

Original Article

Growth Mindset and Grit: How Do University Students' Mindsets and Grit Affect their Academic Achievement?

Apostolia Barbouta, MSc

Teacher of English Language, Private Practice, Larissa, Greece

Christina Barbouta, MSc

Psychologist, Private Practice, Larissa, Greece

Stiliani Kotrotsiou, PhD

Assistant Professor, University of Thessaly, Larissa, Greece

Corresponding Author: Dr. Stiliani Kotrotsiou, Assistant Professor University of Thessaly, GR-411 10 Geopolis, Greece, e-mail: stkotrotsiou@uth.gr

Abstract

Background: Mindset and Grit are two relatively new research fields, but conducted studies clearly demonstrate that they have a positive effect on academic achievement.

Objective: The purpose of the current study is to test how students' perceived mindset and grit affect their academic achievement. The sample of this study was 238 Caucasian (UK, Greek) and Asian (Chinese, Arabic) undergraduate and postgraduate students.

Methodology: For the purposes of this study, electronic questionnaire was developed. Two different questionnaire links (Greek and English) were created and those who did consent to participate could follow them(https://york.qualtrics.com/jfe/form/SV_4NS2uRADMAgBHtH)https://york.qualtrics.com/jfe/form/SV_3gStH5pe0cjvg33). Participation in this study was completely voluntary and participants were informed through written consent in the information letter that they had the right to withdraw at any point. Questionnaire was distributed from May to July 2018.

Results: Analyzing the linear relationship of the subscales of Mindset with the academic performance we found that Growth Beliefs Talent has moderate academic performance has weak strength positive correlation with Growth Beliefs Intelligence ($r(238)=0.366$, $p<0.001$) and Fixed Beliefs Talent ($r(238)=0.284$, $p<0.001$). It was found that there is moderate strength positive correlation between age and grit score ($r(238)=0.442$, $p<0.001$), indicating strong relationship between the two variables, which means that older participants tend to have higher values of grit score.

Conclusion: The current study findings can provide the framework for bigger scale and longer-term studies that examine the relationship between Grit and academic achievement. The reason the word 'longer-term' is used, is because Grit is a non-cognitive factor that can yield more valid results on long-term studies due to its nature (passion and perseverance for long-term goals). Thus, examining a student population in 2 or even 3 different time frames, while obtaining grit scores, self-perceived academic achievement and more importantly GPAs, would serve as a more valid and reliable grit indicator.

Key words: Mindset, Grit, Students, academic achievement

Introduction

Mindset and Grit are two relatively new research fields, but conducted studies clearly demonstrate that they have a positive effect on academic achievement. To be more precise, students' mindsets seem to promote their resilience in the face of academic setbacks (Yeager & Dweck, 2012). Additionally, the type of praise they receive

seems to affect their current mindset with a "process praise" favoring the development of a growth mindset (Mueller & Dweck, 1998). The two theories also foster two different interpretational approaches: entity theorists react in a helpless way in the face of setbacks, whereas incremental theorists interpret setbacks as a chance to improve their strategies (Dweck & Leggett, 1988;

Henderson & Dweck, 1990). Entity theorist are also more likely to make ability attributions when dealing with failures, but incremental theorist attribute failure to lack of effort (effort attributions) (Hong, Chiu, Dweck, Lin, & Wan, 1999). Passion and perseverance for long-term goals also seems to favor academic results as was demonstrated in 6 different studies by Duckworth et al. (2007).

The purpose of this study is to examine how students' perceived mindset and grit can affect their academic achievement. It is hypothesized that "Growth Mindset" and "high Grit" will increase academic achievement, whereas "fixed Mindset" and "low grit" will hinder it, having as a result poorer performance. Previous research conducted in this topic supports this hypothesis (Duckworth et al. 2007; Dweck 2006). Thus, the current study will not only seek to replicate these findings, but also shed light on the cross-cultural aspect of it by comparing a sample of Caucasian (UK, Greek) and Asian undergraduate and postgraduate students. Another major purpose of this study is to inform and improve future academic practices through more personalized interventions that will incorporate students' mindset, grit and cultural background

Methodology the current Study: The purpose of the current study is to test how (undergraduate and postgraduate) students' perceived mindset and grit affect their academic achievement. The sample of this study was 238 Caucasian (UK, Greek) and Asian (Chinese, Arabic) undergraduate and postgraduate students. Specifically, the study will answer the following research questions:

Research Question 1: Do Growth Mindset students have better academic performance?

Research Question 2: Do Growth Mindset students enjoy a given task more than their less gritty peers?

Research Question 3: Grit grows with age

Participants: A total of 238 participants were recruited for the study. The sample consisted of 158 males (66.4%) and 80 females (33.6%). 203 participants were Caucasian (85.3%) and 35 participants were Asian (14.7%). The sample consisted of both undergraduate and postgraduate students. The total number of undergraduates was 103 and the total number of postgraduates was 135. Undergraduate students of Caucasian race were 94 (91.3%) and of Asian race 9 (8.7%).

Procedures: For the purposes of this study, electronic questionnaire was developed. Two different questionnaire links (Greek and English)

were created and those who did consent to participate could follow them.

(https://york.qualtrics.com/jfe/form/SV_4NS2uRA DMAgBHtH)(https://york.qualtrics.com/jfe/form/SV_3gStH5pe0cjvg33).

Participation in this study was completely voluntary and participants were informed through written consent in the information letter that they had the right to withdraw at any point. Furthermore, participants were informed that their participation in this survey will be anonymous and all the data will be destroyed after a 5-year period. The questionnaire was distributed from May to July 2018.

Measures

This study included a demographic section and the use of two scales: a) a 12-item short Grit scale (Grit-S) by Angela Duckworth (Duckworth & Quinn, 2009) and b) a 16-item Dweck Mindset Instrument created by Carol Dweck (DMI). The demographic section included questions about participants': a) ethnicity, b) age, c) gender, d) level of studies (undergraduate, postgraduate), e) field of studies, f) level of self-perceived academic performance (i.e. are you satisfied with your academic performance so far?), g) academic score (if applicable).

Short Grit Scale (Grit-S) contains 12 items composed of two factors. The first factor entails 6 items that indicate consistency of interest (e.g. "I often set a goal but later choose to pursue a different one"), and the second factors another six items indicating perseverance of effort (e.g. "I have achieved a goal that took years of work"). According to Duckworth et al. (2007) The development of this scale demonstrated high internal consistency ($\alpha = .85$) and the two factors were more predictive together than either alone, thus allowing the use of the full 12-item scale for the measurement of grit. Items are rated on a 5-point Likert scale from 1= very much like me to 5= not like me at all. Items pertaining to "consistency of interest" (2, 3, 5, 7, 8, 11) were reversely scored. This scale has well documented reliability and validity. Its predictive validity was assessed by Duckworth & Quinn (2009) in a study predicting higher levels of lifetime schooling among individuals aged 25 years and older.

Dweck Mindset Instrument (DMI), developed and created by Carol Dweck, was used to assess how students view their own intelligence and talent.

The scale consists of 16 items that are rated on a 6-point Likert scale with 1=strongly agree to 6=strongly disagree. Students are instructed to read

the statement and indicate their level of agreement or disagreement. The DMI contains both entity belief statement and incremental belief statements. Entity statements consist of the numbers: 1, 2, 4, 6, 9, 10, 12 and 14. Incremental statements are: 3, 5, 7, 8, 11, 13, 15 and 16. Questions 1-8 refer to intelligence and 9-16 to talent as factors being either malleable or not. There are four fixed item statements (1, 2, 4, 6) and four incremental statements (3, 5, 7, 8) that focus on intelligence, and another four entity statements (9, 10, 12, 14) and four incremental statements focusing on talent (11, 13, 15, 16). The scores from the incremental items are reversed (1=6, 2=5, 3=4, 4=3, 5=2, 6=1). Scores for intelligence and talent are averaged separately as they are considered separate factors (1-8 together and 9-16 together). Average scores between 1 and 3 are considered entity, between 4-6 incremental and 3 and 4 as undecided.

Analysis Description of Online Survey: The current survey was created on google forms (Qualtrics). This methodology was chosen for the data collection, which was mainly based on convenient samples, since only participants consenting to fill in the survey were included in it. Students received an invitation email after the appropriate permission from the University was acquired. Only participants that consented to participate could complete the survey. Attention was paid by the researcher to avoid any participant expectancy effects. Students could withdraw from the survey at any point and were informed through an information letter about their anonymity and confidentiality. The questionnaire was divided in 3 parts. The first part included the consent form, the second part the demographic section along with some open questions and the third part the 2 questionnaires (Dweck's Mindset Instrument and Short Grit Scale). After completing the survey participants had no further obligations. The participation was free, and no compensation provided.

Data Analysis: All data obtained was categorized and analyzed accordingly on SPSS. An exploratory and screening process analysis was conducted in order to ensure no violation of the assumptions of parametric data. During the reliability analysis, Cronbach's α was considered adequate (>0.7) for both group and individual level measurement. The fitting of the variables in the normal distribution was examined with the Kolmogorov-Smirnov and was not rejected. Variable homogeneity was tested with the Levene's test. To compare the mean values of the variables we used the t-tests, in the case of a binary independent, or the Analysis of

Variance (ANOVA), in the case of a non-binary independent. To calculate the correlation between variables, we used the Pearson's correlation coefficient, in the case of scale variables and Spearman's correlation coefficient in the case of ordinal. More specifically, to explore :

Hypothesis 1 we used Pearson's correlation coefficient comparing academic performance and growth Mindset score as variables.

Hypothesis 2 (growth Mindset predicts academic enjoyment) also used Pearson's correlation to explore the relationship between Mindset score and Grit scores.

Hypothesis 3 (Grit grows with age) used Pearson's correlation coefficient comparing grit and age scores.

Results

To explore and present the basic characteristics of the current sample a descriptive analysis was performed. The following two tables contain the characteristics of the participants who completed the online survey (**table 1a**) and their total scores in Dweck's Mindset Instrument (DMI) and Duckworth's Short Grit scale (S-Grit) (**table 1b**). According to the first table the sample consisted of 158 males (66.4%) and 80 females (33.6%). 203 participants were Caucasian (85.3%) and 35 participants were Asian (14.7%). The sample consisted of both undergraduate and postgraduate students. The total number of undergraduates was 103 and the total number of postgraduates was 135. Undergraduate students of Caucasian race were 94 (91.3%) and of Asian race 9 (8.7%). Postgraduate students of Caucasian race were 109 (80.7%) and of Asian race 35 (14.7%). The mean age of the current sample was 29.3 ($SD=7.0$) with undergraduates mean age 25.7 ($SD=6.1$) and postgraduates mean age 32.1 ($SD=6.5$). Out of this sample, 188 (79.0%) students reported being satisfied with their academic results, out of which 80 (77.7%) were undergraduates and 108 (80%) were postgraduates. 34 (14.3%) students answered with 'maybe' concerning their academic satisfaction, out of which 13(12.6%) were undergraduates and 21(15.6%) were postgraduates. 16 (6.7%) students responded they are not satisfied with their academic performance, out of which 10(9.7%) were undergraduates and 6 (4.4%) postgraduates. **Table 1b** Demonstrates mean age of undergraduate and postgraduate students along with their total academic scores and their overall scores at Dweck's Mindset Instrument and Duckworth's Short Grit scale. Thus, the mean age of both undergraduate and postgraduate students was $M=29.3$ ($SD=7$) with undergraduates' mean age

$M=25.7$ ($SD=6.1$) and postgraduates' mean age $M=32.1$ ($SD=6.5$). The total mean academic score was $M=75.9$ ($SD=10.2$) with undergraduates score being lower $M=72.9$ ($SD=9.6$) than postgraduates' $M=78.2$ ($SD=10$). Total students' Grit score was $M=3.0$ ($SD=.5$) with undergraduates scoring slightly lower $M=2.8$ ($SD=.4$) than postgraduates $M=3.2$ ($SD=.4$). The two subscales of Grit (perseverance of effort and consistency of interest) demonstrated similar results: undergraduates' perseverance of effort was lower $M=2.7$ ($SD=.5$) than postgraduates $M=3.1$ ($SD=.5$). Furthermore, undergraduates' consistency of interest was lower $M=2.8$ ($SD=.5$) than postgraduates' $M=3.2$ ($SD=.6$). Moreover, total mean Growth score was $M=3.1$ ($SD=.5$) with undergraduates scoring higher $M=3.0$ ($SD=.5$) than postgraduates $M=3.3$ ($SD=.5$). The subscales of Mindset (growth) (beliefs about intelligence and beliefs about talent) showed the following patterns: total mean score for growth beliefs about intelligence was $M= 2.7$ ($SD=1.0$) with undergraduates demonstrating lower mean score $M= 2.5$ ($SD=1.0$) than postgraduates $M= 3.0$ ($SD=.9$). Growth beliefs about talent also demonstrated a similar pattern: undergraduates had lower mean score $M= 2.6$ ($SD=1.0$) than postgraduates $M=3.0$ ($SD=1.0$). Growth beliefs talent total mean score was $M=2.8$ ($SD=1.0$). Finally, fixed beliefs about intelligence did not show any differential pattern between undergraduates and postgraduates. Therefore, fixed beliefs intelligence for undergraduate students was no different $M= 3.6$ ($SD=.3$) than that of postgraduate students $M= 3.6$ ($SD=.4$). Total mean score for fixed beliefs intelligence was $M= 3.6$ ($SD=.3$). Fixed beliefs about talent for undergraduate students was slightly lower $M= 3.4$ ($SD=.5$) than that of postgraduates $M= 3.6$ ($SD=.3$). Total mean score for fixed beliefs was $M=3.5$ ($SD=.4$).

Hypothesis 1: Growth Mindset predicts academic achievement: The current study results supported these hypotheses. To be more precise, to measure the extent to which academic performance correlates with the growth Mindset score, and its subscales, we used Pearson's correlation coefficient.

From the results of the analysis we can conclude that there is moderate strength positive correlation between the overall academic performance and the total growth Mindset score ($r(238)=0.464$, $p<0.001$). Furthermore, Analyzing the linear relationship of the subscales of Mindset with the academic performance we found that Growth Beliefs Talent has moderate strength positive correlation with academic performance ($r(238)=0.456$, $p<0.001$). Finally academic performance has weak strength positive correlation with Growth Beliefs Intelligence ($r(238)=0.366$, $p<0.001$) and Fixed Beliefs Talent ($r(238)=0.284$, $p<0.001$). Table 1 and Figure 1 below provide a more detailed description of the results.

Hypothesis 2: Growth Mindset predicts academic enjoyment: To continue, the second hypothesis connecting growth Mindset with enjoyment in a given task was also confirmed. To explore this hypothesis, we examined the relationship between Grit score and Mindset score. From the results, of the above tests, we can conclude that there is moderate strength positive correlation between Grit and Mindset score ($r(238)=0.527$, $p<0.001$), indicating strong relationship between the two variables. Analyzing the relationship of Grit and the subscales of Mindset, Beliefs about Intelligence and Beliefs about talent indicate moderate strength positive correlation ($r(238)=0.411$, $p<0.001$) and ($r(238)=0.414$, $p<0.001$) respectively. With fixed beliefs talent the relationship is weak strength positive as well ($r(238)=0.280$, $p<0.001$). Table 2 and figure 1 below indicate these relationships in more details.

Hypothesis 3: Grit grows with age : Another interesting hypothesis examined is that grit grows with age and older individuals tend to be grittier than younger ones. This hypothesis was also confirmed. To examine the relationship between age and grit score, we used Pearson's correlation coefficient. From the results, of the above tests, we can conclude that there is moderate strength positive correlation between age and grit score ($r(238)=0.442$, $p<0.001$), indicating strong relationship between the two variables, which means that older participants tend to have higher values of grit score. **Table 3 and figure 3** provides a more detailed presentation of these findings.

Table 1a The characteristics of the participants

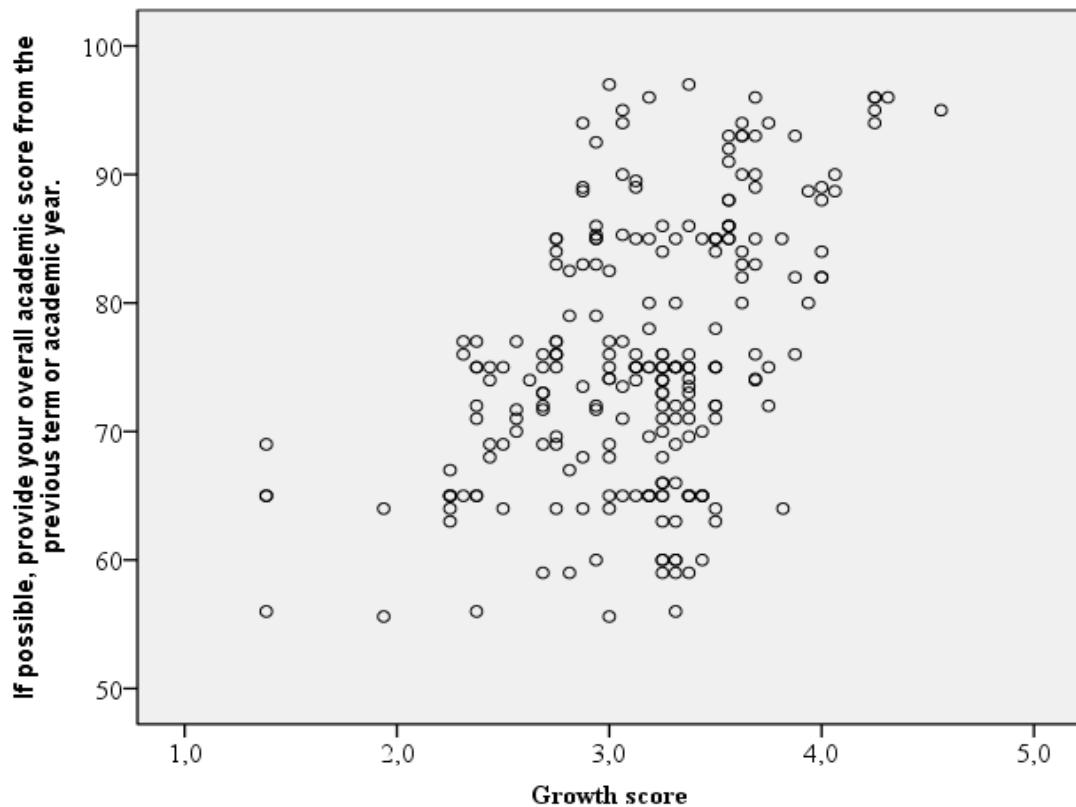
		Undergraduate		Postgraduate		Total	
		N	%	N	%	N	%
What is your ethnicity?	Caucasians	94	91.3%	109	80.7%	203	85.3%
	Asians	9	8.7%	26	19.3%	35	14.7%
Sex	Male	72	69.9%	86	63.7%	158	66.4%
	Female	31	30.1%	49	36.3%	80	33.6%
Are you satisfied with your academic performance so far?	Yes	80	77.7%	108	80.0%	188	79.0%
	Maybe	13	12.6%	21	15.6%	34	14.3%
	No	10	9.7%	6	4.4%	16	6.7%

Table 1b The characteristics of the participants

	Undergraduate		Postgraduate		Total	
	Mean	SD	Mean	SD	Mean	SD
What is your age?	25.7	6.1	32.1	6.5	29.3	7.0
If possible, provide your overall academic score from the previous term or academic year.	72.9	9.6	78.2	10.0	75.9	10.2
Perseverance (grit)	2.7	.5	3.1	.5	3.0	.5
Consistency of interest (grit)	2.8	.5	3.2	.6	3.0	.6
Grit Score	2.8	.4	3.2	.4	3.0	.5
Growth Beliefs	2.5	1.0	3.0	.9	2.7	1.0
Intelligence (growth)						
Growth Beliefs Talent (growth)	2.6	1.0	3.0	1.0	2.8	1.0
Fixed Beliefs Intelligence (growth)	3.6	.3	3.6	.4	3.6	.3
Fixed Beliefs Talent (growth)	3.4	.5	3.6	.3	3.5	.4
Growth score	3.0	.5	3.3	.5	3.1	.5

Table 1: Mean value and standard deviation of the scores, results of t-test and total min, mean, standard deviation and maximum value of the scores

	Growth score	Growth Intelligence	Beliefs	Growth Beliefs Talent	Fixed Intelligence	Beliefs	Fixed Beliefs Talent
If possible, Pearson provide your Correlation overall Sig. (2-tailed) academic score from the previous term or N academic year.	.464** .000	.366** .000		.456** .000	-.019 .776		.284** .000
	238	238		238	238		238

Figure 1: Scatterplot of academic score and growth score**Table 2: Mean value and standard deviation of the scores, results of t-test and total min, mean, standard deviation and maximum value of the scores**

		Growth score	Growth Beliefs Intelligence (growth)	Growth Beliefs Talent (growth)	Fixed Beliefs Intelligence (growth)	Fixed Beliefs Talent (growth)
Perseverance (grit)	Pearson Correlation	.206**	.222**	.176**	-.158*	.159*
	Sig. (2-tailed)	.001	.001	.007	.014	.014
	N	238	238	238	238	238
Consistency of interest (grit)	Pearson Correlation	.373**	.314**	.277**	.005	.246**
	Sig. (2-tailed)	.000	.000	.000	.942	.000
	N	238	238	238	238	238
Grit Score	Pearson Correlation	.359**	.330**	.279**	-.088	.249**
	Sig. (2-tailed)	.000	.000	.000	.176	.000
	N	238	238	238	238	238

Figure 2: Scatterplot of grit and growth score

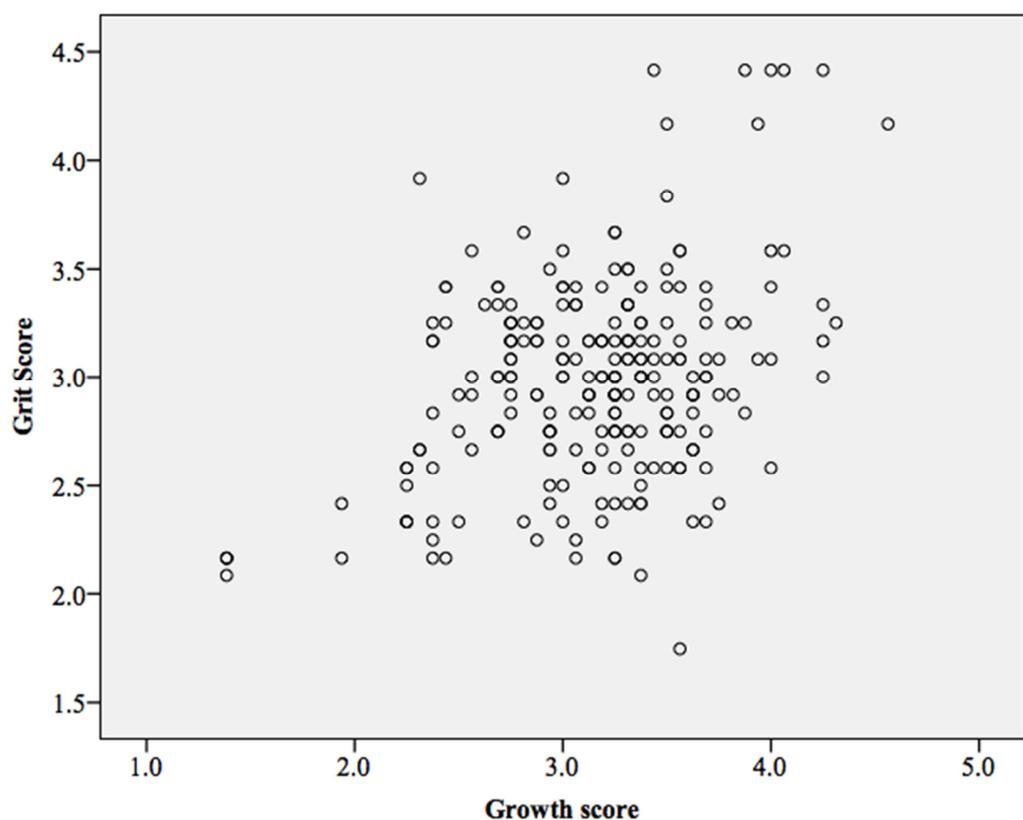
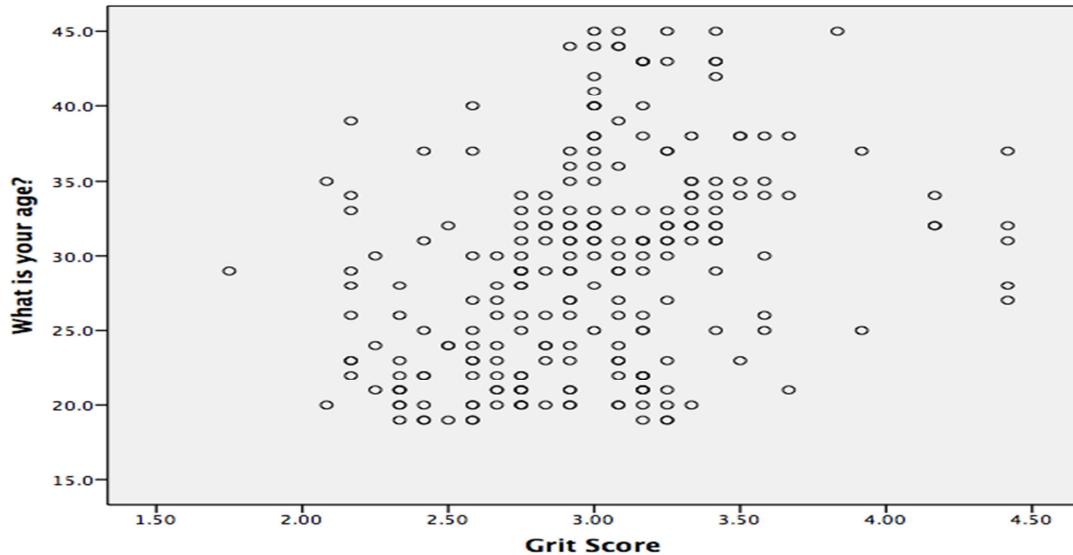


Table 3: Pearson's correlation coefficient and significance level

		Grit Score	Perseverance of effort (grit)	Consistency of interest (grit)
What is your age?	Pearson Correlation	.341**	.329**	.235**
	Sig. (2-tailed)	.000	.000	.000
	N	238	238	238

Figure 2: Scatterplot of age and grit score

Discussion

The current study examined the relationship between Mindset/Grit and (undergraduate - postgraduate) students' academic achievement. It was hypothesized that a) students with a growth Mindset will have better academic achievement than the ones with a fixed Mindset, b) growth Mindset students will show greater enjoyment in a given task, c) Older students tend to be higher in Grit. All these hypotheses were confirmed supporting prior research.

Specifically, the positive relationship between growth Mindset and better academic performance was confirmed. The correlation between academic score ("if possible, provide your overall academic score from the previous term or academic year") and self-perceived Mindset was positive of moderate strength. Furthermore, its two subscales ("Beliefs about intelligence and Beliefs about talent") were also positively correlated. To be more precise, Growth beliefs about talent demonstrated a moderate strength positive correlation with academic performance and growth beliefs about intelligence a weak strength positive correlation. Fixed beliefs about talent also demonstrated a weak strength positive correlation with academic performance. This hypothesis is further supported by Yeager

and Dweck (2012) and the mediating role of resilience in academic performance. More specifically, they state that as students move through the educational system, they will more than likely encounter either social or academic adversities. Viewing these obstacles as something they cannot overcome thus embracing a more fixed approach will not serve them well, whereas viewing setbacks as something they can overcome with good strategies, effort, assistance from others and patience, thus demonstrating resilience (being more growth minded) will prove highly beneficial in the long run facilitating students' academic performance (Yeager & Dweck, 2012). Moreover, an intervention study by Blackwell et al. (2007) further supported this hypothesis. The first study with 373 7th graders demonstrated that the belief in the malleability of intelligence (growth Mindset) predicted an upward trend in grades over the two subsequent years of junior high school, while the belief that intelligence is not developable (fixed Mindset) predicted a flat trajectory. A second intervention study with 48 7th graders being taught an incremental theory and another 43 not being taught (control group) also demonstrated higher classroom motivation levels in the intervention group and an upward trajectory

in grades compared to the control group (Blackwell et al. 2007). Furthermore, this hypothesis was further supported by an experimental study that involved African American students under the “stereotype threat” known to threaten their academic performance compared to their White counterparts (Aronson et al. 2002). In this experiment African American students that were encouraged to see intelligence as developable, rather than a fixed trait, reported greater academic engagement, enjoyment in the academic task and higher grades compared to their counterparts in the two control groups (Aronson et al. 2002). Finally, a big-scale nationwide study that included all 10th grade Chilean students, also confirmed our hypothesis. This study confirmed prior research that family income can strongly predict academic achievement and extended previous research that holding a growth Mindset can also function as a strong predictor of academic achievement despite the toxic effects of poverty (Claro et al. 2016).

The second hypothesis connecting a growth Mindset with more enjoyment of a given task was also confirmed. For the exploration of this question, the relationship between Grit and Mindset scores was examined and the results demonstrated a moderate strength positive correlation between the two variables, indicating a strong relationship. Furthermore, beliefs about intelligence and beliefs about talent also indicated moderate strength positive correlations with Grit. These results were reinforced by (Aronson et al. 2002) intervention study with 79 participants (42 Black and 37 White) that demonstrated not only higher grades and motivation (as mentioned earlier) but also higher engagement and enjoyment of the academic process in the students who received the intervention treatment (learning to view intelligence as a malleable trait). Additionally, a further support to this hypothesis comes from the type of praise or criticism that according to research seems to promote either a more growth or fixed oriented approach to learning. The type of praise or criticism students receive in times of success or failure seems to shape the way

they respond to setbacks and challenges in the long run. According to Mueller and Dweck (1998) 6 studies with 5th graders demonstrated that students praised for their intelligence cared more about performance goals and in the face of setbacks displayed less enjoyment in the given task, were less persistent, and made more ability attributions compared to students praised for their effort (Mueller & Dweck, 1998). Moreover, children praised for intelligence developed a more fixed oriented approach for intelligence compared to children praised for their effort who believed that intelligence is subject to improvement (growth Mindset) (Mueller & Dweck, 1998). Kamins and Dweck (1999) also found similar result patterns for criticism, highlighting the facilitating role of process focused criticism that contributed to the development of a more growth Mindset compared to a person-oriented criticism that showed the opposite results (Kamins & Dweck, 1999). Both person and process praise or criticism seemed to have an indirect facilitating or not effect on the shaping of a growth or fixed mindset that either led students to enjoy or not a given task. Another finding related to academic enjoyment is that of self-perceived academic performance satisfaction (“are you satisfied with your academic performance so far?”) Based on our current results a relationship between self-perceived academic performance satisfaction and growth Mindset emerged. The results suggested a positive and significant correlation between academic performance satisfaction and growth Mindset score, growth beliefs about intelligence and fixed beliefs about talent. Thus, confirming Dwecks’ Mindset theory that the beliefs that students hold about themselves (incremental vs entity) can predict their academic performance and thus satisfaction (Dweck, 2006).

Except for predicting educational attainment, Grit also seems to demonstrate an interesting feature: it grows with age. This relationship was examined in our current sample confirmed previous research. The correlation demonstrated a moderate strength positive correlation, demonstrating that there is a strong relationship between the two

variables: older participants had higher grit values. This finding is interconnected with the previous finding (academic attainment) and further extends it in the sense that in order to achieve higher educational levels one needs to spend more years studying, thus being older in age. Duckworth et al (2007) in a study consisting of multiple age groups (25-34, 35-44, 45-54, 55-64, 65 and older) showed that grit was lower among individuals within the age range of 25-34 and higher for individuals older than 65. Despite the fact that this finding is fairly new and until this point cannot be further supported by research finding, demonstrated a similar pattern in our current results confirming the linkage between grit and educational attainment along with grit and age.

Limitations of the Study: One major limitation if this study is the use of a convenience sample due to time restraints. The initial goal was to gather two purely representative samples of both Greek and UK students. This goal worked out for the Greek sample, which was highly homogenous, but did not apply to the UK one, that was composed of multiple different ethnicities. Thus, some adjustment to the goals of the current study had to be made. To facilitate the research of the current data, we specified that the UK sample was composed of multiple ethnicities studying in the UK. This had the advantage of giving us the opportunity to also include the comparison of other cultural groups (i.e. Asians). Furthermore, some additional limitations stem from the online nature of the survey. It was considered important to use these type of survey as it was more convenient both in terms of student numbers and time management (e.g. collection time). This poses a problem as the use of an online survey lacks the qualitative analysis needed for more validated results. The process also did not include a further explanation of the questions used and participants might have not been able at times to fully comprehend the nature of some questions.

Finally, as the definition of Grit implies (passion and perseverance for long-term goals), it can be best examined in longer term studies. This is a major but unavoidable

limitation of the current study firstly due to lack of resources and secondly due to lack of time (dissertation study). This limitation can be overcome with a future longer-term study that can examine student population in two or even 3 different time frames. This method would provide more reliable and valid results.

Conclusion and Recommendations: The purpose of the current study was to examine how the Mindsets that students hold (growth vs fixed) and their levels of Grit (high Grit vs low Grit) would influence their academic achievement. It was hypothesised that students holding a growth Mindset will have better academic performance than the ones holding a fixed Mindset.

The current study findings can provide the framework for bigger scale and longer-term studies that examine the relationship between Grit and academic achievement. The reason the word 'longer-term' is used, is because Grit is a non-cognitive factor that can yield more valid results on long-term studies due to its nature (passion and perseverance for long-term goals). Thus, examining a student population in 2 or even 3 different time frames, while obtaining grit scores, self-perceived academic achievement and more importantly GPAs, would serve as a more valid and reliable grit indicator.

Finally, based on the findings that grit is higher in postgraduate students compared to undergraduates and that it grows with age, it is considered beneficial to also create educational interventions for the promotion of grit in schools. This can be initially done by the identification of students' grit levels and the subsequent targeted intervention on the more vulnerable groups. These interventions would ideally create useful techniques to increase students grit. If this becomes possible in the future, then we may be able to see more long-lasting education with more resilient students.

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