



Impact of Entrepreneurial Personality Traits on Nascent Entrepreneurial Behaviour of Medical Students: Implications for Medical Education

Kavitha Ashok Kumar^{1*}, S. M. Ferdous Azam², Jayaram J.³, Arunasalam A. P.⁴, Ashok Kumar Jeppu⁵, Muhammad Najib bin Mohamad Alwi⁶, Fazna Saleem⁷

ARTICLE INFO

Article History:

Received: 03 August 2022

Received in revised form: 06 November 2022

Accepted: 02 January 2023

DOI: 10.14689/ejer.2023.103.001

Keywords

Entrepreneurial traits, digital technology, entrepreneurial education, Malaysia.

ABSTRACT

Purpose: Increasing unemployment among youth is a cause for concern that has led to an increase in entrepreneurial studies among university students. Unfortunately, medical students' entrepreneurialism has been widely ignored. To fill this gap, the current study investigated the influence of entrepreneurial personality traits on medical students' nascent entrepreneurial behavior. **Method:** The research utilized quantitative methodology and a cross-sectional design. Using an adapted questionnaire and the traits model of entrepreneurship on a sample of 318 Malaysian medical students selected by disproportionate stratified random sampling, we examined three entrepreneurial traits and nascent entrepreneurial behavior. The influence of entrepreneurial traits on nascent entrepreneurial behavior was investigated using multivariate analysis and structural equation modeling.

Findings: Medical students demonstrated high levels of need for achievement, locus of control, and self-efficacy, according to the results. Nevertheless, they exhibited a moderately low level of nascent entrepreneurial behavior. A significant positive relation between entrepreneurial traits and developing entrepreneurial behavior was observed among the study population ($\beta=0.451$, $t=9.998$, $p<0.01$) with a predictive accuracy (R^2) of 0.283. **Implications:** This study provides unique insights into the entrepreneurial characteristics of Malaysian medical students. Moreover, despite the positive impact of entrepreneurial traits, the study population exhibited bad nascent entrepreneurial behavior.

¹ Associate Professor, Department of Otorhinolaryngology, International Medical School, Management & Science University, University Drive, Off Persiaran Olahraga, Section 13, 40100, Malaysia. Orcid No. 0000-0002-5900-0203

² Associate Professor, Postgraduate Centre, Management & Science University, University Drive, Off Persiaran Olahraga, Section 13, 40100, Malaysia. Orcid No. 0000-0002-0001-3595

³ Senior lecturer, International Medical School, Management & Science University, University Drive, Off Persiaran Olahraga, Section 13, 40100, Malaysia.

⁴ Hospital Serdang, Malaysia

⁵ Professor, Medical Education Unit, International Medical School, Management & Science University, University Drive, Off Persiaran Olahraga, Section 13, 40100, Malaysia. Orcid No.0000-0002-3044-3537

⁶ Professor, Department of Psychiatry, International Medical School Management & Science University, University Drive, Off Persiaran Olahraga, Section 13, 40100, Malaysia Orcid No. 0000-0002-2397-4321

⁷ Senior Lecturer, Medical Education Unit, International Medical School, Management & Science University, University Drive, Off Persiaran Olahraga, Section 13, 40100, Malaysia. Orcid No. 0000-0001-9131-114

*Corresponding author: Kavitha Ashok Kumar, Associate Professor, International Medical School, Management & Science University, University Drive, Off Persiaran Olahraga, Section 13, 40100, Malaysia. Hp No. 60-183695305.

Email: drkavithaent@gmail.com, kavitha_ashok@msu.edu.my

This draws the attention of policymakers to the need for entrepreneurial education in medical curricula incorporating digital technology to promote self-employment among Malaysia's future physicians.

© 2023 Ani Publishing Ltd. All rights reserved.

Introduction

Entrepreneurship or self-employment among youth is a goal for all nations because it creates jobs and stimulates the economy (Alshebami & Seraj, 2022). Sadly, most of today's educated youth seek employment rather than self-employment (Atiya et al., 2019). This paves the way for unemployment to increase. In addition, Malaysia has witnessed a consistent increase in new medical institutions (Ping, Jing, & Yan, 2021). Young medical graduates, therefore, face intense competition for employment placement and specialty training positions. Academicians have examined the antecedents of entrepreneurial behavior among university students to produce more self-employed, college-educated youth. However, most of these studies have focused on students enrolled in management or technology programs (Kerr et al., 2018). Unfortunately, neither the entrepreneurial behavior nor its antecedents have been examined among medical students, as it is commonly assumed that medicine is limited to patient care.

Nonetheless, the exponential growth of digital and biotechnology in the twenty-first century has brought about a revolution in the delivery of healthcare (Watson et al., 2018). Entrepreneurship is pertinent to medical students in this context. To promote entrepreneurship among young physicians, it is essential to comprehend the prevalent nascent entrepreneurial behavior among medical students; this is what the present study seeks to do.

Numerous academics agree that entrepreneurship is difficult. They believe that certain personality attributes are essential for pursuing the path of self-employment (Chen & Jing, 2012). Traits are a person's distinctive characteristics that are believed to be stable (Baciu, Virgă, & Lazăr, 2020). Entrepreneurial traits are the personality characteristics that enable an entrepreneur to create and govern a business successfully. Scholars acknowledge that the entrepreneurial behavior of medical students from the perspective of personality traits has been examined infrequently (Wu & Wu, 2019). This leaves a lacuna in the literature on entrepreneurship. There have been conflicting viewpoints on the significance of entrepreneurial personality traits in influencing entrepreneurship (Cardon et al., 2013; Gartner, 1988). Even though many successful individuals exhibit entrepreneurial characteristics, not all have launched a new business, according to Boyd and Vozikis (1994). Others contend that founding a business is not everyone's cup of tea and that entrepreneurs' propensity for action is essential for creating new businesses (Luo, Huang, & Gao, 2022). In addition, the traits model and the theory of career choice support the notion that a person's career choice is an expression of their personality. Kerr et al. (2018) note that individuals are typically drawn to careers that align with their abilities, motivations, and personality traits. This study sought to determine whether medical students possessed entrepreneurial personality traits and whether these traits influenced their developing entrepreneurial behavior.

Literature Review And Hypothesis Development

Throughout the past six decades, numerous researchers have investigated various essential characteristics of successful entrepreneurs (Pickle, 1964; Şahin, Karadağ, & Tuncer, 2019). These traits may be inherited, acquired, or sometimes developed throughout a person's lifetime (Atiya & Osman, 2021). Literature has broadly described four categories of traits associated with entrepreneurs: a) motivational traits, such as the need for achievement, need for autonomy, and internal locus of control; b) cognitive traits, such as creativity, risk propensity, tolerance, and orientation for problem-solving; c) affective personality traits, such as stress control and emotional stability; and d) social skills, in particular leadership, assertiveness, and interpersonal competence. Among this myriad of traits, the common ones believed to predict future entrepreneurship are the Big Five traits (Şahin et al., 2019), the need for achievement and locus of control (Atiya et al., 2019), the propensity to take on risks (Nishantha, 2009), self-efficacy and tenacity (Baum & Locke, 2004), self-confidence (Watson et al., 2018), persuasiveness, high social intelligence, and psychological well-being (Schmidt et al., 2018). Despite the vast number of studies on entrepreneurial traits available in the literature, there is no consensus on the number of traits or the nature of these characteristics that can predict entrepreneurship (Atiya & Osman, 2021). Moreover Baciú et al. (2020), warn that it is impossible to study all entrepreneurial characteristics. Recent literature highlights the limitations of the Big 5 framework in predicting entrepreneur behavior and understanding how these traits influence entrepreneurial attitudes or actions, prompting researchers to gravitate toward a multidimensional personality framework that includes self-efficacy, internal locus of control, and the need for achievement (Kerr et al., 2018). According to Anwar and Saleem (2019) and Atiya et al. (2019), these motivational entrepreneurial characteristics have predictive value among university students. As a result, these psychological, motivational traits were used to assess the entrepreneurial profile of medical students.

Need For Achievement

Need for achievement (nAch) is a concept popularized by McClelland (1987) to describe a person's desire to solve problems, master certain abilities, and achieve significant accomplishment. Scholars acknowledge that entrepreneurs are highly motivated people who possess this trait more frequently than the average person. In addition, the literature strongly supports nAch as one of the essential entrepreneurial characteristics (Anwar & Saleem, 2019; Atiya et al., 2019; Ida Ketut, 2019). Consequently, it was selected as one of the characteristics to be examined in the present study.

Locus of Control

Rotter's theory of social learning introduced the concept of locus of control (LOC), which refers to an individual's capacity to analyze people and events by focusing on the system as they comprehend it. It is the extent to which one attributes one's actions to the environment or personal choices. It is a complex phenomenon involving the perception of control by an individual (Di Corrado et al., 2021). Individuals who firmly believe they control their fate within certain limits have an internal locus of control. In contrast, those with an external locus of control believe fate is determined by destiny, chance, and others

(Rotter, 1966). It is frequently regarded as a central construct in personality research, particularly regarding entrepreneurs (Atiya et al., 2019; Levine & Rubinstein, 2017). Individuals with a higher internal LOC are anticipated to pursue opportunities and take prompt entrepreneurial action.

Self-Efficacy

Bandura, Freeman, and Lightsey (1999) introduced the concept of self-efficacy. According to Bandura's social cognitive theory, self-efficacy plays a significant role in shaping behavior. An individual's perception of their potential influences their intention to engage in a particular activity. Although self-efficacy is task-specific, it can be generalized to similar tasks and performances. In addition, research indicates that self-efficacy can predict entrepreneurial intentions (Atiya et al., 2019). Consequently, this characteristic was investigated in this research.

Nascent Entrepreneurial Behaviour

Entrepreneurial behavior is any action taken to establish a business or become self-employed (Loan et al., 2021). It is believed to be influenced by an individual's requirements and occurs after an unpredictable delay (Satyalakshmi & Kumari, 2010). Therefore, few studies are measuring entrepreneurial behavior among students. Instead, the literature is replete with studies examining students' entrepreneurial intention based on the theory of planned behavior and the assumption that it will eventually lead to entrepreneurial behavior (Carter, Gartner, & Reynolds, 1996; Nagarathanam & Buang, 2016), academicians lament that not all intentions translate into action and advocate for a focus on student participation in start-up activities. The term "nascent entrepreneurial behavior" refers to all actions that follow the intention to become self-employed but precede the establishment of a new venture. It is regarded as a more accurate indicator of prospective entrepreneurial activity. It includes preliminary activities such as scanning for information on market requirements, consulting with mentors, attending talks, searching for resources, and acquiring expertise to launch a start-up (Aldrich & Martinez, 2001; Belchior & Lyons, 2021; Carter et al., 1996). Consequently, developing entrepreneurial behavior was investigated in this study.

The relationship between personality traits and entrepreneurial behavior is predicated on the traits model, which views the entrepreneur as the "essence of entrepreneurship." Mitton (1989). This model considers an individual's values, requirements, and innate characteristics. It served as the basis for this study, emphasizing that individuals who share characteristics with successful entrepreneurs have a greater propensity to operate in entrepreneurial domains. In addition, empirical literature provides evidence that entrepreneurs are a distinct group of individuals with distinguishing personality traits that contribute to their success (Al Issa, 2022; Kerr et al., 2018). Atiya et al. (2019), Atiya and Osman (2021), and Ida Ketut (2019), have all documented the influence of traits on the entrepreneurial intentions of university students. Literature abounds with evidence that motivational traits are culture-specific (Kerr et al., 2018). This prompted the researcher to investigate these traits and their relationship to developing entrepreneurial behavior among Malaysian medical students. This analysis, therefore, hypothesizes that

H₁: *Entrepreneurial traits have an impact on the nascent entrepreneurial behavior among medical students*

Method

This study employed a conceptual framework, as shown in Figure 1.

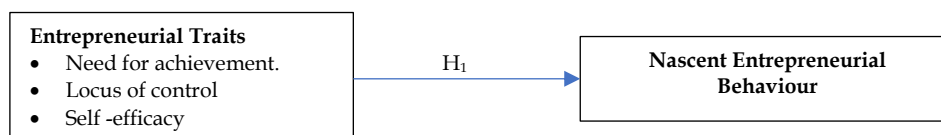


Figure 1. Conceptual framework for the study

Research Approach and Research Design

This study utilized a post-positivist paradigm with a quantitative approach and a cross-sectional analytical survey because it was the most feasible, convenient, and cost-effective method for gathering data from a large population with minimal researcher interference. In addition, data was collected from an educated population that could readily comprehend English-language questions.

Research sample

The research population consisted of Malaysian medical school students attending a private institution. The cohort of the 2020 academic year served as the sample frame, and a stratified random sampling technique was used to select participants from different years of study. Sample size was calculated using the Krejci-Morgan table and added 20% to adjust for non-respondents. The data was collected following approval from the University Ethical Committee (MSU-RMC-02/FR01/01/L1/015). After explaining the research objectives, the voluntary nature of the survey, and assuring the anonymity and confidentiality of the collected data, all respondents were asked for their informed consent.

Research Instrument and Procedure

A well-structured questionnaire was developed with eleven items on the entrepreneurial traits adapted from various sources (Kristiansen & Indarti, 2004; Robinson et al., 1991; Rotter, 1966; Schjoedt & Shaver, 2012; Zainol & Ayadurai, 2011) and thirteen items assessing their nascent entrepreneurial behavior, which was adapted from Othman and Othman (2015). All the items utilized a five-point Likert scale (1=strongly disagree to agree 5=strongly) to collect the responses. To ensure content validity, experts from academia evaluated these items, and minor modifications were made. Later, it was pilot tested on a sample of forty students. The responses to the entrepreneurial traits scale ($\alpha=0.89$) and nascent entrepreneurial behavior scale ($\alpha =0.95$) suggested good internal consistency and reliability for the instrument.

Data Analysis

The collected data were analyzed in three stages using Statistical Package for the Social Sciences (SPSS) version 26 and Smart PLS 3.0. First, exploratory factor analysis (EFA) was conducted to determine the factor structure of the constructs of the study. In the second stage, confirmatory factor analysis (CFA) was performed to validate the factor structure. In addition, the average variance extracted (AVE), Cronbach's alpha, and Composite

Reliability (CR) were calculated to verify that the validity and reliability criteria were met. Finally, structural equation modeling was used to verify hypotheses. Because unobserved variables can be measured indirectly through observed variables while accounting for measurement error in the observed variable, partial least square structural equation modeling, a second-generation statistical analysis test, was utilized. A p-value of less than 0.05 was considered statistically significant in the initial analyses.

Results

The aggregated data were normally distributed with skewness between -2 and +2 and kurtosis between -7 and 7 (Byrne (2013)). Harman's single-factor test was used to examine the common method variance, and the variance explained by the first factor was 33.9%, indicating no significant common method bias in the current study (Podsakoff & Organ, 1986). This ensured that the data could be analyzed further.

This study included 318 medical students, 68.2% of whom were female and 31.8% of whom were male. Table 1 depicts the mean score for each of the 24 items on the questionnaire. According to the scale provided by Othman (2002) to interpret the mean scores, the medical students in this study exhibited a high level of need for achievement, a moderately high level of locus of control, and a high level of self-efficacy. However, the level of nascent entrepreneurial behavior is relatively low.

Table 1

Level of entrepreneurial traits and nascent entrepreneurial behavior among medical students

Construct	Dimension	Item code	Mean	SD	Mean for the dimension	Level			
Entrepreneurial Trait	Need for achievement	ETN 1	3.88	0.84	4.03	High (4.01-5.0)			
		ETN 2	4.19	0.79					
		ETN 3	4.31	0.72					
		ETN 4	4.03	0.84					
		ETN 5	3.82	0.77					
		ETN 6	3.94	0.89					
	Locus of control	ETL 1	3.76	0.90	3.89	Moderately High (3.01-4.0)			
		ETL 2	4.04	0.76					
		ETL 3	3.88	0.80					
	Self-efficacy	ETS 1	3.49	0.99	3.50	Moderately High (3.01-4.0)			
		ETS 2	3.51	0.97					
		Nascent entrepreneurial behavior	EB 1	2.77			1.07	2.40	Moderately Low (2.01-3.0)
			EB 2	2.70			1.21		
EB 3	2.87		1.15						
EB 4	2.77		1.13						
EB 5	2.54		1.07						
EB 6	2.54		1.18						
EB 7	2.50		1.10						
EB 8	2.45		1.05						
EB 9	2.37		1.16						
EB 10	2.59		1.18						
EB 11	2.53		1.15						
EB 12	2.38		1.11						
EB 13	2.84		1.29						

EB =Nascent entrepreneurial behaviour, ETN= Need for achievement, ETS=Self-efficacy, ETL=Locus of control

In the present context, the scale items were factorized using exploratory factor analysis (EFA) with principal component analysis extraction and varimax rotation. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy for the current data was 0.91, significantly higher than the criterion value of 0.6. Bartlett's test of sphericity also achieved statistical significance (Field, 2013). This ensured the data's suitability for factor analysis. Two criteria for factor extraction were considered: an eigenvalue greater than one and factor loadings larger than 0.5. Following exploratory factor analysis (EFA), the three locus of control items and the two self-efficacy items were combined to form a single factor, which was named Self-confidence (Sc) based on literature support (Druckman & Bjork, 1994). Past researchers have concluded that these two characteristics are interrelated intrapersonal dimensions, thereby validating the factor structure found in the present study (Di Corrado et al., 2021). Cronbach's alpha for the scale was 0.934, well above the 0.7 thresholds, indicating acceptable internal consistency (Hair Jr et al., 2021). In addition, data analysis was conducted utilizing Partial Least Squares Structural Equation Modelling (PLS-SEM), regarded as the most appropriate statistical instrument for analyzing primary data (Hair Jr et al., 2021). Two phases were involved in the structural equation modeling process: measurement and structural.

Measurement model

The measurement model evaluated the validity and reliability of the instrument used and is as depicted in Table 2.

Table 2

Factor loading, Validity, and Reliability of the Constructs

Constructs	Indicator variables	Factor loading	Composite reliability (CR)	Cronbach's Alpha (α)	Average variance extracted (AVE)
Nascent entrepreneurial behavior (EB)	EB 1	0.718	0.943	0.934	0.559
	EB 10	0.804			
	EB 11	0.739			
	EB 12	0.733			
	EB 13	0.779			
	EB 2	0.745			
	EB 3	0.718			
	EB 4	0.755			
	EB 5	0.753			
	EB 6	0.752			
Need for achievement (nAch)	ETN 1	0.719	0.860	0.804	0.506
	ETN 2	0.748			
	ETN 3	0.714			
	ETN 4	0.715			
	ETN 5	0.703			
	ETN 6	0.660			
Self-confidence (Sc)	ETS 1	0.831	0.867	0.808	0.568
	ETS 2	0.818			
	ETL 1	0.634			
	ETL 2	0.581			
	ETL 3	0.848			

EB =Nascent entrepreneurial behaviour, ETN= Need for achievement, ETS=Self-efficacy, ETL=Locus of control

This study's two reflective constructs met all of the requirements stated by Hair Jr et al. (2021). The majority of loadings exceeded the minimum value of 0.708, the composite reliability (CR) and Cronbach's alpha (α) exceeded the threshold value of 0.7, and the average variance extracted (AVE) for all constructs exceeded the threshold value of 0.5. This ensured the validity and reliability of concurrent data. In addition, the discriminant validity was determined using the Heterotrait-Monotrait Ratio (HTMT) and results are shown in Table 3.

Table 3

Discriminant validity (Heterotrait-Monotrait Ratio)

	nAch	Sc	EB
Sc	0.675		
EB	0.328	0.564	

nAch = Need for achievement, Sc=self-confidence, EB =nascent entrepreneurial behaviour

The HTMT ratio for all constructs was less than the threshold value of 0.9, indicating good discriminant validity. Thus, all constructs satisfied the reliability and validity criteria for further study (Henseler, Ringle, & Sarstedt, 2015).

Structural Model

A PLS-SEM structural model was used to assess the degree to which the present empirical data supported the theory. A reflective-formative type of hierarchical component model with entrepreneurial traits as the higher order construct (HOC) and need for achievement (nAch) and self-confidence (Sc) as the lower order constructs (LOCs), as depicted in Figure 2.

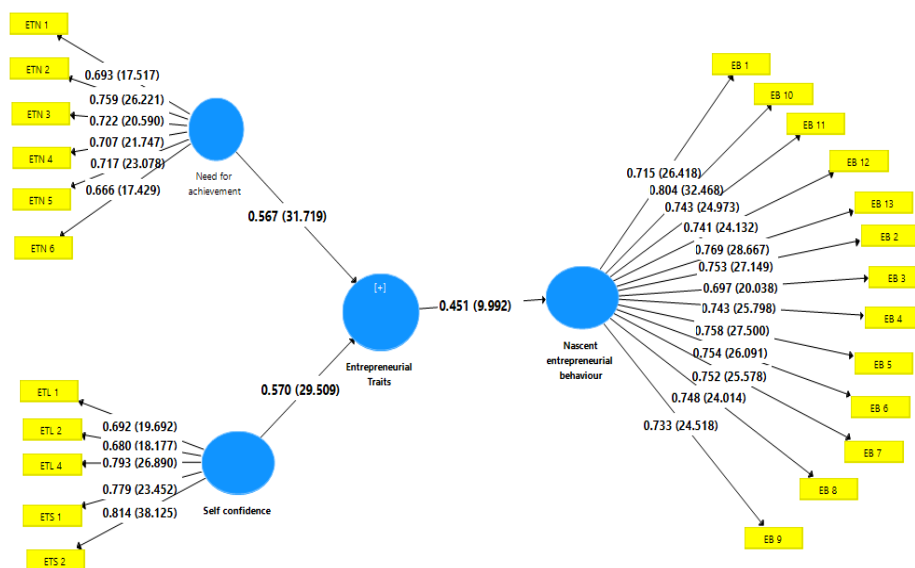


Figure 2. Structural model

Table 4

Measurement properties of the higher-order constructs

HOC	LOC	Outer Weights	T statistics	p-value	Inner VIF	Tolerance
ET	nAch	0.567	31.719	<0.01	1.428	0.73
	Sc	0.570	29.509	<0.01	1.428	0.73

ET=entrepreneurial traits, nAch = need for achievement, Sc=self-confidence

In addition, the significant outer weights depicted in Figure 2 and Table 4 validated HOC. Both the outer and inner variance inflation factor (VIF) values for the construct were less than the minimum threshold of 3.3, and the tolerance values were greater than the minimum threshold of 0.2, indicating the absence of collinearity problems in the model (Diamantopoulos & Siguaw, 2006). To ascertain the significance of the proposed hypothesis, the path coefficient was calculated using the bootstrap resampling technique with 5000 resamples, and the results are presented in Table 5. The path coefficient demonstrated a significant positive relationship between entrepreneurial traits and prospective entrepreneurial behavior ($\beta=0.451$, $t=9.992$, $p<0.01$), with confidence intervals that did not contain zero. The proposed hypothesis, H1, was therefore supported.

Table 5

Relationship between Entrepreneurial Traits and Nascent entrepreneurial behavior

Hypothesized Relationship	Std Beta value	Mean		T value	P value	Confidence Interval		Hypothesis
		SD				2.5%	97.5%	
Entrepreneurial Traits ->Nascent Entrepreneurial Behaviour	0.451	0.454	0.04	9.99	<0.01	0.44	0.60	Supported

Based on the adjusted R2 value of 0.283 Hair Jr et al. (2021), determined that the predictive accuracy of entrepreneurial traits on nascent entrepreneurial behavior was inadequate. Nevertheless, this R2 value is deemed adequate because the endogenous variable in the inner path model was explained by a single exogenous variable (Henseler, Ringle, & Sinkovics, 2009). The findings suggest that entrepreneurial traits account for 28.3% of the variance in medical students' nascent entrepreneurial behavior.

Discussion and Conclusion

There has been a resurgence of interest in assessing personality traits that can predict entrepreneurial behavior among university students (Kerr et al., 2018) due to the 21st century's fascination with start-ups. This study attempts to cover a gap in the literature on entrepreneurship by examining the entrepreneurial behavior of medical students from the perspective of personality traits using a cross-sectional, analytical survey. According to the findings of this study, medical students have a high need for achievement and a moderately high internal locus of control and self-efficacy (Zeffane, 2013). These results suggest that medical students possess the same entrepreneurial motivation as students

pursuing business, management, and technical studies. It is common knowledge that studying medicine is extremely difficult (Suciu et al., 2021). In most Asian nations, pupils who excel academically and pass competitive exams pursue medicine. This explains the high scores attained in this study for the three motivational traits. Despite this, their average score on nascent entrepreneurial behavior was moderately low. The results indicated that although the medical students possessed entrepreneurial characteristics, they did not enthusiastically engage in entrepreneurial activities. In a similar investigation on Chinese medical students, Wu and Wu (2019) found that entrepreneurial abilities were lacking. Devi et al. (2020) found that medical students have a high entrepreneurial ability but are unprepared for an entrepreneurial career.

Similarly, Kohlhaas et al. (2021) found that German medical students were less inclined to pursue self-employment. Thus, our findings are consistent with previous research on medical students. Brady and Zarb (2018) are adamant that the lack of entrepreneurial training in medical curricula discourages medical students from pursuing self-employment. Cohen and Klapman (2018) adds that the lackluster academic medicine culture of the past failed to foster innovation and left many medical residents unprepared for the commercialization and implementation of excellent ideas. This explains the low level of nascent entrepreneurial behavior observed in the population under study.

In addition, the results demonstrate a statistically significant and positive correlation between entrepreneurial traits and emerging entrepreneurial behavior. Entrepreneurial characteristics were a modest but significant predictor of developing entrepreneurial behavior. Lanivich, Lyons, and Wheeler (2021) acknowledged that entrepreneurial traits are associated with early-stage entrepreneurial performance. Similar positive effects of motivational personality traits on the success of entrepreneurial ventures have been reported in the Malaysian context (Yap, Keling, & Ho, 2023). Anwar et al. (2021), Atiya and Osman (2021), and Li, Huang, and Gao (2022) have found that personality attributes have a direct effect on university students' intentions to launch a new business. This study reveals that personality traits have a positive impact on nascent entrepreneurial behavior as well as entrepreneurial intention. Thus, it dispels doubts regarding the role of personality traits in fostering entrepreneurial behavior. Consequently, it provides empirical evidence to support the traits model of entrepreneurship and highlights the significance of "person" in entrepreneurship. Thus, it supports the notion that an individual with an entrepreneurial personality is most likely to be an entrepreneur.

Limitations and Recommendations

Despite the empirical rigor of the methodology employed, the authors acknowledge that this study has some limitations. First, the study is limited by its cross-sectional design. Even though the results suggest a positive correlation between personality traits and nascent entrepreneurial behavior, this does not prove that these traits are the underlying causes. Consequently, it would be instructive if future studies utilized a longitudinal study design to search for actual new-venture formation or self-employment. Without measuring individuals' wealth and access to resources, an "omitted variable" bias may result from conclusions based solely on personality characteristics. Thirdly, because the results were derived from a self-administered questionnaire, they may be subject to "social desirability"

bias. In addition, the conclusions were supported by data from a particular medical school. Future research utilizing a larger sample size drawn from both public and private medical institutions in Malaysia may help to validate these findings.

Implications

This study provides insights into entrepreneurial characteristics among medical students whose interests and abilities in entrepreneurship have rarely been studied. This information is crucial as many newly-trained physicians graduate from medical institutions each year, resulting in fewer vacancies and increased competition among junior physicians. In today's digital healthcare and personalized medicine era, entrepreneurship provides medical students with a viable career option.

Although medicine and business appear to be distinct disciplines, they require similar characteristics. The findings of this study suggest that medical students possess an abundance of entrepreneurial personality traits but exhibit subpar nascent entrepreneurial behavior, presumably due to an excessive academic workload or lack of training in innovation and managerial skills. Therefore, every endeavor must be to incorporate these topics into the medical curriculum. Presently, medical education is tasked with imparting to students the many competencies required for patient treatment within the timeframe stipulated by accrediting bodies. Consequently, the incorporation of other talents required by allied industries has been relatively limited. However, the availability of digital technology now enables online and blended delivery of entrepreneurial courses. In addition, computer simulations and gamification may be used to practice entrepreneurial activities. The internet's widespread use enables communication with entrepreneurs from around the world. Online collaboration between medical and engineering graduates could result in innovative approaches to patient care. Therefore, policymakers and curriculum developers must develop plans for incorporating entrepreneurialism into the medical curriculum.

This study's positive relationship between traits and entrepreneurial behavior provides educators with useful information for designing intervention strategies to instill these traits in medical students. The findings also demonstrate the significance of appropriate candidate selection for entrepreneurial course success. Individuals with intrinsic entrepreneurial characteristics are most likely to benefit from formal training in entrepreneurship and produce more doctor-entrepreneurs in the future.

Acknowledgment

The authors are grateful to the respondents for their time and for providing information valuable for this research.

References

- Al Issa, H.-E. (2022). Psychological capital for success: the mediating role of entrepreneurial persistence and risk-taking. *Journal of Entrepreneurship in Emerging Economies*, 14(4), 525-548. <https://doi.org/10.1108/JEEE-09-2020-0337>
- Aldrich, H. E., & Martinez, M. A. (2001). Many are called, but few are chosen: An evolutionary perspective for the study of entrepreneurship. *Entrepreneurship theory and practice*, 25(4), 41-56. <https://doi.org/10.1177/104225870102500404>

- Alshebami, A. S., & Seraj, A. H. A. (2022). Exploring the influence of potential entrepreneurs' personality traits on small venture creation: The case of Saudi Arabia. *Frontiers in Psychology*, 13, 885980. <https://doi.org/10.3389/fpsyg.2022.885980>
- Anwar, I., Jamal, M. T., Saleem, I., & Thoudam, P. (2021). Traits and entrepreneurial intention: testing the mediating role of entrepreneurial attitude and self-efficacy. *Journal for International Business and Entrepreneurship Development*, 13(1), 40-60. <https://doi.org/10.1504/JIBED.2021.112276>
- Anwar, I., & Saleem, I. (2019). Exploring entrepreneurial characteristics among university students: an evidence from India. *Asia Pacific Journal of Innovation and Entrepreneurship*, 13(3), 282-295. <https://doi.org/10.1108/APJIE-07-2018-0044>
- Atiya, T., & Osman, Z. (2021). The effect of entrepreneurial characteristics on the entrepreneurial intention of university students in Oman and Sudan. *Entrepreneurship and Sustainability Issues*, 8(4), 217-234. [https://doi.org/10.9770/jesi.2021.8.4\(12\)](https://doi.org/10.9770/jesi.2021.8.4(12))
- Atiya, T. M. S., Bilal, Z. O., Abulhamid, M., & Shoaib, S. A. (2019). The impact of entrepreneurial characteristics on entrepreneurial intention of Sudanese and Omani university students. *European Scientific Journal*, 15(4), 1857-7881. <https://doi.org/10.19044/esj.2019.v15n4p66>
- Baciu, E.-L., Virgă, D., & Lazăr, T.-A. (2020). What characteristics help entrepreneurs 'make it' early on in their entrepreneurial careers? Findings of a regional study from Romania. *Sustainability*, 12(12), 5028. <https://doi.org/10.3390/su12125028>
- Bandura, A., Freeman, W. H., & Lightsey, R. (1999). *Self-efficacy: The exercise of control*. Springer. <https://doi.org/10.1891/0889-8391.13.2.158>
- Baum, J. R., & Locke, E. A. (2004). The relationship of entrepreneurial traits, skill, and motivation to subsequent venture growth. *Journal of applied psychology*, 89(4), 587-598. <https://doi.org/10.1037/0021-9010.89.4.587>
- Belchior, R. F., & Lyons, R. (2021). Explaining entrepreneurial intentions, nascent entrepreneurial behavior and new business creation with social cognitive career theory—a 5-year longitudinal analysis. *International Entrepreneurship and Management Journal*, 17(4), 1945-1972. <https://doi.org/10.1007/s11365-021-00745-7>
- Boyd, N. G., & Vozikis, G. S. (1994). The influence of self-efficacy on the development of entrepreneurial intentions and actions. *Entrepreneurship theory and practice*, 18(4), 63-77. <https://doi.org/10.1177/104225879401800404>
- Brady, C., & Zarb, M. (2018). Medical students opinions on the inclusion of non-traditional skills in the curriculum. *Journal of entrepreneurship education*, 21(2), 1-6. <http://hdl.handle.net/10059/2882>
- Byrne, B. M. (2013). *Structural equation modeling with Mplus: Basic concepts, applications, and programming*. Routledge. <https://doi.org/10.4324/9781410600219>
- Cardon, M. S., Gregoire, D. A., Stevens, C. E., & Patel, P. C. (2013). Measuring entrepreneurial passion: Conceptual foundations and scale validation. *Journal of business venturing*, 28(3), 373-396. <https://doi.org/10.1016/j.jbusvent.2012.03.003>
- Carter, N. M., Gartner, W. B., & Reynolds, P. D. (1996). Exploring start-up event sequences. *Journal of business venturing*, 11(3), 151-166. [https://doi.org/10.1016/0883-9026\(95\)00129-8](https://doi.org/10.1016/0883-9026(95)00129-8)
- Chen, S.-C., & Jing, L.-L. (2012). University students personality traits and entrepreneurial intention: Using entrepreneurship and entrepreneurial attitude as mediating variable. *International Journal of Economics and Research - IJER*, 3(3), 76-82. <https://www.ijeronline.com/Vol3issue3.php>

- Cohen, M. S., & Klapman, S. (2018). Preparing America's Entrepreneurial Workforce: Reinventing the Medical Curriculum. In *Medical Innovation* (pp. 209-220). Elsevier. <https://doi.org/10.1016/B978-0-12-814926-3.00021-8>
- Devi, A., Ghazi, H. F., Ariffin, I. A., & Ab Yajid, M. S. (2020). Level of entrepreneurship competence and readiness among medical students in a private university in shah alam, Malaysia. *Journal of Entrepreneurship and Business*, 2289-8298. <https://doi.org/10.17687/JEB.0801.07>
- Di Corrado, D., Coco, M., Guarnera, M., Maldonato, N. M., Quartiroli, A., & Magnano, P. (2021). The influence of self-efficacy and locus of control on body image: a path-analysis in aspiring fashion models, athletes and students. *International Journal of Environmental Research and Public Health*, 18(11), 6128. <https://doi.org/10.3390/ijerph18116128>
- Diamantopoulos, A., & Siguaw, J. A. (2006). Formative versus reflective indicators in organizational measure development: A comparison and empirical illustration. *British journal of management*, 17(4), 263-282. <https://doi.org/10.1111/j.1467-8551.2006.00500.x>
- Druckman, D. E., & Bjork, R. A. (1994). *Learning, remembering, believing: Enhancing human performance*. National Academy Press. <https://doi.org/10.17226/2303>
- Field, A. (2013). *Discovering Statistics Using IBM SPSS Statistics*. Sage Publications Ltd. <https://edge.sagepub.com/field5e>
- Gartner, W. B. (1988). "Who Is an Entrepreneur?" Is the Wrong Question. *Entrepreneurship theory and practice*, 12(4), 11-32. <https://doi.org/10.1177/104225878801200401>
- Hair Jr, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *Partial least squares structural equation modeling (PLS-SEM) using R: A workbook*. Springer Nature. <https://doi.org/10.1007/978-3-030-80519-7>
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science*, 43, 115-135. <https://doi.org/10.1007/s11747-014-0403-8>
- Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. In *New challenges to international marketing* (pp. 277-319). Emerald Group Publishing Limited. [https://doi.org/10.1108/S1474-7979\(2009\)0000020014](https://doi.org/10.1108/S1474-7979(2009)0000020014)
- Ida Ketut, K. (2019). The prediction of need for achievement to generate entrepreneurial intention: A locus of control mediation. *International review of management and marketing*, 9(4), 54-62. <http://dx.doi.org/10.32479/irmm.8330>
- Kerr, S. P., Kerr, W. R., & Xu, T. (2018). Personality traits of entrepreneurs: A review of recent literature. *Foundations and Trends® in Entrepreneurship*, 14(3), 279-356. <http://dx.doi.org/10.1561/03000000080>
- Kohlhaas, A., Zwierlein, R., Steinhäuser, J., Strumann, C., & Goetz, K. (2021). Considerations towards management competencies and their associations with becoming self-employed in a future career—a cross-sectional study with medical students in Germany. *Beiträge zur Hochschulforschung*, 114-129. https://www.bzh.bayern.de/fileadmin/user_upload/Publikationen/Beitraege_zur_Hochschulforschung/2021/2021-4-Kohlhaas-Zwierlein-Steinhaeuser-Strumann-Goetz.pdf
- Kristiansen, S., & Indarti, N. (2004). Entrepreneurial intention among Indonesian and Norwegian students. *Journal of enterprising culture*, 12(01), 55-78. <https://doi.org/10.1142/S021849580400004X>

- Lanivich, S. E., Lyons, L. M., & Wheeler, A. R. (2021). Nascent entrepreneur characteristic predictors of early-stage entrepreneurship outcomes. *Journal of Small Business and Enterprise Development*, 28(7), 1095-1116. <https://doi.org/10.1108/JSBED-08-2019-0283>
- Levine, R., & Rubinstein, Y. (2017). Smart and Illicit: Who Becomes an Entrepreneur and Do They Earn More?*. *The Quarterly Journal of Economics*, 132(2), 963-1018. <https://doi.org/10.1093/qje/qjw044>
- Li, L.-N., Huang, J.-H., & Gao, S.-Y. (2022). The relationship between personality traits and entrepreneurial intention among college students: The mediating role of creativity. *Frontiers in Psychology*, 13, 52. <https://doi.org/10.3389/fpsyg.2022.822206>
- Loan, L. T., Doanh, D. C., Thang, H. N., Nga, N. T. V., Van, P. T., & Hoa, P. T. (2021). Entrepreneurial behaviour: The effects of the fear and anxiety of Covid-19 and business opportunity recognition. *Entrepreneurial Business and Economics Review*, 9(3), 7-23. <https://doi.org/10.15678/EBER.2021.090301>
- Luo, Y. F., Huang, J., & Gao, S. (2022). Relationship Between Proactive Personality and Entrepreneurial Intentions in College Students: Mediation Effects of Social Capital and Human Capital. *Front Psychol*, 13, 861447. <https://doi.org/10.3389/fpsyg.2022.861447>
- Mcclelland, D. C. (1987). Characteristics of Successful Entrepreneurs. *Journal of Creative Behavior*, 21(3), 219-233. <https://doi.org/10.1002/j.2162-6057.1987.tb00479.x>
- Mitton, D. G. (1989). The compleat entrepreneur. *Entrepreneurship theory and practice*, 13(3), 9-20. <https://doi.org/10.1177/104225878901300303>
- Nagarathanam, R., & Buang, N. (2016). The Relationship between Attitude, Intention, and Entrepreneurship Career Choice among Malaysian Indian Undergraduates. *Akademika*, 86(2), 43-52. <http://dx.doi.org/10.17576/akad-2016-8602-03>
- Nishantha, B. (2009). Influence of Personality Traits and Socio-demographic Background of Undergraduate Students on Motivation for Entrepreneurial Career : The Case of Sri Lanka. *Ryukoku Journal of Economic Studies*, 49(2), 71-82. <https://www.researchgate.net/profile/B-Nishantha/publication/48411177>
- Othman, N. (2002). *Keberkesanan program keusahawanan remaja di sekolah menengah* (Unpublished Ph.D. Thesis, Serdang, Selangor DE: UPM). <http://psasir.upm.edu.my/id/eprint/9275>
- Othman, N., & Othman, N. H. (2015). Relationship between entrepreneurial intentions and entrepreneurial career choice behavior among university students. *Journal of Business and Economics*, 6(1), 179-186. [https://doi.org/10.15341/jbe\(2155-7950\)/01.06.2015/017](https://doi.org/10.15341/jbe(2155-7950)/01.06.2015/017)
- Pickle, H. B. (1964). *Personality and success: An evaluation of personal characteristics of successful small business managers*. Small Business Administration.
- Ping, C. S., Jing, R. T. S., & Yan, L. W. (2021). Improving the Quality of Medical Education in Malaysia. *Policy Brief POL*. <https://static1.squarespace.com/static/5e477eb18ae6b644167d06ab/t/6043d5e56856623a539759b3/1615358675970/Policy-2021-02-Medical-Education.pdf>
- Podsakoff, P. M., & Organ, D. W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of management*, 12(4), 531-544. <http://dx.doi.org/10.1177/014920638601200408>
- Robinson, P. B., Stimpson, D. V., Huefner, J. C., & Hunt, H. K. (1991). An attitude approach to the prediction of entrepreneurship. *Entrepreneurship theory and practice*, 15(4), 13-32. <https://doi.org/10.1177/104225879101500405>

- Rotter, J. (1966). Generalised expectancies for internal versus external control of reinforcement. *Psychological Monographs: General and Applied*, 80(1), 1-28. <https://doi.org/10.1037/h0092976>
- Şahin, F., Karadağ, H., & Tuncer, B. (2019). Big five personality traits, entrepreneurial self-efficacy and entrepreneurial intention: A configurational approach. *International Journal of Entrepreneurial Behavior & Research*, 25(6), 1188-1211. <https://doi.org/10.1108/IJEBr-07-2018-0466>
- Satyalakshmi, K., & Kumari, P. (2010). Addressing The Complex Issue Of Understanding Entrepreneurial Intentions Of Indian Millennials: Adopting A Intention-Driven, Theory-Based Model. *IUIJ Journal Of Management*. <http://journal.ijharkhand.edu.in/Nov2017/Addressing-The-Complex-Issue-Of-Understanding.pdf>
- Schjoedt, L., & Shaver, K. G. (2012). Development and validation of a locus of control scale for the entrepreneurship domain. *Small Business Economics*, 39, 713-726. <https://doi.org/10.1007/s11187-011-9357-0>
- Schmidt, S., Bohnenberger, M. C., Panizzon, M., Marcon, S. R. A., Toivonen, E., & Lampinen, M. (2018). Students entrepreneurial behaviour: An eight-construct scale validation. *International Journal of Entrepreneurship*, 22(2), 1-20. <https://www.researchgate.net/profile/Silvana-Marcon/publication/328048644>
- Sekaran, U., & Bougie, R. (2019). *Research Methods for Business: A Skill Building Approach*. John Wiley & Sons, Inc.
- Suciu, N., Mărginean, C. O., Meliț, L. E., Ghiga, D. V., Cojocaru, C., & Popa, C. O. (2021). Medical students' personalities: a critical factor for doctor-patient communication. *International Journal of Environmental Research and Public Health*, 18(17), 9201. <https://doi.org/10.3390/ijerph18179201>
- Watson, A., MacDowell, C., Khodorov, G., Tartaglia, J., & Weber, P. (2018). Assessing Entrepreneurial Characteristics of Healthcare Students Participating in an Entrepreneurial-Medicine Curriculum. *MedEdPublish*, 7, 101. <https://doi.org/10.15694/mep.2018.0000101.2>
- Wu, J., & Wu, L. (2019). Evaluation of Medical College Students' Entrepreneurial Skills and Its Relationship with Social Intelligence. *Open Journal of Social Sciences*, 7(4), 13-23. <https://doi.org/10.4236/jss.2019.74002>
- Yap, C. S., Keling, W., & Ho, P. L. (2023). Determinants of entrepreneurial performance of rural indigenous women entrepreneurs in Sarawak, Malaysia. *Gender in Management: An International Journal*, 38(3), 337-356. <https://doi.org/10.1108/GM-06-2021-0170>
- Zainol, F. A., & Ayadurai, S. (2011). Entrepreneurial orientation and firm performance: the role of personality traits in Malay family firms in Malaysia. *international Journal of Business and social science*, 2(1), 59-71. <http://ijbssnet.com/journals/Vol. 2 No. 1; January 2011/6.pdf>
- Zeffane, R. (2013). Need for achievement, personality and entrepreneurial potential: A study of young adults in the United Arab Emirates. *Journal of enterprising culture*, 21(01), 75-105. <https://doi.org/10.1142/S0218495813500040>

Appendix: Research instrument

Impact of Entrepreneurial Personality Traits on Nascent Entrepreneurial Behaviour of Medical Students: Implications for Medical Education

This section has questions on some personality traits. Please TICK an appropriate answer that represents your response for each of the following questions (1=Strongly disagree, 2= Disagree, 3=Neither agree nor disagree, 4= Agree, 5=Strongly agree).

S No.	Code	Entrepreneurial Personality Traits	Source	Scale
1	ETN1	I do very well in fairly difficult tasks relating to my study and my work.	Kristiansen and Indarti (2004)	1 2 3 4 5
2	ETN2	I do every job given to me as thoroughly as possible	Robinson et al. (1991)	1 2 3 4 5
3	ETN3	I work hard to improve on my past work performance.	Kristiansen and Indarti (2004)	1 2 3 4 5
4	ETN4	I seek added responsibilities in jobs assigned to me.	Kristiansen and Indarti (2004)	1 2 3 4 5
5	ETN5	I am successful in my job as I use my time wisely.	Robinson et al. (1991)	1 2 3 4 5
6	ETN6	I strive to perform better than others.	Kristiansen and Indarti (2004)	1 2 3 4 5
7	ETL1	When I get what I want, it is usually because I worked hard and luck has nothing to do with it;	Rotter (1966), Schjoedt and Shaver (2012).	1 2 3 4 5
8	ETL2	When I make plans, I am almost certain that I can make them work.	Schjoedt and Shaver (2012)	1 2 3 4 5
9	ETL3	I am confident of my skills and abilities to start a new business.	Schjoedt and Shaver (2012)	1 2 3 4 5
10	ETS1	I have leadership skills that are needed to be an entrepreneur	Kristiansen and Indarti (2004), Zainol and Ayadurai (2011).	1 2 3 4 5
11	ETS2	I have mental maturity to be an entrepreneur	Kristiansen and Indarti (2004), Zainol and Ayadurai (2011).	1 2 3 4 5

SECTION C: This section has questions enquiring on some of your entrepreneurial activities. Please TICK an appropriate answer that represents your response for each of the following questions

S No	Code	Nascent Entrepreneurial behaviour	Source	Scale				
12	EB 1	I often hang out with entrepreneurs.		1	2	3	4	5
13	EB 2	I often read books/magazines related to business.		1	2	3	4	5
14	EB 3	I often surf the internet looking for business opportunities.		1	2	3	4	5
15	EB 4	I often engage in business online.		1	2	3	4	5
16	EB 5	I regularly attend social functions because I can meet lots of people particularly in relation to business .		1	2	3	4	5
17	EB 6	I frequently visit trade exhibitions because it allows me to get ideas or identify business opportunities.		1	2	3	4	5
18	EB 7	I regularly participate in entrepreneurship workshops organized by the university.	Othman and	1	2	3	4	5
19	EB 8	I regularly participate in seminars/entrepreneurship courses organized by the universities.	Othman (2015)	1	2	3	4	5
20	EB 9	I regularly run a part-time business at the university.		1	2	3	4	5
21	EB 10	I often review the strategic premises or locations to start a business.		1	2	3	4	5
22	EB 11	I have often been involved in sales in various activities organized by the university.		1	2	3	4	5
23	EB 12	I often seek advice from government or private agencies about entrepreneurial opportunities.		1	2	3	4	5
24	EB 13	I often seek advice from family and friends in the same field as my prospective business.		1	2	3	4	5