

*The Influence of Growth Mindset and Grit on Self-Efficacy Among  
Chinese Undergraduates*

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**Abstract**

In recent studies, growth mindset and grit have been widely adopted as two common indicators of undergraduates' self-efficacy. However, the majority of studies are conducted among western samples. Moreover, the extent to which growth mindset and grit would impact self-efficacy simultaneously has not been systematically studied. The study first explores the influence of the two indicators in China and then examines the two dimensions of grit - consistency of interest and the perseverance of effort - and compares their influences on self-efficacy. 150 questionnaires were collected from undergraduate students across China, measuring their responses on Learning Questionnaire Manual, GRIT-S and 8-item Growth Mindset Scale. Multiple linear regression models were used to study their relationships while controlling GPA as an important covariate. The study concludes that while grit is an effective indicator of self-efficacy, only the effort preservation dimension contributes to the statistical significance. Another noteworthy finding is that compared to growth mindset, grit (with its effort dimension alone) is a stronger predictor of undergraduate students' self-efficacy.

Keywords: Self-Efficacy, Grit, Growth Mindset

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## **1. Introduction**

Self-efficacy has been one of the hotspots in psychological research in recent years. It denotes a person's belief in his or her abilities to carry out behaviors needed to perform certain attainments (Bandura, 1977). Self-efficacy is a meaningful indicator of an individual's confidence and capacity to control over his or her motivation and endeavors. In psychological terms, it serves as a reliable representation of an individual's perception of surrounding social factors (Miller & Dollard, 1941). Regarding the development of university students, self-efficacy is widely accepted as a predictor of academic success - an individual with high self-efficacy tends to think they can do well, and is more likely to actually perform well (Gist & Mitchell, 1992). In a university where each student serves as an active part of a large social group, self-efficacy is also crucial in realizing one's potential to contribute to the group setting (Ormrod, 1999).

The interrelationships between self-efficacy, grit and growth mindset have obtained great empirical attention. A great variety of studies incorporate self-efficacy with grit and growth mindset. For instance, Alhadabi and Karpinski (2020) demonstrated that grit and self-efficacy, as two types of personalities, can jointly offset negative factors in academic study. Further, several recent studies revealed that self-efficacy is a complex attribute not only correlated to, but also dependent on grit and growth mindset. Specifically, Usher et al. (2019) found a positive correlation between grit and self-efficacy, and De La Cruz et al. (2021) further discovered that grit contributes to self-efficacy. Similarly, Rhew et al. (2018) designed a quasi-experiment to conclude that a growth mindset intervention would improve students' self-efficacy. Wangwongwiroj and Yasri (2021) further indicated such a positive correlation between growth mindset and self-efficacy with surveys.

From former western studies one may conclude that both growth mindset and grit correlate positively to self-efficacy. However, there are three major challenges in the extant literature. Firstly, relevant conclusions are yet to be proved reliable in global terms. Also, it remains unresolved whether growth mindset or grit is a stronger predictor of self-efficacy. Moreover, out of the two different dimensions of grit, namely consistency of interest and the perseverance of effort, there are controversies about which attribute contributes more to self-efficacy. In response, our study used questionnaire to examine the contribution of growth mindset, grit to self-efficacy. Referring to principles advocated by Ato et al. (2013), we built multiple linear regression models on an explanatory cross-sectional basis. The paper reports the results of our models and provides insights to tackle the three challenges mentioned above.

## **2. Literature Review**

### **2.1 Self-Efficacy**

The concept of self-efficacy was brought into research scope in the 1970s, and was formerly described by Albert Bandura (1997), which refers to people's belief in their abilities to make plans for prospective attainments. Mastery experiences, vicarious experiences, social persuasion, and emotional states are the most important factors that influence self-efficacy (Bandura 1997). To some extent, self-efficacy not only reflects one's judgement and confidence level of his or her capability, but also provides motivations and polar attitudes to one's behavior.

Previous research shows that self-efficacy plays an indispensable role in academic success.

Students who have high self-efficacy would be actively engaged in risky and chronically increasing goals, making greater efforts, and working with patience and persistence (Bandura 1997; Zimmerman 2000). Subsequent research dives deeper into this topic, discovering that high self-efficacy students credit success to their internal traits and attribute failures to situational factors, while low self-efficacy students consider success to their good luck and think failures as the representation of their weak ability (Hsieh 2010; Salanova 2012). In general, recent researchers concluded that students with high self-efficacy tend to have fewer sensitive feelings and more motivations for their academic outcomes and goals (Kurbanoglu 2010).

## **2.2 Grit**

Grit was first informally introduced in early psychological research as a trait related to adherence and passion in plan fulfillment. Duckworth et al. (2007) defined grit as an indicator of an individual's passion and perseverance for a difficult task without being confronted or frustrated with it. They developed a 12-item grit scale which includes two dimensions - the consistency of interest and the perseverance of effort. Based on the 12-item grit scale, Duckworth and Quinn (2009) later established an 8-item grit scale to improve the efficiency and accuracy of grit measurement.

Duckworth (2007) conducted a series of studies, verifying the causal link that people's talent and effort determine to what extent they are able to achieve academic success. The studies conclude that grit can be a reliable index in assessing the intensity, direction, and duration of one's exertions towards a goal. Specifically, higher grit level is correlated to higher education level, fewer career changes, and higher GPAs at school (Duckworth and Quinn 2009; Strayhorn 2013). In recent years, extensive research has concluded positive relations between grit and self-efficacy. For example, Wolters and Hussain (2015) found that grit can be a predictor of self-regulated learning which builds on self-efficacy.

## **2.3 Growth Mindset**

Psychologist Carol S. Dweck (1999) conducted research on people's beliefs when evaluating the meaning of every event. She classified these beliefs into the fixed mindset and the growth mindset. Individuals with a fixed mindset usually believe that their intelligence is natural and unchangeable, regarding failures as proof of their limited intelligence. As a result, their expectations, as well as possibilities for success, are small. On the contrary, people with a growth mindset believe that their intellect can be learned or changed by hard work, embracing failures as chances to accumulate experience and success as their further motivations to challenge new events (Dweck 2006). From a development point of view, while students with a fixed mindset tend to avoid risk and choose easy tasks to conduct in the fear of failure, students with a growth mindset will make every effort to attain their goals and integrate new learned experiences with the old ones (Dweck 1999).

Recently, researchers have also discovered a direct correlation between growth mindset and self-efficacy. Ferguson (2017) discovered that both traits correlate to academic success to a similar extent, and Keenan (2018) observed that growth mindset impacts self-efficacy directly.

### **3. Method**

A cross-sectional survey was conducted questionnaires with multiple-choice questions were collected from the selected population to deduce each participant's level of growth mindset, grit and self-efficacy as latent variables.

#### **3.1 Participants**

A total of 150 students were recruited, including exactly 75 males and 75 females. All participants in this study were sophomores, juniors, and seniors from three universities with similar rankings in mainland China. The selection of the universities is meant to account for the geological and cultural diversity in China. The three universities are all comprehensive universities with very similar admission cut-off line for the Chinese College Entrance Examination, ensuring that the GPA percentages of individuals from all three universities have equivalent reference value. To address the impact of university social settings, the study chose not to include first-year students who had just matriculated. Among all participants, 44 individuals were sophomores, 58 individuals were juniors, and the remaining 58 were seniors. As for field of study background, 53 students were liberal arts majors. 31 students were science majors. 66 students were engineering majors.

#### **3.2 Instruments**

Our questionnaire produces two classes of variables – independent variables and dependent variables. Demographic variables include gender, major field, year of study and age. It also includes blanks for the ranking of each individual's grade point average (GPA) and the class size, such that the GPA percentage can be automatically computed. All these variables can be directly collected upon students' completion of the background section of our questionnaire. On the other hand, for each individual, the scales of self-efficacy, growth mindset and grit were calculated from his or her responses to a set of relevant multiple-choice questions according to the guidance of the Learning Questionnaire Manual, GRIT-S and 8-item Growth Mindset Scale (all translated into Chinese). Cronbach's alpha (Cronbach, 1951) is utilized to ensure the reliability of the calculated scales.

##### **3.2.1 Scale of Self-Efficacy**

To measure an individual student's self-efficacy, our questionnaire utilized the scale 'Self-Efficacy for Learning and Performance' from Motivated Strategies for Learning Questionnaire Manual (Pintrich et al., 1991). To compute the actual scale of self-efficacy, a student is given seven questions about an item related to his or her self-feeling or thinking tendencies in a particular situation, and is required to choose one of the rates on a seven point Likert scale ranging from 'not at all true of me (1)' to 'very true of me (7).' An example question is 'I believe I will receive an excellent grade in this class.' Taking each one of the seven questions as a distinct variable, we are able to calculate their mutual covariance, and hence Cronbach's Alpha. The Cronbach's Alpha in this study is satisfactory (0.901). Upon good internal consistency within the set of numerical values retrieved from each question, we simply take the mean of a student's selected rates as the scale of self-efficacy.

### **3.2.2 Scale of Grit**

The Short Grit Scale (GRIT-S) in 2009 contains 8 items (Duckworth & Quinn, 2009), all of which are referred to in a one-to-one correspondence with a question in our questionnaire. Specifically, GRIT-S is made up of two subscales - consistency of interest and perseverance of effort, each containing 4 items. Similarly, in the questionnaire, students choose a rate for themselves from 'not at all like me (1)' to 'very much like me (5)' on eight questions that each covers an item. As the items which correspond to the consistency of interest subscale are negatively worded items, the numerical values associated with students' ratings need to be reversed. For example, for a person who chooses a rate of 1 in a question corresponds to consistency of interest, our study will record the response as a score of 5. An example item for perseverance of effort is 'setbacks don't discourage me', and an example item for consistency of interest is 'new ideas and projects sometimes distract me from previous ones. Using the computation routines, the same as that of self-efficacy, we obtained satisfactory internal consistency satisfactory for both the subscales 'consistency of interest' and 'perseverance of effort', as their correspondent Cronbach's Alpha are 0.747 and 0.603, respectively. To compute the scale of grit as well as its subscales, we also take the mean of the scores - in reversed form if correspondent to consistency of interest - for each participant.

### **3.2.3 Scale of Growth Mindset**

The study makes use of the 8-item Growth Mindset Scale (Dweck, 1999). According to Dweck, the scale includes two subscales – growth mindset and fixed mindset. In the study, only the subscale of growth mindset - with 4 correspondent items - was used. The questionnaire also contains a section with 4 questions in one-to-one correspondence with each respective question, with responses chosen from 'extremely unlikely (1)' to 'extremely likely (5).' An example is 'no matter who you are, you can significantly change your intelligence level.' Similarly, we use the same computation routine as above to obtain satisfactory internal consistency, as Cronbach's Alpha is equal to 0.841. Analogously, we take the mean of each participant's scores as his or her scale of growth mindset.

## **3.3 Data Collecting and Analysis Procedure**

The questionnaire was designed as an online form, and we promote it in the social media groups of the three universities. The distribution of the questionnaire was in compliance with the principle of voluntary participation, and those who finished the questionnaire were awarded with a gift card. The questionnaire remained open for answers until a total of 70 questionnaires were collected from each of the three universities. We first pre-processed the response dataset to exclude collected questionnaires that contained incomplete information, were filled in within 2 minutes, or showed a possibility of hasty or randomized answer selection. We also pruned out a few extra data points to make sure that we have equal male and female data points. After data collection, multiple linear regression models are built with self-efficacy as the outcome variable, two dimensions of grit, growth mindset and GPA as the independent variables. The independent variables were entered into the model sequentially to examine the change of model prediction.

## **4. Result**

After the preprocessing and computation routines described in the above sections, 150 data points are each associated with a scale of grit (both dimensions), growth mindset and

self-efficacy, respectively. With these variables we're able to calculate the inter-correlations between variables and the median, standard deviation, skewness and kurtosis of each variable. This information is shown in Table 1.

Variable	1	2	3	4	5	Mean	SD	Skewness	Kurtosis
1 Self-efficacy	1					4.96	1.06	-0.54	0.15
2 Grit(interest)	0.13	1				2.92	0.83	-0.08	-0.59
3 Grit(effort)	0.46**	0.37**	1			3.40	0.74	-0.15	0.06
4 Growth mindset	0.37**	0.05	0.20*	1		2.97	0.82	-0.01	-0.33
5 GPA Percentage	0.45**	0.02	0.21*	0.09	1	67.37%	24.49%	-0.49	-0.92

Note: Values with corresponding P value < 0.01 and <0.05 are marked with 2 and 1 asterisks respectively.

Table 1: Inter-correlations and Descriptive Statistics

The five variables in our study all showed reasonable standard deviation, mild negative skewness and comparatively low kurtosis. This suggests that our data has a moderate form of dispersion, does not include significant distortion, and has a low propensity for outlier generation. These metrics suggest that our data is rather unbiased and reliable.

The inter-correlations data (the lower triangular 5\*5 matrix on the left half of the Table 1) shows that self-efficacy is greatly correlated with the subscale of grit in perseverance of effort, growth mindset and GPA. It has a non-significant correlation with grit in consistency of interest. It is also noteworthy that the two dimensions of grit are greatly correlated, so it makes logical sense to conclude that grit, as a whole, is greatly correlated with self-efficacy. We also find that grit in perseverance of effort is moderately correlated with growth mindset and GPA percentage, so it can be itself a predictor of multiple relevant traits.

From the table one may also observe that grit, if only considering its effort perseverance dimension, has a stronger correlation with self-efficacy than growth mindset does.

To better study the interrelationships, we stratify our set of variables and build multiple regression models based on a subset of all variables. The first model only considers the two dimensions of grit; the second model accepts both the grit dimensions and the growth mindset; the last model considers an additional variable - the GPA percentage. The output of the models is shown in Table 2.

Regression Equations	Fit Index	Coefficient		
		Standardized Beta	t-statistic	
Predictor	R <sup>2</sup>	Coefficient		
1	0.21	Grit(interest)	-0.04	-0.54
		Grit(effort)	0.48	6.10***
2	0.28	Grit(interest)	-0.04	-0.48
		Grit(effort)	0.42	5.52***
		growth mindset	0.29	4.14***
3	0.41	Grit(interest)	-0.01	-0.20
		Grit(effort)	0.34	4.83***
		growth mindset	0.27	4.24***
		GPA percentage	0.36	5.53***

Table 2: Multiple Regression Relationships

From the first model reported by Table 2, we can see that the effort perseverance dimension of grit has a significantly greater beta coefficient, and thus a much more significant t-statistic, than the interest consistency dimension does. This further proved our previous observance that perseverance of effort is the only significant dimension in grit in self-efficacy prediction.

Considering the second model reported in Table 2, we can similarly conclude from the coefficient beta and t-statistic that both grit (effort perseverance dimension) and growth mindset can be reliable predictors of self-efficacy, and that growth mindset appears as the weaker predictor. These findings are also consistent with our observance of Table 1.

Moreover, we can see that the R-squared indices for the first two models are intermediate, while the last model achieves a significantly higher R-squared. This suggests that the data fits more precisely with regression models when GPA percentage is included. Also, considering the strong correlation between GPA percentage and scale of self-efficacy, it suffices to conclude that GPA, or academic performance in a wider scope, is itself a very important predictor of self-efficacy. That being said, when we consider grit and growth mindset as indicators of self-efficacy, GPA must be controlled as a crucial covariate. In the third model reported by Table 2, GPA percentage is included in the regression model, yet the prediction power of grit (effort perseverance) and growth mindset persists. This model suggests that grit (effort perseverance) and growth mindset are indeed reliable predictors of self-efficacy, even if GPA, or academic performance, is strictly controlled as the most important covariate.

## 5. Discussion

From the results of our study, we have successfully extended western research on grit, growth mindset and self-efficacy to the circumstances of China, and we find that the prediction capacity of “grit - self-efficacy” and “growth mindset - self-efficacy” applies to Chinese students as well.

Similar to previous studies, we conclude grit and growth mindset as reliable indicators of self-efficacy. However, our study also finds that only the effort perseverance dimension of grit correlate to self-efficacy significantly. We have also pioneered the comparison of

prediction power between grit (effort perseverance) and growth mindset, and claimed that the former is a slightly better predictor.

The study expanded the practicality of state-of-the-art theory to the Chinese group and verified its cross-cultural consistency. Our study can also provide global literature support on relevant topics. We look forward to inspiring further research on relevant topics.

Also, our study has several limitations. As cross-sectional models cannot eradicate the possible existence of confounders, we are not able to claim explicit causal relationships. We hope that a longer and more rigid experimental study could be done on this subject to formally prove grit and growth mindset as direct causes or constructive factors of self-efficacy. Another drawback of our study is the limitation of data collection. We were not able to perform random sampling to ensure objectivity, and the range of sources as well as the sample size of our study were limited. We expect to see future studies with random samples and larger or more diversified participants to ascertain our findings.

## **6. Conclusion**

Our study concludes that the recent western findings regarding the correlation between grit, self-efficacy and growth mindset apply to China. Moreover, we claim that at least in a Chinese cultural background, the effort perseverance dimension is the only dimension in grit that is significantly correlated with undergraduate students' self-efficacy. It is the effort perseverance dimension, also turned out to be a better predictor of undergraduate students' self-efficacy than growth mindset, though both are indeed reliable predictors.

We hope that our findings can assist educational psychologists in their efforts to propose ways to increase one's self-efficacy, either towards undergraduate students or all social individuals in general. We also expect our findings may break the ice in the relevant field, arousing more rigorous research studies to both formally prove possible causal links and dive more into the specifics of grit, growth mindset and self-efficacy as an organic integration.



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