Relationship between Academic Challenge Stress and Creativity

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Contributor: Hao Yao , Shuzhen Chen , Ang Liu

Creativity, a multidimensional construct, is commonly defined as the production of novel and useful ideas or solutions. The quality of graduate student cultivation, especially their level of creativity, largely determines the quantity and quality of innovative talents. Therefore, improvement of graduate student creativity is also considered as an important indicator for evaluating the quality of higher education. How to cultivate and stimulate graduate student creativity and thus enhance the innovation capacity and performance of universities has gradually become the focus of universities. However, creativity as an important feature of graduate student performance has received little academic attention. Studies showed that challenge stress has a positive impact on an individual's life, work, and personal growth. In addition, challenge stress is a positive stressor that enhances innovation performance.

academic challenge stress creativity resilience academic self-efficacy heterogeneity

1. Introduction

Previous studies have mostly analyzed the factors influencing creativity in terms of psychological and organizational factors (Anderson et al. 2014; Standing et al. 2016). But research stressing creativity is not very mature, and scholars often take stress as a negative factor affecting individual abilities. Indeed, there has been no consistent conclusion on the theoretical attributions, effects, and underlying mechanisms of different stressors affecting creativity (Byron et al. 2010; Cai et al. 2022). Hon and Lui (2016) suggest that stress deserves more attention as a key factor in creativity. Current research on the effects of stress on individual creativity can be divided into positive functional theory, negative stress theory, and stress balance theory. Functionalism is based on the idea that "stress is motivation". That is, stress can motivate individuals' sense of achievement and efficacy. This is because they see difficult tasks as a great opportunity to improve their skills and knowledge. Moreover, when they are under great stress, they are stimulated to be more challenged, and individuals have higher levels of positive motivation in trying to achieve their goals (LePine et al. 2004). In other words, the process of overcoming stress can awaken creativity (Bunce and West 1994; Yeh et al. 2015). Negative stress theory is a pessimistic perception that stress depletes cognitive resources. Individuals facing external pressures may experience work overload, role ambiguity, and role conflict and perceive that they do not have abilities to perform satisfactorily at work, which may result in stress reactions that cause individuals to experience physical and psychological symptoms (Devereux et al. 2009) and even weaken creativity (Talbot et al. 1992; Grosser et al. 2018). The equilibrium theory suggests an inverted U-curve relationship between stress and creativity, with the right level of stress maximizing creativity (Baer and Oldham 2006; Shao et al. 2019; Antwi et al. 2019). In response to the

findings that stress affects creativity differently, a specific categorization framework of challenge versus blocking stress has been proposed, i.e., there are also “good” and “bad” categories of stress, and differences in the nature of stress may be a key factor in explaining differences in creativity outcomes (Byron et al. 2010; Byron et al. 2018). Challenge stress may originate from positive stressors. Challenge stress comes from the environment, such as competition, work, study, family, etc. It can also come from internal motivation, such as self-motivation, self-challenge, self-actualization, etc. Challenge stressors can help people attain higher achievement, stimulate their potential, and promote positive psychological experiences after individuals achieve their goals (LePine et al. 2005, 2016).

Little research on the relationship between challenge stress and creativity has focused on the field of graduate education. Zhao et al. (2021) analyzed the effect of advisor–student relationships on student creativity, analyzing challenge stress as a mediating variable. Eisenberg and Thompson (2011) analyzed the role of stress of students as a mechanism influencing creative performance during improvisation. However, there is a lack of research on academic challenge stress and the creativity of graduate students. Academic challenge stress focuses on the academic field and refers to positive stress in terms of academic responsibilities, academic tasks, academic goals, and academic workload.

The relationship between challenge stress and creativity may be influenced through the mediating role of resilience (Liang et al. 2021) and academic self-efficacy (Zhang et al. 2018). Resilience refers to a person’s ability to coordinate and adapt psychologically when they are facing adversity such as difficulties, setbacks, and failures (Holdsworth et al. 2018). It relates to an individual’s ability to recover from risk and stress and has been widely recognized as an important competency for graduate students’ development (Van Kessel et al. 2022). Self-efficacy refers to an individual’s judgment of his or her ability to organize and perform to achieve desired goals (Bandura 1997). Academic self-efficacy is self-efficacy in a particular academic field. Academic self-efficacy is defined as the learner’s judgment of one’s ability to successfully achieve academic outcomes in a given academic context (Elias and MacDonald 2007). It is more specifically regarded as a graduate student’s perceived ability to successfully deal with different curriculum, learning activities, academic research projects, and faculty–student peer relationships (Greco et al. 2022).

This study of the relationship between academic challenge stress and creativity is unique to Chinese graduate students. According to statistics from the Chinese Ministry of Education, there were 3.33 million graduate students in China in 2021. Unfortunately, with such a large graduate student population, Chinese graduate students lack creativity education, and creativity research has not received sufficient attention (Pang and Plucker 2012). In addition, Chinese graduate students face complex academic stress. Intense academic competition has transferred the stress to graduate students, which has significantly increased the stress on graduate students in terms of academic performance and publication (Li 2016; Wang et al. 2019). Actually, current research on graduate students’ academic stress in the Chinese context does not strictly distinguish between challenge stressors that have positive effects and hindering stressors that have negative effects.

2. Academic Challenge Stress and Creativity

Most graduate students face two differential outcomes when they suffer from academic stress. The first one is that academic stress drives graduate students to engage in academic activities and prompts them to enhance their creativity (Sun et al. 2019). Another outcome is that the academic stress seriously increases the psychological burden of graduate students, leading to a negative psychological state and resistance, which may also breed academic corruption and academic misconduct, not to mention the inability to enhance individual creativity (He and Wong 2015). The reason for the two different results on the impact on graduate student creativity is that there are differences in the types of stressors. LePine et al. (2004) explain that stressors can be categorized into challenging and hindering stressors based on differences in their attributes. Although stress sounds slightly negative, academic challenge stress appears to be a positive element because it is understood to be stress that individuals believe they can overcome and that is beneficial to their own work performance and academic development. Taking on the appropriate stress is accompanied by a corresponding reward and a sense of recognition of the value of the current academic work (Travis et al. 2020). Moreover, academic challenge stress usually has benefits on individual outputs. For example, Zhu et al. (2017) showed that academic challenge stress was positively associated with students' academic performance. For the purpose of this research, an example of academic challenge stress in the graduate student context is "I can conduct independent research and complete difficult academic tasks and workloads, and take on challenging academic responsibilities".

Previous studies showed that challenge stress has a positive impact on an individual's life, work, and personal growth (Liu and Ren 2022; LePine et al. 2005). In addition, challenge stress is a positive stressor that enhances innovation performance (Cai et al. 2022; Moin et al. 2022). In terms of the reason why challenge stress affects creativity performance, from a psychological perspective, the Conservation of Resources (COR) Model indicates (Halbesleben et al. 2014) that individuals strive to protect their resources and obtain additional resources in all situations. Challenge stress may largely result in a successful outcome. If a person enjoys challenging and creative tasks, this leads to a spiral of individual resource acquisition, which increases positive emotions and creative performance (Akinola et al. 2019). Kim and Beehr (2018) found that challenge stressors can promote individuals to produce better work behaviors and enhance achievement motivation and psychological empowerment as a way to promote creativity. Akinola et al. (2019) argued that explanations of physiological responses to stress can inspire scholars to understand the relationship between stress and creativity. The effect of stress on creative performance critically depends on whether stress-inducing situations engender challenging physiological states (i.e., fluid physiological stress responses). The transactional model of stress predicts that an individual facing a creative task will first appraise whether engaging in the creative task is likely to be beneficial or harmful (Li et al. 2018). For example, if an individual is faced with the need for creativity to solve a problem, he will judge whether it is worth investing time to solve and overcome the problem based on what is at stake for him in the current situation (Akinola et al. 2019). When graduate students are confronted with academic tasks that require creativity, they show higher levels of creativity when they view the experience of the academic task as a challenge rather than a threat.

3. The Mediating Effect of Resilience

Garmezy et al. (1984) identified three primary models of resilience including the compensatory model, protective factor model, and challenge model. The challenge model refers to the fact that challenge stress actually increases resilience. Wister et al. (2016) describe resilience as the dynamic process by which individuals use personal, life, and environmental resources to effectively negotiate, adapt, and manage stressors in order to adapt to adversity. Moderate challenge stress, especially when individuals are able to adapt to and overcome such stress, actually contributes more to individual resilience (Smith and van der Meer 1994; McLaughlin et al. 2008).

Thomson (2020) highlights the close relationship between resilience and creativity. Resilient and creative individuals share characteristics such as flexibility, initiative, resourcefulness, adaptability, spontaneity, and originality (McFadden and Basting 2010). It also includes emotional positivity, as individuals with high resilience can cope with critical situations with humor, creative exploration, and optimistic thinking (Fredrickson et al. 2003) and generate higher levels of creativity (López-Aymes et al. 2020). Individuals with high resilience also have higher individual adaptive cognition and divergent thinking patterns (Cranney and Morris 2011), which is a component of creative potential (Runco 2008). Adaptive cognition and divergent thinking patterns enable them to understand problems in complex situations from different perspectives and find possible solutions to overcome various difficulties with creativity (Kashdan and Rottenberg 2010). When graduate students face academic challenge stress, for example, when they choose a research topic, summarize existing empirical evidence in the literature review, and outline a research design, they may undertake the stress of an academic research task with high goals. The stressful process of academic research can help them to develop a certain level of initiative and adaptability to promote resilience. After overcoming this academic stress, they can generate higher achievement, motivation, etc., which promotes the creativity of graduate students (Eisenberg and Thompson 2011).

4. Mediating Effects of Academic Self-Efficacy

When graduate students face academic challenge stress, the supervisor or organization assigns more academic research tasks to them, which indicates the expectation, trust, and empowerment of the organization and supervisor, and the graduate students are convinced that they are fully capable of achieving their academic research tasks or goals by putting in extra efforts and gaining high moral benefits after achieving their goals, and this social persuasion effect helps stimulate positive psychological states such as the self-efficacy of graduate students (Widmer et al. 2012; Prem et al. 2017). Hence, academic challenge stress can promote academic self-efficacy.

Social cognitive theory suggests that self-efficacy is an important motivator for individuals to sustain their efforts in the face of challenges to achieve their goals (Gong et al. 2009). Graduate students with high academic self-efficacy are more likely to set challenge goals that change the status quo, generate novel and useful ideas, work hard to achieve their goals, and persevere in the face of difficulties and failures (Liao et al. 2010). Graduate students with high self-efficacy also tend to have the confidence and ability to make a difference and generate creative ideas (Tierney and Farmer 2011). Empirical research also confirms that self-efficacy is a positive predictor of creativity (Liao et al. 2010; Kim et al. 2019).

5. The Chain Mediating Effect of Resilience and Academic Self-Efficacy

Research on the relationship between resilience and self-efficacy has been recognized as an important topic (Schwarzer and Warner 2013; Sagone and De Caroli 2016a). According to Hurtes and Allen's (2001) approach and the revised model of resilience by De Caroli and Sagone (2014), individuals with high resilience have distinguishing characteristics, such as the ability to know how to deal with problems in unfavorable environments or under significant stress. It reflects the tendency of individuals with high resilience to look for the "positive side" of difficult situations. They can manage stress with positive emotion and regulate behavior (Sagone et al. 2020). These characteristics are positively associated with Bandura's (2007) sense of self-efficacy. As in Hamill's (2003) study, analyses based on the distribution of students' levels of resilience indicated that differences in resilience were an important feature in distinguishing students' self-efficacy. Sagone and De Caroli's (2016b) study also found that adolescents with high resilience showed greater self-efficacy than those with less resilience in general (and in academic settings in particular). Therefore, this research concluded that graduate student resilience contributes to academic self-efficacy. Meanwhile, resilience underlies an individual's ability to deal with stress and anxiety (Holdsworth et al. 2018; Brannick et al. 2005), which can be affected by academic stress (Caruana 2014). Academic self-efficacy in turn positively affects individual creativity (Shaabani et al. 2011).

6. Heterogeneity of Effects on Creativity

There may be a difference in the effects of stress, resilience, and academic self-efficacy on creativity across individuals. Individuals with high levels of creativity may have different characteristics than those with low levels of creativity, and individuals with higher levels of creativity may have better openness, unconventionality, and ambition (Helson and Srivastava 2002). And these characteristics will cause stress to have differential effects on individuals with different levels of creativity. Therefore, it is necessary to analyze the impact effects on graduate students with different creativity. Furthermore, in terms of the relationship between resilience and creativity, López-Aymes et al. (2020) argued that resilience is a dynamic rather than a linear process, and that it can evolve in response to shifts in people and their environmental subsystems. Therefore, there may also be individual differences in the relationship between resilience and creativity. De Caroli and Sagone (2014) found a significant relationship between creative personality traits and resilience in adolescents, and the more creative individuals perceived themselves to be, the more they tended to work on finding new solutions to their problems in a resilient way. Thus, the effect of resilience on creativity may vary due to the individuals' own level of creativity and thus the differences in impact. As far as the relationship between academic self-efficacy and creativity is concerned, Haase et al. (2018) analyzed that most of the existing studies present a positive correlation between creative performance and creative self-efficacy, but the results of these studies indicate that the strength of the association varies and that there will be variability in the individual impact due to the influence of some moderating variables.

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