Title: Assessment of Personality Traits and Their Changes Over the Undergraduate Medical Course: A Pseudo-longitudinal Analysis among Indian Medical Students

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Authors Contribution Statement:

<table>
<thead>
<tr>
<th>Contributor Role</th>
<th>Role Definition</th>
<th>Authors</th>
</tr>
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<tbody>
<tr>
<td>Conceptualization</td>
<td>Ideas; formulation or evolution of overarching research goals and aims.</td>
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</tr>
<tr>
<td>Data Curation</td>
<td>Management activities to annotate (produce metadata), scrub data and maintain research data (including software code, where it is necessary for interpreting the data itself) for initial use and later reuse.</td>
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IJMS
### Discussion Points:

- What are the most prevalent personality traits among Indian undergraduate medical students?
- Do these traits change over the course of their curriculum?
- If these personality traits change over time, what trends of change do they show?
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**ABSTRACT.**

**Background:** Personality of medical students have been shown to affect both their academic performance as well as their capabilities to develop rapport with patients, with evidence that they change through the medical course. This research aimed to explore the personality traits of undergraduate medical students and assess whether personality parameters changed throughout the medical education course.

**Methods:** A pseudo-longitudinal design was utilized for this study. A total of 346 MBBS students studying in a Medical College of Eastern India were recruited at different stages of their coursework. These participants were similar in their sociodemographic makeup and differed only with respect to their year of MBBS study. The personality characteristics were assessed among these participants using the short-form revised Eysenck personality inventory.

**Results:** The minimum possible score for each subscale was 0, and the maximum was 12. Mean scores of the participants for the extraversion, neuroticism, psychoticism, and lie scales were 6.17±3.09, 7.51±3.16, 3.40±1.61, and 4.98±2.48, respectively. Females scored significantly higher in neuroticism and lie dimensions. There were significant differences of psychoticism scores between rural and urban background participants. Significant negative trend was seen from the first to the final year of study in the extraversion dimension (Kendall's tau =-0.094, p-value=0.025).

**Conclusion:** Medical students in India scored high on the neuroticism and low on the psychoticism scales of personality with a trend of increasing extraversion over the years of their coursework.

**Key Words:** Extraversion (Psychology), Medical Education, Neuroticism, Personality, Social Desirability
INTRODUCTION.

A physician’s mannerism and personality help build rapport with their patients. It has been seen that physicians with personality characteristics complimentary to that of their patients reported better clinical outcomes and vice versa.\(^1\) Therefore, it is important to assess and understand the personality characteristics of medical students as they enroll and progress through their medical coursework to ensure better doctor-patient interactions in the future.

Studies conducted internationally have shown that students who opt to pursue medical education differ significantly in personality traits as compared to their peers studying in other streams such as engineering, commerce, and arts. For example, Lievens F et al. reported that medical students in Belgium were among the highest scorers in extraversion when compared to other majors.\(^2\) Another study done in Singapore by Lean LL et al. found that medical students scored low in neuroticism and higher in extraversion.\(^3\) It has also been observed that over time, personality traits of a person can change due to the influence of external factors.\(^4\) Thus, knowledge about the baseline personality traits of medical students and their changes through the coursework can not only contribute more information about the people entering the stream, but also provide valuable insights to the traits that are amenable to change during the course of their study. This knowledge can be translated into better curriculum development and integration of skill training that helps medical students develop better rapport with their patients in the future as physicians.

However, data on the personality characteristics of medical students is hard to come by in the context of medical education in the Indian subcontinent. In India, there is no provision for documentation and assessment of various personality parameters of medical students during their entry to the medical course. It was seen that only one study explored the personalities of medical students at the time of their admission to the MBBS course.\(^5\) Furthermore, research regarding the gradual change of personality characteristics of college students as their courses progress is scarce,\(^6\) with no research being found that investigated this particular aspect among medical students of India. The present study aimed to assess the prevalent personality traits of medical students enrolled in the MBBS course in an Indian medical institute and to determine any existing trend of change of personality traits from the first to the final years of the course.
METHODS.

For the current study, we conducted an observational, descriptive study with a pseudo-longitudinal design. It was conducted at a tertiary care teaching hospital located in the state of West Bengal of Eastern India from April to June 2020. Medical students enrolled in the MBBS course at the hospital formed our study sample.

The pseudo-longitudinal design of the current study allowed us to look for trends in personality characters from the first through the final year MBBS students. Pseudo-longitudinal studies are done when it is not possible to follow the same individuals over time. Then, researchers can carry out a comparison of cross-sectional studies of different groups of learners at different stages of development (age, proficiency, exposure to certain conditions). This generates an effect where “time” (which is accounted for directly in longitudinal studies) is measured by a proxy such as proficiency level or age. Those groups, while containing different participants, often share some characteristics to have some homogeneity and therefore mimic a cohort. Pseudo-longitudinal or quasi-longitudinal studies are uncommon, but not unknown in medical sciences.

The selection procedure for MBBS courses in India is through a merit-based, multiple-choice question, all-India examination. This ensures that almost similar groups of students get admission to the course every year. Furthermore, by virtue of the nature of the exam itself as well as the college-allotment processes, which are also online, choice-based, each batch of students entering a medical college approximates a random sample drawn from all medical students in the country. Therefore, the personality scores obtained by a cross-sectional assessment of students studying in different course years in an Indian medical college is equivalent to assessing random samples of the country’s medical student population over the course years. This provides data which is fairly similar to that observed in a true longitudinal design where a single random sample of undergraduate medical students is followed from their first to final years of MBBS course. This made a pseudo-longitudinal design a viable study design for the current research.

We collected data from the participants using an anonymized self-administered online questionnaire consisting of two parts. The first part contained 8 sociodemographic questions followed by the short-form revised Eysenck personality questionnaire (EPQR-S). The latter consists of 48 yes/no questions that assess the individual personalities of the participants across four distinct dimensions extraversion-introversion, neuroticism-stability, psychoticism, and lie dimensions. Each dimension is assessed by 12 yes/no questions. Those participants who scored less than 6 were considered to have a low score in that particular dimension of interest, and a high score in the opposite direction. For example, a participant scoring 2 out of 12 in the extraversion-introversion dimension were considered to be more introverted than extraverted in their personality. The questionnaire also included an Instructional Manipulation Check (IMC) question to check whether the participants were paying attention to individual questions. The IMC included in this question was a yes/no question where the participant was instructed to answer with the ‘yes’ option only. Participants who answered to the ‘no’ were not included in the analysis.

Records review showed that from first to the final year, 638 MBBS students were studying in the medical college at the time of study. Of them, 200 students (31.3%) were enrolled in their first professional year, 192 students (30.1%) were enrolled in Second Professional year, 148 (23.2%) students in Third Professional Year (Part – I) and 98 students (15.4%) in their final year (Third Professional Year Part – II) of their MBBS curriculum. All students were selected into the MBBS course through a pan-India multiple choice question-based selection examination. Therefore, we approached all 638 students to take part in the study. Of these students, those who
were unwilling or incapable of giving informed consent and those who were diagnosed with a neuropsychiatric condition in the year prior to the study were excluded from the study.

We aimed to include the total student population for the current study. To that effect, we employed a complete enumeration sampling technique for the study. Of the 638 currently enrolled students contacted, a total of 391 students gave informed consent to participate in the study. We excluded 39 students who had been diagnosed with a neuropsychiatric condition such as depressive disorders, anxiety disorders, cyclothymia and bipolar disorders in the past one year (six from first professional year, nine from second professional year, 13 from third professional year part I and the rest from final year). This resulted in a final sample of 352 participants. (Figure 1)

Personality parameters of the participants as per the EPQR-S questionnaire (Extraversion, Introversion, Neuroticism, Psychoticism, and Lie) at each course year were the outcome variables of the study. Socio-demographic factors of the study population like age, sex, socioeconomic status, and residence as well as the course year of study of MBBS for each participant were considered as explanatory variables.

After collecting all data, they were entered in a spreadsheet. For the statistical analysis, we used the Statistical Package for the Social Sciences (SPSS) version 25 (IBM corp.). We used descriptive statistics, such as frequency, percentage, frequency, mean, median, and standard deviation to look at the data. The scores of each subscale of the EPQR-S were found to be non-normally distributed as per the Shapiro-Wilk's test. Therefore, we considered median scores as the measure for central tendency and thus used non-parametric tests for their analyses. For non-normally distributed variables, Jonckheere-Terpstra test for trends and Kendall’s tau-b test for correlation were used to look for the presence of trends in the observed data and their direction and strength, respectively. The analysis of categorical variables was performed using Chi-Square test. All statistical tests performed were two-tailed, with a statistical significance level was considered as p-value of <0.05.

This study was conducted after obtaining proper ethical clearance from the Institutional Ethics Committee of the North Bengal Medical College and Hospital. [IEC/NBMC/2020-21/11]
RESULTS.

Of the 352 participants, six (1.7%) answered the IMC question as ‘no’ and were therefore excluded, resulting in 346 respondents; 167 (48.3%) men and rest women. (Table 1) The mean age of the participants was 20.99 ± 1.46 years. Majority of the respondents were from the pre-final year of their course (3rd Professional Part I) (36.4%), followed by the first years, second years and final years respectively. Of the participants, 198 (57.2%) were from an urban residential background. When socio-economic background of the participants was considered, a majority of them hailed from families belonging to the Class I (Upper class) of the Modified B. G. Prasad Scale for Socioeconomic status (SES) updated with the All India Consumer Price Index (AICPI) for January 2020. It was followed closely by the Class II (29.2%), III (13.6%), IV (13.6%), and V (9.3%), respectively. All respondents were unmarried. Participants of the four academic years included in the study differed in their age, which showed a statistically significant increase over the years (p-value = 0.00003*, Pearson’s r = 0.712). However, we did not observe any statistically significant differences between the analyzed groups with respect to sex, socioeconomic status, and residence. (Table 1)

We observed that women scored significantly higher than men in the neuroticism (Mann-Whitney U test statistic = -3.783, p-value=0.000) and lie subscales (Mann-Whitney U test statistic = -3.364, p-value=0.001). There was no difference in the scores with respect to the participants’ socioeconomic status. However, we observed a statistically significant difference in psychoticism scores between participants hailing from rural and urban backgrounds (Mann-Whitney U test statistic = 2.342, p-value=0.019). (Table 2)

A Jonckheere Terpstra test for trends was used to look for any existing trend of scores in each personality subscale across the academic years. We found that there existed a significant negative trend in the extraversion scores from the first to the final year (TJT = 19,306.5, z = -2.235, Kendall’s tau-b correlation coefficient= -0.094, p-value=0.025). However, no significant trend was seen for the other subscale scores across the years of study. (Table 3)
DISCUSSION.
Personalities are amenable to change depending on the environment. Over the course of their medical training, certain personality traits among medical students might get modified from when they were enrolled in the course. We postulate that this could be due to increased stress, length and difficulty of course, or from increasing exposure to clinical scenarios involving significant mortality and morbidity, etc. Studies done a priori have provided some evidence in favor of this assertion, such as Gough HG et al. whose study found significant changes in personality traits as medical students move through the years of their study. A study conducted in Malaysia found that final year medical students had lower scores in neuroticism when compared to students enrolled in other years. A longitudinal study done on pharmacy and medical students of Malta also reported the shifting of certain personality traits from their baseline at the time of their enrollment.

Background characteristics of the participants
One of the primary assumptions of a pseudo-longitudinal design is that the groups selected for the study should be similar to each other in their background characteristics except the time of exposure to the risk factor under observation. In this study, we corroborated this assumption, as the analysis of the different socio-demographic variables showed that the four primary groups of students were like each other in their socio-demographic characteristics except their age, which, as expected, increased from the first to final year.

Neuroticism
We found that medical students scored on the higher end of the neuroticism scale, with a median score of 8. This is higher than the median score of 5 reported by Kuriata et al. in their study done in Poland and differs from the findings of Lean et al. in Singapore, who reported medical students to be less neurotic as compared to their non-medical peers. This discrepancy compared to international research needs to be explored in detail especially in the Indian context, as there are conflicting reports of the effect of higher neuroticism on the performance of medical students in their course. The higher scores of neuroticism among medical students can be explained by the unique, highly competitive entrance tests to the medical courses, where competitiveness and cognitive function are rewarded. The fact that neuroticism has been positively correlated with competitiveness as well as academic achievement in medical schools also lends support to this assumption. However, our observation that women scored significantly higher in the neuroticism subscale than their male counterparts is in line with previous research done on this subject.

Social Desirability
Another finding of male-female difference in personality traits was seen in the case of the lie subscale scores, where women scored significantly higher than men. Social desirability bias, the factor assessed by the Eysenck lie subscale is complex in its interpretation and association with the other three subscales. However, it has been seen that there is a distinct relationship between the Eysenck neuroticism and the lie subscales. Jackson and Francis demonstrated that people who scored high in the neuroticism subscale also had high scores in the lie subscale, indicating a higher social desirability bias. By that measure, we expected that women, who scored higher in the neuroticism scale would also do the same in the lie scale, an assumption that was reinforced by the current study.

Psychoticism
We found that psychoticism was low in medical students across all academic years, implying lower aggression, recklessness, and impulsiveness. However, even at that low score threshold, participants from an urban background scored significantly higher than their rural counterparts. This is consistent with previous research
that suggests a link between urbanicity and risk for psychosis, a character represented by higher psychoticism scores.\textsuperscript{22}

\textit{Introversion-extraversion}

With a minimum score of 0, a maximum score of 12, and a median score of 6, it can be said that medical students are equally likely to be introverted as they are to be extraverted. However, our subgroup analyses showed that there existed a significant trend towards introversion from the first through the final years. This can be explained as being a result of increased stress and increased exposure to significant morbidity and mortality as students move up the academic years. Research done \textit{a priori} has found that with increased clinical exposure, medical students become less empathetic, as they suffer from increased stress and distress associated with it.\textsuperscript{23} Some authors explain this negative coping mechanism as being resultant of the fact that more often than not medical students have to deal with these stressors alone, which lead to detached concern and increased carefulness and anxiety, which are characteristics of introversion.\textsuperscript{24}

Since we conducted this study among voluntary willing participants, the data collection was prone to volunteer bias, which could’ve skewed the results obtained. Furthermore, the absence of a control group further limits the study to only describing the observed personalities among medical students, which cannot be compared to those of their non-medical peers. Finally, personality change over the years can be best observed by a prospective design, although the pseudo-longitudinal design of the current study aimed to mimic a prospective design, it is less powerful than a true longitudinal design due to the underlying principle of the study design being substituting a single group followed-up over time with similar group data examined with time taken as a proxy. However, even with these limitations, to our knowledge, this is the first study that analyses the personality traits of undergraduate MBBS students studying in India. This is also the first study that looks at the trends of change of those personality traits throughout the course years of MBBS. The main strength of the study was the pseudo-longitudinal research design which made trend analyses possible.

We found that medical students studying in India without overt psychiatric illnesses scored high in neuroticism and low in psychoticism dimensions of the Eysenck Personality Inventory. Furthermore, there was an increasing trend towards introversion from the first to the final years of their study. Women were more likely than men to have personalities high in the neuroticism and social desirability traits.
REFERENCES.


3. Lean LL, Hong RY, Ti LK. How the personalities of medical students at the National University of Singapore differ from those of the local non-medical undergraduate population: a cross-sectional study. Singapore Med J. 2018;59(12):656.


SUMMARY - ACCELERATING TRANSLATION

Title: Assessment of Personality Traits and Their Changes Over the Undergraduate Medical Course: A Pseudo-longitudinal Analysis among Indian Medical Students

Main problem to solve: What sort of personalities do Indian students entering the undergraduate medical course possess? Do their personalities change as they progress through their course?

Aim of the study: This research was conducted with an aim of identifying the most common personality traits among MBBS students enrolled at an Indian medical institute and to see if there was any trend of change of their personality traits from the first to the final years of the MBBS course.

Methodology: A descriptive, pseudo-longitudinal study was conducted. A personality assessment questionnaire was filled up by MBBS students studying at different academic years. There personality traits were assessed under 4 parameters, i.e. Extraversion-Introversion, Neuroticism, Psychoticism, and Lie or social desirability. Each parameter was assessed by a scoring system, ranging from 0 to 12. After their personality related data was collected, statistical analyses were applied to see which personality traits were the most commonly observed among the students. Furthermore, it was also analyzed whether any, or all of the personality traits of the medical students changed meaningfully over the course-years.

Results: It was seen that medical students scored on the higher end of the Neuroticism trait and low on the psychoticism and social desirability (lie) trait and were equally likely to be introverted as they were extroverted. However, women scored much higher than men in the neuroticism trait, and also in the social desirability parameter.

As for the trends of change of personality traits over the years, only extraversion trait showed any change. It was seen that as the medical students progressed through their coursework, they become more introverted. This has been explained by some authors a result of a negative coping mechanism, where the students become more detached and anxious in response to the various stressful situations that they encounter in their course.

Conclusion: Undergraduate medical students studying in India have personalities high in neuroticism and low in psychoticism and social desirability traits. As they progress through their MBBS course, however, they become more introverted than when they begun their coursework.
# Tables and Figures

## Table 1. Table showing the socio-demographic characteristics of the study participants (n=346)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Total (N=346)</th>
<th>1st Professional</th>
<th>2nd Professional</th>
<th>3rd Professional</th>
<th>3rd Professional Part I</th>
<th>3rd Professional Part II</th>
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<tr>
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<td>61 (17.63)</td>
<td>126 (36.42)</td>
<td>56 (16.18)</td>
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<tr>
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<td>19.51</td>
<td>20.92</td>
<td>21.61</td>
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<tr>
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<td>51 (49.52)</td>
<td>31 (50.82)</td>
<td>60 (47.62)</td>
<td>31 (55.36)</td>
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*Statistically significant
Table 2. Table showing the differences in personality traits and demographic characters of participants (n=346)

<table>
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<tr>
<th>Characters</th>
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<th>Extraversio p-value(^a)</th>
<th>Neuroticism (median)</th>
<th>Neuroticism p-value(^a)</th>
<th>Psychoticism (median)</th>
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<th>Lie (median)</th>
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</tr>
<tr>
<td>Urban</td>
<td>6</td>
<td>0.831</td>
<td>8</td>
<td>0.656</td>
<td>3</td>
<td>0.019(^*)</td>
<td>5</td>
<td>0.323</td>
</tr>
<tr>
<td>Rural</td>
<td>7</td>
<td>0.831</td>
<td>8</td>
<td>0.656</td>
<td>3</td>
<td>0.019(^*)</td>
<td>5</td>
<td>0.323</td>
</tr>
</tbody>
</table>

\(^a\)Kruskall-Wallis H test and Mann-Whitney U test for independent samples, wherever appropriate

\(^*\)statistically significant
Table 3. Table showing the difference in subscale scores of participants according to their academic year of study (n=346)

<table>
<thead>
<tr>
<th>Subscale Score</th>
<th>Academic Year (n)</th>
<th>1&lt;sup&gt;st&lt;/sup&gt; Professional</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; Professional</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt; Professional Part I</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt; Professional Part II</th>
<th>( \tau^b )</th>
<th>( p )-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>(346)</td>
<td>(103)</td>
<td>(61)</td>
<td>(126)</td>
<td>(56)</td>
<td></td>
</tr>
<tr>
<td>Extraversion</td>
<td>Mean</td>
<td>6.17</td>
<td>6.54</td>
<td>6.46</td>
<td>6.02</td>
<td>5.52</td>
<td>-0.094</td>
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<tr>
<td></td>
<td>SD</td>
<td>3.09</td>
<td>3.15</td>
<td>3.30</td>
<td>2.99</td>
<td>2.92</td>
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<tr>
<td></td>
<td>Median</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td></td>
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<tr>
<td>Neuroticism</td>
<td>Mean</td>
<td>7.51</td>
<td>7.36</td>
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<td>Median</td>
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<td>5</td>
<td>4</td>
<td>5</td>
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</tr>
</tbody>
</table>

\( ^a \)Kendall’s tau-b correlation coefficient

\( ^* \)statistically significant
Figure 1. Data collection protocol for the study

Records

638 total MBBS students across 4 professional years

First professional – 200 students
Second professional – 192 students
Third professional I – 148 students
Third professional II – 98 students

Students diagnosed with a neuropsychiatric condition within a year prior to the study excluded

Response by consenting participants

First professional – 103 students
Second professional – 61 students
Third professional I – 126 students
Third professional II – 56 students