

THE UNIVERSITY OF MEDICINE AND PHARMACY FROM CRAIOVA

DOCTORAL SCHOOL

**THE INFLUENCE OF THE PERSONALITY
FACTORS AND STRESS ON THE ACADEMIC
PERFORMANCE OF MEDICAL STUDENTS**

Ph.D. THESIS

SUMMARY

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Abbreviations

N = Neuroticism

E = Extraversion

O = Openness to experience

A = Agreeableness

C = Conscientiousness

INTRODUCTION. TOPIC RELEVANCE

The personality traits are playing an important role in acquiring knowledge and in evolution, as they are directly involved in the choices we make, in the objectives we set for ourselves and in the concrete way we perform our activities and the create the context by whose aid we reach these objectives.

There are many conclusions which attest that being a doctor is a demanding profession, associated with many physical and psychical problems and that the process of forming, knowing and optimizing the personality traits significantly influences this respect. But there are equally important studies which support the idea that the performance in any field, especially in the academic one, can be increased or more easily achieved if the individual has access to information explaining their inner world, thus helping them to come in touch with resources needed to establish objectives in accordance with possibilities, to make choices in accordance with interests and not with emotional states and to analyze a task always bearing in mind the internal instruments meant to decipher and accomplish it.

It is generally acknowledged at a worldwide level that the professional training of doctors requires a personal development process, which, in the current Romanian education context, is performed empirically, when needed and depending on the personal experience of the trainer, who, in turn, did not benefit from a structured education in this respect. As a result, psychologically assessing the doctors and

having them know how to preserve their own psychical and physical health is no longer just optional or a desideratum.

Part I – CURRENT KNOWLEDGE

CHAPTER I. Personality

A clear definition of the personality concept still represents a problematic issue in the psychology field, due to its complexity, but also to the various approaches to it. So far, none of the attempts to identify the elements that could be included in the personality definition has been unanimously accepted. To the diversity of definition one can also add a quite large range of theories, that more or less claim explicative comprehensiveness.

Thus, of the **psycho-dynamic theories**, those essential for this study are the Freudian and Jungian theories.

Of the **behaviorist theories**, those belonging to B. Watson and B.F. Skinner are the most relevant for this research.

Another tendency in approaching personality is the one dealing with **traits**, which are defined either as “dispositional properties” [1], or as “factors [2].

CHAPTER II. Stress in medical students

That medical students are subject to stress is something everyone can guess, no matter if one is part of the medical system or not. Analyzed research has shown why, how much and what effects the stress has on the academic evolution and the career of our future doctors. Numerous studies have revealed that the alteration or even the invalidation of the organism defense methods against diseases, leading to increased risks of contracting grave conditions, including cancer, are triggered by emotional shocks, such as the loss of a dear and close person [3].

A determining factor of the status a person gains in their career is the social status obtained during their academic studies [20], and the time spent studying in a university is considered as being one of the most stressing periods. And, the higher psychological problems such as depression or anxiety are, the higher their impact is on academic performance which can manifest through a decrease in the capacity to concentrate attention and a low motivation [4].

The medical students present a high level of secondary traumatic stress; moreover, those who choose medicine because they want to help people or by following the parents' guidance have a significantly higher level of stress than those who want to study at this faculty because it will lead them to a respected profession and material benefits, motivation which seems to play a protecting role by preventing involvement in the patient's story to the latter's detriment; last, but not least, the medical students who have chosen this job to help other people present the most traits that predispose them to the stress triggered by their profession. Thus, the more we will prepare our students for a job anyway characterized by enormous pressure, the stronger fatigue or exhaustion will be, especially in the absence of a program for preventing this kind of risks the future doctors are exposed to [5].

Part II – AUTHOR'S CONTRIBUTION

CHAPTER III. The paper goal. Work hypotheses. Research objectives

For this research, we have formulated the following **hypotheses**:

1. The subjects' gender will not influence the measured stress level;
2. The stress triggered by life events will have a negative influence on the academic performance from the last year;
3. The Neuroticism personality factor will negatively correlate with the academic performance;
4. The Extraversion personality factor will negatively correlate with the academic performance;
5. The Conscientiousness personality factor will strongly and positively correlate with the academic performance.

The **goal** of this paper is to identify the personality profile associated with academic performance in the context of the Romanian superior medical education system. By analyzing studies dedicated to this topic, we can draw the conclusion that each personality factor has an important and well defined role in achieving academic success, so we are more interested in the unique way they combine rather than in their separate influence.

We express our hope that, by becoming aware of the personality factors which are involved in the academic performance, we would be able to identify ways of optimizing these relations, so that academic preparation to be made consciously, responsibly and durably.

Objectives:

- to evaluate the stress level for life events by genders;
- to inventory the medical students' personality traits;
- to highlight relations between stress and academic performance;
- to realize the subjects' personality profiles;
- to identify relations between stress and personality factors;
- to identify personality factors that influence academic performance.

Work Instruments

1. The NEO-FFI personality inventory, the short form of the NEO PI-R personality inventory, consisting in 60 items, one of the most used instruments for studying personality in the last decades, based on the Big Five penta-factorial personality model. It comprises five scales, Neuroticism (N), Extraversion (E), Openness to experience (O), Agreeableness (A) and Conscientiousness (C).

2. The Holmes-Rahe life event scale for youth and teenagers was created in 2009 by Pastorino and Doyle-Partillo. [36] This scale does not measure the individual perception of stress, but starts from the assumption that each event affects us, and what differs is the way we successfully cope with it.

3. Academic performance

Indicators:

- the general average grade, calculated based on the results obtained by the students throughout their entire academic period at the faculty
- the average grade from the last examination session (which is calculated by using the grades obtained by the students at their first examination, excluding re-examination sessions or grade-improving sessions)

The average grades were split into three categories, as follows:

- very good results: average grades comprised between 9.01 and 10.00;
- medium results: average grades comprised between 7.01 and 9.00;
- poor results: average grades comprised between 5.01 și 7.00.

For establishing the categories we have used the levels corresponding to the letter-based scale grading. [6]

The studied **group** is formed of 259 subjects from the Faculty of Medicine, aged 21 to 30, academic years III-VI, of whom 68 male subjects (26.25%) and 191 female subjects (73.75%), who have given their written consent to participate at the study.

Regarding data processing, in order to compare distributions by gender, year of study, stress level or quality of the results obtained in the last year of throughout the entire academic period, we have employed the Chi square test. The analysis of numerical values representing personality factor scores, stress score, as well as average grades obtained in the last year or general average grades was performed by using tests for comparing the average grades. We used the Student test when comparing two sets of values (male vs. female subjects) or the ANOVA test, when analyzing four sets of values (comparisons between years of study). Furthermore, in case when the result of the ANOVA test was <0.05 , we employed the “post hoc” Fisher LSD test in order to identify the pairs of categories between which statistically significant differences occurred. The correlations between the different numerical variables were performed by using the r Pearson quotient, when we analyzed pairs of parameters, respectively the multi-variable linear analysis, when we aimed at estimating a variable’s value depending on multi-predictors. We employed the Kappa test to evaluate the accordance between the students’ results in the last year and the general results, aiming at determining whether the recent results are relevant for students’ study-related behaviors. For all these tests we used, as maximum admitted significance threshold, the value $p=0.05$.

CHAPTER IV. Results

The studied group consisted in students from year III – 41 – 15.83%, year IV – 59 – 22.78%, year V – 22.39% and year VI – 101 – 39.00%. One can notice that the gender distribution in the total number of the Faculty of Medicine students is observed, as it records 26.55% male and 73.45% female students, while the studied group the subjects were split into 26.25% male and 73.75% female students.

We analyzed the stress level depending on the subjects' genders. The result of the Chi square test was $p > 0.05$, which indicates insignificant differences between the distribution of the two genders depending on the stress level, **the 1st hypothesis** being thus confirmed.

There are some differences, but they do not exceed the significance limit, as a higher percentage of men have a low stress level, while more women have a medium level in this respect.

Although the comparison between the stress level categories showed that there are no significant differences between male and female subjects from this point of view, the comparison of the average values of the stress levels revealed the existence of some significant differences ($p < 0.05$), as women recorded a higher score average than men.

We analyzed the differences between the students' general results depending on gender. The result of the Chi square test was $p < 0.001$, thus proving there are highly significant differences between the distributions of the two genders depending on the overall academic results. A higher proportion of men obtained poor grades, while a significantly higher proportion of women have medium and very good average grades.

We analyzed the differences between the students' results from the last examination session depending on gender. The result of the Chi square test was $p < 0.05$, which corresponds to a significant difference between the two genders' distributions according to the academic studies from the last examination session. A higher proportion of men obtained poor results, while a significantly higher proportion of women obtained very good results.

The value of the Kappa quotient, calculated to verify a possible correspondence between results, was 0.66 (CI 95%=0.59-0.74), which indicates a strong correspondence between global academic results and those from the last examination session.

By comparing the results from the last year depending on the students' stress level, we noticed that there is no significant difference between the students with different stress levels, as the result of the Chi square test was $p > 0.05$, so over the maximum admitted limit, **hypothesis 2 being thus refuted**.

By comparing the general results, from all years, depending on the N personality factor, we noticed that there is no significant difference between students

with various obtained grades, as the result of the Chi square test was $p < 0.05$, so over the maximum admitted limit. We did not notice any differences regarding the N scores for students with various grades in the last examination session (Chi square $p > 0.05$). The Neuroticism factor influences neither the general average grade, nor the average grade from the last session, **hypothesis 3 being thus confirmed.**

The Extraversion factor does not significantly influence the average grade, but has a strong influence on the average grade from the last session. So, up to a point, we can claim that **hypothesis 4 is partially confirmed.**

Only the academic performance measured by means of the general average grade depends on the C factor, so, up to this moment, we can say that **hypothesis 5 is partially confirmed.**

One can notice significant differences regarding the stress level for N score (Chi square $p < 0.05$) at the students who we identified different stress levels to. Students with a high stress level have also a high score for the N factor, while those with a low stress level have a correspondingly low score for the named personality factor.

By comparing the average values of the N personality factor depending on the students' current academic year, we noticed the existence of statistically significant differences (p ANOVA < 0.05). We continued the analysis by employing the Fisher LSD test, in order to identify the pairs of categories between which there are significant categories. Thus, we noticed that there are significant differences between the average values for years III and V, between years III and VI, as well as between IV and VI.

We also analyzed the differences between the scored obtained at the N factor depending on the subjects' gender. The result of the t Student test, $p < 0.001$ shows that there is a highly significant difference between the values of the N factor scores for female and male subjects, as the former present higher values.

By comparing the average values of the stress scores depending on the students' current academic year, we noticed the existence of statistically significant differences (p ANOVA > 0.05).

By comparing the average values of the number of examinations during the last academic semester depending on the students' current academic year, we noticed the existence of some highly significant differences from a statistical point of view (p ANOVA < 0.001).

By comparing the average values of the result recorded during the last year depending on the students' current academic year, we noticed the existence of some highly significant differences from a statistical point of view (p ANOVA <0.001). By comparing the average values of the general results depending on the students' current academic year, we did not notice the existence of statistically significant differences (p ANOVA >0.05). Even if there are significant differences between the average grades obtained in the last session, an overview analysis shows that these differences blur, which suggests once again the important role the re-examination and grade improvement sessions have.

Among the various numerical variables which we analyzed, we identified the following statistically significant correlations, by means of the r Pearson correlation quotient.

Variables		r Pearson Quot.	Correlation type	
N score	E score	-0.312	reverse	weak
N score	O score	-0.169	reverse	very weak
N score	C score	-0.335	reverse	weak
N score	Stress score	0.265	direct	weak
E score	O score	0.287	direct	weak
E score	A score	0.177	direct	very weak
E score	C score	0.414	direct	moderate
O score	C score	0.203	direct	weak
O score	Stress score	0.229	direct	weak
A score	C score	0.223	direct	weak
Last session average	No. exam. last session	0.193	direct	very weak
Last session average	General average	0.868	direct	very strong
Last session average	C	0.125	direct	very weak
General average	C	0.145	direct	very weak

Table 1 – Significant correlations between personality factors, stress and academic performance

One can notice that the stress level is correlated with the values for N and O. The results, both the last session average grades, and the general average grade, significantly depend on just C, without being correlated with stress.

We performed a multi-variable linear regression in order to estimate the value of stress according to the personality traits (N, E, O, A, C), to the number of examinations during the last year and the last year average grade.

We obtained the following calculation formula, whose accuracy is highly significant ($p<0.001$).

$$\text{STRESS} = -111.29 + 5.79 * N + 2.55 * E + 5.63 * O - 1.40 * A + 0.087 * C - .59 * \text{No.exam.} + 4.08 * \text{Average}$$

The resulted model depends from a statistically significant point of view just on the Neuroticism (N) and Openness to experience personality factors, as the other considered parameters did not present important contributions (Fig. 1).

Both N and O influence the stress value in a directly proportional way.

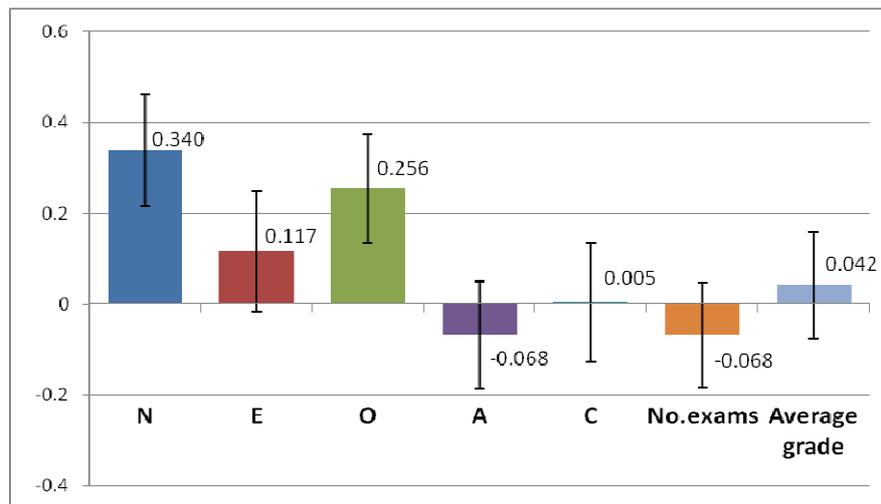


Fig. 1 – The parameters of the regression equation for estimating the stress value

We performed a multi-variable linear regression in order to estimate the value of the general average grade depending on the personality traits, on the number of examinations in the last year and the stress score obtained as result of testing. We have thus reached the following calculation formula, whose accuracy is highly significant ($p < 0.05$)

$$\text{AverageSEM.1} = 6.56 - 0.0004 * N - 0.034 * E + 0.01 * O + 0.011 * A + 0.033 * C + 0.0005 * \text{Stress} + 0.153 * \text{No.SEM.1}$$

The resulted model depends in a statistically significant way just on the Extraversion (E), Conscientiousness (C) personality factors and on the number of exams. The C score and the number of exams during the last semester influence in a directly proportional way the value of the average grade for the last year, whereas the value of the C factor has a negative inversely proportional influence (Fig. 2).

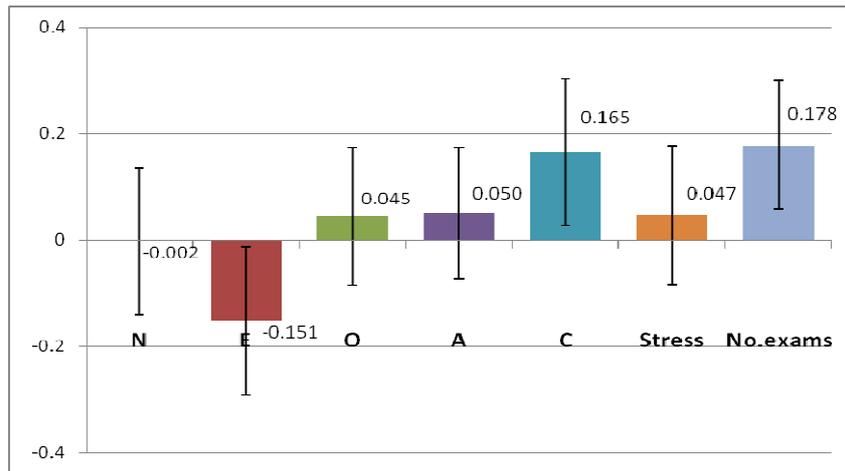


Fig. 2 – The parameters of the regression equation for estimating the value of the last session average grade

We performed a multi-variable linear regression in order to estimate the value of the general average grade depending on the personality traits (N, E, O, A, C), on the number of examinations in the last year and the stress score obtained as result of testing. We have thus reached the following calculation formula, whose accuracy is highly significant ($p < 0.05$)

$$\text{Gen. AVERAGE} = 7.131 + 0.014 * N - 0.029 * E + 0.013 * O + 0.0015 * A + 0.036 * C - 0.00007 * \text{Stress}$$

The resulted model depends in a statistically significant way only on the Extraversion (E) and Conscientiousness (C) personality factors. The C value has a directly proportional influence on the value of the general average grade, whereas the E value has negative inversely proportional influence. (Fig. 3).

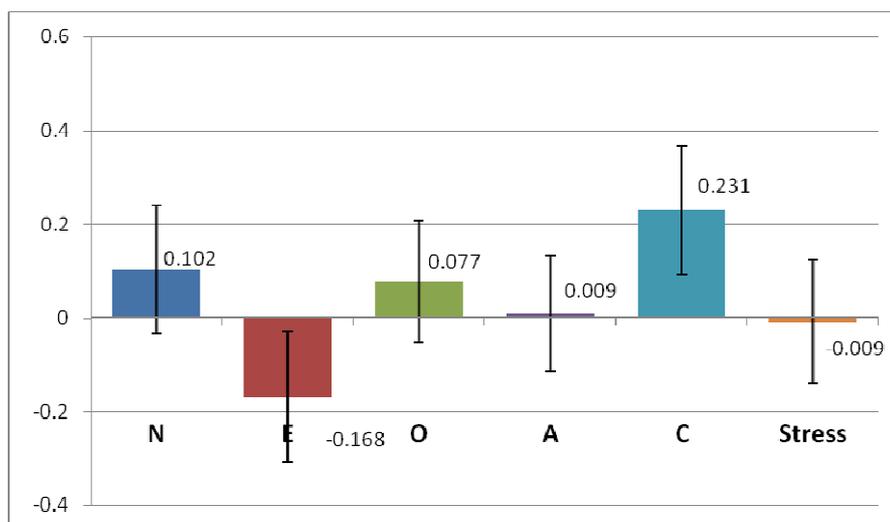


Fig. 3 – The parameters of the regression equation for estimating the value of the general average grade

Regarding hypotheses 4 and 5 which were partially confirmed, the Chi square test performed on grade categories did not show an influence of the C factor on the last examination session average grade, respectively of the E factor on the general average grade. If the influence of the C factor on the average grade from the last session was weak and might not have been detected by means of the Chi square test, as far as the influence of the E score on the general average grade is concerned, we can invoke the incapacity of the e Pearson quotient to correctly detect a relation that is not linear, in which case the connection between the two parameters is better estimated by means of a polynomial equation.

CHAPTER V. DISCUSSIONS

This paper aimed at studying the influence of the personality factors and of stress on the academic performance. According to our expectations based on prior research performed on this topic, it has been proved that there are significant differences regarding academic performance depending on the subjects' gender and on the influence of the personality factors. Contrary to our expectations, the stress triggered by life events does not influence the academic performance.

The **stress** triggered by life events from the last year does not seem to influence the grades obtained by the students in the last examination session. However, the female subjects obtained higher scores on the stress scale than their male counterparts. This statement is particularly important for the formation process of the future doctors, as there is a known fact that each person handles stress in a different manner, according to their gender. This can lead us to the idea that we can apply the same coping strategies for the academic stress, as for other aspects of life. Moreover, there are significant differences between subjects depending on their year of study, as the year III students recorded higher scores on the stress scale than the others.

The stress is directly correlated with the Neuroticism and Openness to experience personality factors and it is higher for the year III in comparison to years V and VI. Thus, the emotional instability and the permanent quest for new experiences determine changes in the life of our subjects, affecting the way their entire lives will take place, for example the relationships with others and the lifestyle, categories included in the life event scale.

Conscientiousness (C) directly and strongly influences, along with an inversely proportional negative Extraversion and with number of examination, the average grade from the last examination session, and in combination with negative Extraversion, inversely proportional the general average grade. The introverted, organized individuals, who plan their tasks, both professionally, and personally, who control their impulsiveness, manage their emotions and perseveringly pursue their objectives achieve academic success in all moments of their evolution.

The number of examinations the students have every year and semester influences in a directly proportional way the average grade from the last examination session, but not the general average grade, and only in combination with the C and E personality factors, which means, that the re-examination and grade improvement sessions and the way they are passed are important in the calculation of the general average grade. If we notice there are differences regarding the grades from the last session for the Vth year and the IVth year, although they have the same number of examinations, but not the same general average grades, we could state that they can be attributed to the personality factors, as scores on the stress scale are not different. Although the IIIrd year has the least examinations, and the IVth year the most, their average grades do not differ significantly from the others', so we can conclude again that the personality factors bear responsibility for this, especially Neuroticism, to which the IIIrd year and the IVth year recorded higher scores, considering the scores on the stress scale did not present significant differences.

The explanation mentions the increased effort the individuals with a high score for the C factor perform and the positive perception they have about their academic abilities and go as far as detailing the involvement modalities for each subscale. For example, of all the Conscientiousness' facets, not the order and organization are those which ensure success, but the self-control capacity, the effort to achieve performance when obstacles occur, the capacity to stay motivated over a long term period and perseverance. It has often been suggested that this factor is closely related to motivation [7, 8], the most often encountered mechanism through which self-effectiveness, which is the individual's belief that he can produce a certain expected level of performance in a certain assignment, leads to success, especially when the extrinsic factors are constant, while the studies have shown that between self-effectiveness and conscientiousness there is a very strong link. The individuals who believe in their ability to successfully fulfill an assignment are more involved in

initiating and applying some strategies which would ensure the success. Self-effectiveness is, in some studies [9] the emotional and behavioral expression of the combination between all personality factors, experience and cognitive abilities, while in other, just of C, N and E factors in others [10], and they positively correlated with academic performance [11,12]. Sometimes, the connection between Conscientiousness and Neuroticism can work against performance. When such a factor as self-effectiveness occurs, and the individual has a high confidence in his possibility to succeed in an examination, those with high levels of emotional stability (low score at the Neuroticism factor) can present over-confidence, which decreases their academic motivation.

Depending on the connection it can form with the other factors, we can have a view over the exact way an individual can achieve performance with the help of the C factor: by conformity, by independence, in relation with the others' goals or their own goals etc.

The students from years II and IV have higher scores at the **Neuroticism (N)** factor, so they are more emotionally unstable than those from the years V and VI, but this aspect has not proved to be a predictor for their academic performance. In the same time, the result analysis revealed that the year III students present a higher level of stress than the others.

The neuroticism has also proved to be directly correlated with the stress level, as the students with a high score in the N scale present a high stress level, while those with a low stress level have medium and low scores in a higher proportion. It is known that those with low and medium scores on the Neuroticism scale are calm persons, who manifest fairly positive emotions, which helps them in normalizing and solving problematic situations, without this affecting their pacing and lifestyle. According to the result analysis, the female subjects have higher scores than male subjects, so they are more emotionally unstable than them.

But Neuroticism can have positive influences on the academic performance, as it is the case of our study, in certain contexts, such as the one when there is a high level of Conscientiousness and self-effectiveness. The way the two concepts change the relation has already been explained within the paragraphs dedicated to the analysis of the C factor and refer to the differences in motivation appeared between emotionally stable and unstable students, which are supposedly attributed to the negative consequences of the emotional stability. When students believe in

their capacity to pass the examination with a high grade, the emotionally stable ones present an over-confidence which decreases the academic motivation and affects, implicitly, their academic performance. Also, self-effectiveness has not been proved as having a demonstrated effect on academic motivation, which means that the way the neurotic students positively face the fears related to failure, such as increased involvement in preparing the exams during the semester, and by employing strategies which are in their disadvantage, as thought before. [13]

Extraversion (E) is another relevant factor in the academic context and, in our study, they correlate negatively and inversely proportional with the general academic performance, as well as with the results obtained in the last examination session, conclusion supported by other studies. [6, 8, 14, 15] The introverts, who are silent, withdrawn and are comfortable when they are rather isolated from the groups, are more easily distracted, obtain higher grades than extroverts both the first time they have the examinations and during the sessions organized for re-examinations and grade improvement. On the opposite side, the extroverts are talkative, dominant, open to express emotions and assertive and have previous positive experiences that involve successfully managing situations, which leads them to believe in a positive outcome. There are empirical proofs that connect extraversion and a high degree of self-effectiveness. But as result of this profile, the extraverts seem to be more motivated by the group dynamics and by the high position they can have and less by the individual performance in a certain assignment. [14, 16]

In the same time, the extraverts make premature decisions, which involve and increased adjusting effort as they advance in the assignment solving process. [17]

There have been reports showing important correlations between perseverance, on the one hand, and neuroticism and introversion, on the other, thus involving these two factors in the educational context even more. [18]

In conclusion, the personality factors influence the academic performance both directly, and indirectly. More important than identifying the strong and separate influence is to outline the combination of factors which function as a whole, as the individual actually does, beyond theoretical delimitations, aspect which results from considering even those factors which have a weak or indirect action. There are studies which show that the mere knowledge of one's personality profile has a positive effect on one's academic performance, thus, the preparation of medical students should include an personal optimization and development program.

CHAPTER VI. CONCLUSIONS

1. We found insignificant differences between the distribution of the two genders depending on the stress level ($p < 0.05$), which **confirms hypothesis 1**.
2. The academic performance recorded for the female gender was significantly superior, both regarding global results ($p < 0.001$) and results during the last examination session ($p < 0.05$).
3. The stress level was significantly higher for the year III ($p < 0.05$) and does not influence the academic performance from the last examination session, which **refutes hypothesis 2**.
4. For the Neuroticism personality factor we noticed highly significant superior scores for the female gender ($p < 0.001$), while the scores recorded for Neuroticism and Openness to experience correlated in a highly significant way with the stress level. The score for the N factor does not influence the obtained grades ($p > 0.05$), **which refutes hypothesis 3**.
5. The Extraversion personality factor influences the academic performance, as those who had superior grades recorded significantly low scores ($p < 0.05$).
6. The scores recorded for the Extraversion factor influenced the academic performance in an inversely proportional way, both regarding the last session average grade and the general average grade ($p < 0.05$), which **confirms hypothesis 4**.
7. The scores recorded for the Agreeableness personality factor have been significantly superior as far as the female gender is concerned ($p < 0.05$), which translates in a higher openness to relationships and collaboration.
8. The Conscientiousness personality factor influenced the last session average grade and the general average grade in a directly proportional way ($p < 0.05$), **which thus confirms hypothesis 5**.
9. The Extraversion and Conscientiousness personality factors are predictors for the academic performance.

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