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THE INFLUENCE OF EMOTIONAL DISTRESS ON THE ACADEMIC PERFORMANCE IN UNDERGRADUATE MEDICAL STUDENTS

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ABSTRACT

Stress associated with medical education, correlated with symptoms of depression and anxiety, has been involved in generating academic performance problems and thus, long term consequences such as poor quality of medical care. If anxiety and depression are proven to influence the quality of academic achievement, their prevention could lead to better outcomes in the quality of medical care as well. The objective of the study was to analyze whether anxiety and depression decrease academic performance among first and second year medical students. As a measure of anxiety and depression symptoms we used the Zung Self-rating Anxiety score >36, and the Zung Self-rating Depression Scale score >40, in the periods before the examination session, in the first semester (in no-stress conditions). As a measure of academic performance, we have obtained the GPA at the end of the academic year from 254 of the total number of 356 first and second year medical students. Statistical analyses were carried out with SPSS version 16 (Spearman correlations and logistic regression). Academic performance decreases as anxiety (rho=-1.144, p<0.05) and depression (rho=-1.192, p<0.05) rise, as shown by the scores registered before the examination session. Also, depression in this period predicts low levels of academic performance with a GPA in the inferior quarter (grades lower than 7.52) particularly in first year students, irrespective of gender (χ²=8.922, p<0.01, OR=0.928; I.C.95%=0.864-0.997). These findings suggest the necessity to come up with prophylactic methods to prevent anxiety and depression especially in first year medical students, as these prove to be factors that impede academic performance.

Keywords: Distress, academic performance, anxiety, depression

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INTRODUCTION

Anxiety and depression are mental disorders affecting a wide percentage of the population, and their severity is increased if the onset is at a younger age [1]. These disorders not only involve the affected individuals, but also their connections at work, their family and social environments. Stress is frequently listed among the contributing factors to the development of disorders such as depression and anxiety, [2,3], and it has been described and studied in the academic environment [4], often in medical students [5,6].

The distress associated with medical education is substantial, being permanent along an individual’s entire career. Thus, the long-term consequences may reflect on the doctor’s own wellbeing, as well as on the quality of the medical care given. Doctors are forced to face high levels of stress from the first years of their studies. They deal with it not only on a personal level [7,8,9], but also on academic (e.g. the effort to memorize increased amount of information in short periods of time) or social one (e.g. sacrificing time spent with the loved ones, financial problems, professional abuse, racism, sexual harassment) [10,11]. Furthermore, particularly for medical students who are involved in fields of study which are different than those of other young adults of the same age, stressors of an existential type are added, when students are inevitably faced with human suffering and death. All these stressors may have all sorts of negative consequences: depression, suicide, anxiety, negative and pathologic coping mechanisms, like empathy loss [12 - 18].

Academic performance is a very valuable notion, because this parameter has practical and theoretical applications. The notion is proportional to the grade point average (AG), which is also the most often used parameter to quantify academic performance [19]. Nevertheless, we must be aware of the limitation posed by the subjectivity in giving grades and the differences between various universities, as well as differences in time [20]. In Romanian academic institutions, a 10-point scale is used, 5 being the minimum grade needed to pass and examination. In one examination, the grade is rounded up or down (e.g. if a student scores above 8.5, the grade is rounded up to 9, if the initial score is 8.40, it is rounded down to 8). The grade average is not rounded, thus a
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A student at the end of an academic year can have a grade average of 9.55, for example.

The relation between stress and academic performance has different aspects. On the one hand, stress could have positive effects, being a motivator for study and achievement of better grades. A study analyzing the correlation between academic performance, stress and motivation in medical students [21] found that there is a feedback loop between these elements, any imbalance arising at any level consolidating the other two (as a protection mechanism). Thus, decreased academic performance raises stress levels and motivation, which leads to improved grades. On the other hand, there are findings revealing that stress has a negative impact on academic performance [22,23]. This may be due to the presence of significant levels of anxiety and depression among medical students [24-27].

Doctors and medical students are subjected to high levels of distress. The importance of managing this problem from early stages, from the first university years, when it appears that stress levels are higher than in senior years [28] comes from the desire to prevent depression, burnout syndrome, suicidal thoughts or other complications (discussed above), which appear even during studentship [7, 28-30]. A better understanding of academic performance and its correlation with distress may help develop better strategies to prevent it.

Stress, correlated with symptoms of depression and anxiety, has been involved in increasing dropout rates, but also in generating academic performance problems. One explanation would be that stress plays an important role in the students’ decisions, including that of following the initially chosen career path or not [31]. Experiencing positive life events (e.g. satisfying social encounters, pleasant activities and good academic performance) means to be protected from emotional distress by buffering the effects of negative events and by decreasing their levels [32]. Students with decreased performance during examinations associate statistically significant symptoms of depression, anxiety and negative expectations on regulating the emotional status [33].

OBJECTIVES

The null hypothesis of the study is that students with emotional distress have the same or higher academic performances than those without this problem.
METHODS

The subjects included in the study were first and second year medical students during 2011 school year from which we randomly selected a representative number of 400 individuals. After informing the students about the study and receiving their consent, we applied the scales over a selected period of time - considered without academic stress (before the exam session): Zung Self-Rating Anxiety Scale [34], Zung Self-Rating Depression Scale [35], Brief Assessment of Cognition in Affective Disorders (BAC-A) [36, 37]. We also used a socio-demographical questionnaire (Socio-demo-AHC) [38, 39]. The final number of students to give their consent and do all the tests was 356.

Emotional distress was quantified by self-rating anxiety and depression (Zung Anxiety and Zung Depression Scales) symptoms during the periods before the examination session, in the first semester (in no-stress conditions). We considered a subject as being anxious if the score on Zung Anxiety was 36 or above, depressed if the score on Zung Depression was 40 or above, anxious and depressed (comorbidity) if both cut-off scores were met on Zung scales.

The demographic characteristics and the distribution on pathological groups are described in Table I.

Table I. Sociodemographic aspects of undergraduate medical students included in the study.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Control</th>
<th>Anxiety</th>
<th>Depression</th>
<th>Comorbidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>N total=356</td>
<td>190</td>
<td>41 (%)</td>
<td>29 (%)</td>
<td>96 (%)</td>
</tr>
<tr>
<td>Age (m±sd)</td>
<td>20.09</td>
<td>19.76</td>
<td>19.93</td>
<td>20.09</td>
</tr>
<tr>
<td>Gender</td>
<td>120 (63.2%)</td>
<td>37 women (90.2%)</td>
<td>24 women (16.7%)</td>
<td>78 women (81.2%)</td>
</tr>
<tr>
<td>Age&lt;20 years</td>
<td>42 (22.1%)</td>
<td>17 (11.5%)</td>
<td>9 (31%)</td>
<td>30 (61.2%)</td>
</tr>
<tr>
<td>First year of</td>
<td>47 (24.7%)</td>
<td>22 (53.3%)</td>
<td>13 (48.8%)</td>
<td>43 (44.8%)</td>
</tr>
</tbody>
</table>

For the current study, academic performance was expressed through the grade average (GPA) received at the end of the academic year. We received information on the GPA from 254 students. We could not get this parameter from the rest of the subjects because they had either dropped out (29 students), or had to repeat the year (27 students), while 46 did not mention their initials on the questionnaires (thus not agreeing to continue to be part of future research in the study).
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Figure 1. Academic performance (GPA at the end of the academic year).

In the representative lot of medical students with ages between 18 and 24 years, GPAs are distributed between the control group and the pathological groups (individuals with depression, anxiety, depression and anxiety) according to Figure 1.

We can notice that the scores are lower in the pathological groups (8.24 in anxiety; 8.11 in depression; 8.06 in anxiety and depression) when compared to the control group (8.31).

RESULTS

We tested the null hypothesis that if the individual suffers from anxiety and/or depression, academic performance will be better compared to an individual who has not reported either anxiety or depression. To test this hypothesis we used the Spearman correlations function, because the GPAs variable is not distributed normally, and we applied the linear regression function.

We obtained weak reverse correlations, but they were statistically significant at the beginning of the academic year (period without academic stress, before the examination session) between GPA and anxiety (rho=-.144, p<0.05) and between GPA and depression (rho=-.192, p<0.05). In other words, academic performance at the end of the...
year decreases inversely proportional with the score of anxiety or depression from the period before the examination session (considered a period without academic stress). Gender did not influence the correlations (Table II).

**Table II. Spearman correlations between GPA and Zung depression and Zung Anxiety Scales, with gender as control variable**

<table>
<thead>
<tr>
<th>Control variable</th>
<th>Zung Depression Scale</th>
<th>Zung Anxiety Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPA at the end of the academic year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spearman coefficient</td>
<td>-.21**</td>
<td>-.12*</td>
</tr>
</tbody>
</table>

*The correlation coefficient is significant at .05 level (2-tailed)

**. The correlation coefficient is significant at a .05 level (2-tailed)

The linear regression with the dependent variable being GPA at the end of the academic year and anxiety and depression as factors shows that AG would be inversely influenced by self acknowledging depression: \( R^2 = 0.043, p < 0.05 \). Regarding anxiety, the magnitude of the effect is statistically significant, but very low \( R^2 = 0.015, p = 0.05 \). The efficiency of depression as a predictor for academic performance expressed by GPA at the end of the year cannot be explained by chance \( (F_{2,251} = 5.971, p = 0.003, \beta = -0.207, t = -3.364 (p = 0.001)) \).

We have also noticed that the variable AG correlates in a statistically significant manner with a series of tests from the Brief Assessment of Cognition in Affective Disorders (BAC-A): verbal memory \( (\rho = 0.27, p = 0.04) \), semantic fluency \( (\rho = 0.16, p = 0.01) \), composite BAC-A score \( (\rho = 0.155, p = 0.013) \). These were used as independent variables in the linear regression analysis (enter method, AG used as the independent variable) to check their influence as mediation factors. The results have shown that these cognitive factors do not interfere with the inversely proportional relationship between depression and academic performance \( (R^2 = 0.08, p < 0.01, (F_{3,248} = 4.301, p = 0.001, \beta = -0.245, t = -2.638, p = 0.009)) \), which means that the academic performance is inversely related to depression in young adults, irrespective of cognitive functioning.

The same linear regression was applied separately to men and women. We can notice that the proportional relationship is maintained between GPA at the end of the year and the depression score with the coefficients listed in Table III. In other words, academic performance is predicted by the depression score before
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the examination session, irrespective of gender.

**Table III. Coefficients obtained from the linear regression analysis - GPA as variable, subject gender as control**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Model</th>
<th>Unstandardized</th>
<th>Standardized</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>(Constant)</td>
<td>9.28</td>
<td>.62</td>
<td>14.89</td>
</tr>
<tr>
<td>Male</td>
<td>Zung Depression</td>
<td>-0.03</td>
<td>.01</td>
<td>-21</td>
</tr>
<tr>
<td>Female</td>
<td>(Constant)</td>
<td>9.10</td>
<td>.30</td>
<td>29.62</td>
</tr>
<tr>
<td>Female</td>
<td>Zung Depression</td>
<td>-0.02</td>
<td>.00</td>
<td>-21</td>
</tr>
</tbody>
</table>

We applied the same statistical analyses separately to students from the first and the second year, to eliminate the effect that the experience from the previous year might have on the emotional status of the student, and thus on academic performance.

We can notice that only in the case of first year students there are weak, but statistically relevant correlations between GPA and anxiety (rho=-.290, p<0.05) and between GPA and depression (rho=-.245, p<0.05). In other words, academic performance of first year students, but not of second year students, decreases in increments equal to increases in the levels of anxiety or depression during the period before the examination session.

A possible explanation may be that first year students have to face not only academic demands, but also life changes, unfamiliar situations and new responsibilities (e.g. financial aspects, displacement from home) [40-42]. Through linear regression we can notice that it is only in the case of first year students that the proportional relationship between GPA at the end of the year and Depression and Anxiety levels is maintained, with the following coefficients listed in Table IV. In other words, academic performance of first year students, but not of second year students, is predicted by the anxiety and depression scores.
Table IV. Coefficients obtained from the linear regression analysis in first year students – GPA variable

<table>
<thead>
<tr>
<th>Dependent variable: GPA (academic performance)</th>
<th>Unstandardized</th>
<th>Standardized</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predictors:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>8.657 (.451)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zung Depression V1</td>
<td>-.023 (.011)</td>
<td>-.235 (t=.015)</td>
<td>0.065</td>
</tr>
<tr>
<td>(Constant)</td>
<td>8.899 (507)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zung Anxiety V1</td>
<td>-.031 (.008)</td>
<td>-.255 (t=.022)</td>
<td>0.065</td>
</tr>
</tbody>
</table>

In order to analyze the impact of emotional distress on academic performance levels, we divided our subjects in quarters depending on their GPA and we built a dichotomic variable to use logistic regression with the independent variable the Zung Depression Scale score and Zung Anxiety Scale score. The dependant variable is the AG of the superior quarter 75% (grades higher than 8.93) versus the inferior quarter 25% (grades lower than 7.52).

Using logistic regression we notice that only the depression score during the period before the examination session predicts ($\chi^2=8.922$, $p<0.01$) the fact that the student belongs to the group with a lower GPA: OR=0.928 (I.C. 95% =0.864-0.997) (table 5.). The amplitude of the effect is, nevertheless, small ($2\text{LL}_g=171.17$, $R^2_{\text{CS}}=0.066$, $R^2_N=0.088$). In other words, medical students with depression symptoms during the period before the examination session are at risk of getting GPAs lower than 7.52.

Table V. Coefficients obtained from the logistic regression analysis – GPA variable inferior quarter vs. superior quarter

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Sig.</th>
<th>O.R.</th>
<th>95.0% I.C.</th>
<th>Inferior</th>
<th>Superior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zung Anxiety</td>
<td>0.011</td>
<td>0.035</td>
<td>.758</td>
<td>1.011</td>
<td>.945</td>
<td>1.082</td>
<td></td>
</tr>
<tr>
<td>Zung Depression</td>
<td>-0.075</td>
<td>0.036</td>
<td>.040</td>
<td>0.928</td>
<td>.864</td>
<td>.997</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.481</td>
<td>0.930</td>
<td>.008</td>
<td>11.954</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

We did not obtain statistically significant correlations between perceived stress and academic performance ($r_S=-.106$, $p=0.09$).

DISCUSSION

Our study on the impact of emotional distress on the academic performance (grade average – GPA) of medical students with ages between 18-24 years old revealed that GPA is inversely proportional to depression. In other words, the higher the score of depression obtained
at the beginning of the year during the period before the examination session (considered a period without academic stress) the lower the GPA obtained by the student at the end of the year. More specifically, we demonstrated that depression during the period before the examination session predicts that the student will belong to the group with a GPA in the lower quarter (grades lower than 7.52).

We noticed that academic performance is inversely correlated with depression scores, regardless of gender or cognitive function, this being more important in first year students, in agreement with other reported results [43]. The reason for this could be the fact that subjects reporting symptoms of depression have sleep disorders, feelings of sadness, hopelessness, lack of motivation, which makes them more vulnerable to problems in focusing, memorizing, or studying issues. It is possible that depression and anxiety raise concerns regarding examinations, which decreases academic performance [44]. The results are in line with other research, which found an inversely proportional correlation with negative affectivity in young adults and academic performance [44,45]. The fact that this association is maintained irrespective of gender and more pronounced in first year students shows the necessity of certain routine prevention methods, especially in first year students, to prevent emotional distress, especially depression.

Though the strengths of this study are that it is a prospective analysis on anxiety and depression levels and GPA in the same students, and the sample was randomized, this study also has limitations, as it did not take into account other causes of anxiety and depression (personality, personal or family issues, etc.) or other buffer factors against emotional distress (such as social support). Also, we did not investigate the students’ coping strategies. Some of these limitations may become future research directions.

**CONCLUSIONS**

In studying the impact of emotional distress on the grade average of first and second year medical students (aged 18-24), we noticed that academic achievement decreases inversely proportional to depression scores during the period before the examination session (considered a period without academic stress). More
specifically, we noticed that depression during the period before the examination period predicts low levels of academic performance with GPA in the inferior quarter (grades lower than 7.52) particularly in first year students, irrespective of gender. These findings suggest the necessity of coming up with prophylactic methods to prevent emotional distress, especially in first year students who experience great amounts of stress generated on the one hand by academic overload and demands, and on the other hand, by the transition (and adjustment) to a new stage in their lives.

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