do you feel about your family environment?	1	2	3	4	5	6	7
2)	How happy do you feel about your school life?	1	2	3	4	5	6	7
3)	Actually, how happy do you feel in general?	1	2	3	4	5	6	7

11.3. Suicide behaviour (three questions, CDC, 2009; Eaton *et al.*, 2008)

1)	In the past 12 months, have you ever seriously considered attempting suicide?	1 Yes	2 No
2)	In the past 12 months, have you ever made a plan about how you would attempt suicide?	1 Yes	2 No
3)	In the past 12 months, have you ever committed suicide action?	1 Yes	2 No

11.4. If you have seriously thought about suicide in the past 12 months, what were your main reasons for that? (Please respond to each choice)

1)	suffering from physical diseases	1 Yes	2 No
2)	family financial hardship	1 Yes	2 No
3)	loss of family member(s)	1 Yes	2 No
4)	being bullied by peers	1 Yes	2 No
5)	conflicts with parents	1 Yes	2 No
6)	being punished by teacher(s)	1 Yes	2 No
7)	too much academic pressure	1 Yes	2 No
8)	problems in romantic relationship(s)	1 Yes	2 No
9)	loneliness because of no friends	1 Yes	2 No
10)	being teased by others	1 Yes	2 No

If you have also considered other reasons, please specify: _____

11.5. Substance use (two questions, CDC, 2009; Eaton *et al.*, 2008)

1)	In the past 30 days, have you ever smoked cigarettes?	1 Yes	2 No
2)	In the past 30 days, have you ever had alcoholic drink?	1 Yes	2 No

Appendix 12: Additional Results

Appendix table 12.1. Counts, Percentages and Mean Score (SDs) of Items and Factors of the Educational Stress Scale for Adolescents (ESSA) in a Chinese Sample of Secondary School Students ($N = 1627$)

Factors and items		Distribution					Means and standard deviations (SDs)
		<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	
Factor 1: Pressure from study							14.0 (3.8)
6)	I feel a lot of pressure in my daily studying	149 (9.2)	215 (13.2)	393 (24.2)	551 (33.9)	319 (19.6)	3.4 (1.2)
11)	There is too much competition among classmates which brings me a lot of academic pressure	119 (7.3)	166 (10.2)	419 (25.8)	554 (34.1)	369 (22.7)	3.5 (1.2)
4)	Future education and employment bring me a lot of academic pressure	120 (7.4)	136 (8.4)	262 (16.1)	521 (32.0)	588 (36.1)	3.8 (1.2)
5)	My parents care about my academic grades too much which brings me a lot of pressure	211 (13.0)	256 (15.7)	382 (23.5)	476 (29.3)	302 (18.6)	3.2 (1.3)
Factor 2: Workload							9.4 (3.0)
3)	I feel there is too much homework	200 (12.3)	260 (16.0)	456 (28.0)	462 (28.4)	249 (15.3)	3.2 (1.2)
2)	I feel that there is too much school work	226 (13.9)	252 (15.5)	569 (35.0)	382 (23.5)	198 (12.2)	3.0 (1.2)
7)	I feel that there are too many tests /exams in the school	206 (12.7)	235 (14.4)	542 (33.3)	356 (21.9)	288 (17.7)	3.2 (1.2)
Factor 3: Worry about grades							11.4 (2.8)
10)	I feel that I have disappointed my teacher when my test/exam results are not ideal	106 (6.5)	130 (8.0)	429 (26.37)	542 (33.3)	420 (25.8)	3.6 (1.1)
9)	I feel that I have disappointed my parents when my test/exam results are poor	43 (2.6)	64 (3.9)	209 (12.9)	524 (32.2)	787 (48.4)	4.2 (1.0)
8)	Academic grade is very important to my future and even can determine my whole life	187 (11.5)	202 (12.4)	276 (17.0)	357 (21.9)	605 (37.2)	3.6 (1.4)
Factor 4: Self-expectation							9.8 (2.5)
14)	I feel stressed when I do not live up to my own standards.	87 (5.3)	268 (16.5)	518 (31.8)	450 (27.7)	304 (18.7)	3.4 (1.1)
15)	When I fail to live up to my own expectations, I feel I am not good enough.	41 (2.5)	149 (9.2)	492 (30.2)	566 (34.8)	379 (23.3)	3.7 (1.0)
16)	I usually cannot sleep because of worry when I cannot meet the goals I set for myself.	226 (13.9)	526 (32.3)	472 (29.0)	245 (15.06)	158 (9.7)	2.7 (1.2)
Factor 5: Study despondency							9.1 (2.8)
12)	I always lack confidence with my academic scores	388 (23.8)	406 (25.0)	374 (23.0)	326 (20.0)	133 (8.2)	2.6 (1.3)
1)	I am very dissatisfied with my academic grades	132 (8.1)	320 (19.7)	326 (20.0)	534 (32.8)	315 (19.4)	3.4 (1.2)
13)	It is very difficult for me to concentrate during classes	201 (12.4)	314 (19.3)	412 (25.3)	457 (28.1)	243 (14.9)	3.1 (1.2)

Appendix table 12.2. Mean Scores (*SDs*) of PBI Factors in a Chinese Sample of Secondary School Students (*N* = 1627)

	Father care	Mother care	Father control	Mother control
Total	11.44 (2.57)	12.18 (2.33)	5.08 (2.79)	5.35 (2.86)
Sex				
Male	11.27 (2.55)*	11.96 (2.37)**	5.22 (2.83)*	5.47 (2.83)
Female	11.60 (2.59)	12.42 (2.25)	4.92 (2.74)	5.22 (2.90)
Age				
11-14	12.10 (2.49)**	12.63 (2.36)**	4.92 (2.74)	5.09 (2.79)*
15-16	11.22 (2.57)	12.14 (2.21)	5.29 (2.74)	5.56 (2.83)
17-20	11.00 (2.54)	11.78 (2.34)	5.03 (2.88)	5.40 (2.95)
Family location				
Urban	11.56 (2.73)	12.39 (2.32)**	4.95 (2.90)	5.29 (2.94)
Rural	11.34 (2.44)	12.02 (2.32)	5.17 (2.70)	5.38 (2.81)
Family income				
Low	10.15 (2.87)**	11.12 (2.68)**	5.21 (2.94)	5.40 (2.72)
Middle	11.40 (2.45)	12.13 (2.26)	5.14 (2.80)	5.41 (2.88)
High	12.19 (2.57)	12.86 (2.16)	4.80 (2.64)	5.11 (2.86)
Father occupation				
Farming	11.20 (2.43)**	11.99 (2.17)*	5.13 (2.60)	5.44 (2.77)
Others	11.58 (2.62)	12.29 (2.40)	5.06 (2.89)	5.30 (2.92)
Mother occupation				
Farming	11.33 (2.40)	12.00 (2.21)**	5.16 (2.60)	5.50 (2.75)
Others	11.52 (2.68)	12.32 (2.37)	5.04 (2.91)	5.26 (2.93)
Father education				
Junior or lower	11.21 (2.52)**	11.98 (2.30)**	5.22 (2.79)	5.33 (2.77)
Senior or higher	11.67 (2.57)	12.41 (2.31)	4.99 (2.83)	5.39 (2.98)
Mother education				
Junior or lower	11.32 (2.44)*	12.02 (2.25)**	5.16 (2.72)	5.39 (2.80)
Senior or higher	11.66 (2.75)	12.48 (2.37)	4.96 (2.94)	5.29 (3.03)
School location				
Major city	10.87 (2.65)**	11.80 (2.50)**	4.98 (2.84)	5.13 (2.76)
County city	11.82 (2.71)	12.52 (2.24)	5.02 (2.83)	5.39 (2.99)
Rural town	11.48 (2.27)	12.13 (2.22)	5.22 (2.70)	5.49 (2.80)
School year				
Year 7	12.64 (2.17)**	13.00 (2.27)**	4.56 (2.56)**	4.61 (2.61)**
Year 8	11.56 (2.56)	12.20 (2.35)	5.47 (2.68)	5.52 (2.64)
Year 9	11.36 (2.60)	12.25 (2.32)	5.07 (2.83)	5.46 (2.91)
Year 10	11.38 (2.52)	12.27 (2.10)	5.22 (2.85)	5.67 (3.03)
Year 11	11.01 (2.39)	11.73 (2.33)	5.19 (2.61)	5.46 (2.71)
Year 12	10.75 (2.79)	11.69 (2.36)	4.86 (3.12)	5.29 (3.16)

Note. *SD* = standard deviation; PBI = Parental Bonding Inventory. The sample size for each variable was not necessarily identical due to missing.

* $p < .05$; ** $p < .01$ (*t*-test or One-way ANOVA when appropriate)

Appendix table 12.3. Mean Scores (*SDs*) of GSES, Family and School Connectedness by Demographics in a Chinese Sample of Secondary School Students (*N* = 1627)

	GSES	Family connectedness	School connectedness
Total	26.91 (5.95)	3.79 (0.68)	14.25 (4.11)
Sex			
Male	27.77 (5.97)**	3.77 (0.67)	14.02 (4.27)*
Female	25.78 (5.73)	3.81 (0.69)	14.53 (3.85)
Age			
11-14	28.51 (6.30)**	3.95 (0.70)**	15.36 (4.27)**
15-16	26.57 (5.66)	3.76 (0.64)	14.25 (3.89)
17-20	25.76 (5.53)	3.66 (0.67)	13.19 (3.89)
Family location			
Urban	27.97 (6.48)**	3.79 (0.74)	14.41 (4.30)
Rural	26.14 (5.40)	3.79 (0.64)	14.12 (3.97)
Family income			
Low	25.53 (6.16)**	3.49 (0.78)**	13.29 (4.59)**
Middle	26.55 (5.66)	3.78 (0.65)	14.25 (4.00)
High	28.85 (6.42)	3.97 (0.68)	14.71 (4.16)
Father occupation			
Farming	25.74 (5.22)**	3.77 (0.63)	14.37 (3.89)
Others	27.53 (6.24)	3.80 (0.70)	14.21 (4.22)
Mother occupation			
Farming	25.96 (5.29)**	3.79 (0.63)	14.29 (3.90)
Others	27.57 (6.27)	3.80 (0.70)	14.22 (4.25)
Father education			
Junior or lower	26.05 (5.42)**	3.72 (0.67)**	14.21 (4.02)
Senior or higher	27.83 (6.28)	3.87 (0.67)	14.24 (4.21)
Mother education			
Junior or lower	26.12 (5.51)**	3.76 (0.63)**	14.22 (4.04)
Senior or higher	28.18 (6.31)	3.87 (0.73)	14.27 (4.24)
School location			
Major city	27.22 (6.33)**	3.64 (0.72)**	14.83 (3.91)**
County city	27.49 (6.27)	3.87 (0.69)	13.67 (4.37)
Rural town	26.09 (5.18)	3.83 (0.62)	14.40 (3.92)
School year			
Year 7	29.56 (6.41)**	4.12 (0.65)**	17.20 (3.23)**
Year 8	26.74 (5.63)	3.82 (0.69)	13.98 (4.25)
Year 9	27.82 (6.46)	3.77 (0.71)	13.59 (4.37)
Year 10	26.27 (5.11)	3.79 (0.61)	15.04 (3.55)
Year 11	25.36 (5.27)	3.70 (0.64)	13.36 (3.64)
Year 12	26.12 (5.97)	3.56 (0.69)	12.55 (3.91)

Note. *SD* = standard deviation; GSES = Generalized Self-Efficacy Scale. The sample size for each variable was not necessarily identical due to missing.

* $p < .05$; ** $p < .01$ (*t*-test or One-way ANOVA when appropriate)

Appendix table 12.4. Mean Scores (*SDs*) of CES-D, Happiness Scores by Demographics in a Chinese Sample of Secondary School Students (*N* = 1627)

	CES-D	Happiness scores			
		Happiness at home	Happiness at school	Happiness overall	Total average score
Total	15.58 (9.36)	5.73 (1.55)	4.75 (1.73)	5.36 (1.57)	5.28 (1.33)
Sex					
Male	15.16 (9.16)*	5.63 (1.64)*	4.68 (1.80)	5.32 (1.62)	5.21 (1.41)
Female	16.15 (9.63)	5.82 (1.43)	4.82 (1.62)	5.39 (1.52)	5.34 (1.23)
Age					
11-14	13.30 (9.14)**	6.03 (1.52)**	5.09 (1.87)**	5.73 (1.62)**	5.62 (1.42)**
15-16	15.67 (9.06)	5.73 (1.55)	4.74 (1.69)	5.38 (1.53)	5.28 (1.26)
17-20	17.64 (9.41)	5.44 (1.53)	4.42 (1.56)	5.01 (1.49)	4.96 (1.24)
Family location					
Urban	15.00 (9.42)*	5.76 (1.56)	4.97 (1.78)	5.47 (1.60)*	5.40 (1.35)**
Rural	16.00 (9.31)	5.70 (1.55)	4.58 (1.67)	5.28 (1.55)	5.18 (1.32)
Family income					
Low	19.51 (10.98)**	4.99 (1.87)**	4.16 (1.74)**	4.65 (1.69)**	4.60 (1.44)**
Middle	15.67 (8.86)	5.75 (1.48)	4.77 (1.68)	5.35 (1.54)	5.29 (1.29)
High	13.41 (9.58)	6.00 (1.51)	4.97 (1.83)	5.75 (1.50)	5.58 (1.31)
Father occupation					
Farming	15.96 (9.17)	5.64 (1.57)	4.56 (1.67)**	5.27 (1.53)	5.16 (1.30)**
Others	15.35 (9.43)	5.78 (1.53)	4.86 (1.75)	5.42 (1.59)	5.35 (1.34)
Mother occupation					
Farming	16.06 (9.33)	5.70 (1.55)	4.57 (1.65)**	5.26 (1.55)*	5.17 (1.30)
Others	15.27 (9.39)	5.75 (1.55)	4.86 (1.77)	5.44 (1.59)	5.35 (1.35)
Father education					
Junior or lower	16.13 (9.42)	5.64 (1.58)*	4.63 (1.68)*	5.28 (1.56)*	5.18 (1.31)**
Senior or higher	15.25 (9.26)	5.80 (1.51)	4.85 (1.76)	5.44 (1.59)	5.37 (1.34)
Mother education					
Junior or lower	16.05 (9.31)	5.69 (1.53)	4.69 (1.68)	5.32 (1.57)	5.23 (1.30)
Senior or higher	15.11 (9.57)	5.77 (1.57)	4.82 (1.79)	5.43 (1.59)	5.34 (1.38)
School location					
Major city	15.05 (9.40)*	5.53 (1.66)**	5.18 (1.58)	5.36 (1.60)	5.36 (1.37)
County city	16.44 (10.01)	5.89 (1.43)	4.63 (1.79)	5.45 (1.51)	5.32 (1.31)
Rural town	15.11 (8.55)	5.72 (1.56)	4.53 (1.71)	5.29 (1.61)	5.18 (1.32)
School year					
Year 7	11.44 (7.88)**	6.29 (1.47)**	5.46 (1.89)**	5.92 (1.68)**	5.89 (1.48)**
Year 8	14.76 (9.04)	5.85 (1.50)	4.83 (1.79)	5.56 (1.54)	5.41 (1.27)
Year 9	15.81 (9.77)	5.63 (1.64)	4.47 (1.81)	5.32 (1.69)	5.14 (1.40)
Year 10	15.17 (8.72)	5.74 (1.57)	4.97 (1.56)	5.46 (1.43)	5.39 (1.24)
Year 11	17.46 (9.63)	5.64 (1.39)	4.50 (1.48)	5.10 (1.41)	5.08 (1.13)
Year 12	18.48 (9.41)	5.26 (1.56)	4.34 (1.59)	4.87 (1.52)	4.83 (1.28)

Note. *SD* = standard deviation; CES-D = Center for Epidemiological Studies – Depressed Scale. The sample size for each variable was not necessarily identical due to missing.

* $p < .05$; ** $p < .01$ (*t*-test or One-way ANOVA when appropriate)

Appendix table 12.5. Prevalence (%) of Depression (CES-D \geq 24) and Suicidal Behaviours by Demographics in a Chinese Sample of Secondary School Students ($N = 1627$)

	Depression	Suicidal thoughts	Suicidal plans	Suicidal attempts	Smoking	Drinking
Total	291 (18.6)	333 (20.6)	162 (10.0)	29 (1.8)	97 (6.0)	423 (26.2)
Sex						
Male	155 (18.2)	150 (17.0)**	74 (8.4)*	15 (1.7)	79 (9.0)**	288 (32.8)**
Female	134 (19.3)	182 (25.5)	87 (12.2)	14 (2.0)	17 (2.4)	133 (18.6)
Age						
11-14	64 (12.7)**	98 (18.7)	49 (9.4)	10 (1.9)	30 (5.8)	107 (20.5)**
15-16	91 (18.0)	123 (23.3)	60 (11.4)	12 (2.3)	33 (6.3)	158 (30.0)
17-20	134 (24.8)	110 (19.9)	52 (9.4)	7 (1.3)	34 (6.2)	153 (27.8)
Family location						
Urban	117 (17.8)	164 (24.4)**	95 (14.2)**	19 (2.8)**	57 (8.5)**	204 (30.4)**
Rural	172 (19.2)	169 (18.1)	67 (7.2)	10 (1.1)	40 (4.3)	218 (23.4)
Family income						
Low	52 (33.8)**	41 (26.3)	24 (15.5)*	8 (5.2)**	13 (8.3)	42 (26.9)
Middle	198 (18.2)	223 (19.8)	102 (9.0)	12 (1.1)	61 (5.4)	295 (26.2)
High	41 (13.1)	68 (21.1)	36 (11.2)	9 (2.8)	23 (7.2)	86 (26.7)
Father occupation						
Farming	102 (18.7)	92 (16.1)**	38 (6.7)**	6 (1.1)	24 (4.2)*	129 (22.6)*
Others	186 (18.5)	236 (22.9)	122 (11.9)	23 (2.2)	71 (6.9)	291 (28.3)
Mother occupation						
Farming	125 (19.9)	116 (17.7)*	47 (7.2)**	7 (1.1)	26 (4.0)**	148 (22.7)**
Others	164 (17.8)	214 (22.6)	114 (12.1)	22 (2.3)	70 (7.4)	269 (28.5)
Father education						
Junior or lower	155 (19.7)	156 (19.1)	79 (9.7)	13 (1.6)	44 (5.4)	211 (25.8)
Senior or higher	125 (18.1)	160 (22.6)	78 (11.0)	16 (2.3)	49 (6.9)	193 (27.3)
Mother education						
Junior or lower	183 (19.5)	182 (18.8)**	86 (8.9)*	14 (1.5)	46 (4.8)*	244 (25.2)
Senior or higher	97 (17.8)	137 (24.4)	71 (12.7)	14 (2.5)	46 (8.2)	158 (28.2)
School location						
Major city	66 (15.3)**	108 (24.0)	58 (12.9)**	14 (3.1)**	36 (8.0)**	133 (29.6)
County city	131 (22.9)	119 (20.7)	63 (11.0)	12 (2.1)	42 (7.3)	153 (26.7)
Rural town	94 (16.8)	106 (18.0)	41 (7.0)	3 (0.5)	19 (3.2)	137 (23.3)
School year						
Year 7	22 (9.4)**	25 (10.3)**	14 (5.8)**	3 (1.2)	3 (1.2)**	32 (13.2)**
Year 8	40 (14.9)	61 (21.3)	25 (8.7)	4 (1.4)	20 (7.0)	78 (27.2)
Year 9	50 (19.1)	74 (27.5)	43 (16.0)	11 (4.1)	26 (9.7)	90 (33.5)
Year 10	50 (18.5)	60 (21.8)	23 (8.4)	3 (1.1)	13 (4.7)	74 (26.9)
Year 11	65 (22.6)	62 (20.9)	27 (9.1)	5 (1.7)	15 (5.1)	89 (30.0)
Year 12	64 (26.7)	51 (21.0)	30 (12.4)	3 (1.3)	20 (8.2)	60 (24.8)

Note. CES-D = Center for Epidemiological Studies – Depressed Scale. The sample size for each variable was not necessarily identical due to missing.

* $p < .05$; ** $p < .01$ (Chi-Square test or Fisher's Exact Probability test when appropriate)