

Affective neuroscience personality differences between medical school students and engineering school students

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ABSTRACT

Objective: Medical and engineering faculty students both choose their majors from the field of science. But the educational process differs between the two majors. In this study we aimed to investigate the personality traits that might affect this preference. Affective Neuroscience Personality Scales (ANPS) could be particularly useful in studying the traits linked to the affective formation of the individual.

Materials and Methods: We prepared an online survey form collecting the sociodemographic and clinical data and the ANPS. We investigated the relationship between affective personality traits determined by the ANPS and the selection of the major. Also, we examined the affective personality traits that may influence the development of psychiatric illness in our sample.

Results: 219 medical students and 222 engineering students participated the study. Participants' ages ranged between 18 and 33 (Median=21; IQR=3). Among participants 60,5% were female, 34,7% has a psychiatric illness, 11,3 % had a chronic illness, and 16,8% has a family history of psychiatric illness. ANPS total and subscale scores weren't different between the groups. The SADNESS subscale scores were associated with the occurrence of the psychiatric illness.

Conclusion: The lack of difference between the two groups may indicate that affective personality profile is not a decisive factor in this choice. Our limitations are the small sample size, the lack of representation of our sample and the scarcity of data about other factors that might affect this preference. SADNESS was associated with psychiatric disorders in both groups.

Keywords: medical school, engineering, choice of major, personality.

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INTRODUCTION

Choosing a major for university is a critical choice that will affect the whole life. Students may choose a university for many different reasons but being successful and happy in the department they have chosen is not only due to cognitive skills but also personality traits [1]. It has been documented that there are consistent personality differences between groups of students enrolled in different majors [1-10]. Most of the studies utilized the Big -Five inventory that is designed to measure

the big five personality traits like extraversion, agreeableness, conscientiousness, neuroticism, and openness.

Being a medical student is a long and difficult process. A consistent finding revealed that 28% of doctors report clinically significant levels of stress [11]. Performance and patient care have been shown to be affected by high levels of stress [12]. The personality trait of a medical student

is an important predictor of long-term success and well-being [1,13]. It also has long-standing implications for postgraduate clinical performance [14]. In a longitudinal study comparing medical school students with other academic majors, medical school students were found to have the highest scores on extraversion and agreeableness [1]. Conscientiousness has emerged as the most prominent personality trait in medical school students that have been associated with academic success [1,14,15].

It has been reported that engineering students, similar to medical students, experience stress under heavy course load. Students feel academic pressure [16]. Engineering programs have high attrition rates. Conscientiousness was reported as a significant predictor of retention [17]. In a study with the big five scales, there was a relationship between academic performance and the personality traits of extraversion, openness, and conscientiousness. Also, the authors claimed that these results led to the characterization of students based on their personality traits and provided elements that may enhance the development of an effective personality that allows the students to successfully face their environment, playing an important role in the educational process [18].

The affective neuroscience theory developed by Jaak Panksepp is one of the most important theories in explaining the neurological substrates of basic affects [19-21]. In order to elaborate on the individual differences in personality in line with the affective neuroscience findings, the Affective Neuroscience Personality Scale (ANPS) has been developed [22]. The ANPS assesses the subcortical basic affects; SEEKING, PLAY, CARE as the positive subscales and ANGER, SADNESS, FEAR as the negative subscales. The relationship of the ANPS and the Big Five Scales [23], also showed that ANPS is a valid tool [22,24]. It has been reported that high SEEKING correlates to Openness to Experience, high PLAY to Extraversion, low ANGER and high CARE to Agreeableness, and high FEAR, SADNESS, and ANGER to low Emotional Stability (high Neuroticism). Between subcortical affective systems measured by the ANPS and the

cortical cognitive systems measured by the Big Five, support the suggestion that the basic subcortical affective systems need the cortical regions in their regulation [25].

In Turkey, both medical and engineering faculties enroll students via the same nationwide examination through ranking the science field score which derives from the same questions [26]. But the educational process differs between the two majors. In this study, we aimed to investigate the affective personality traits that might influence the choice between the medical school and engineering. We hypothesized that the ANPS, which is assumed to indicate the regulation of cortical structures through subcortical systems, could be particularly useful. We also aimed to investigate whether any personality trait creates resilience against psychiatric illness. We investigated the relationship between personality traits determined by the ANPS and the department selection of the students. In addition, we examined the personality traits that may influence the development of psychiatric illness.

MATERIALS AND METHODS

Study Design and Participants

An online survey comprising a sociodemographic form and the Affective Neuroscience Personality Scales (ANPS) was created via Google forms and shared through the email system of the XXX university, Ankara. We were able to reach out to a total of 1197 medical faculty students and 1718 engineering students (computer engineering, biomedical engineering, electrical and electronics engineering). 441 students completed the surveys. The survey link was shared between April 2021 and October 2021.

The ANPS assesses six basic affects (PLAY, SEEK, CARE, FEAR, ANGER, SADNESS) and "Spirituality" (Davis et al. 2003). The total questionnaire includes 110 items. Each subscale features 14 questions; 7 positively and 7 negatively formulated, whereas

only the Spirituality subscale comprises 12 questions; 6 positively and 6 negatively formulated. The scale had 14 filler items, some of which sought to evaluate deception (e.g., "I always tell the truth."). All the questions are designed to be answered on a four-point Likert scale. The Turkish validity and reliability of the scale were performed by Özkara-Gradwohl et al. in 2014. The validity and reliability of the scale was previously carried out in university students aged between 18-25 (M=21.66 SD= 1.60). Cronbach's Alphas are .56 for SEEK, .72 for CARE, .70 for PLAY, .70 for FEAR, .73 for ANGER, .55 for SADNESS and .78 for Spirituality. Correlation analyses with the big five scales also showed structural validity [27]. Since the population of our study consisted of students, the same validity and reliability scores were accepted.

Statistical analyses

The data were analyzed using SPSS Statistics 24 (IBM, USA). The normality of data was evaluated by Kolmogorov-Smirnov (K-S) and Shapiro-Wilk tests. The student T-test was used for groups where continuous variables were normally distributed, and the Mann-Whitney U test was used for non-normally distributed groups. A Chi-square test was carried out to assess the differences between categorical variables. Correlation analyses were performed with Pearson or Spearman tests according to the data distribution. Logistic regression analysis was applied for the variables that were related. P values under 0.05 were accepted as statistically significant.

Ethical Approval

Informed consent was obtained from all participants electronically. Ethics committee approval was obtained from the Research Ethics Committee of Baskent University (Protocol No:KA 22/319 date: 05.07.2022).

RESULTS

Descriptive Features

A total of 441 participants completed the survey. 219 were medical school students. Participants' ages ranged between 18 and 33 (Median=21; IQR=3). Females' age (n=267) range between 18-32 (Median=21, IQR =3) and males' age (n=174) range 18-33 (Median=21, IQR=3). Among participants most of them (60,5%) were female, 34,7% has a psychiatric illness, 11,3 % had a chronic illness, and 16,8% has a family history of psychiatric illness.

The age distribution was similar between the groups (p=0,225). Females were significantly more frequent in medical students (p<0,001). While there was no significant difference between the two groups of students in terms of the frequency of chronic medical disease and a history of psychiatric disease, the frequency of psychiatric disease in the family was significantly higher in medical school students (p=0.58, p=0.315, p=0.001, respectively). Demographic characteristics for each group are given in Table 1.

Table 1. Demographic Characteristics and ANPS scores of participants in each major

| | | Medical School Students | Engineering School Students | | |
|--------------------------------------|--------|-------------------------|-----------------------------|-------------------|----------|
| | | Median (IQR)/ N (%) | | X ² /Z | P value |
| Age | | 21 (3) | 21 (3) | -1,212 | 0,225 |
| Gender (N(%)) | Female | 168 (76,7) | 99 (44,6) | 47,60 | <0,001** |
| | Male | 51 (23,3) | 123 (55,4) | | |
| Chronic illness (N(%)) | Yes | 23 (10,5) | 27 (12,2) | 0,3 | 0,58 |
| | No | 196 (89,5) | 195 (87,8) | | |
| Psychiatric illness (N(%)) | Yes | 81 (37) | 72 (32,4) | 1,009 | 0,315 |
| | No | 138 (63) | 150 (67,6) | | |
| Psychiatric illness in family (N(%)) | Yes | 50 (22,8) | 24 (10,8) | 11,40 | 0.001* |
| | No | 169 (72,2) | 198 (89,2) | | |

Note: Abbreviations: IQR: interquartile range, N: number, X²: Chi square test, Z: Mann Whitney U test, *p<0,05, **P<0,001

Table 2. The ANPS subscales in medicine and engineering students

| | Medical School Students | Engineering School Students | Z | P value |
|----------------------------|-------------------------|-----------------------------|--------|---------|
| | Median (IQR) | | | |
| ANGER (Median(IQR)) | 25 (7) | 25 (9) | -0,648 | 0,517 |
| FEAR (Median(IQR)) | 26 (9) | 24 (8,25) | -2,027 | 0,043 |
| SEEK (Median(IQR)) | 26 (6) | 25 (6) | -1,542 | 0,123 |
| CARE (Median(IQR)) | 29 (7) | 28 (8) | -2,283 | 0,017 |
| PLAY (Median(IQR)) | 25 (6) | 25 (7) | -0,963 | 0,336 |
| SADNESS (Median(IQR)) | 22 (8) | 21 (6) | -1,775 | 0,076 |
| SPIRITUALITY (Median(IQR)) | 20 (7,25) | 19 (8) | -1,842 | 0,065 |

Note: Abbreviations: IQR: interquartile range, Z: Mann Whitney U test, Bonferroni corrected $p < 0.0071$

Table 3. Comparison of participants with and without psychiatric disorders in terms of ANPS subscales

| | Psychiatric illness | | Z | P value |
|--------------|---------------------|--------|--------|----------|
| | Yes | No | | |
| | Median (IQR) | | | |
| ANGER | 26 (9) | 24 (7) | -2,544 | 0,011 |
| FEAR | 28 (7) | 24 (8) | -6,143 | <0.001** |
| SEEK | 25 (6) | 25 (6) | -0,838 | 0,402 |
| CARE | 28 (7) | 28 (7) | -1,746 | 0,081 |
| PLAY | 24 (7,5) | 25 (6) | -2,040 | 0,041 |
| SADNESS | 24 (7) | 20 (6) | -6,741 | <0.001** |
| SPIRITUALITY | 19 (8,5) | 20 (7) | -0,714 | 0,475 |

Note: Abbreviations: IQR: interquartile range, Z: Mann Whitney U, *Bonferroni corrected $p < 0.0071$

Medicine and engineering students were compared for ANPS subscale scores. There remained no difference between the groups in ANPS subscales scores after Bonferroni correction (Table 2).

Factors associated with psychiatric disease in the students

We then wanted to investigate the factors associated with psychiatric disease in our sample. The frequency of psychiatric disease was not different between the student groups (Table 1), therefore we proceeded the analysis with the whole group. First, the participants were divided into two as those with and without psychiatric illness, and these two groups were compared in terms of ANPS subscales. FEAR, and SADNESS subscale scores were significantly higher in patients with psychiatric illness after the Bonferroni correction (Table 3).

Then we built up a logistic regression model of factors associated with psychiatric illness using age, gender; FEAR and SADNESS subscales of the ANPS; and psychiatric illness in family as the independent variables. SADNESS and having a psychiatric illness

Table 4. Logistic regression analysis for factors associated with psychiatric illness

| Variable | 95%CI | OR | P value |
|-------------------------------|----------------|-------|---------|
| Age | 0,833 to 1,002 | 0,912 | 0,056 |
| Gender | 0,542 to 1,324 | 0,847 | 0,467 |
| FEAR | 0,99 to 1,004 | 0,955 | 0,07 |
| SADNESS | 0,867 to 0,965 | 0,915 | 0,001* |
| Psychiatric illness in family | 0,255 to 0,743 | 0,435 | 0,002* |

Note: Dependent variable: psychiatric illness.

Abbreviations: CI: confidence interval, OR: odds ratio-adjusted, * $p < 0,05$, ** $p < 0,001$

in the family were significantly associated with the occurrence of a psychiatric disease ($p < 0.05$; $p < 0.05$) (Table 4).

DISCUSSION

Affective personality traits were examined between medical and engineering students. According to the results of our study, the affective personality profiles did not differ between the students of these two majors.

In the Big-Five approach, compared with the other majors, medical students have the highest scores on extraversion and agreeableness [1]. CARE was found to be associated with "agreeableness" in studies comparing ANPS with the big five [19]. For this reason, we hypothesized that CARE scores could be higher in our medical student sample, but the results were not compatible with this. This process may be due to the fact that the choice of profession in Turkey differs from those abroad. Planning new studies which consider cultural differences in the choice of profession may be valuable.

FEAR enables us to cope with sudden dangers by triggering the freeze or flight response by being affected by the defensive distance between the prey and the predator. Its main purpose is to protect us from danger [32,33]. Literature revealed that the medical education itself and the patients they encounter during their internship may have traumatizing stress effects on students [34-36]. However, in our study, there was no difference between engineering faculty and medical faculty in terms of FEAR. There may be different variables that the two departments feel threatened, or the resilience of medical faculty students in Turkey may be higher than in other countries. There is a need for a multicultural analysis of stress factors between departments.

FEAR, and SADNESS were different in participants with and without psychiatric illness. SADNESS was found to have a significant effect in logistic regression. Emotional stability or neuroticism in Big Five Model correspond to ANGER, FEAR, and SADNESS in ANPS. It is also well-known that neuroticism is a risk factor for psychiatric diseases, especially depression [19,37]. Montag (2017) reported that depressed patients exhibit higher scores on SADNESS [38]. In a following study, Fuchshuber investigated primary emotions predicting psychopathology and observed that SADNESS is related to substance abuse, depression, anxiety, and somatization. He also identified SADNESS as the major ANPS predictor of depression [39]. In our study, SADNESS also showed the strongest relationship with a psychological illness. Those with SADNESS personality trait may be considered as more prone to psychiatric disorders and may be prioritised for psychological support.

Although this is the first study that compares medical school students with engineering students

in terms of ANPS, we had major limitations. First, there were limitations about our sample. Our sample was collected from one university and might not be generalizable even for Turkey. Also, the lack of differences in ANPS scores might be due to the limited sample size. We were only able to reach out to less than 20% of our target sample which left us with a significant within group heterogeneity. For example, the engineering group was composed of students participating from different engineering departments. Also even though we proposed that the entrance exam scores are similar, due to the heterogeneity of the group there might be significant differences which also may affect the variables investigated in this study. The gender distribution between the two groups is not equal, which affects the results in a study measuring personality traits. Second, factors associated with psychiatric diseases could have been detailed. Third, whether the students' personality traits are shaped in the beginning or through such education should also be investigated. Finally, profession-related variables such as financial expectations from the profession, professional prestige, job security, and opportunities abroad are also effective factors in career choice [40]. Unfortunately, we were not able to collect any data on these variables. In future studies, the effect of these factors on career choice together with personality traits should be examined.

CONCLUSION

In this study on the personality differences of students in the faculty of medicine and engineering, medical school students showed a similar ANPS profile to engineering students. SADNESS was associated with psychiatric disorders in our sample.

Author contribution

Study conception and design: YHA, JH, SC; analysis and interpretation of results: SC, YHA, JH; draft manuscript preparation: YHA, SC. All authors reviewed the results and approved the final version of the manuscript.

Ethical approval

The study was approved by the Clinical Research Ethics Committee of Baskent University (Protocol no. KA22/319).

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Conflict of interest

The authors declare that there is no conflict of interest.

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