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The longitudinal relationship between Chinese high school students' academic stress and academic motivation

Yangyang Liu

Nanjing University, China

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ABSTRACT

In a sample of 298 Chinese high school students, the present study examined the prediction of students' academic stress on their academic motivation in the subject of mathematics. The results showed that Chinese high school students' academic stress at grade 10 negatively predicted their intrinsic motivation and positively predicted their amotivation at grade 12. Furthermore, the results revealed that academic stress was not significantly related to extrinsic motivation. Our findings suggest that reducing academic stress can increase students' intrinsic motivation and reduce their amotivation.

In the existing literature, a number of studies indicated that stress was significantly related to several facets of an individual's psychological functioning (Lupien, McEwen, Gunnar, & Heim, 2009) (Liu & Lu, 2012). Among them, a few studies using rodents (Barr & Phillips, 1998; Kleen, Sitorner, Killeen, & Conrad, 2006) and human beings (Shinto, 1998) showed that stress was negatively related to motivation. Academic stress that largely came from work overload, the amount of material to learn, and the need to perform well (Huan, See, Ang, & Har, 2008) was an important source of students' everyday stress (Byrne, Davenport, & Mazanov, 2007; Kaplan, Liu, & Kaplan, 2005), particularly in Asian countries (Ang, Huan, & Braman, 2007; Liu & Lu, 2011). In empirical research, academic stress has been widely linked to several developmental outcomes such as adjustment (Kenny, Gallagher, Alvarez-Salvat, & Silsby, 2002), mental health (Byrne et al., 2007; Hankin, Mermelstein, & Roesch, 2007), and academic achievement (Kaplan et al., 2005; Liu & Lu, 2011). However, until now, very limited studies have examined the relationship between students' academic stress and their academic motivation (Baker, 2004; Park et al., 2012).

Nearly three decades ago, Deci and Ryan (1985) proposed that academic motivation could be divided into intrinsic motivation, extrinsic motivation, and amotivation. These three kinds of motivation are on a motivational continuum based on the amount of self-determination (Deci & Ryan, 2000; Park et al., 2012). Intrinsic motivation is defined as the drive from the inherent pleasure of an academic activity (Vansteenkiste, Lens, & Deci, 2006). Extrinsic motivation consisted of three types: external regulation, introjected regulation, and identified regulation (Deci & Ryan, 1985). External regulation refers to students' learning behaviors that are controlled by external outcomes such as a high salary in the future (Otis, Grouzet, & Pelletier, 2005). When introjected regulated, students participate in academic activities in order to meet their own expectations. Identified regulation is motivation that students are driven by the importance of their learning behaviors (Otis et al., 2005). Amotivation is “a lack of intention or value for behavior that results in either no action or passive behavior” (Garn, Matthews, & Jolly, 2010). In previous research, very limited studies (Baker, 2004; Park et al., 2012) have examined the relationship between stress and academic motivation by using the framework of the self-determination theory's (SDT) multidimensional perspective of motivation (Deci & Ryan, 1985). The results indicated that students' academic motivation was a predictor of their stress (Baker, 2004; Park et al., 2012). Furthermore, limited evidence showed that intrinsic motivation as a higher form of self-determined motivation was negatively correlated with academic stress and amotivation as a lower form of self-determined motivation was positively correlated with academic stress (Baker, 2004; Park et al., 2012). About extrinsic motivation, Park et al.'s (2012) study found that external regulation was negatively and identified regulation was positively correlated with stress, while introjected regulation was not correlated with stress.

On the other side, some researchers posited that perceived competence could also influence the development of academic motivation (Deci & Ryan, 1985). A low level of perceived competence could decrease intrinsic motivation and increase amotivation (Deci, Vallerand, Pelletier, & Ryan, 1991). In the present study, we sought to explore whether students' academic stress can predict their academic motivation in the subject of mathematics by using the SDT's multidimensional

E-mail address: liuyangyang661@sina.com.

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perspective of motivation. It was expected that: (1) academic stress negatively predicted intrinsic motivation and external regulation; (2) academic stress positively predicted amotivation and identified regulation; and (3) academic stress did not significantly predict introjected regulation. In previous studies, researchers found that female students displayed higher intrinsic motivation and less extrinsic motivation and amotivation than male students (Vecchione, Alessandri, & Marsicano, 2014). Hence, in this study, students' gender was treated as a control variable.

1. Method

1.1. Participants and procedures

Two hundred ninety eight grade 10 students (150 girls, 148 boys) who were from three urban high schools located at Nanjing, People's Republic of China agreed to participate in our investigation. Their mean age was 16.46 years (SD = .52) at grade 10. We measured students' academic stress at grade 10 and their academic motivation at both grades 10 and 12. Ethical approval for the study was granted by our institution and informed consent was obtained from students and their parents.

1.2. Measures

1.2.1. Academic stress

Academic stress was assessed with a six-item scale in Chinese (e.g., I feel stress when a mathematical test comes). Students were asked to respond on a five-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). In the present study, an exploratory factor analysis showed that only one factor could be identified among the six items. The reliability of the scale was also good ($\alpha = .82$).

1.2.2. Academic motivation

Academic motivation was measured by a twenty-item scale. The scale was adapted from Vallerand et al.'s (1992) scale on academic motivation (the original scale can be seen on Otis et al., 2005). The scale had five subscales: intrinsic motivation, identified regulation, introjected regulation, external regulation, and amotivation. Items were possible answers to the question "Why do you go to mathematical classes?". The anchor labels for the scales were (1) strongly disagree and (5) strongly agree. The psychometric properties of this scale were well established in previous research (Vallerand et al., 1992). In this study, the internal consistencies of the subscales at both waves were adequate (for intrinsic motivation, $\alpha s = .82–.87$; for identified regulation, $\alpha s = .74–.80$; for introjected regulation, $\alpha s = .72–.80$; for external regulation, $\alpha s = .72–.76$; and for amotivation, $\alpha s = .72–.75$; respectively).

2. Results

Means, standard deviations (SD), and inter-correlations of the variables are shown in Table 1. According to the suggestion of Otis et al. (2005), missing values for the variables (less than 5%) were filled by the expectation–maximization algorithm (Dempster, Laird, & Rubin, 1977). Paired sample T tests indicated that Chinese high school students' academic motivation in the subject of mathematics did not significantly change during two academic years (for intrinsic motivation, T = −.15, df = 297, *ns*; for identified regulation, T = −.75, df = 297, *ns*; for introjected regulation, T = 1.66, df = 297, *ns*; for external regulation, T = .46, df = 297, *ns*; and for amotivation, T = −1.28, df = 297, *ns*). Multiple regression was next conducted to examine the prediction of Chinese high school students' academic stress at grade 10 on their academic motivation at grade 12. During analysis, gender and students' academic motivation at grade 10 were controlled. Boys were coded as 0 and girls were coded as 1. Each model was shown as follows:

$$\text{Intrinsic motivation(grade 12)} = 0.35\ \text{intrinsic motivation(grade 10)} - 0.28\ \text{academic stress} + 0.14\ \text{gender}.$$

$$\text{Identified regulation(grade 12)} = 0.23\ \text{identified regulation(grade 10)} - 0.08\ \text{academic stress} + 0.02\ \text{gender}.$$

$$\text{Introjected regulation(grade 12)} = 0.43\ \text{introjected regulation(grade 10)} + 0.00\ \text{academic stress} + 0.05\ \text{gender}.$$

$$\text{External regulation(grade 12)} = 0.45\ \text{external regulation(grade 10)} - 0.04\ \text{academic stress} - 0.09\ \text{gender}.$$

$$\text{Amotivation(grade 12)} = 0.28\ \text{amotivation(grade 10)} + 0.37\ \text{academic stress} - 0.02\ \text{gender}.$$

The results indicated that Chinese high school students' academic stress at grade 10 negatively predicted their intrinsic motivation ($\beta = -.28$, $p < .01$) and positively predicted their amotivation ($\beta = .37$, $p < .01$) at grade 12. Moreover, the results revealed that Chinese high school students' academic stress was not significantly related to their extrinsic motivation (for identified regulation, $\beta = -.08$, *ns*; for introjected regulation, $\beta = .00$, *ns*; and for external regulation, $\beta = -.04$, *ns*).

Table 1
Descriptive data and inter-correlations among academic stress and academic motivation.

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Academic stress (grade 10)											
2. Intrinsic motivation (grade 10)	−.37**										
3. Identified regulation (grade 10)	−.14*	.38**									
4. Introjected regulation (grade 10)	−.20**	.38**	.49**								
5. External regulation (grade 10)	.09	−.06	.44**	.50**							
6. Amotivation (grade 10)	.19**	−.46**	−.16**	−.16**	.18**						
7. Intrinsic motivation (grade 12)	−.41**	.44**	.17**	.27**	.03	−.28**					
8. Identified regulation (grade 12)	−.11	.12*	.24**	.29**	.28**	.07	.37**				
9. Introjected regulation (grade 12)	−.09	.08	.21**	.42**	.32**	−.04	.45**	.48**			
10. External regulation (grade 12)	.00	−.01	.21**	.30**	.45**	.26**	.05	.53**	.46**		
11. Amotivation (grade 12)	.42**	−.37**	−.08	−.12*	.15*	.35**	−.58**	−.26**	−.19**	.07	
Mean	16.51	14.11	14.16	13.81	14.09	8.62	14.14	14.25	13.47	13.99	8.93
SD	4.80	4.30	3.88	3.60	3.83	3.74	3.46	3.38	3.01	3.49	3.68

Note. N = 298.
* $p < 0.05$.
** $p < 0.01$.