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To What Extent Can the Big Five and Learning Styles Predict Academic Achievement

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Abstract
Personality traits and learning styles play defining roles in shaping academic achievement. 202 university students completed the Big Five personality traits questionnaire and the Inventory of Learning Processes Scale and self-reported their grade point averages. Conscientiousness and agreeableness, two of the Big Five personality traits, related positively with all four learning styles, namely synthesis-analysis, methodical study, fact retention and elaborative processing. On the other hand, neuroticism was found to have a negative relationship with all four learning styles. Furthermore, both extraversion and openness appeared to have positive relationships with elaborative processing. The results of the Big Five personality traits explained 17% of the variance in grade point average and learning style added 5% , indicating that both contribute to academic performance. Further, the relationship between openness and GPA was mediated by synthesis-analysis and elaborative processing, both reflective learning styles. These findings suggest that when students process information thoroughly and meticulously and combine such an approach with intellectual curiosity, their academic performance will be enhanced. The impacts of these findings on teaching techniques and curriculum design are also deliberated.
Keywords: Learning styles, reflective, synthesis-analysis, Big Five, conscientiousness, openness, academic achievement,

1. Introduction

The way of processing, encoding, recalling, organizing and applying the knowledge assimilated changes from student to student in universities. There are conscientious learners and there are less conscientious ones who prefer to process information superficially; two categories indicating the presence of both the preferred learning styles and the depth of information processing. Can personality be the key to explain such individual differences ? Can learning styles and strategies be the link between academic performance and the personality? This paper attempts to elucidate such questions by exploring the relationships between academic performance, learning styles and personality traits among university students.

1.1. Learning styles

The style of learning is an entity that depicts information processing, by means of which the world is perceived through intelligences such as language, logical-mathematical analysis, spatial representation, musical thinking, the use of the body to solve problems or to make things, an understanding of other individuals, and an understanding of ourselves. On the other hand, individuals differ in the strength of these intelligences - the so-called profile of intelligences -and in the ways in which such multiple intelligences are invoked and combined to carry out different tasks, solve diverse problems and progress in various domains (Snyder, 2000). Depending on the particular combination of these strengths, individuals develop their own learning styles and these learning styles , coupled with intelligence, lead to academic achievement. Because learning styles has been the focus of such a vast number of research, there exists a variety of definitions, theoretical positions, models, interpretations and measures of constructs with the common premise being the differences in the ways individuals learn (Coffield et al., 2004). Among the existing models of learning styles (Cassidy, 2004), the one preferred for this study is the one by Schmeck, Ribich, and Ramanaiah (1997). It opens with a conceptual framework of effective information processing and proceeds to identify learning strategies that may enhance studying and academic performance as it is developed around the belief that it is the quality of thinking during learning which affects the learning outcome and it regards memory as a consequence of conscientious thinking and depth of processing (Craik & Lockhart, 1972). Furthermore, in this model, learners are not necessarily classified into mutually exclusive categories. It is suggested that some students may assume agentic/shallow processing with, for example, the performance goal of doing well on a test while others may adopt reflective/deep processing with the mastery goal of deep understanding and long-term retention. The students naturally are aware of how they process information from the lectures they attend, the material they read or the discussions they undertake. Thus, if students are encouraged to reflect more deeply about the information, they are more likely to encode the information more thoroughly and thereby remember it longer.

The main premises of the four learning styles are as follows. Fact retention indicates processing of information in such a way that main concepts are memorized with the goal of doing well on tests rather than assimilating the essence of what is being learned. Methodical study consists of all that are conventionally

highlighted in most academic environments – being careful and meticulous while delivering all types of projects on time. Elaborative processing implies adding new information to current reserves of knowledge and enriching the personal experiences of the student through implementation. Synthesis-analysis learning style denotes processing knowledge, categorizing and organizing that knowledge into hierarchies.

Differences in the intellectual styles of individuals and their preferences in acquiring knowledge have been highlighted in literature (Zhang, 2003; Sternberg & Zhang, 2001). Students apparently need to employ more complex approaches that necessitate and invoke deeper processing as they progress from first year to the last (Bartling, 1988; Jakubek & Swenson, 1993).

1.2. The Big Five Personality Traits

For investigating the relationship between personality and various academic endeavors, the Big Five framework designed and developed by Costa and McCrae (1992) has emerged as a reliable tool used worldwide. Poropat (2009) , in his study of the Big Five and academic performance, drew attention to the relationship between personality and individual differences in learning styles. Openness of the Big Five personality traits is delineated by strong intellectual curiosity and indulgence in novelty and variety. Conscientiousness indicates a person who is oriented to accomplish, organized and disciplined. Extraversion specifies a high degree of sociability relative to others, assertiveness and verbosity. Agreeableness refers to being helpful, cooperative, sympathetic towards others while showing close empathy. Finally, neuroticism measures the degree of emotional stability, anxiety and ability to manage impulses. Literature emphasizes the links between individual differences in learning styles and personality and educational goals of students and it is recommended in the literature that instructors take these factors into consideration in scaling the academic behavior of their students (Miller, 1991).

1.3. Personality and Academic Performance

Personality traits affect academic performance and achievement. For example, the trait of conscientiousness has continuously emerged as a reliable predictor of academic performance (Conard, 2006; Chamorro-Premuzic & Furnham, 2003). It has been established that various educational outcomes have been successfully predicted by relevant combinations of the Big Five personality traits. When used jointly, the traits of conscientiousness and openness have satisfactorily predicted course performance (Paunonen & Ashton, 2001). Agreeableness, conscientiousness and openness have been found to predict overall academic performance (Poropat, 200; Farsides & Woodfield, 2003) . It has also been ascertained that openness, extraversion, and conscientiousness may predict academic achievement, especially when previously accumulated knowledge is applied to real-life situations (Lievens, Ones, & Dilchert, 2009). Contrary to these, emotional instability or neuroticism has been found to influence academic performance negatively (Chamorro-Premuzic & Furnham, 2003). There are other traits such as perseverance or grit that may also be employed for predicting academic performance (Duckworth, Peterson, Matthews, & Kelly, 2007). These studies verify the significance of personality traits. However, over and above the personality traits, other individual factors such as learning styles should be explored.

1.4. Learning Styles and Personality

Research reveals the presence of intriguing links between personality traits and learning styles. Considering, for example, the depth of processing, it has been established that deep-processing students are more likely to employ suitable study methods, draw conclusions effectively and are self-regulated when compared to the students who prefer to process in a shallow fashion (Gadzella, Ginther, Masten, & Gutrie, 1997). Furnham (1992) and Zhang (2003) have both maintained that deep-processing students are more likely to be conscientious, intellectually curious and extraverted. Geisler-Brenstein, Schmeck, & Hetherington (1996) emphasize that such students are also emotionally stable. Zhang (2003) also suggests that if a student favors intuitive processing and a structured learning environment, then that student may be susceptible to anxiety and worry. Furnham (1992) asserts that students who prefer a vigorous and pragmatic approach generally turn out to be extraverted. Hence, it can be surmised that learning styles and personality traits are inextricably linked.

1.5. Learning Styles and Academic Performance

Thinking, processing information and accruing knowledge are processes that differ from student to student (Schmeck, 1999; Zhang, 2003). Each student comes with his or her preferred style. Agentic styles such as methodical study and fact retention are conducive to higher grades and therefore are favorites of some. On the other hand, there are others who utilize reflective styles such as elaborative processing and synthesis-analysis which may lead to greater understanding and knowledge (Schmeck, Ribich, & Ramanaiah, 1997). According to some studies, these individual differences in learning styles may be employed for predicting the performance of the students (Lockhart & Schmeck, 1984). In general, some learning strategies have been found to be more effective for academic performance and achievement. Among these are elaborative processing (Hall, Hladyj, Perry, & Ruthig, 2004), deeper levels of reflection (Jakoubek & Swenson, 1993), synthesis-analysis (Miller,

Alway, & McKinley, 1987), and active thinking and organized studying (Entwistle & Waterston, 1988). According to Payne, Youngcourt, & Beaubien (2007), the deep-processing students may duly benefit from added values such as being receptive to feed-back. They may also benefit from inadvertent learning through spontaneous assimilation of material (Schmeck, 1999). As can be surmised, students who are conscientious and analytical-minded will probably perform better academically.

It has also been implied in the literature that if learning styles are harmonized with teaching methods, academic performance and achievement may increase (Sternberg & Zhang, 2001). On the other hand, Pashler, McDaniel, Rohrer, & Bjork (2008) have carried out a comprehensive study revealing the lack of reliable and empirical support for adapting teaching styles to students' learning styles. According to Pashler et al. (2008), instead of tailoring teaching techniques to specific learning styles, investigating strategies that supplement learning and memory should be preferred. Numerous viewpoints seem to coalesce on this issue (Komarraju, Karau, Schmeck, & Avdic, 2011). Enhancing academic achievement by matching learning styles and teaching methods is not investigated in this current study. Instead, the significance of specific learning styles in enhancing learning and the role that they play in mediating personality traits and academic performance are explored.

1.6.Academic Performance, Learning Styles and Personality Traits

The personality traits of the students and learning styles have been investigated extensively in the literature. On the other hand, about the combined effects of these two variables in explaining academic performance and achievement there seems to be little knowledge. Ferguson, James, & Madeley (2002) suggest that learning styles and personality traits together may predict performance in medical schools. Furthermore, it has been established that openness is related to certain learning styles that appear to be positively associated with academic success (Farsides & Woodfield, 2003). Contrary to these, Busato, Prins, Elshout, and Hamaker (2000) convey diverse results about the association between personality traits, academic success and learning styles. They reported that the personality traits of conscientiousness and openness correlated significantly with academic success and learning styles. On the other hand, according to their findings, there was no significant relationship between learning styles and academic performance. Thus, there seems to be a scarcity of research and also inconsistency in describing academic success in terms of individual differences in personality traits and preferred strategies for learning.

1.7. The Present Research and Hypotheses

Although it has been established in the literature that personality traits and learning styles are both associated with academic success, the combined effect of personality traits and learning styles on academic performance appears to be vague. In addition, not much seems to be known about the extent of mediation of learning styles between personality traits and academic performance. The present research attempts to fill this gap by directly exploring the relationships between learning styles, personality traits, and academic achievement. It also investigates the extent to which relationships between personality traits and academic success might be mediated by learning styles. The following hypotheses are made:

1. The first hypothesis pertains to openness. Students who display a high degree of openness possess a strong intellectual curiosity and are eager to learn. Strong intellectual curiosity may involve deep processing. Therefore, it is predicted that openness would be related positively with reflective learning styles such as elaborative processing and synthesis-analysis. It is also predicted that openness would be related positively with academic success since the tendency for deeper understanding is likely to promote academic performance.
2. The second hypothesis concerns conscientiousness. Conscientious students are expected to have strong work ethics and are expected to employ purposeful and focused learning strategies. As such, they are likely to be high achievers. Therefore, it is predicted that conscientiousness would be positively related to the agentic learning styles such as methodical study and fact retention. It is also predicted that conscientiousness would be positively associated with academic performance as conscientious students tend to be both self-regulated and achievement oriented.
3. Another hypothesis is related to agreeableness. Agreeable students display cooperative attitudes which indicate that they are usually cooperative, trusting and helpful and more likely to meet deadlines. Taking these characteristics into account, it may be predicted that agreeableness would be positively associated with all four learning styles. Another prediction may be that this personality trait and academic success would be positively related.
4. The fourth hypothesis is about neuroticism which refers to individuals who experience anxiety, self-doubt and negative emotions. Such individuals are likely to abandon the learning process and may give up easily if they face difficulties. Therefore it may be predicted that neuroticism would be negatively related with all four learning styles as well as with academic success.
5. The next hypothesis incorporates the two reflective learning styles and academic success. As these two

reflective learning styles, namely synthesis- analysis and elaborative processing, allow for deeper understanding, it may be predicted that they would be positively associated with academic success.

6. As mentioned above, since openness and reflective learning styles may be conducive to acquiring more knowledge, it may be predicted that openness and reflective learning styles are both positively associated with academic success. Furthermore, their combined effect should also be investigated. For students who prefer reflective learning styles, the trait of openness may be beneficial to learning. Therefore, the extent to which the relationship between academic success and openness is mediated by synthesis-analysis and elaborative processing is also examined.
7. No predictions are offered about extraversion as this trait depends highly on context.

2. Methods

2.1. Participants

The participants consisted of 202 undergraduate university students enrolled in various departments of a non-profit, private university in İstanbul, Turkey. The ages of the students varied between 18 to 20. Since the language of instruction is English , the scales used were in English as well . The native language of the students was Turkish and English was their second language with levels ranging from intermediate to advanced.
The breakdown according to departments and gender is given in table 1.
Table 1. Breakdown of participants according to gender and department

Department	**Arts & Sci.**		**Bus. Adm.**		**Commun.**		**Engineer.**		**Architect.**		**Law**		**total**
Gender	M	F	M	F	M	F	M	F	M	F	M	F	
Number	21	17	18	13	10	18	26	24	17	15	9	14	
Sum (M+F)	38		31		28		50		32		23		202
%	18.8		15.3		13.8		24.8		15.8		11.5		100

86% of the students were first-year, 9 % were second and 5% third-year students.

2.1. The Instruments – Questionnaires and interviews

Both quantitative and qualitative approaches were employed.

2.1.1. The Big Five Personality Traits questionnaire :

The five major domains of personality , openness to new experiences, conscientiousness, extraversion, agreeableness, and neuroticism were assessed by the NEO-FFI, a 60-item scale with well-established reliability and validity (Costa & McCrae, 1992). The Cronbach's α values for internal consistency were: openness 0.74, conscientiousness 0.82, extraversion 0.78, agreeableness 0.76, neuroticism 0.82.

2.1.2. The Inventory of Learning Processes scale (ILP) :

The Inventory of Learning Processes of Schmeck, Ribich, and Ramanaiah (1997) is a widely-used 62-item scale that entails two types of learning styles: reflective and agentic. Reflective learning styles consists of synthesis-analysis (18 items) and elaborative processing (14 items). Agentic learning styles comprises methodical study (23 items) and fact retention (7 items). A number of studies provided reliable evidence about internal consistency and construct validity in addition to factor analysis results presenting robust structural validity (Schmeck, Ribich, & Ramanaiah, 1997; Schmeck & Ribich, 1978) . In the current study, the Cronbach alphas were 0.84 for synthesis-analysis, 0.77 for elaborative processing, 0.75 for fact retention and 0.84 for methodical study. The correlation analysis between the two reflective learning styles yielded 0.66 and between the two agentic learning styles, 0.54. Correlations across the two types varied from 0.39 to 0.52.

2.2. Procedure

The 202 students filled in the demographic data, completed the Five Factor Inventory (NEO-FFI) and the Inventory of Learning Processes (ILP), and self-reported their current GPAs. The ILP and the NEO-FFI were used for the quantitative part of this study. The procedure was administered in the spring term of 2014 during class-time and the students were asked to respond individually. They were given to understand that their answers were going to remain confidential. Ethical standards to protect the rights of the participants were observed throughout the study.

For the qualitative analysis, a number of students were recruited to participate in individual interviews for obtaining more detailed responses across a range of questions posed in the surveys. A total of 36 students offered their perspectives during the interviews and focus group sessions.

3. Results

3.1. Correlation

Correlation analyses revealed a number of significant relationships consistent with the predictions which are displayed in table 2 below. Consistent with the first hypothesis, openness was found to be positively related with synthesis-analysis and elaborative processing, the two reflective learning styles. As expected, neuroticism was

negatively related with all four learning styles. Agreeableness and conscientiousness were positively associated with all four learning styles. Extraversion turned out to be positively related with fact-retention and elaborative processing. Three of the five personality traits (openness, agreeableness and conscientiousness) and all four learning styles correlated positively with academic success.

Table 2. Correlations between the Big Five personality traits, learning styles and GPA

The Big Five personality traits	Learning Styles Subscales				GPA
	Elaborative Processing	Synthesis Analysis	Methodical Study	Fact Retention	
Openness	0.44	0.39	0.12	0.09	0.23
Conscientiousness	0.32	0.29	0.63	0.37	0.39
Extraversion	0.21	0.17	0.08	0.18	0.09
Agreeableness	0.28	0.29	0.25	0.31	0.32
Neuroticism	-0.17	-0.38	-0.19	-0.27	-0.03
GPA	0.24	0.26	0.34	0.25	

$p<0.05$

3.2. Regression

The first issue considered was the extent to which the Big Five personality traits predicted the four learning styles. It was found that

- 36 % of the variance in synthesis-analysis was explained by conscientiousness, openness and neuroticism , $F(5,194)=29.48$, $p< 0.05$;
- 26 % of the variance in elaborative processing was explained by openness and conscientiousness, $F(5,194)=19.08$, $p< 0.05$;
- 40 % of the variance in methodical study was explained by openness and conscientiousness, $F(5,194)=29.72$, $p< 0.05$;
- 16 % of the variance in fact retention was explained by conscientiousness, $F(5,194)=12.07$, $p< 0.05$.

The relevant findings are given in table 3.

Table 3. Multiple regression with the Big Five and the four learning style

Dependent variable	Independent variable	Beta	R^2	Adjusted R^2
Synthesis –analysis	Neuroticism	-0.38		
	Openness	0.44		
	Conscientiousness	0.24		
			0.36	0.34
Elaborative processing	openness	0.39		
	Conscientiousness	0.28		
			0.26	0.24
Methodical study	openness	0.18		
	conscientiousness	0.72		
			0.40	0.38
Fact retention	conscientiousness	0.26		
			0.16	0.14

$p<0.05$

The second analysis pertained to determining which of the specific Big Five personality traits and learning styles explained variations in academic success , as measured by GPA. Two runs were made, the first one involving the Big Five personality traits and the second the learning styles. The Big Five traits without extraversion explained 15 % of the variance in GPA. In other words, neuroticism, openness, agreeableness and conscientiousness provided the relevant input, $F(5,146)=10.67$, $p< 0.05$. Learning styles explained 14 % of the variance in GPA, $F(5,148)=8.77$, $p< 0.05$, with synthesis-analysis and methodical study emerging as significant predictors. The results are displayed in tables 4 and 5.

Table 4. Multiple regression with the Big Five on GPA.

Dependent variable	Independent variable	Beta	R^2	Adjusted R^2
GPA	Openness	0.25		
	Conscientiousness	0.46		
	Extraversion	0.05		
	Agreeableness	0.19		
	Neuroticism	0.27		
			0.19	0.17

$p<0.05$

Table 5. Multiple regression with the four learning styles on GPA.

Dependent variable	Independent variable	Beta	R^2	Adjusted R^2
GPA	Elaborative processing	0.07		
	Synthesis-analysis	0.29		
	Methodical study	0.31		
	Fact retention	0.04		
			0.14	0.11

$p<0.05$

Thirdly, a hierarchical regression analysis was carried out in order to determine whether learning styles explained further variation in addition to what already has been depicted by the Big Five personality traits. Firstly, four of the five personality traits that emerged as the most significant were selected and entered. Then, the most significant two of the four significant learning styles were chosen and entered. Personality traits explained 17 % of the variance in GPA with conscientiousness, agreeableness and neuroticism as significant variables and learning styles an additional 5%, with synthesis-analysis as the only significant variable . Personality traits and learning styles together explained 22 % of the variance in GPA, $F(6, 144)$ 11.82, $p< 0.05$. The results are tabulated in table 6.

Table 6. Hierarchical multiple regression

Dependent variable		Independent variable	Beta	R^2	Adjusted R^2
GPA	Step 1	Conscientiousness	0.32		
		Neuroticism	0.28		
		Agreeableness	0.22		
		Openness	0.08		
				0.17	
	Step 2	Synthesis-analysis	0.19		
		Methodical study	0.12		
				0.05	
				0.22	0.17

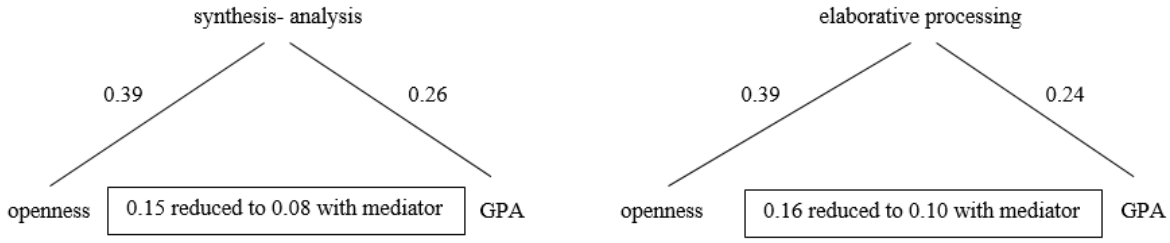
$p<0.05$

3.3. Mediation

In order to obtain a better understanding of the relationship between the personality traits and the learning styles, the extent to which learning styles mediated the relationship between personality traits and GPA was explored (Baron & Kenny, 1986). The findings demonstrated that the two reflective learning styles, namely the synthesis-analysis and the elaborative processing, partially mediated the relationship between openness and GPA. Specifically, when elaborative processing was considered, the relationship between openness and GPA was reduced significantly from 0.16 to 0.10, with Sobel's test = 3.23, $p< 0.05$. Similarly, when synthesis-analysis was included, the relationship between openness and GPA was reduced from 0.15 to 0.08 , with Sobel's test = 2.87, $p< 0.05$.

Figure 1

Synthesis analysis and elaborative processing partially mediating Openness and GPA



4. Discussion

The results obtained seem to ascertain a number of intriguing links between the Big Five personality traits, learning styles and academic success and also demonstrate that reflective learning styles can partially mediate the relationship between openness and academic success. In other words, the findings generate a number of interpretations of the dynamic relationship between personality and learning styles and also identify some potential practical implications. Furthermore, the results emphasize the joint influence of personality and learning styles on academic success.

In the first place, the findings on personality traits reveal several clues both for students and educators. The most notable among these is related to conscientiousness. The results verified the key importance of conscientiousness for learning and academic success. This personality trait was not only significantly and positively related to all four learning styles, but also presented the strongest link with GPA. None of the other independent variables showed such a striking association. Thus, learning strategies seems to be facilitated by conscientiousness and it appears to be an especially useful trait for achieving high levels of academic performance. Low levels of performance are probably the consequences of carelessness and not studying methodically. Furthermore, both agreeableness and openness were found to be positively related to GPA which implied that students might benefit from being not only conscientious but also cooperative and cognitively inquisitive. Educators who are aware of the crucial role of personality traits as predictors of academic performance may design course assignments to promote such traits. For fostering conscientiousness, students may be asked to submit their assignments in small parts, rather than in large projects. For agreeableness, cooperative behaviors may be rewarded. For openness, concepts may be linked to current events in order to attract students' imaginations.

Moreover, the results obtained denote that all four learning styles were associated with academic success. Such a correlation is not unexpected as it is consistent with the concept that these styles represent different approaches to information processing and that all have some value for learning (Schmeck et al., 1977). Furthermore, findings from the regression analyses corroborate the notion that reflective styles lead to a deeper or more thoughtful learning (Schmeck, 1999). Specifically, synthesis-analysis was found to be the only learning style explaining significant variation in GPA over and above the Big Five. It should also be remembered that both synthesis-analysis and elaborative processing techniques mediated the positive relationship between openness and GPA partially. In other words, educators who uphold synthesis-analysis and elaborative methods by explaining a concept or theory by giving real-life examples, by referring to relevant current events, by demonstrating the material using hierarchical concepts, by organizing information around themes meaningful to students may create greater student interest and success.

Furthermore, considering the relationship between personality traits and learning styles, it was predicted that students who were conscientious and open-to-new-experiences might resort to any one of the four learning styles. This insinuates that organized, meticulous, determined and intellectually-curious students are more likely to exploit any or all four learning styles in order to amplify their learning. Such students are likely to be very thorough, and are keen to build on and relate to previous knowledge and to study systematically. Therefore, in all likelihood, they would excel in exams. On the other hand, the relationships between neuroticism and all four learning styles were found to be negative, indicating that students who worried and were anxious would probably not be interested in the learning process and fail to organize and categorize what they are learning into meaningful units.

Lastly, although it has been maintained that deep processing of information is one of the key

approaches in many university courses and that the trait of openness-to new-experiences is the key to such an end, this study revealed that reflective learning styles, namely synthesis-analysis and elaborative processing, play a critical role in achieving academic success via openness. One of the findings of this study was that the relationship between openness to new experiences and academic achievement was partially mediated by both elaborative processing and synthesis-analysis. This implies that the intellectually curious students actively process information by arranging what they have learnt systematically into significant categories and by making meaningful connections to real-life situations. In other words, the tendency for the trait of openness to enhance GPA is due , at least in part, to such an approach. It can be advocated that students who are intellectually curious and open to new experiences and theories be cognizant of their personal preferences for specific learning styles and by time, develop a more reflective style. Perhaps they could consciously try to relate the information learned in one course to other courses, classify information acquired in categories that make sense to them, and link whatever they learn to their personal goals.

Although this study provides valuable insights into dual impact of personality traits and learning styles on academic achievements, it comes with certain limitations. Firstly, although prior research has found GPA obtained from school records to be positively and strongly correlated with self-reported GPA (Noftle & Robins, 2007) , future research could require participants' permission to obtain grades from university records instead of relying on self-reported GPSs. Secondly, future researchers could also include other indicators of academic performance such as attendance, persistence and time taken to complete a full semester. Thirdly, the fact that this study is conducted in a single institution hinders generalization. The fourth constraint is the lack of earlier research in this country which might have been used for comparison among universities. The medium of instruction is a further drawback. As the medium of instruction is English, results obtained can only be used to infer about students of the universities that provide education in English. And the final limiting factor is the fact that all the participants are of the first year – inclusion of upper classes may make a difference.

In conclusion, this study established the presence of a number of connections between personality, learning styles and academic achievement. It also showed how learning styles might mediate the relationship between personality traits and academic performance. Future research could advance the comprehension of the complex nature of academic achievement by exploring other facets of individual differences such as self-efficacy. Such research could also consider environmental factors such as socioeconomic status as predictors of academic performance.

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