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RESEARCH ARTICLE

Born this way or formed this way? Distal personality traits and proximal self-efficacy of Malaysian students and their academic performance

Seong-Yuen Toh[1], Fakhra Yasmin[2], Shehnaz Tehseen[1], Petra Poulova[2], Syed Arslan Haider[1,*], Elizabeth Andrews[1], Punitha Sinnappan[3], Rayhan Zaky Mahendra[1]

[1] *Department of Management, Sunway Business School (SBS), Sunway University, Selangor Darul Ehsan 47500, Malaysia*

[2] *Department of informatics and quantitative methods, Faculty of Informatics and Management, University of Hradec Kralove, 50003 Hradec Kralove, Czech Republic*

[3] *Department of Marketing Strategy & Innovation, Sunway Business School (SBS), Sunway University, Selangor Darul Ehsan 47500, Malaysia*

*** Corresponding author:** Syed Arslan Haider, haidershah24@gmail.com

ABSTRACT

It has been acknowledged that academic performance has important consequences in one's career, thus, a better understanding of both distal and proximal predictors deserves consideration. Based on social cognitive theory, this study contributes to the limited research investigating the academic performance of university students in Malaysia using the trait model which considers the mediation of self-efficacy (proximal characteristic) in the relationship between student personality (distal trait) and academic performance (outcomes). In a sample of 264 participants, self-efficacy positively relates to academic performance and positively mediated effects of all traits (except neuroticism) on academic performance. Contrary to past research, conscientiousness, extraversion, and agreeableness do not exert direct effects on academic achievement but instead through self-efficacy. Openness to experience turned out to be the strongest predictor pointing to a need for in-depth investigations into this dimension and for more complex model incorporating other proximal attributes in predicting academic performance in future research.

Keywords: social cognitive theory; self-efficacy; openness to experience; five factor model; academic performance; Malaysia

1. Introduction

Academic performance is vitally important for the lifelong success and career path of students. Students with positive academic outcomes have overall better well-being and higher remunerations compared to counterparts who do not perform well during their academic life[1]. Many studies have examined both cognitive as well as non-cognitive factors that contribute to academic performance (e.g., MacCann et al.[2]). However, the focus of current study is only on "individuals' personality" which has been regarded as a key non-cognitive factor that is related to individuals' academic performance[3]. Personality is one of the

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important factors that assist in understanding the human behaviour[4]. Personality, being a crucial determinant of human behaviour, has a substantial impact on academic achievement[5]. An individual's attitude to learning, ability to handle problems, and behaviour in educational environments are closely connected to their personalities[6]. For instance, an individual exhibiting elevated level of conscientiousness may display attributes such as diligence, organisation, and attention to detail, which frequently result in continuous academic achievement. Conversely, extroverted individuals may demonstrate exceptional performance in group conversations or presentations, whilst introverted persons may prefer alone study. Comprehending the correlations between personality traits and learning behaviours enables educators to customise teaching approaches to accommodate various personalities[7], ultimately cultivating an environment where students can excel academically according to their own strengths and inclinations. Five-factor model (FFM) is a dimensional representation of personality that is well established in recent times as it has been used in a wide variety of studies to test the effect of personality (for example, Mammadov[1]). Social cognitive theory conceptualises personality as a set of dynamic and intrapersonal factors that controls the behaviour of an individual whilst the five-factor model emphasizes in assigning specific personalities to inherent traits[8,9]. A major component in Bandura's social cognitive theory is self-efficacy and is defined as an individual's capacity to be persistent and be able to change behaviours to achieve their desired goals[10]. These individuals achieve their goals through proper planning, with the help of their confidence in their ability to solve complex issues. Furthermore, Soon et al.[11] found that in Malaysia, university students with a higher CGPA score have higher average salaries and students with first-class honours generally have 11.3% higher salary than their non-first-class counterparts. If academic performance is predominantly determined by distal characteristics like personality traits, then student screening becomes the prime factor in academic excellence while at the same time counselling students to appropriate majors to fit their trait characteristics may be beneficial[12]. But if proximal attributes of self-regulatory mechanism like self-efficacy is a robust predictor of academic performance, then human development perspective plays a more significant role in student academic achievement. Therefore, based on social cognitive theory[8], this study investigates individual differences of students involving the relationship between distal characteristics of students in terms of their personality traits and the proximal attributes in terms of self-efficacy and their impact on academic performance.

There are limited studies investigating the relationship between FFM and self-efficacy[13]. Stajkovic et al.[9] indicate that the few studies on relationship between FFM and self-efficacy are inconclusive. Moreover, Caprara et al.[14] and Ran et al.[15] asserted that academic performance was exclusively predicted by self-efficacy, with no discernible impact from the big five traits. Conversely, Poropat[16] contends otherwise, suggesting that the big five traits do directly influence academic performance. Judge et al.[17] concluded that self-efficacy exhibits limited predictive power for work performance but proposed that its influence may be moderated by individual differences. Despite these varied perspectives, there have been scarce attempts to explore the combined impact of both the big five characteristics and self-efficacy on academic success[9]. The inconsistencies observed regarding the direct effects of the big five traits and self-efficacy on academic performance prompt the question of whether self-efficacy might serve as a mediating factor between these two variables.

2. Theory and hypotheses development

2.1. Five-factor model of personality (FFM)

The FFM categorizes personality into five basic dimensions: extraversion (positive activity, emotions, sociability), openness to experience (a degree of, creativity, intellectual curiosity, as well as preference for

variety and novelty), agreeableness (a propensity for being socially and cooperatively with other people), conscientiousness (a propensity to exercise self-control, plan ahead, and be organised), and neuroticism (a susceptibility to negative feelings including anger, worry, and depression)[1]. These personality traits were extensively examined in different settings such as schools and universities[18]. Although the big-five trait theory has been criticized for not being based on a proper theory-driven model and its incapability of explaining all the personalities, FFM is widely preferred in personality research, such as studies of personality related to leadership, social well-being, work performance, and academic achievement[9,19]. Similarly, personality differences and personality differences and their effects on student academic performance have been investigated using FFM[16,20]. The five factor model proposes that personality traits exhibit behavior consistency across different situations. Such trait-behavior consistency aligns with the idea of self-efficacy, as individuals with certain traits may exhibit more consistent self-efficacy beliefs in academic tasks. In the academic context, self-efficacy beliefs are related to a student's confidence in their ability to perform well in academic tasks. According to social cognitive theory, students learn by observe the behaviors and coping strategies of their peers, teachers, or role models. In this study, a model linking FFM as predictor with self-efficacy as mediator is testing on students' academic performance.

2.2. Development of hypotheses

2.2.1. Openness to experience and academic performance

Openness to experience refers to the imaginative and insightful characteristics of a person which include curiosity, the willingness to explore new things, and unconventional or abstract thinking that evokes creativity[21]. De Raad and Schouwenburg[22] stated that these characteristics portray "the ideal student", due to studies finding that students with high levels of openness tend to be open with new modes of studying due to their creative nature. Additionally, openness to experience positively correlates with the motivation to learn[6,23] and better critical thinking abilities[24,25] whilst having the strongest negative correlation contributing towards absenteeism at the same time[26,27]. Oddly, even though Caprara et al.[28] concluded that the big-five factor was an unreliable measure, their study found that openness was the only variable that demonstrated potential in predicting academic outcomes, as it is suggested that openness is correlated with intelligence[28] that results towards better academic performance[12]. Thus, due to the positive relationship of openness with various performance-related outcomes including approaches to learning, critical thinking, and autonomous motivation give a convincing justification for why it is crucial for student achievement[1,16]. Based on the above supported literature, we hypothesize as below:

H1: Openness to experience has a positive relationship with academic performance.

2.2.2. Conscientiousness and academic performance

Many studies have often linked conscientiousness to academic performance[16,22]. Likewise, a study by Rimfeld et al.[29] possesses empirical data to support that conscientiousness is one of the stronger indicators of academic performance. Conscientiousness refers to the extent a person is organized in nature, which typically characterizes them as a responsible, dependable, and rule-abiding person[21] who contributes towards consistent effort in working towards their goals[30]. Students with high levels of conscientiousness can exert better self-discipline, and therefore are able to have better time-management skills which could help them complete their schoolwork with ease due to their preparedness in their studies[24]. Students with conscientiousness typically exhibit self-control, organisation, and efficiency when performing assignments. These traits are anticipated to improve students' performance on exams, tests, and other evaluation tools[18]. Thus, the following hypothesis is established regarding this relationship.

H2: Conscientiousness has a positive relationship with academic performance.

2.2.3. Extraversion and academic performance

Extraversion addresses the sociability aspect of a person, where people with higher levels of extraversion tend to spend more time socializing with a larger group of friends compared to their introverted counterparts[17]. Higher energy levels generally portrayed by extraverted people is argued to be a positive factor in affecting academic performance due to their positive attitude, as this intrigues them to learn and understand better[22]. However, Bidjerano and Dai[24] have noted that higher levels of extraversion may inhibit the student's ability to focus, and according to Eysenck[25] as cited in Poropat[16], students would instead pursue their other interests rather than studying, hence lowering academic performance in the process. We have hypothesized a positive relationship between these two variables stated below:

H3: Extraversion has a positive relationship with academic performance.

2.2.4. Agreeableness and academic performance

Agreeableness reflects the extent to which an individual is cooperative and altruistic in nature[21]. Studies suggest that agreeableness has a positive impact on academic performance[16,22]. Vermetten et al.[26] have suggested that higher levels of compliance facilitate the learning process by cooperating with the teacher's instructions and staying focused on tasks provided. The consistency of attending classes also increases[31], which is found to have a positive and important influence on exam performance[32], which therefore reflects academic performance. Furthermore, friendly characteristics of agreeableness trait engender students to get along well and facilitate entry to new relationship and mastery of new skills which is especially significant since most university level assessments are group based. Thus, the following hypothesis was developed.

H4: Agreeableness has a positive relationship with academic performance.

2.2.5. Neuroticism and academic performance

Additionally, the degree to which a person is nervous, emotionally unstable and unsafe is reflected in neuroticism[33]. De Raad et al.[22] and Han et al.[34] have found that emotional instability causes anxiety which interferes with the concentration towards academic tasks, and therefore the reduction in academic performance. Test anxiety is another symptom of emotional instability whereby a student may be unable to perform during exams[16]. Few other studies have also found the negative relationship of neuroticism and academic performance among students[35,36]. Thus, we have hypothesized negative relationship of neuroticism with academic performance as proposed below,

H5: Neuroticism has a negative relationship with academic performance.

2.2.6. Mediating role of self-efficacy

Although there are many factors that contribute towards the psychological process of an individual, self-efficacy stands out to be the most influential[37], when taken in the context of their perceived capabilities for performance. Wang et al.[38] describes self-efficacy as the beliefs of individuals in their ability to achieve desired performance levels. Self-efficacy influences how learners think, feel, and act. Beliefs in the capability of self in performance tasks and meeting challenges reflect a mastery over environmental demands. Higher level of self-efficacious beliefs is instrumental towards achieving higher level of performance outcomes. Bandura believes actual performance motives self-efficacious individual in a virtuous circle[10]. When students with high self-efficacy face temporary setbacks, they look at other factors to improve and not doubt their capabilities. Success inspires higher self-efficacy, which further improves performance. Low self-efficacy disinclined a person towards desired behaviours if the outcomes are perceived to be unlikely. It is the ability of an individual to persevere in the face of difficulty and perform

necessary behaviours needed to achieve their goals. As such, self-efficacy is a major factor in this study as research has found that self-efficacy is correlated to academic performance[39]. Richardson et al.[3] have backed up this claim through their meta-analytical study by examining 50 antecedents of academic performance and found self-efficacy to be the strongest correlator. Schneider and Preckel[40] also confirmed this result by using 105 academic performance predictors to conduct a similar study, whereby self-efficacy, after student-peer evaluation, was the second strongest predictor of academic performance. Thus, self-efficacy may be the most important variable in this study due to its strong and consistent correlation with academic performance.

In relation to the FFM, studies have also found a link between self-efficacy and five personality traits[17,41]. Openness to experience is positively correlated with self-efficacy and academic self-confidence[42], as it alters the individual's perception of hardship into a challenge that needs to be addressed, which continuously expands task engagement further, which in turn increases self-efficacy. High levels of conscientiousness promote task-engagement and greater effort towards work, hence stimulating higher levels of self-efficacy as well[43]. Extraversion increases self-efficacy by attracting greater positive attitude from others towards themselves[41], whilst agreeableness encourages exploring new activities and learning them, which may lead to an increase in self-efficacy[14]. Furthermore, emotional stability is found to be positively correlated with self-efficacy[16]. Contrary to Judge et al.[17], Stajkovic et al.[9] recommend self-efficacy as a partial mediator in the relationship between FFM and academic performance. Similarly, Vecchione and Capara[44] report self-efficacy as fully mediating the effects of the big five traits. However, past studies claim inconclusive evidence about the relationships of self-efficacy and big five traits on academic achievement[9,31]. This study proposes self-efficacy as a positive mediator between FFM and academic performance. The relevant hypotheses are stated as below:

H6: Self-efficacy mediates the positive relationship between openness to experience and academic performance.

H7: Self-efficacy mediates the positive relationship between conscientiousness and academic performance.

H8: Self-efficacy mediates the positive relationship between extraversion and academic performance.

H9: Self-efficacy mediates the positive relationship between agreeableness and academic performance.

H10: Self-efficacy mediates the negative relationship between neuroticism and academic performance.

The hypothesised relationships in the model are shown in **Figure 1**.

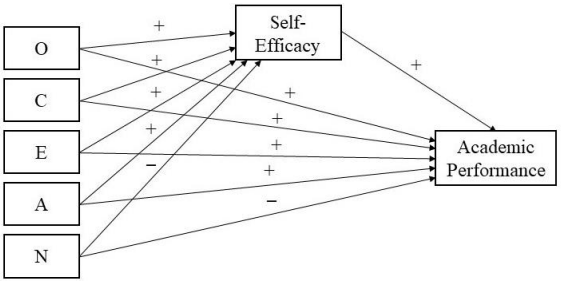

Figure 1. Conceptual model.
Note: O = Openness to experience; C = Conscientiousness; E = Extraversion; A = Agreeableness; N = Neuroticism.

3. Research methodology

Sample: Purposive sampling method utilising anonymous online questionnaire was used to survey

students in schools and universities in Malaysia. A total of 264 completed questionnaires were collected. However, two items contained missing data found in 8 cases. The mean values of each items were used to replace the missing values (lowest marks, 2 cases, $\bar{x}$ = 21.37; openness, 6 cases, $\bar{x}$ = 3.81) which did not significantly impact the integrity of the dataset. 48% female and 52% male students mostly pursuing university degree studies (82%) while 15% are in pre-university or below and 3% pursing their master's degree (see **Table 1**).

Table 1. Profile of respondents.

Characteristic	Category	Frequency	Percentage
Age	16–19	42	16
	20–23	192	73
	24–27	25	10
	28–31	4	2
Gender	Male	125	48
	Female	138	52
Education	Secondary school	6	2
	Pre-university	35	13
	Bachelor's degree	215	82
	Master's degree	7	3
Programme	Business studies	86	33
	Accounting & finance	31	12
	Marketing & communication	25	10
	Computer & engineering	59	22
	Others	56	21
	Not indicated	6	2

Measurements: FFM was measured replicating Rogers and Glendon[45] with 25 items (also presented in Appendix). Each item was measured with a 5-point Likert scale (1: "strongly disagree" to 5: "strongly agree"). Cronbach's alpha was α = 0.66 for openness to experience, α = 0.74 for conscientiousness, α = 0.85 for extraversion, α = 0.81 for agreeableness, α = 0.84 for neuroticism. Self-efficacy was measured following Chen et al.[43] with 8 items. Each item was measured with a 5-point Likert scale (1: "strongly disagree" to 5: "strongly agree"). Cronbach's alpha detected was α = 0.84. Academic performance was measured based on self-reporting of three highest marks (α = 0.95), three lowest marks (α = 0.90), and the overall average marks from the subjects in their respective academic programme.

4. Data analysis

Pearson correlation values are below 0.8 for all independent variables indicating no multicollinearity issues (see **Table 2**). Furthermore, it provides support for the relationships between FFM traits and self-efficacy. Regression analysis was used to test the hypotheses and Hayes process model 4 in SPSS was used to test the mediating effects[46]. **Table 3** shows the results for significant direct relationships in the model whereas **Table 4** shows the confidence internals for the significant indirect effects of self-efficacy using 5000 bootstrap samples.

Table 2. Intercorrelation matrix.

	Mean	**SD**	**1**	**2**	**3**	**4**	**5**
Openness	3.671	0.521	1				
Conscientiousness	3.572	0.673	0.291**	1			
Extraversion	3.441	0.829	0.363**	0.274**	1		
Agreeableness	3.993	0.578	0.141*	0.106	0.205**	1	
Neuroticism	3.000	0.872	−0.078	−0.115	−0.089	−0.003	1
Self-efficacy	3.732	0.520	0.532**	0.433**	0.397**	0.273**	−0.119

**$p < 0.01$, *$p < 0.05$.

Table 3. Significant direct effects.

Hypothesis	**Relationships**	***B***	**S.E.**	***T*-values**	***P*-values**	**VIF**	***R*2**	**Decision**
H1	O → AP_{HM}	3.05	1.371	2.225	0.027*	1.213	0.04	Supported
	O → AP_{LM}	3.803	1.918	1.983	0.048*	1.213	0.03	
	O → AP_{AM}	2.691	1.113	2.418	0.016*	1	0.02	
H2	C → AP_{HM}	0.94	1.037	0.906	0.366	1.143		Not Supported
	C → AP_{LM}	1.567	1.451	1.08	0.281	1.143		
	C → AP_{AM}	1.961	1.189	1.649	0.100	1.143		
H3	E → AP_{HM}	0.571	0.874	0.654	0.514	1.228		Not Supported
	E → AP_{LM}	−1.952	1.223	−1.596	0.112	1.228		
	E → AP_{AM}	0.932	1.002	0.93	0.353	1.228		
H4	A → AP_{HM}	0.66	1.154	0.572	0.568	1.051		Not Supported
	A → AP_{LM}	1.025	1.615	0.635	0.526	1.051		
	A → AP_{AM}	−0.912	1.323	−0.69	0.491	1.051		
H5	N → AP_{HM}	−0.236	0.758	−0.311	0.756	1.019		Not Supported
	N → AP_{LM}	−0.867	1.061	−0.817	0.414	1.019		
	N → AP_{AM}	0.217	0.869	0.25	0.803	1.019		
	SE →AP_{HM}	4.788	1.245	3.846	0.000***	1.000	0.05	
	SE →AP_{AM}	4.022	1.441	2.791	0.006***	1.000	0.03	
	SE →AP_{LM}	4.595	1.755	2.618	0.009***	1.000	0.03	
	O →SE	0.37	0.052	7.179	0.000***	1.213	0.42	
	C →SE	0.199	0.039	5.112	0.000***	1.143		
	E →SE	0.096	0.033	2.911	0.004***	1.228		
	A →SE	0.144	0.043	3.314	0.001***	1.051		

*$p < 0.05$ ***$p < 0.001$. Notes: O = Openness to experience, C = Conscientiousness, E = Extroversion, A = Agreeableness, N = Neuroticism, SE = Self-Efficacy, APHM = Academic performance based on highest marks, APLM = Academic performance based on lowest marks, APAM = Academic performance based on average marks.

Table 4. Significant indirect effects of self-efficacy.

Hypothesis	**Relationship**	***β***	**S.E.**	**LLCI**	**ULCI**	**Decision**
H6	O → SE → APHM	1.984	0.819	0.408	3.634	Supported
	O → SE → APLM	1.969	1.096	−0.212	4.129	Not supported
	O → SE → APAM	1.587	0.875	−0.159	3.282	Not supported
H7	C → SE → APHM	1.519	0.504	0.6	2.578	Supported

Table 4. (*Continued*).

Hypothesis	Relationship	*β*	S.E.	LLCI	ULCI	Decision
	C → SE → APHM	1.519	0.501	0.618	2.565	Supported
	C → SE → APAM	1.422	0.719	0.163	2.993	Supported
H8	E → SE → APHM	1.113	0.391	0.403	1.946	Supported
	E → SE → APLM	1.45	0.53	0.495	2.592	Supported
	E → SE → APAM	0.858	0.414	0.089	1.706	Supported
H9	A → SE → APHM	1.153	0.393	0.461	1.98	Supported
	A → SE → APLM	1.118	0.499	0.195	2.157	Supported
	A → SE → APAM	1.067	0.401	0.366	1.924	Supported
H10	N → SE → APHM	−0.337	0.239	−0.887	0.06	Not supported
	N → SE → APLM	−0.316	0.245	−0.901	0.062	Not supported
	N → SE → APAM	−0.287	0.217	−0.784	0.05	Not supported

Level of confidence for all confidence intervals in output: 95.00. Notes: O = Openness to experience, C = Conscientiousness, E = Extraversion, A = Agreeableness, N = Neuroticism, APHM = Academic performance based on highest marks, APLM = Academic performance based on lowest marks, APAM = Academic performance based on average marks.

5. Discussion

5.1. Direct effects

Surprisingly, openness to experience turns out to be the strongest personality trait predicting academic performance directly and indirectly. Thus, the hypothesis 1 is supported due to the positive and significant relationship of openness to experience and academic performance. This is contrary to past studies which reported consciousness as the strongest predictor[9]. But this positive relationship is not uncommon as various studies have indicated such results (e.g., O'Connor et al.,[47]). Furthermore, this openness to experience has been described as including intellectual curiosity and intelligence[33].

This study did not find the positive and significant relationship between conscientiousness and academic performance. This finding is not consistent with some other studies that have found positive and significant impact of conscientiousness and academic performance under different contexts[1,22,29,48]. Thus, hypothesis 2 is not supported by the study's finding. This positive relationship occurs due to greater motivation or effort. Existing studies have mentioned that conscientiousness leads towards better academic performance due to intrinsic motivation of students[48]. However, the non-significant result of this relationship could be due to lack of intrinsic motivation among Malaysian students due to which conscientiousness was not found to be positively related with their academic performance.

Likewise, extraversion was also not found to be positive and significantly related with academic performance. This finding is contradictory to the existing studies that have found the positive and significant relationship of extraversion and academic performance[22,24]. Therefore, the results of this study do not support hypothesis 3 as well. The possible explanation regarding the positive effect of extraversion on students' academic performance is that it is characterized by individuals' high energy levels that develop positive attitudes toward learning among students[22]. However, the contradictory finding of this relationship could be due to the circumstances of individual participant. When studying the correlation between personality traits and test scores, it is important to account for the ways in which cultural norms, pedagogical approaches, and specialist evaluation tools could impact the results. There may be indirect relationships between extroversion and academic performance due to the complexity of human behaviour and the many factors impacting academic success. It is vital to consider unmeasured variables or mediation/moderation

effects that could be impacting these findings, even if some research show a positive link between extraversion and academic performance. Consequently, these discrepancies need additional research.

We found that the personality trait of agreeableness was not correlated with students' academic performance which is non-congruent with the findings of some other studies[16,22] that found strong correlation between agreeableness and students' academic performance in various contexts. The study's findings also do not support hypothesis 4 as well. The positive relationship between agreeableness and students' academic performance is due to accommodating nature of students due to which they can perform well in their coursework and exams by following the instructions of educators. However, the negative correlation of agreeableness academic performance could be due to factors including cultural diversity, educational environment, and demographics of participants. Moreover, the complex intricacy of academic success, which incorporates additional variables including motivation and learning preferences, might obscure the precise relationship between agreeableness and performance in coursework or examinations. Unquantified variables or the impact of mediation may have additional implications for these findings, necessitating additional research to reconcile these inconsistencies.

Neuroticism does not play any significant roles in students' academic performance whereas conscientiousness, extraversion and agreeableness have some positive effects on academic performance indirectly through students' self-efficacy, although no significant direct relationships were detected. **Table 4** results support partial mediation of self-efficacy in the relationship between openness to experience and academic performance. Besides the direct relationship between openness to experience and academic achievement, there is also a significant relationship between self-efficacy and academic achievement.

5.2. Self-efficacy

The results of this study provide evidence that self-efficacy not only affects academic performance but it is also one of the strongest predictors of academic performance. This finding is in line with the findings of few existing studies regarding this relationship[3,40]. Furthermore, the study supports the results of mediating relationship of self-efficacy that is also consistent with the finding of existing studies (e.g., Stajkovic et al.[9]). Contrary to Caprara et al.[14], the results show both self-efficacy and big five personality predicts academic performance to a certain extent. It is unsurprising that students with high self-efficacy can better face challenges with perseverance trait embedded in high self-efficacy construct. Since self-efficacy regulates the cognitive, motivational, emotional, and decisive processes[49], high self-efficacy suggests higher degree of such functional regulations conducive for academic pursuit. Hypothesis 6 (i.e., mediating relationship of self-efficacy between openness to experience and academic performance) was partially supported by the study's findings. On the other hand, hypothesis 7 (i.e., mediating relationship of self-efficacy between conscientiousness and academic performance), hypothesis 8 (i.e., mediating relationship of self-efficacy between extraversion and academic performance), and hypothesis 9 (i.e., mediating relationship of self-efficacy between agreeableness and academic performance) were fully supported based on this study's findings regarding the positive mediating impact of self-efficacy and respective variables. However, the study's results did not support hypothesis 10 because self-efficacy was not found as a mediator between neuroticism and students' academic performance.

5.3. Conclusion

Self-efficacy, significantly influenced by environmental factors, experiences, and social learning, emerges as a positive mediator in the context of academic performance. The research outcomes indicate that personality traits, with the exception of neuroticism, impact academic success through the adaptive behaviors and coping mechanisms acquired from the surrounding environment. The identification of self-efficacy as a

positive mediator underscores the nurture rather than nature. While personality traits may establish an underlying predisposition, the adaptive behaviors and beliefs cultivated through experiences and interactions assume a more important role in determining academic success, aligning with a nurture-centric perspective. This discovery implies that interventions targeting the enhancement of self-efficacy hold promise for improving academic performance. Consequently, this serves as an optimistic affirmation that one's academic trajectory is not exclusively predetermined by inherent personality traits.

5.4. Study limitations and directions for future research

The limitations of this research include self-reported measurements, restricted measures for academic performance, and limited sample size. Although self-report assessments are widely used, they nonetheless have some drawbacks. A major limitation is the probability of inaccurate or biased responses, influenced by factors like social desirability, when individuals modify their answers to seem more appealing in social situations. Moreover, due to the reliance on subjective viewpoints and interpretations, there will inevitably be variations in how individuals see and react to the same questions. The reliability and validity of self-report judgements may be influenced by factors such as the individual's mood, memory, and cognitive abilities. Moreover, obtaining a comprehensive understanding of an individual's ideas or actions just through self-reported data is challenging due to the potential lack of representation of deeply established or unconscious opinions. However, self-reporting is widely accepted for assessing personality and self-efficacy. Academic performance can be better gauged with GPA outcomes and a segregated sampling differentiating pre-secondary, secondary, and post-secondary data should provide richer findings.

We expect this intellectual aspect of openness to experience to offer a fertile area for future research. Furthermore, aspect-level and facet-level analysis of openness to experience should be considered in regression analysis as predictors[12]. The paucity of research investigating openness to experience especially among Malaysian university students should be reversed. Self-efficacy functions as proximal determinant of motivation[50]. Therefore, possible intervening factors that exert positive moderating effects on the relationship between openness to experience and academic performance should be investigated which may include need for achievement and motivation to achieve with aspects of possible self. Besides, mediating effects of specific intelligence related behaviours overlooked in modern research like error checking and persistence[25] and integrating this with recent conceptual framework using a self-regulated perspective could offer greater insights into predicting student's academic achievement. This point could develop more complex models incorporating salient proximal factors in predicting academic performance.

5.5. Practical implications

Students and parents should find it comforting that one is not born this way as in predestined by nature to be academically strong or weak. Proximal factors, like self-efficacy, are more responsive to nurturing, modelling, and development; thus, prove to be better predictors of academic performance. This offers hope to both students and parents as they continue to strive towards improvement by self-development, improvement in self-beliefs in efficacy, and towards creating an environment conducive to acquiring knowledge and skills. Students with self-efficacy avoid making negative comparisons to others, form positive, communicative relationships with peers, set clear boundaries, adapt well to change and welcome novelty, acknowledge their own ignorance but are open to expanding their knowledge, bounce back quickly from setbacks and are motivated by the success of others, help others without coming across as arrogant or cynical, and take responsibility for their own actions.

Author contributions

Conceptualization, SYT and FY; methodology, ST and PP; software, SYT; validation, EA, PS and RZM; formal analysis, SAH; investigation, SYT; resources, SAH; data curation, SYT; writing—original draft preparation, SYT, FY, ST, PP, EA, PS and RZM; writing—review and editing, SYT and SAH; visualization, SYT, FY, ST and PP; supervision, EA, PS and RZM; project administration, SYT, FY, ST and PP; funding acquisition, FY, PP and SAH. All authors have read and agreed to the published version of the manuscript.

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Conflict of interest

The authors declare no conflict of interest.

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Appendix

Instruments adopted for this study:

Self-efficacy (Chen et al.[43])	1) I will be able to achieve most of the goals that I have set for myself.
	2) When facing difficult tasks, I am certain that I will accomplish them.
	3) In general, I think that I can obtain outcomes that are important to me.
	4) I believe I can succeed at most any endeavor to which I set my mind.
	5) I will be able to successfully overcome many challenges.
	6) I am confident that I can perform effectively on many different tasks.
	7) Compared to other people, I can do most tasks very well.
	8) Even when things are tough, I can perform quite well.
FFM (Rogers & Glendon[45])	**Openness**
	1) I have lots of ideas.
	2) I am inventive.
	3) I know about a lot of things.
	4) I am very inquisitive.
	5) I am rather curious.
	Conscientiousness
	1) I organise myself well.
	2) I manage time well.
	3) I can stay focused on a task.
	4) I always have a plan.
	5) I set goals for myself.
	Extraversion
	1) I am very sociable.
	2) I am very outgoing.
	3) I always have something to talk about.
	4) I will always be the one to say "Let's do something".
	5) I have more friends than other people do.
	Agreeableness
	1) I always think about other people's feelings.
	2) I will put others' needs before my own.
	3) I like to help others.
	4) I am considerate of others.
	5) I like giving things to others).
	Neuroticism
	1) I am easily annoyed.
	2) I get snappy over little things.
	3) I can get annoyed at the smallest of things.
	4) I am moody a lot of the time.
	5) I am quite anxious a lot of the time.

5-point Likert Scale was used ranging from 1 = strongly disagree to 5 = strongly agree).