A Note on Big Five Personality and Academic Performance[*]

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Abstract

This paper examines the relationship between personality and academic performance. We investigate how much the Big Five personality traits account for the test score of a certain subject and Grade Point Average (GPA). The explanatory power of the Big Five factors is large for GPA, while it is limited for the test score of lectures on the Japanese Economy. Conscientiousness and Neuroticism contribute to raise GPA, as the existing literatures suggest. Contrary to intuition, our results show that Extraversion and Openness to Experience lower GPA. We find that outward interests and intellectual curiosity do not simply contribute to raise academic performance.

1 Introduction

1.1 Backgrounds

Many researchers suggest that personality is important for all sorts of things. In the educational context, personality as well as intellectual ability is said to account for academic achievement. Though many people have emphasized the importance of effort, but the ability to make an effort is also important and it have just been recognized recently as "grit" (Duckworth 2016). The purpose of this paper is to present how much personality can account for academic achievement, using the original individual data.

Although there exist many kinds of the scales that measure personality, the Big Five personality trait is well known even in behavioral economics. John and Srivastava (1999) review the history of the Big Five taxonomy of personality trait dimensions from 1930s. The Big Five stems from lexical study of the personality-relevant terms in English dictionaries.

Through various researches, NEO Personality Inventory Revised (NEO PI-R, Costa and McCrae 1992) and Trait Descriptive Adjectives (TDA, Goldberg 1992) are invented to measure the Big Five factors. Finally, Gosling, Rentfrow, and Swann (2003) produced Ten Item Personality Inventory (TIPI) to measure the Big Five factors by ten items. Oshio, Abe, and Cutrone (2012) developed a Japanese version of the Ten-Item Personality Inventory (TIPI-J). Now TIPI is trusted and validated as a robust and simple inventory.

Regarding personality, economists seem to have different views from psychologists. Heckman and Kautz (2014) states "Character is a skill, not a trait." Achievement tests can simply measure cognitive skills known as intellectual ability, but cannot adequately capture noncognitive skills such as personality traits, motivations, and preferences that are valued in school and society. Heckman and Kautz call them character skills and we can raise them by human capital investment (Tsuru 2018). We can include "grit" mentioned above with character skills.

1.2 The Big Five Factors

The Big Five factors consist of five dimensions of personality[1]. Extraversion is an orientation of one's interests and energies toward the outer world of people and things. Agreeableness is the tendency to act in a cooperative and unselfish manner. Conscientiousness refers to the tendency to be organized, responsible

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[1]   The Big Five factors have the acronym OCEAN (Heckman and Kautz 2014).

and hardworking[2]. Neuroticism is a chronic level of emotional instability and anxiety. Openness to Experience is reflected in a strong intellectual curiosity and a preference for novelty and variety.

O'Connor and Paunonen (2007) reviewed the empirical literature on the relations between the Big Five personality dimensions and post-secondary academic achievement. Their meta-analysis showed Conscientiousness to be most strongly and consistently associated with academic success. In addition, Openness was sometimes positively associated with scholastic achievement, whereas Extraversion was sometimes negatively related to academic performance, although the empirical evidence regarding these two dimensions was somewhat mixed.

Komarraju, Karau, Schmeck, and Avdic (2011) examines significant roles of personality and learning styles are in influencing academic achievement. Two of the Big Five traits, Conscientiousness and Agreeableness, were positively related with learning styles, whereas neuroticism was negatively related with them. Furthermore, extraversion and openness were positively related with elaborative processing. Their research suggests that intellectual curiosity enhances academic performance when it is combined with thoughtful information processing.

Cognitive skills can be measured by IQ test or achievement test, while noncognitive skills cannot be measured by such a method. As we have mentioned, Heckman and Kautz (2014) asset that character is not a personality trait but a noncognitive skill and use the term "character skill" instead. According to their explanation, "traits" suggests a sense of permanence and possibly also of heritability, while "skills" suggests that these attributes can be learned. Furthermore, both cognitive and character skills can change and be changed over the life cycle. They treat the Big Five as a well-accepted taxonomy of character skills.

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[2] Interestingly, the international comparison analysis shows that Japan ranks the lowest in terms of Conscientiousness (Schmitt, Allik, McCrae, and Benet-Martinez 2007).

2 Data

2.1 Data Description

Our data is collected from the participants of our lecture on the Japanese Economy in Aichi University in the spring term of 2019. Aichi University is one of average-level universities located in the central Japan. The number of correspondences applicable to our study is 225, including 141 males (62.7%) and 84 females (37.3%). They consist of 57.8% sophomores, 35.1% juniors and 7.1% seniors. The questionnaire is based on the Japanese Version of Ten Item Personality Inventory (TIPI-J) presented by Oshio et al. (2012) and it is duplicated in the Appendix.

Ten-Item Personality Inventory consists of ten questions that ask the extent to which you agree or disagree with each statement. The statements are given in Table 1 and the Appendix. The choices are seven; 1) Disagree strongly, 2) Disagree moderately, 3) Disagree a little, 4) Neither agree nor disagree, 5) Agree a little, 6) Agree moderately, 7) Agree strongly. For example, the score of Extraversion is the sum of the value of Question 1 and eight minus the value of Question 6, because Question 6 is a reverse measure. The rest of scores are calculated in the same way.

2.2 Basic Statistics

We present the basic statistics of this analysis as follows. The average of GPA is 2.26 (SD 0.59), and its maximum and minimum are 3.59 and 0.57 respectively. On the other hand, the average of the test score of the Japanese Economy (JE score, hereafter) is 66.58 (SD 15.74), and its maximum and minimum are 101.25 and 27.50 respectively.

Assuming the results of Oshio et al. (2012) as a benchmark, let us find the

Table 1: The basic statistics of the Big Five factors

	Our results (N=225)		Oshio et al. (2012) (N=907)		Significant Difference
	Mean	SD	Mean	SD	
Extraversion	7.44	3.02	7.83	2.97	(−)*
1. Extraverted, enthusiastic.	3.62	1.76	3.89	1.70	(−)**
6. Reserved, quiet. ⟨R⟩	4.18	1.70	4.06	1.63	
Agreeableness	10.00	2.16	9.48	2.16	(+)***
2. Critical, quarrelsome. ⟨R⟩	2.67	1.44	2.99	1.53	(−)***
7. Sympathetic, warm.	4.68	1.38	4.47	1.23	(+)**
Conscientiousness	6.50	2.64	6.14	2.41	(+)**
3. Dependable, self-disciplined.	3.12	1.46	3.19	1.44	
8. Disorganized, careless. ⟨R⟩	4.62	1.72	5.05	1.46	(−)***
Neuroticism	8.92	2.71	9.21	2.48	
4. Anxious, easily upset.	4.67	1.92	5.00	1.60	(−)***
9. Calm, emotionally stable. ⟨R⟩	3.74	1.51	3.79	1.50	
Openness	7.35	2.23	8.03	2.48	(−)***
5. Open to new experiences, complex.	4.01	1.47	4.51	1.44	(−)***
10. Conventional, uncreative. ⟨R⟩	4.67	1.49	4.48	1.53	(+)*

Notes: ⟨R⟩ stands for the reverse measure. *p<0.10, **p<0.05, ***p<0.01.

characteristics of our samples[3]. Our samples show strong Agreeableness and less Openness, reflecting conservative characteristics of average-level students. Conscientiousness is rather strong, while Extraversion is weak. These characteristics accord with the feeling we receive during our usual lectures.

The correlations between the Big Five factors and academic achievements are summarized in Table 2. Extraversion has positive correlations with Openness and Conscientiousness, and Agreeableness positively correlates with Conscientiousness. On the other hand, Neuroticism has negative correlations with Extraversion, Conscientiousness and Openness.

Conscientiousness is positively associated with GPA, while openness is negatively associated with it. O'Connor and Paunonen (2007) summarizes the results reporting correlations between Big Five personality factors and post-secondary

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[3] The mean differences are tested by t-values in Table 1.

Table 2: The correlation matrix

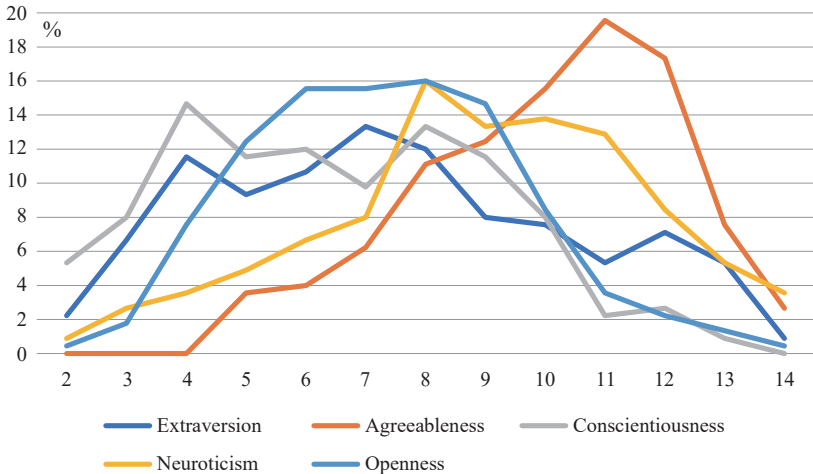|	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness	GPA	JE Score
Extraversion	–						
Agreeableness	−0.058	–					
Conscientiousness	0.167**	0.198***	–				
Neuroticism	−0.246***	−0.120	−0.250***	–			
Openness	0.401***	−0.033	0.077	−0.208***	–		
GPA	−0.107	0.068	0.344***	0.055	−0.178***	–	
JE Score	−0.061	0.018	0.095	0.114*	−0.085	0.428***	–

Notes: *p<0.10, **p<0.05, ***p<0.01.

Figure 1: Distribution of the Big Five scores

academic performance. Many researches confirm positive correlations between Conscientiousness and GPA. However, the correlations between Openness and GPA are reported both positively and negatively. This ambiguity has gathered researchers' attention as is discussed later.

Distribution of the Big Five scores is shown in Figure 1. Interestingly, the distributions of the Big Five scores are almost the same as those of Oshio et al. (2012). The unique difference is that our distribution of Conscientiousness has two

humps, while that of Oshio et al. has a single peak. Our samples are divided into two groups of less self-disciplined and well self-disciplined. As is shown later, this character affects the GPA so greatly. Extraversion and Openness show symmetry distributions, while Agreeableness and Neuroticism have right-skewed distribution.

2.3 Openness and Academic Achievement

A negative effect of Openness to Experience on academic performance seems somewhat strange intuitively. However, it is widely reported by previous studies as Pororat (2009) surveyed. Eysenck (1992) suggests that students who socialize and pursue other activities than study are likely to lower performance level. If a student has eyes open to various things, he or she challenges to take any subject that seem interesting but may receive a strict evaluation, and tends to push GPA down.

By way of another explanation, Gatzka (2021) suggests that the notion of Openness contains two different aspects which give opposite effects on academic performance. The two sides of Openness are named intellectual and senso-aesthetic openness subjectively. Intellectual openness stands for the preference for intellectual stimulation or scholastic endeavors and facilitates academic performance. On the other hand, senso-aesthetic openness means the preference for sensory and perceptual exploration and immersion in art, fantasy, and imagination, and it shows an impeding effect on academic performance (Gatzka and Hell, 2018).

3 Regression Analysis

We show the results of the regression analysis of the Big Five personality on academic achievement in this section. Academic achievement is measured by GPA or the test score of a particular subject. The explanatory power of the Big Five personality on GPA is quite good, while it is not good on the test score of our lecture on the Japanese Economy. Both results are quite contrastive and suggestive to

examine the effects of personality on academic performance.

Table 3 shows the results of the regression analysis of the Big Five personality on GPA. The explanatory variables are female dummy and the Big Five factors. The results are quite good because all the variables except Agreeableness are significant and coefficient of determination is high.

Female students receive higher GPA than male students by 0.45 points. This result is agreeable as many instructors feel that women tend to show more serios attitudes for study. To understand the impact of each variable on academic performance, standardized coefficients are also given in the same table. Surprisingly, all the Big Five factors except Agreeableness are significant in our analysis. Conscientiousness is the strongest predictor of academic performance as O'Connor and Paunonen (2007) suggest that it contains achievement-striving and self-discipline facets. Contrary to most of the past literatures, Neuroticism is positively associated with academic performance in our analysis. Students who feel anxiety and stress against academic performance tend to take safety precautions by studying harder or cooperating with other students. Mullar (1992) posits that individuals high on trait anxiety are more likely to have lower self-efficacy and it leads to impair test performance. We feel

Table 3: The results of the regression analysis on GPA

Dependent Variable: GPA

Explanatory Variables	Coefficient (B)	Standard Error	Standardized Coefficient (β)	t-value
Intercept	1.7443	0.2720		
Female	0.4514	0.0695	0.3724	6.4958***
Extraversion	−0.0304	0.0125	−0.1562	−2.4427**
Agreeableness	0.0001	0.0157	0.0005	0.0087
Conscientiousness	0.0864	0.0133	0.3879	6.5208***
Neuroticism	0.0268	0.0131	0.1234	2.0466**
Openness	−0.0307	0.0164	−0.1164	−1.8732*
Adjusted R^2	0.2925			
N	225			

Notes: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

that students of average-level university tend to have low self-efficacy.

Both Openness and Extraversion have been identified as negative predictors of academic performance in our research. According to O'Connor and Paunonen (2007), both factors produced mixed results as predictors of post-secondary academic performance. As we discussed in the previous section, Openness reflects outward interests and intellectual curiosity that seem to contribute academic performance, but it also means less concentration towards a certain subject or an innocent diversion from it.

Extraversion involves being energetic, hurried, and enthusiastic, as a positive predictor of academic performance, but disagreement exists concerning the relation between Extraversion and academic performance. Our results suggest that Extraversion is a negative predictor of it and interests toward the outer world do not simply contribute to academic performance. This negative association has been interpreted as suggesting that introverts spend more time studying, whereas extraverts spend more time socializing (Chamorro-Premuzic and Furnham, 2005).

Table 4 shows the results of the regression analysis of the Big Five personality on the test score of lectures on the Japanese Economy (JE score). The explanatory

Table 4: The results of the regression analysis on the JE score

Dependent Variable: JE Score

Explanatory Variables	Coefficient (B)	Standard Error	Standardized Coefficient (β)	t-value
Intercept	56.5205	8.5477		
Female	4.3625	2.1841	0.1344	1.9973**
Extraversion	−0.2767	0.3916	−0.0530	−0.7066
Agreeableness	0.0438	0.4947	0.0060	0.0885
Conscientiousness	0.7905	0.4166	0.1325	1.8974*
Neuroticism	0.8044	0.4114	0.1384	1.9556*
Openness	−0.3082	0.5152	−0.0436	−0.5982
Adjusted R^2 N	0.0256 225			

Notes: * $p<0.10$, ** $p<0.05$.

power of this model is quite low as the adjusted coefficient of determination is so small. Female dummy, Conscientiousness and Neuroticism are significant and these variables show the same sign as the previous model. The Big Five personality does not sufficiently explain the performance of a specific subject but surely explain the whole academic performance.

4 Conclusion

Our analysis suggests that the Big Five personality surely explain academic performance, but it does not sufficiently explain the performance of a specific subject. It means that the Big Five factors are good predictors of the whole academic performance. Conscientiousness is the strongest predictor of academic performance reflecting achievement-striving and self-discipline facets. Contrary to the past literatures, Neuroticism is associated with academic performance in our analysis. Students who feel anxiety against academic performance tend to take safety precautions by studying harder. Both Openness and Extraversion have been identified as negative predictors of academic performance in our research. Outward interests and intellectual curiosity do not simply contribute to raise academic performance. This research is just a pilot analysis. Detailed analysis collecting more samples or using other personality measures with more items are left for future works.

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Appendix: The Japanese Version of Ten Item Personality Inventory (TIPI-J)

1 全く違うと思う　2 おおよそ違うと思う　3 少し違うと思う　4 どちらでもない
5 少しそう思う　　6 まあまあそう思う　　7 強くそう思う

1　外向性 Openness
　　私は自分自身のことを　活発で、外向的だと思う
2　協調性R Agreeableness
　　私は自分自身のことを　他人に不満をもち、もめごとを起こしやすいと思う
3　勤勉性 Conscientiousness
　　私は自分自身のことを　しっかりしていて、自分に厳しいと思う
4　神経症傾向 Neuroticism
　　私は自分自身のことを　心配症で、うろたえやすいと思う
5　開放性 Extraversion
　　私は自分自身のことを　新しいことが好きで、変わった考えをもつと思う
6　外向性R
　　私は自分自身のことを　ひかえめで、おとなしいと思う
7　協調性
　　私は自分自身のことを　人に気をつかう、やさしい人間だと思う
8　勤勉性R
　　私は自分自身のことを　だらしなく、うっかりしていると思う
9　神経症R
　　私は自分自身のことを　冷静で、気分が安定していると思う
10　開放性R
　　私は自分自身のことを　発想力に欠けた、平凡な人間だと思う