The Effect of Stress Depression on Medical and Non-Medical Students and the Role of MRI in Detecting and Analyzing Structural Change

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ABSTRACT::

This article demonstrates different studies that shows how stress and depression has several effects, which alters the brain's structure in medical students. Several studies were reported between first and senior year students, which in this article we present different reviews on these studies and suggest future development. The population of the research were medical and non-medical students (n = 40) who provided written consents. Students who were recruited from medical and non-medical schools went through magnetic resonance imaging (T1-weighted images-MPRAGE-) and answered a k-10 questionnaire to identify levels of distress and anxiety, images were analyzed by VBM technique and all data were statically analyzed using an SPSS Statistic program. The results indicate that the brain does exhibit structural changes due to severe stress, which is present in female medical students showing higher significance levels in comparison to non-medical student. Medical students were found to undergo a higher level of stress, with structural grey matter changes.

INTRODUCTION:

Mental health according to The World Health Organization is "a state of well-being in which every individual recognizes his or her own potentials and their ability to cope with the normal stress of life, can work profitably and fruitfully, and their ability to make a change and a contribution to their community". [1] People these days, if not, all have experienced anxiety which is a type of fear or worry usually associated with the thought of a threat or something going wrong in the future but can also arise from something happening right now. The goal of college education is to graduate keen and professional students who can work efficiently under high stress levels, from multiple fields and with different experiences, due to that adolescents may experience many physical, emotional, hormonal, social and intellectual pressures making them prone to mental illnesses. [17]

OBJECTIVES:

This research presents a new study on stress and depression, applicable in higher and undergraduate education, that enables comparisons to be made between students of different disciplines (medical and non-medical). Different stressors operate at these different educational fields. Its aides in raising the awareness to the many medical education communities by addressing how mental health changes can affect brain function and hinder the learning process. It can also act as a reference source for upcoming educational researches within the same field and achieve a better understanding of these factors and the various effects of them.

MATERIAL & METHODS

University students from King Saud University (KSU) at the college of applied medical science (CAMS).

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Medical and non-medical students (N = 40) who provided written consents.

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MR images were obtained using a 3 Tesla (Siemens, Spectra, Medical Systems, Iselin, NJ).

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T1-weighted images (sequence MPRAGE) were obtained in the axial, sagittal, and coronal planes. Using a repetition time (TR) 1900 msec, echo time (TE) 2.42msec.

↓

K-10 questionnaire included questions about personal history, stress, and trait considering incidents that may invoke any stress.

↓

MRI safety questionnaire, this determines whether it is safe for participant to have an MRI scan.

↓

VBM meta-analysis was performed on all meta-data using the **MRICloud** is a website providing cloud-based medical image processing services.

↓

The data of the populations were analyzed using IBM SPSS Statistic (version 20.0).

RESULTS:

A Cross-sectional statistical analysis of field and stress effect on MRI volumes, was done, to compare the mean values of different K-10 variables in relation to stress levels according to each different field showed that, 22.5% of medical and 22.5% of non-medical participants are likely to be well, while 10.0% of medical and 7.5% of non-medical participants are likely to have mild disorder and 30.0% of medical and 7.5% of non-medical participants are likely to have severe disorder. Resulting in that students who showed severe stress levels were 37.5% of the total students from both groups. When subgrouping students, medical student showed higher stress levels, 60.0%, compared to their counterparts from non-medical school which was only 5.00 %. A summary of K-10 results can be found in Chart 1.

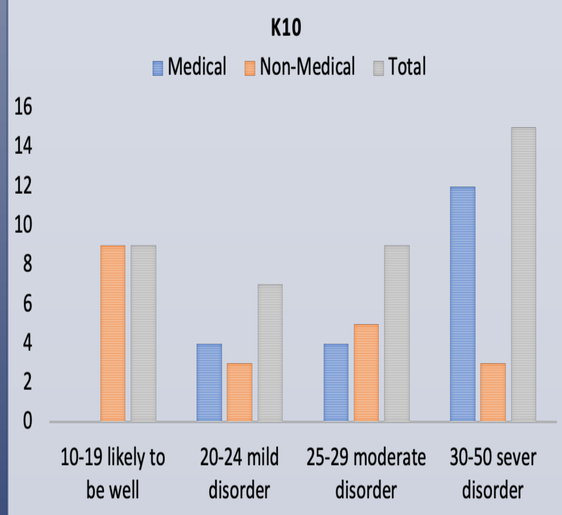

Chart 1. K10 * Field Crosstabulation.

The presence of higher K-10 results had a significant association with a higher level of stress among the students where a p -value of <0.05 was considered as a significant value. (Figure 2)

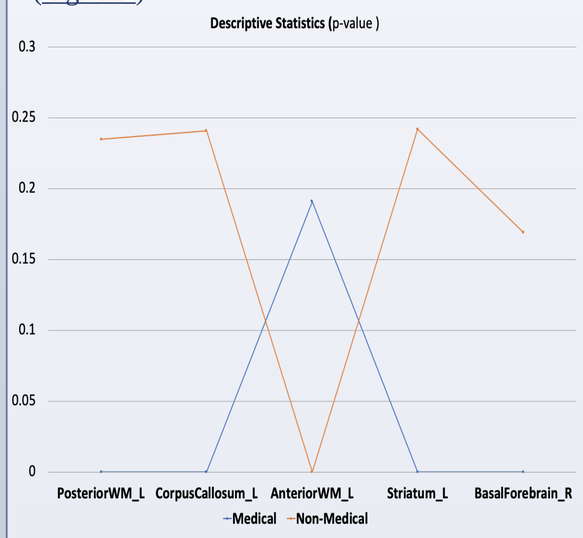

Chart 2. Descriptive Statistics (p-value)

Comparison between VBM and K-10:

The multivariate statistical results showed a statistically significant difference in VBM results based on the stress level of medical students. There was no significant association between the VBM results of the elevated brain signals and the level of stress among the non-medical students.

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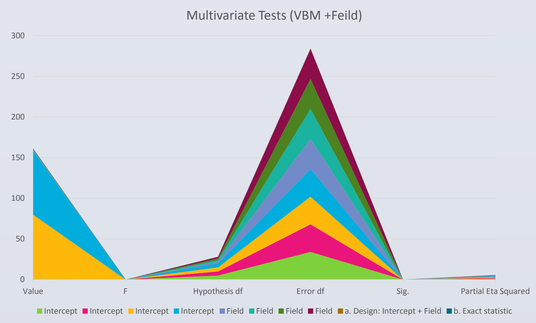

Chart 3. Multivariate Tests (VBM +Field)

DISSCISSION:

The left corpus callouses showed higher significance in medical compared to non-medical students. That could be due to, that researchers have revealed that it is involved in many developed features of the brain, like learning, memory, which will increase the learning load on medical participants ,elevating their stress level. [1]

While the lowest significance was found at the Striatum_L, based on recent theories of flexible decision-making, it engages prospection and projection arising from a network involving the hippocampus.

The left hemisphere of medical participants is significantly higher in comparison to the non-medical participants. That could be due to hemispheric asymmetry.

The left hemisphere is said to process information in a logical and sequential manner were the right hemisphere is said to process information holistically and nonlinearly .This was indicated by numerous studies that have reported brain hemi-sphericity is related to different academic majors and careers, whereas one study reported that applied science students appeared to endorse items of a more right-hemispheric style in processing information than did the social science students.[13]

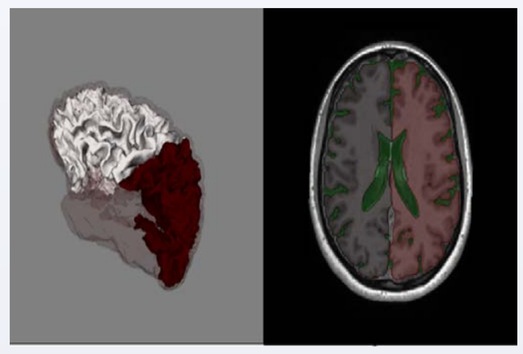

Figure 4. 3D and VBM images of the grey matter of medical students after processing the MRI images.

CONCLUSIONS:

The study showed that Stress and depression have made a significant structural change in medical student more than non-medical student, showing a higher significance in specific brain parts.

Limitations:

The sample size and the limited time frame were the major limitation in our study. Withdrawals from participation in non-medical group more than their counterparts which may be due to their fear and lack of knowledge of MRI procedures. Other variables that may play a role in stress that are not related to their education such as medical history, economical background, social status or family issues were not collected.

Recommendations:

Raise the awareness of time management for the student in both medical and non-medical paths to reduce the stress.

medical schools should consider this issue and improve the learning environment by encouraging teamwork and group studies.

Future longitudinal studies allow a comparison between the baseline and during the examination period. It should include validated and a thorough stress measures to explore any other factors that might influence stress levels.

Medical schools should acknowledge this issue and change the medical learning environment for it to be a more interactive and less stressful.

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