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Original Article

Personality Traits and Academic Performance among Undergraduate Dental Students: Evidence from a Cross-Sectional Study at Azra Naheed Dental College

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Abstract

Background: Academic performance in dental education is shaped by a complex interplay of cognitive and non-cognitive factors. Understanding these associations is particularly relevant in high-stakes educational systems where annual professional examinations largely determine academic success.

Objective: To examine the association between the five major personality traits; openness, conscientiousness, extraversion, agreeableness, and neuroticism; and academic performance among undergraduate dental students and recent graduates at Azra Naheed Dental College, Lahore.

Methodology: This cross-sectional study included third-year and final-year dental students as well as recent graduates from Azra Naheed Dental College. A total of 97 participants completed a structured questionnaire incorporating the Ten-Item Personality Inventory (TIPI) to assess personality traits. Academic performance was measured using the most recent annual professional examination scores obtained from academic records. Data were analyzed using SPSS version 27.0, with correlation analyses performed to evaluate associations between personality traits and academic achievement.

Results: The study population consisted of 60% female and 40% male participants, with a mean academic score of 71.67%. Conscientiousness emerged as the most prevalent personality trait and demonstrated a statistically significant positive correlation with academic performance ($p < 0.05$). Extraversion showed a modest positive association, while neuroticism exhibited a weak negative trend. Other personality traits did not show significant associations with academic outcomes.

Conclusion: Conscientiousness was positively associated with academic performance among dental students, highlighting its relevance in demanding educational environments. Extraversion and neuroticism demonstrated weaker, non-significant trends. These findings underscore the importance of considering personality traits in academic support strategies, while acknowledging the limitations of a single-institution, cross-sectional design.

Keywords: Academic Performance, Agreeableness, Conscientiousness, Dental Education, Extraversion, Five-Factor Model (FFM), Neuroticism, Openness, Personality Traits.

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Introduction

Research concerning the academic performance of medical Academic performance among medical and dental students has been the focus of extensive research, with prior studies highlighting the influence of both intrinsic and extrinsic factors on student achievement. These factors include motivation, grit, intellectual ability, and personality characteristics, alongside environmental determinants such as socioeconomic status and institutional support [1]. In recent years, increasing emphasis has been placed on enhancing professionalism and quality of services within the medical field, necessitating continuous effort from both educators and students to achieve optimal educational outcomes [2].

While cognitive ability has long been regarded as one of the strongest predictors of academic success, growing evidence suggests that non-cognitive factors play a substantial role in explaining individual differences in academic performance [3,4]. Among these, personality traits have received particular attention due to their relative stability and their influence on learning strategies, stress tolerance, and behavioral regulation.

The Five-Factor Model (FFM) of personality—comprising openness, conscientiousness, extraversion, agreeableness, and emotional stability (neuroticism), commonly referred to as the OCEAN framework—has been widely applied in educational research and has demonstrated meaningful associations with academic performance across diverse student populations [5,6]. Conscientiousness, characterized by organization, diligence, and goal-directed behavior, has consistently emerged as a robust predictor of academic success [7]. In contrast, neuroticism, reflecting emotional instability and proneness to stress, has often been linked to poorer academic outcomes [8].

Academic performance measurement systems vary across institutions and regions. Although grade point averages (GPAs) are commonly used indicators of academic success, concerns have been raised regarding their reliability due to grade inflation and inconsistencies across courses and time periods [6]. In Pakistan, most medical and dental institutions employ an annual examination system in which performance in high-stakes professional examinations determines academic standing, thereby intensifying academic pressure and potentially amplifying the influence of personality traits on outcomes.

Evidence specific to dental education suggests that personality traits may differentially affect academic performance. Studies have reported that dental and medical students with higher levels of conscientiousness, agreeableness, and emotional stability tend to perform better academically [9,10]. Furthermore, understanding how personality traits interact with academic demands may help educators optimize teaching strategies, enhance student support systems, and guide future career development within health professions [9].

In this context, the present study aims to examine the relationship between the five major personality traits, as defined by the Big Five model, and academic performance among dental students enrolled at Azra Naheed Dental College, Lahore. By exploring these associations within a Pakistani dental education setting, this study seeks to contribute context-specific evidence to the growing literature on personality and academic achievement.

Methodology

Study Design

This study employed a cross-sectional analytical design to examine the association between personality traits and academic performance among undergraduate dental students and recent graduates. The design was chosen to allow assessment of personality dimensions and academic outcomes at a single point in time within a defined academic setting.

Ethics

Ethical approval was obtained from the Institutional Review Board of Azra Naheed Dental College, Lahore (IRB Reference No. ANDC/RAC/2024/35). Participation was entirely voluntary. All eligible participants were informed about the objectives, procedures, and confidentiality of the study, and written informed consent was obtained prior to data collection. No incentives were provided, and participants were free to withdraw at any stage without academic or professional consequences.

Setting

The study was conducted at Azra Naheed Dental College (ANDC), Lahore, Pakistan, a private medical and dental institution that follows an annual professional examination system for undergraduate dental education. Data collection took place within the academic environment of the college, ensuring accessibility to both students and recent graduates.

Participants

Participants included third-year and final-year Bachelor of Dental Surgery (BDS) students, as well as recently

graduated dental interns enrolled or affiliated with ANDC during the study period. A convenience sampling approach was used. Of the 120 eligible individuals approached, 97 consented to participate, yielding a response rate of approximately 81%. No participant was excluded after consent was obtained, and the only exclusion criterion was refusal to participate.

Variables

The primary independent variables were the five personality traits defined by the Five-Factor Model: openness, conscientiousness, extraversion, agreeableness, and neuroticism. The primary dependent variable was academic performance, operationalized as the percentage score obtained in the most recent annual professional examination. Demographic variables, including age and gender, were included as covariates.

Data Sources/Measurement

Data were collected using a two-part structured questionnaire. The first section recorded socio-demographic information. The second section assessed personality traits using the Ten-Item Personality Inventory (TIPI) [11], a validated brief measure of the Five-Factor Model. The TIPI consists of 10 items rated on a 7-point Likert scale ranging from "strongly disagree" to "strongly agree" and was administered in English, the official language of instruction at the institution. Internal consistency values for the five domains ranged from Cronbach's alpha 0.55 to 0.70, which is considered acceptable for ultra-brief personality measures. Academic performance data were obtained from official academic records, ensuring objective measurement. Missing responses, which accounted for less than 2% of items, were managed using person-mean imputation within each personality domain, consistent with standard practice for short psychometric scales.

Bias

Several potential sources of bias were considered. Selection bias may be present due to voluntary participation and the use of convenience sampling. Self-report bias is inherent in personality assessment tools; however, the TIPI has demonstrated acceptable validity for research settings. To minimize information bias, academic scores were obtained directly from institutional records rather than self-report. No blinding was applied due to the observational nature of the study.

Study Size

A minimum sample size of 90 participants was calculated to achieve 80% statistical power to detect a medium effect size ($f^2 = 0.15$) in a multiple regression model with five predictors at an alpha level of 0.05. Ultimately, 97 participants were enrolled, exceeding the required sample size and thereby maintaining adequate statistical power.

Quantitative Variables

Personality trait scores were treated as continuous variables and calculated by averaging item scores corresponding to each trait. Academic performance was analyzed as a continuous percentage score. Age was treated as a continuous variable, while gender was analyzed as a categorical variable.

Statistical Methods

Data were analyzed using SPSS version 27.0. Descriptive statistics were computed for demographic variables, personality trait scores, and academic performance. Pearson correlation analysis was used to assess associations between personality traits, age, and academic scores. Where appropriate, multivariable analyses were conducted to examine independent relationships between personality traits and academic performance. Statistical significance was set at $p < 0.05$.

Results

Participants

A total of 97 participants were included in the final analysis, comprising undergraduate dental students and recent graduates from Azra Naheed Dental College. Of these, 60% (n≈58) were female and 40% (n≈39) were male, reflecting a female-predominant cohort typical of dental education programs. All participants had complete academic performance records and valid responses to the personality assessment questionnaire, and no cases were excluded after consent was obtained.

Descriptive Data

Academic performance scores demonstrated a mean examination score of 71.67%, with values ranging from 54% to 88% (Figure 01). The standard deviation of 6.77 indicates moderate variability in academic achievement across the sample. With respect to personality traits, mean scores (± SD) were as follows: openness 4.2 ± 1.1, conscientiousness 5.1 ± 1.2, extraversion 4.6 ± 1.0, agreeableness 4.8 ± 0.9, and neuroticism 3.9 ± 1.0 (Figure 02). Among these, conscientiousness showed the highest average score, suggesting it was the most prominent personality trait in this cohort. All personality traits were analyzed as continuous variables.

Outcome Data

The primary outcome measure was academic performance, operationalized as the percentage score obtained in the

most recent annual professional examination. Personality traits served as predictor variables, while age and gender were evaluated as additional correlates. Correlation analyses revealed variability in the strength and direction of associations between individual personality traits and examination performance.

Main Results

Pearson correlation analysis (n = 97) demonstrated that conscientiousness was significantly positively correlated with academic performance (r = 0.34, p = 0.01), indicating that higher levels of conscientiousness were associated with better examination scores. Extraversion showed a positive but non-significant association with academic performance (r = 0.18, p = 0.09). Neuroticism demonstrated a weak negative correlation (r = −0.12, p = 0.21). Openness (r = 0.05, p = 0.62) and agreeableness (r = 0.07, p = 0.48) were not significantly associated with academic outcomes.

Age was significantly negatively correlated with academic performance (r = −0.28, p = 0.02). No significant association was observed between gender and academic performance (p > 0.05).

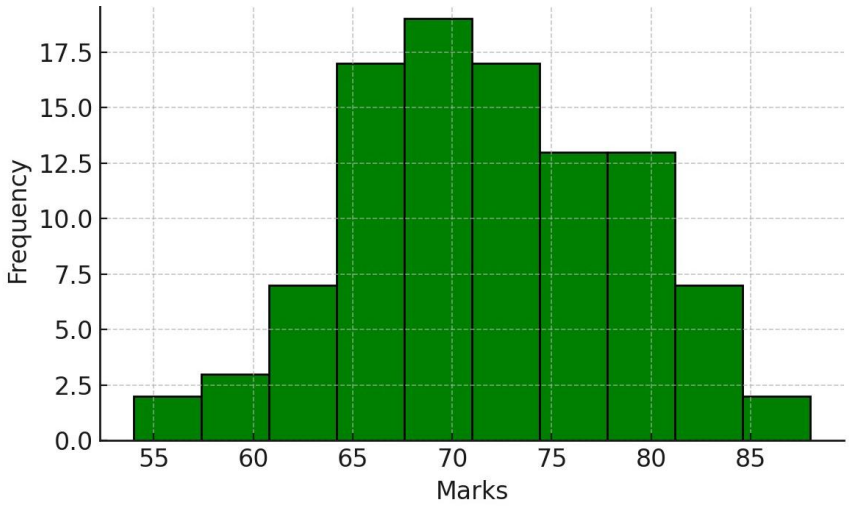


Figure 1: Distribution of Marks

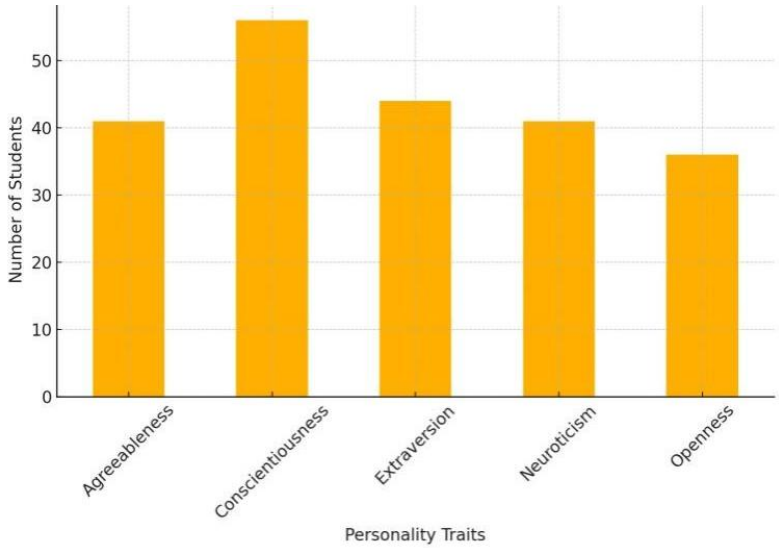


Figure 2: Distribution of Traits

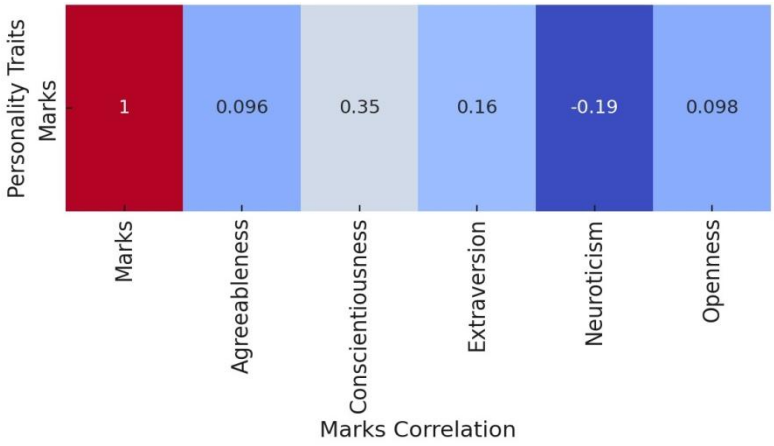


Figure 3: Correlation between personality traits and Marks

Discussion

The findings of the present study provide valuable insight into the relationship between personality traits and academic performance among dental students within a Pakistani educational context. Among the five personality traits examined, conscientiousness demonstrated a statistically significant positive association with academic performance, aligning with a substantial body of literature identifying conscientiousness as one of the strongest non-cognitive predictors of academic success [12,13].

Conscientious individuals tend to exhibit higher levels of organization, discipline, and persistence—attributes that are particularly beneficial in demanding academic environments such as dental education. Similar findings have been reported among medical and dental students in other settings, where conscientiousness has been linked to effective task management and sustained academic effort [14,15]. These results reinforce the notion that conscientiousness plays a central role in academic achievement across health professions.

Extraversion showed a modest positive association with academic performance in this study, although the relationship did not reach statistical significance. This finding suggests that traits related to sociability and assertiveness may offer some academic advantage in dentistry, a field that requires frequent interpersonal interaction. Previous studies have reported mixed results regarding extraversion, with some identifying positive associations in collaborative learning environments [16], while others have reported neutral or negative effects in settings emphasizing solitary study.

Neuroticism demonstrated a weak negative association with academic performance, consistent with evidence indicating that emotional instability, anxiety, and stress can impair concentration and cognitive processing [17,18]. In high-pressure examination systems, such as the annual assessment structure used in Pakistan, the adverse effects of neuroticism may be particularly pronounced. This context may further explain why conscientiousness emerged as a dominant positive trait, as it may buffer the impact of academic stress [19]. Overall, the findings highlight the relevance of personality traits, particularly conscientiousness in understanding academic performance among dental students, while also emphasizing the influence of educational context and assessment systems.

Limitations

This study has several limitations. Its single-center, cross-sectional design limits the generalizability of findings and precludes causal inference. The use of the Ten-Item Personality Inventory, while efficient, provides a brief assessment of personality traits and may not capture their full complexity. Academic performance was assessed using a single annual examination score, which may not fully reflect longitudinal academic achievement. Additionally, voluntary participation introduces the possibility of self-selection bias. Future studies should employ multi-center, longitudinal designs with comprehensive personality measures and broader academic outcome indicators.

Conclusion

The present study demonstrates that conscientiousness is positively associated with academic performance among dental students, underscoring its importance in rigorous educational settings. Extraversion showed a favorable but non-significant trend, whereas neuroticism was associated with poorer academic outcomes. These findings suggest that personality traits contribute meaningfully to academic achievement and should be considered in academic

counseling, student support programs, and educational planning within dental education.

Authors' Contributions:

All authors meet the ICMJE criteria for authorship.

Author 1: Substantial contribution to conception and design, drafting the manuscript, final approval, agreed to be accountable for all the work.
Author 2: Substantial contribution to conception and design, data acquisition, drafting the manuscript, final approval, agreed to be accountable for all the work.
Author 3: Analysis and interpretation of data, drafting the manuscript, final approval, agreed to be accountable for all the work.
Author 4: Analysis and interpretation of data, critical revision, final approval, agreed to be accountable for all the work.
Author 5: Substantial contribution to conception and design, drafting the manuscript, final approval, agreed to be accountable for all the work.
Author 6: Substantial contribution to conception and design, data acquisition, drafting the manuscript, final approval, agreed to be accountable for all the work.

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