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Psychological responses of COVID 19 pandemic of students in Greek universities

By

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ΜΕΤΑΠΤΥΧΙΑΚΟ ΠΡΟΓΡΑΜΜΑ

Οι ψυχολογικές επιπτώσεις της πανδημίας COVID 19 στους φοιτητές των ελληνικών πανεπιστημίων

Άννα Μαρία Γκλώτσου

ΔΙΑΤΡΙΒΗ

Που υποβλήθηκε στο Τμήμα Στατιστικής
του Οικονομικού Πανεπιστημίου Αθηνών
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This study is part of the COVID-19 International Student Well-Being Study (C19 ISWS). C19 ISWS is the result of a study design, study protocol and questionnaire developed by a team of the University of Antwerp, Belgium (prof. Sarah Van de Velde, prof. Edwin Wouters, dr. VeerleBuffel)

ABSTRACT

February 26th in 2020, was the day when the virus that had infected almost the whole world, now known as COVID -19 (Corona Virus), began to spread in Greece. At the beginning of March, the first strict measures were taken, which led the Greek people to a state of confinement that lasted for almost two months. As a result, many students were trapped in the city where they were staying and due to the measures that were taken for the protection of the public health, they were forbitten to go out of their residence unless it was necessary and were isolated from friends and relatives. Some of them experienced the confinement all alone. However, it was expected that this condition would have a direct impact on their psychology, and this could potentially lead to depression. Between the 13th of May and the 12th of June 2020, questionnaires were dispensed to the students of Greece, which were related to general information about their personal life, the conditions that prevailed during the confinement, the various ways of entertainment, as well as questions related to their emotions and mental state. The target of this paper is to obtain an overview of the situation experienced by the students in order to examine whether the prevailing conditions contributed to the formation of their psychology, mental health and eventually to investigate in which way these all circumstances could contribute to the provocation of depression. In order to draw conclusions, various descriptive measures (position measures, diagrams), tests for the relationship of variables (χ^2 test, t-test, ANOVA, Kruskal Wallis) will be estimated, as well as models will be created so to find out which factors possibly are contributing to the provocation of depression among the students. More specifically, depression will be considered as self-reported depression, which will be a quantitative variable based on eight item scaled variables, according to the Center of Epidemiological Studies-Depression (CES -D). However, it is not a clinical measure as it does not include all the variables that contribute to depression.

ΠΕΡΙΛΗΨΗ

Η 26η Φλεβάρη του 2020, ήταν η ημέρα όταν στην Ελλάδα άρχισε να εξαπλώνεται ο νέος ιός που είχε προσβάλει τότε σχεδόν όλον τον κόσμο, γνωστός πλέον ως COVID -19. Στις αρχές Μαρτίου πάρθηκαν τα πρώτα αυστηρά μέτρα όπου οδήγησαν τον ελληνικό λαό σε καθεστώς εγκλεισμού, το οποίο διήρκησε σχεδόν δύο μήνες. Ως αποτέλεσμα ήταν πολλοί φοιτητές να εγκλωβιστούν στην πόλη που διέμεναν και λόγω των μέτρων απαγόρευσης καθώς και για λόγους προστασίας της δημόσιας υγείας, απομονώθηκαν στις κατοικίες τους. Ορισμένοι από αυτούς πέρασαν τον εγκλεισμό μόνοι και άλλοι έχοντας συντροφιά άλλα άτομα. Ωστόσο είναι αναμενόμενο αυτή η κατάσταση να έχει άμεσες επιπτώσεις στην ψυχολογία τους και πολλές φορές αυτό δυνητικά να μπορούσε να οδηγήσει και σε κατάθλιψη. Μεταξύ της 13ης Μαΐου και 12η Ιουνίου δόθηκαν στους φοιτητές των ελληνικών πανεπιστημίων ερωτηματολόγια τα οποία σχετίζονταν με γενικές πληροφορίες όσον αφορά τις συνθήκες που επικρατούσαν κατά τη διάρκεια του εγκλεισμού, τους διάφορους τρόπους ψυχαγωγίας και απασχόλησης που είχαν, καθώς και ερωτήσεις που σχετίζονταν με τα συναισθήματα και την ψυχική τους κατάσταση. Στόχος της παρούσας εργασίας, είναι μέσω των ερωτηματολογίων που συλλέχθηκαν να αποκτηθεί μία γενική εικόνα της κατάστασης που βίωσαν οι φοιτητές, να εξετάσουμε κατά πόσο οι συνθήκες που επικρατούσαν συνέβαλλαν στην διαμόρφωση της ψυχολογίας τους, της ψυχικής τους υγείας και εν κατακλείδι να διερευνήσουμε σε τι βαθμό όλα αυτά θα μπορούσαν να συμβάλουν στην πρόκληση κατάθλιψης. Για τη διεξαγωγή συμπερασμάτων, υπολογίζονται διάφορα περιγραφικά μέτρα (μέτρα θέσης, διαγράμματα), έλεγχοι για τη σχέση των μεταβλητών (χ^2 test , t test, ANOVA, Kruskal Wallis test) και εφαρμόζονται μοντέλα προκειμένου να καταλήξουμε στους παράγοντες οι οποίοι ενδεχομένως συνέβαλαν στην πρόκληση κατάθλιψης στους φοιτητές. Πιο συγκεκριμένα, ως κατάθλιψη θα θεωρήσουμε τη self – reported κατάθλιψη, η οποία είναι μία ποσοτική μεταβλητή που δημιουργείται με βάση οκτώ μεταβλητών του ερωτηματολογίου, σύμφωνα με τη μεθοδολογία του Κέντρο Επιδημιολογικής Έρευνας της κατάθλιψης (CES -D). Ωστόσο δεν αποτελεί κλινικό μέτρο καθώς δεν εμπεριέχει όλες τις μεταβλητές που συμβάλλουν στην κατάθλιψη.

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1.Introduction

Depression is a transient condition of sadness and melancholy, usually due to pointless causes and does not last for an extended period. It differs significantly from clinical depression in which individuals experience symptoms that are of a much longer duration and affect their lives. The causes of depression vary but the most important are related to environmental reasons such as the loss of an important person, problems in the family relatives and even changes related to the surrounding area. In addition, an equally important cause of depression is psychological factors, which are mainly related to the individual's internal problems and have an impact on his psychology (Robinson, Spalletta, 2010). Finally, biological agents such as inheritance can be an important cause. In February 2020, in Greece was found the first case of a new virus, now known as COVID-19, which caused a pandemic that was spread around the world. The consequences were too many in terms of loss of people, as well as financial (Pfefferbaum, North, 2020). Also important was the fact that to avoid the spread, containment measures were taken in March of the same year for the citizens of the country. These measures have affected the directly the psychology of whole society. It is understood that a portion of the population affected was students, as many of them were away from their families. In this project a survey will be examined, conducted between May 3rd and June 12th of 2020, through the completion of electronic questionnaires which were created and dispersed (Stathopoulou, et.al. 2020) involving 785 Greek students. The same research has been made in other countries too. The questionnaires were related to general information about students, the conditions under they were constricted and various personal questions related to their mental state and feelings. Of the questionnaires, only the fully completed were used, corresponding to the number 585. In this paper, when the period before the outbreak of the virus is mentioned, it is meant the interim situation during the month before the first response measures are taken, while when during the period of detention is mentioned, it refers to the moment the questionnaire was completed. As far as students are concerned, 93% of those surveyed are Greek and 7% are English and some of them, particular 4%, were not born in Greece. The target of this study is to examine whether the new COVID-19 virus has contributed to the onset of depression among the population concerned during the outbreak.

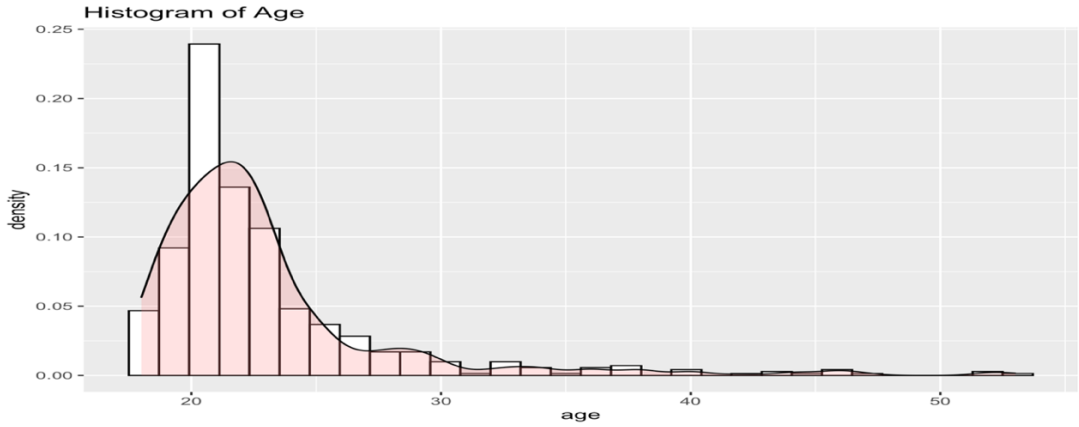
To this end and to draw the right conclusions, various diagnostic tests will be used, depending on the types of our variables.

In the second chapter descriptive statistics are presented. In chapter three, depression scores will be calculated, categorized and compared with the rest of the variables. More specific, among categorical variables tests such as χ^2 will be used, between continuous and categorical ones, t-tests and in the case of continuous variables and categorical with multiple levels ANOVA or Kruskal Wallis tests, depending on whether the conditions of the first one are applied. Finally, in chapter four various models (either linear or general) will be created in order to examine whether and to what extent our variables affect, the variable of interest that is depression.

2.General Information and Descriptive Statistics

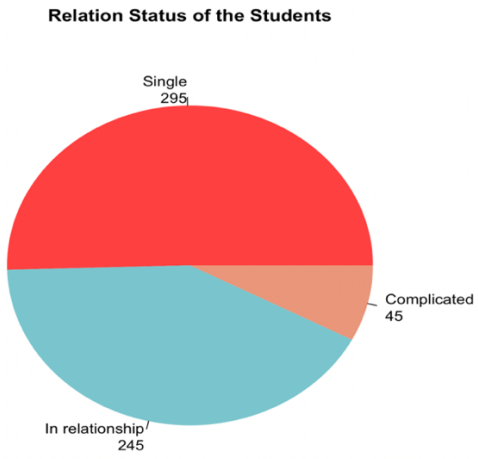
It is of a great importance to be aware of the general information regarding to the students of the sample. These will be helpful to understand better key issues that will be later used to answer our questions. The following diagram provides the age distribution of our sample.

Figure 1 : Histogram of Students' age



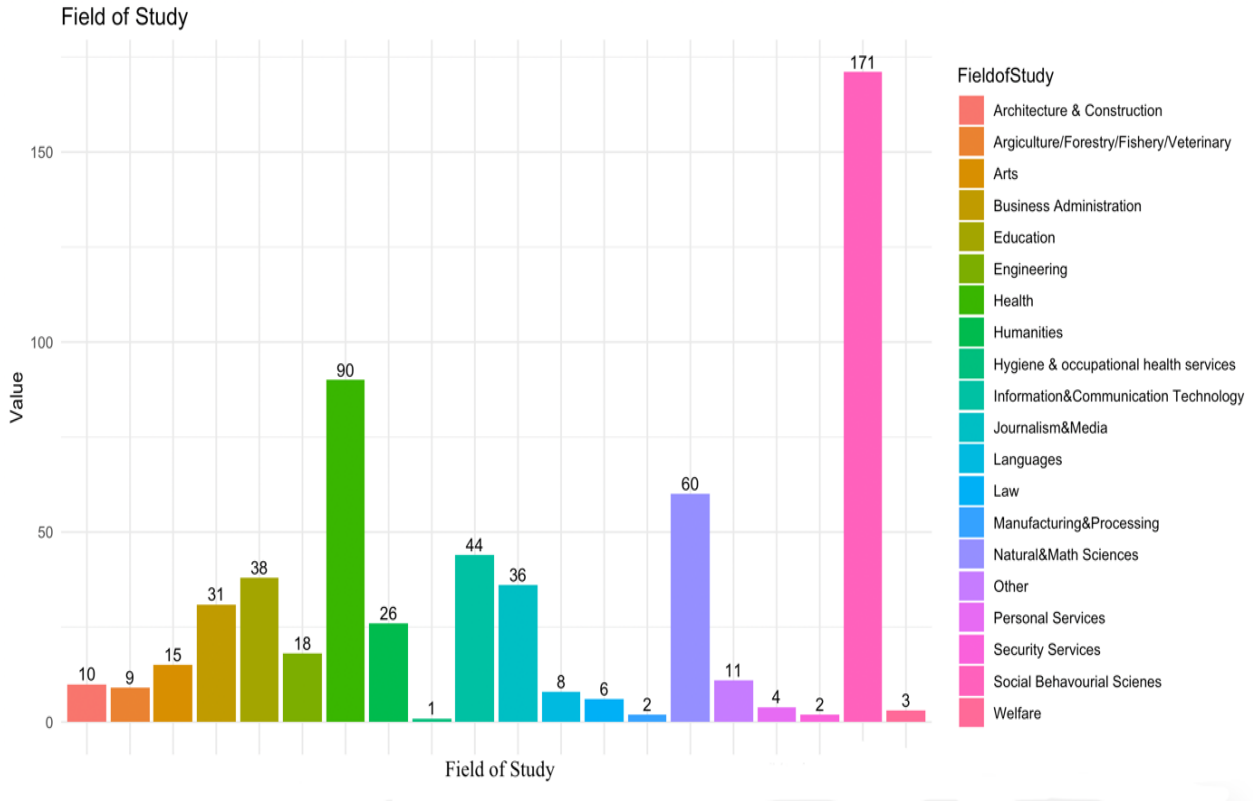
As it is ascertained from the histogram above that the age of the students' majority is mainly between eighteen and twenty three) years old (almost ≈ 81%) while the 19% is over 25 years old and there is also an extreme value there is one student of 53 years old. Besides, the sample was consisted of 412 women almost 71% and of 169 men, 29%. The figure 2 illustrates the responders' relationship status as they declared in the questionnaires.

Figure 2 : Pie chart of relationship's status



A percentage of 50% (295) were single while almost the 42% (245) had a partner and just 45 students declared that their relationship situation was complicated. The responders attended universities across all over the country (Greece) and the percentage of 46% (266) were affiliated either to the National Kapodistrian University of Athens or the University of Macedonia. In the following bar chart, it is presented the study field of the students , in broader categories.

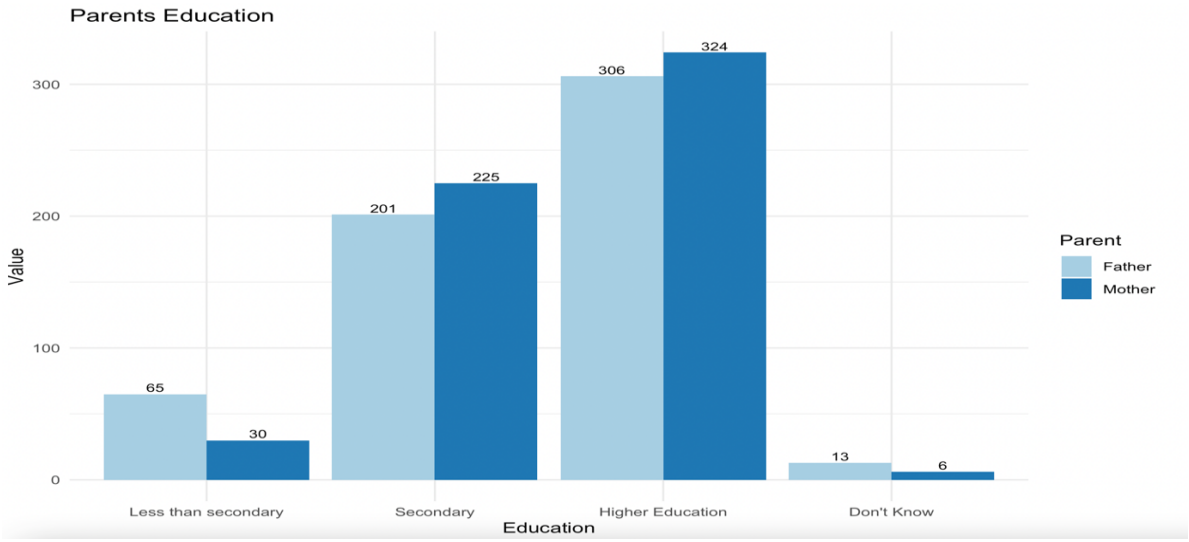
Figure 3 : Field of Studies



It is obvious that the field of study with the highest frequency is the Social Behavior Sciences (30%) and next is the field of health (15%).

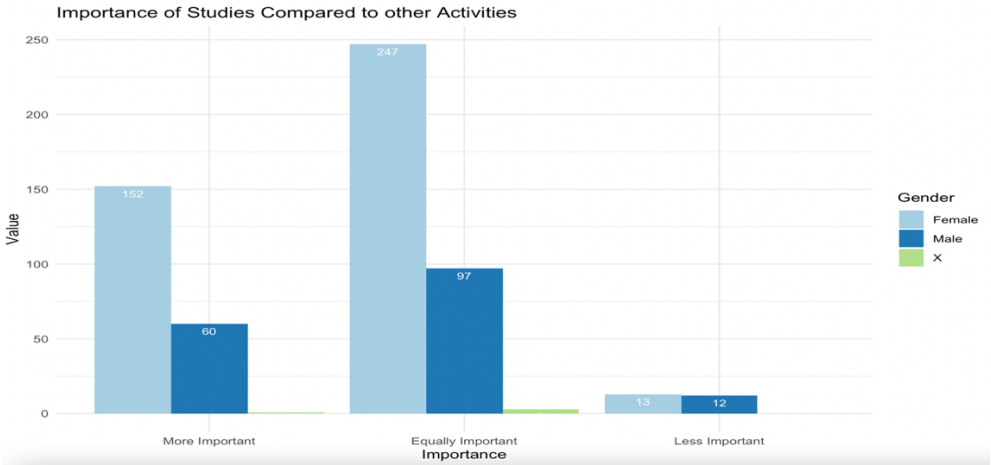
Furthermore, the education level of the students' parents is presented by the bar charts below and give us the information that as concerns the majority, both of the parents have completed the higher education level of studies while second comes the secondary level of education. Mothers seem to be first regarding to the two first levels of education with not great difference from fathers (5.6% & 3%) , respectively.

Figure 4 : Bar chart of Parents' Education



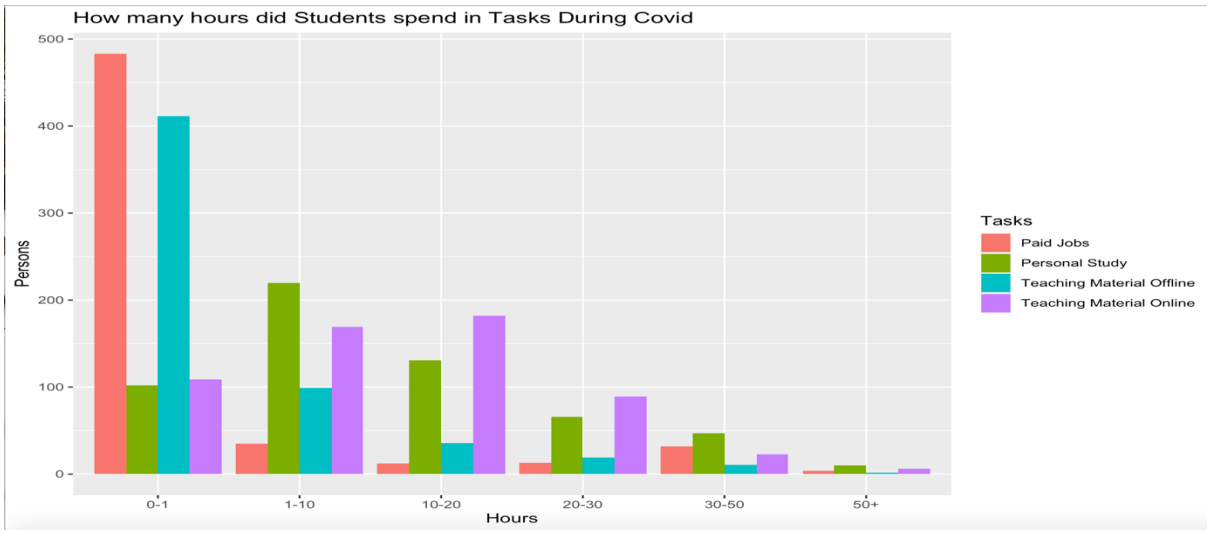
Moreover, the importance of the studies compared to other activities such as hobbies and common activities with friends were examined, according to the answers of the responders. The results are reflected in the following bar chart.

Figure 5 : Importance of Studies Compared to other Activities



It is obvious that 25% of the women, are of the opinion that studies are more important than other activities. On the contrary, men that are related to this statement are the 10% of the sample. The 42% which is consisted of women only, assumes that studies are equally important with all the other occupations mentioned, with the men to be of the same opinion, reaching the 17%. Generally, the majority considers that studies are equally important. To continue, the different tasks that students occupied themselves and the hours spent in each one during the implementation of the strictly measures were investigated. The bar chart below provides this information .

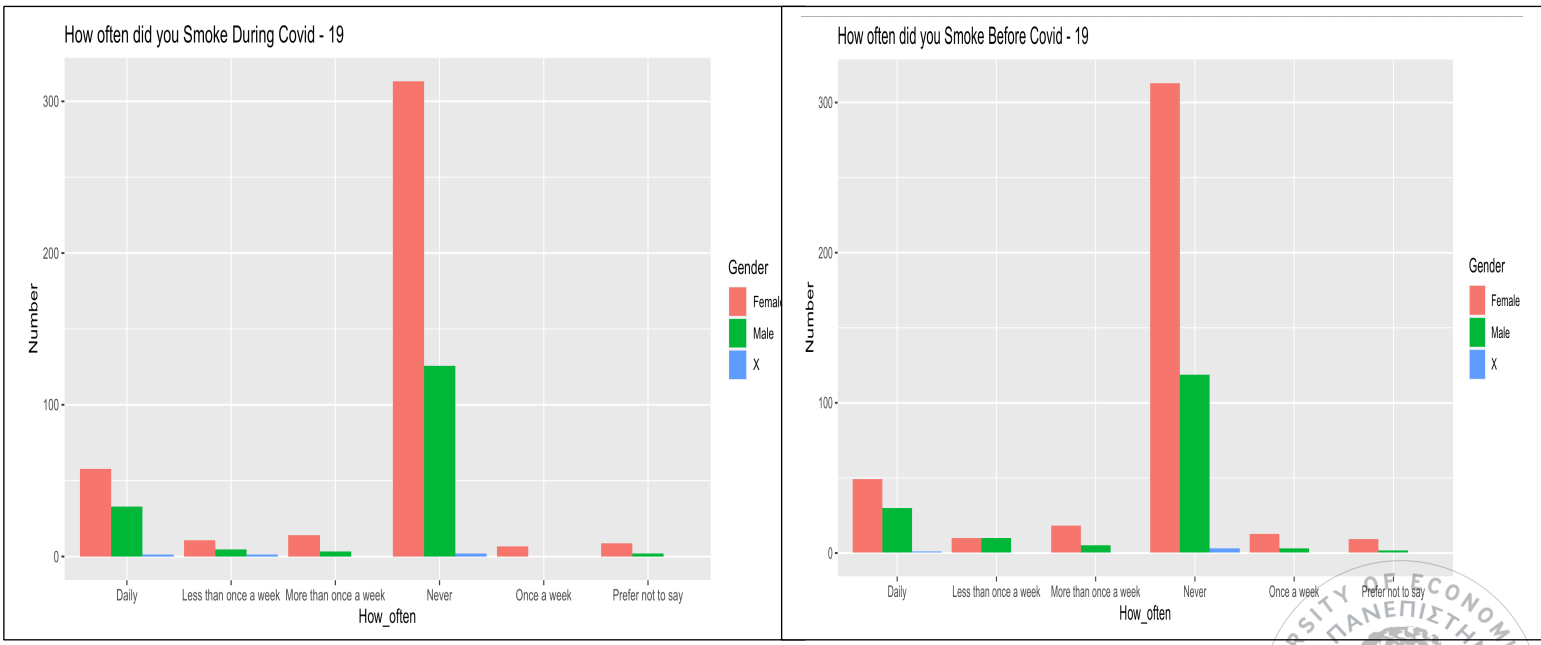
Figure 6 : Bar chart of Hours spend in Tasks During COVID measures



According to the chart , students have occupied themselves mostly with personal study and teaching material online (lectures, seminars), from 1 to 20 hours maximum. The tasks that students did not work on a lot on were, teaching material offline (such as face to face lectures, seminars, or labs) and the paid jobs. The reason for this it is believed to be the strictly measures that were implemented due to the virus. Students that spent more than 20 hours in any task are the minority.

As concerns students' habits, smoking is believed to be a de-stressing factor (Parrott, 2009). It is perplexing whether its frequency has increased during the outbreak of the virus.

Figure 7 : Bar charts of Smoking Frequencies Before and After COVID-19



According to the previous figures smoking does not seem to have a significant difference between the periods before and after the COVID, neither for men or women. It seems though that men increased their smoking habit during the outbreak compared to females. Nevertheless, a hypothesis test such as χ^2 test, should be used so to confirm this assumption. The chi-squared statistic compares the size any discrepancies between the expected results and the actual results, given the size of the sample and the number of variables in the relationship. More specifically it is used to determine whether there is a statistically significant difference between the expected frequencies and the observed frequencies in one or more categories of a contingency table. The null hypothesis here is that gender and the smoking rate are not related, namely that the factor gender does not have an impact on the smoking habit. χ^2 applies Pearson's independency test. The results are presented below.

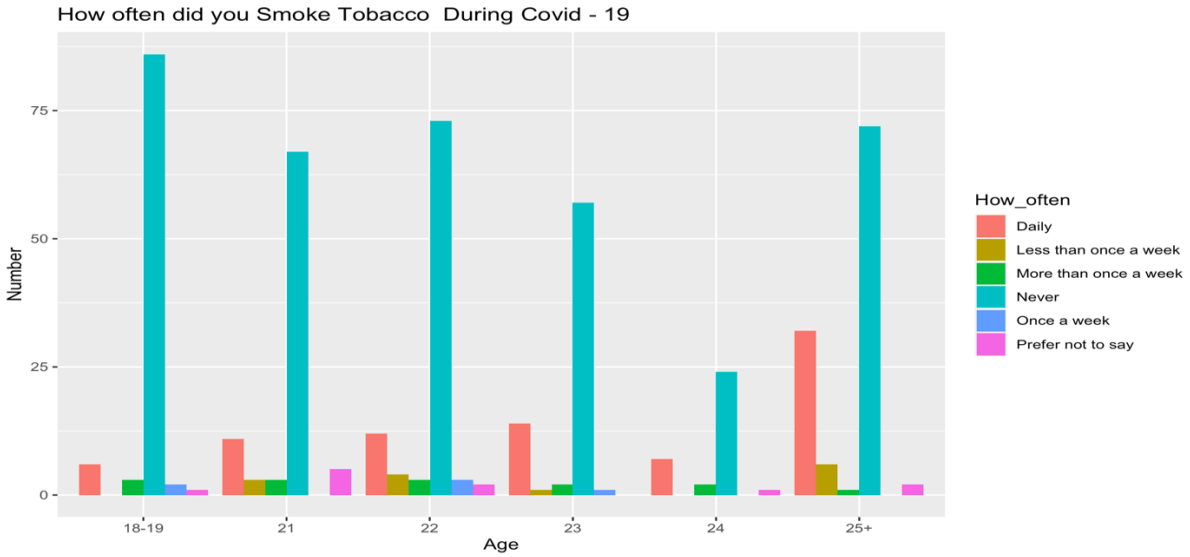
Table 1 : Frequencies of smoking according to the gender (with column percentages)

	Male	**Female**	**Row Total**
Never	125 (74.9%)	313 (77.7%)	***438*** ***(76.8%)***
Less than once a week	5 (3%)	11 (2.7%)	***16*** ***(2.8%)***
Once a week & More than once a week	4 (2.4%)	21 (5.2%)	***25*** (4.4%)
Daily	33 (19.9%)	58 (14.4%)	***91*** ***(16%)***
Column Total	***167*** ***(29.3%)***	***403*** ***(70.75)***	***570***
χ^2 p value = 0.2			

The table one (1) gives the information that most students do not smoke. This percentage reaches the 76.8%, meaning 438 students in total. It is noticeable that the 19.9% of the male students smokes daily, while the respective column percentage for the female student is 14.4%. It is asserted from the χ^2 p value which is equal to 0.2 and it is greater than the level of significance a=0.05, that the null hypothesis is not rejected, meaning that the variables smoking and gender are independent.

However, it is of a great interest to examine not only the gender but also the age of the students according to smoking habits. In the bar chart below, it can be concluded whether those two variables are related or not.

Figure 8 : Frequencies of smoking according to the age category



Most of the students do not smoke in different age categories, especially in the younger ages. As the age increases, there is also a great increase in the frequency of the daily smokers. It can be said that these two variables are related, χ^2 test is used again to evaluate the results and our conclusions.

The results confirm our beliefs from the bar chart, p value (=0.005) is quite smaller than the level of significance a=0.05, so we reject the null hypothesis of independency. The variables age and smoking are depended. That means that the factor age has an impact on the smoking frequency.

The next question is whether the smoking habit of the students that are daily smokers has changed after the adjustment of the government's measures. This time, t-test will be used to examine if there is a significant change. A t-test is a type of inferential statistic used to determine if there is a significant difference between the means of two groups, which may be related in certain features.

The groups are depended as it concerns the same students in two different times (paired t test). The correlated t-test is performed when the samples typically consist of matched pairs of similar units, or when there are cases of repeated measures. There is one important assumption of the normal which is accurate due to the great sample (585 students). The table 2 below illustrates some descriptive statistics.

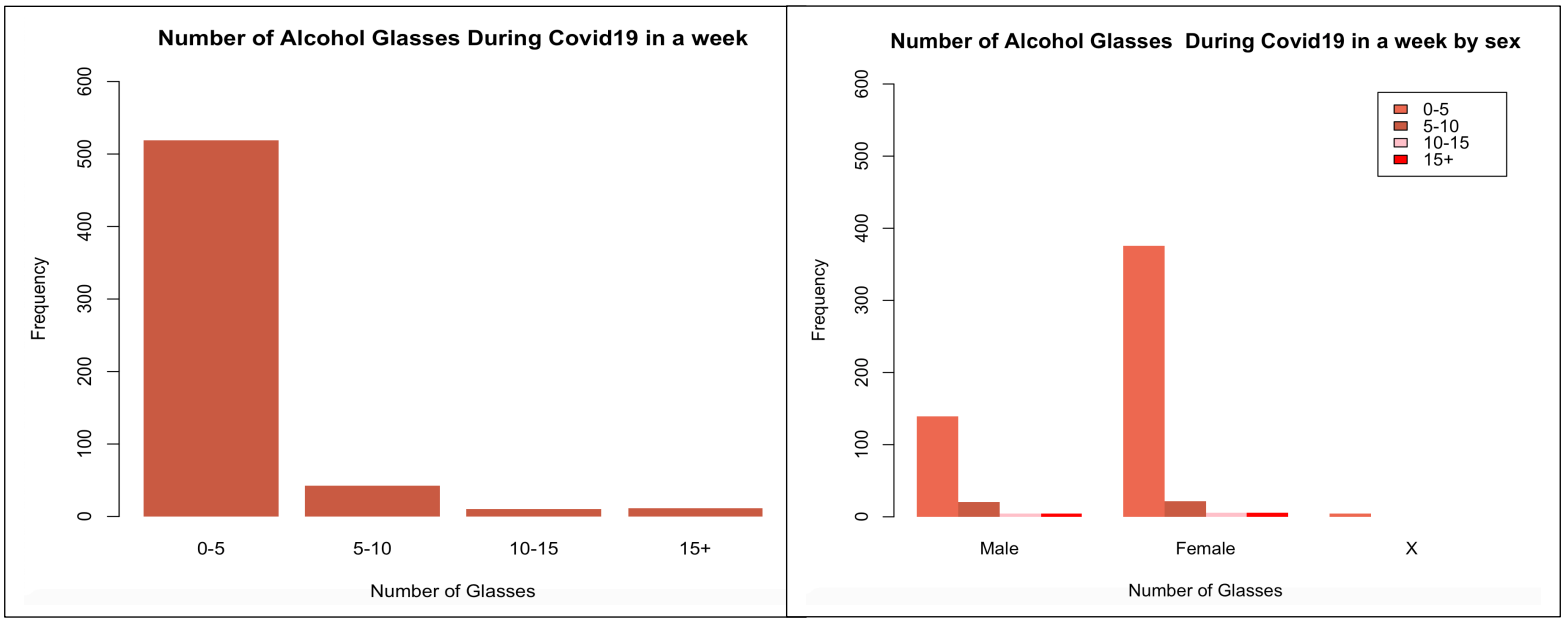
Table 2 : Descriptive Statistics of Smokers daily mean number of cigarettes

	Mean Value	Minimum Value	Maximum Value	Standard Deviation
Before COVID 19	8	1	70	9
After COVID 19	9	1	70	10

From these results, it is not seen that students smoke less or more after the implementation of the measures. According to the paired t -test results, the mean daily number of the cigarettes before and after the COVID measures, is not significant different. P value is 0.25 which is quite higher than the significant level (a=0.05), the null hypothesis of means equality is not rejected.

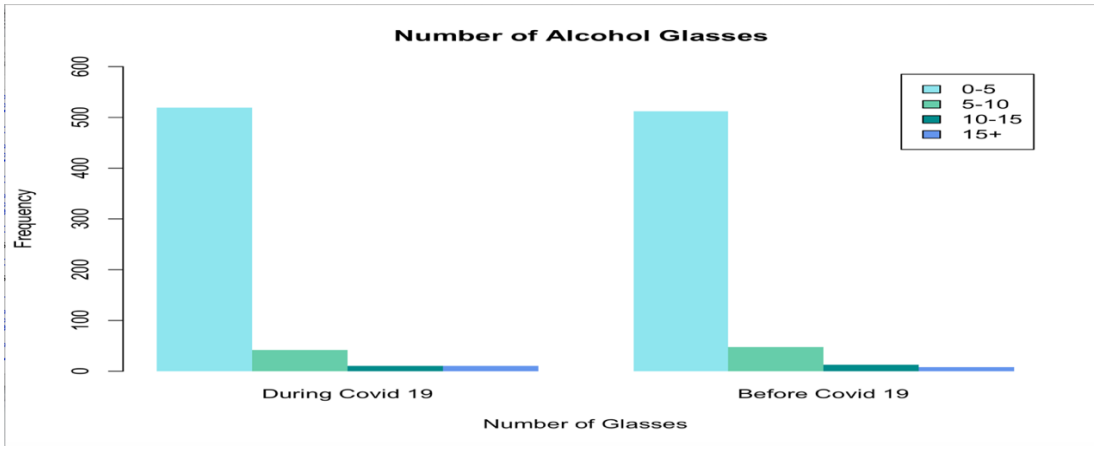
It is also of a great interest to examine the total alcohol consumption during COVID 19 in a week and besides to evaluate whether there is a significant difference concerning the gender of the students.

Figure 9 : Bar charts of weekly drink consumption



From these bar charts, it is observed that most of the students (over 500), male and female, consume weekly maximum 5 drinks. Conducting the χ^2 test, it cannot be assumed that there is a relation between the variable of drink consumption and the gender. χ^2 p value is 0.17 greater than a=0.05 so we do not reject the null hypothesis of independency. However, it is necessary to find out if these frequencies have been changed after the implementation of COVID measures .

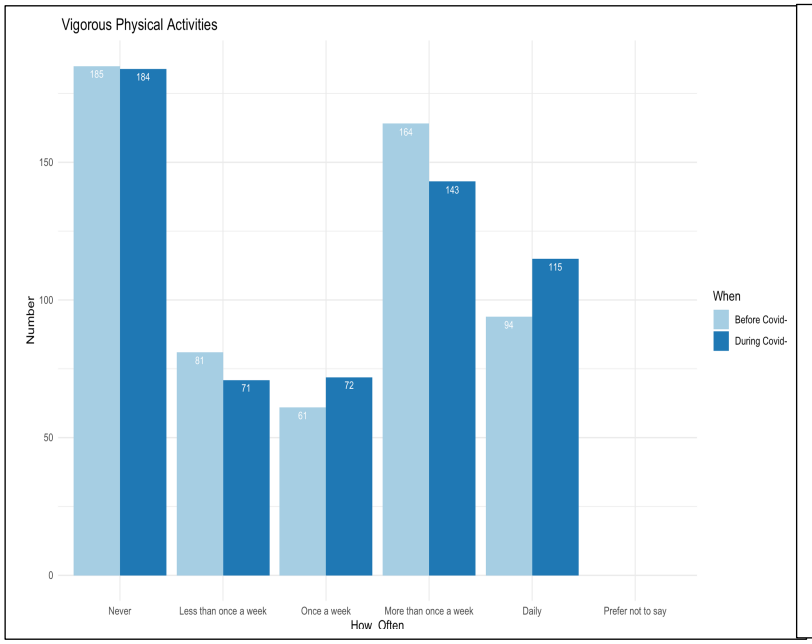
Figure 10 : Number of weekly Drinks Before and After COVID Measures.



It cannot be seen any significant difference between the two periods, as concerns the consumption of the weekly drinks. Most students consumed 0 to 5 drinks before the implementation, as they did after. However, paired t-test can be used again to confirm our assumptions (the paired t test was not applied to the categorical variable of alcohol glasses but to the numeric one). The null hypothesis assumes that the mean number of alcohol glasses remains the same in both periods. The test results suggest that the null hypothesis is not rejected as the p value equal to 0.7. Consequently, there is no difference in the consumption of alcohol.

Next we examine whether the different physical activities differ compared to the two periods. The bar charts below and the χ^2 tests help us end up to the conclusions.

Figure 11 : Activities Before & After COVID 19



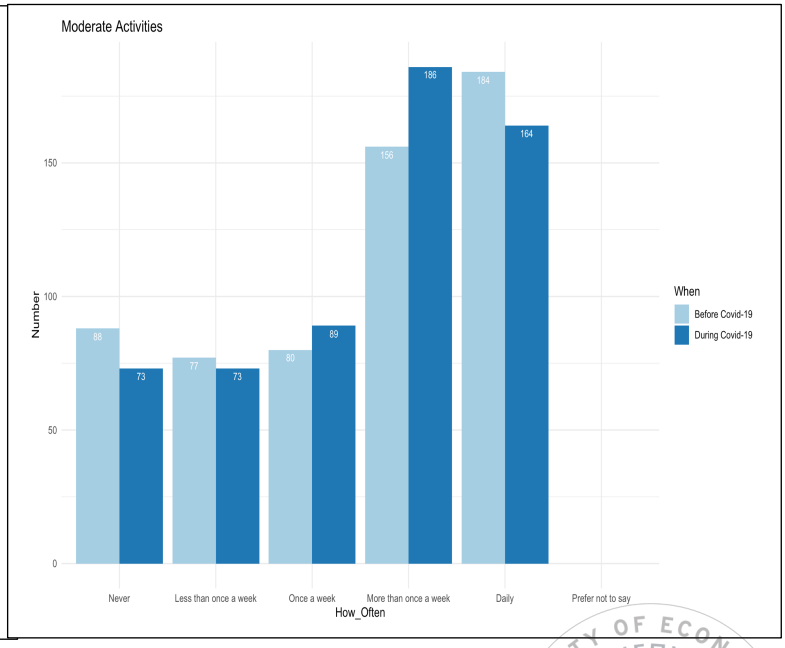


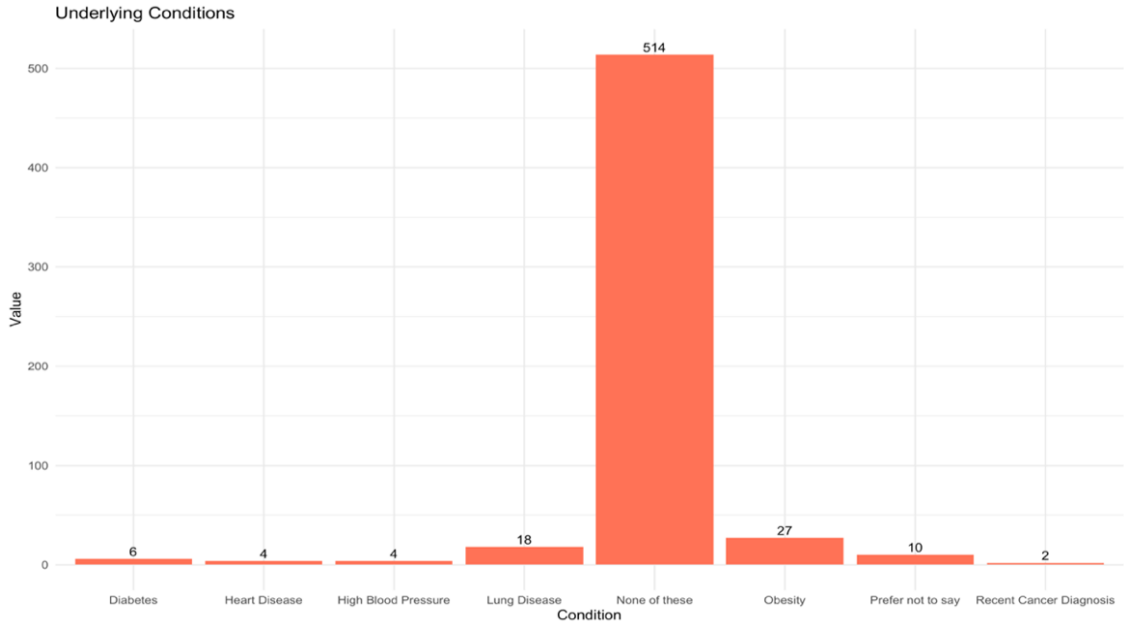
Table 3 : Chi Squared results

	P values
Vigorous Activities (Before &After COVID)	0.00
Moderate Activities (Before &After COVID)	0.00

According to the χ^2 results there is a significant difference between the vigorous and moderate activities before and after COVID 19, as the p values are smaller than the significant level a. Generally, some of the students that did not work out vigorously assimilated to the categories that include exercise once a week or daily. Those students did not come from the category that never exercises vigorously , as this category remains high after the COVID measures. As concerns the moderate activities there was an increase in the once a week and in the more than once a week occupation, as the persons which had never exercised seemed to be reduced.

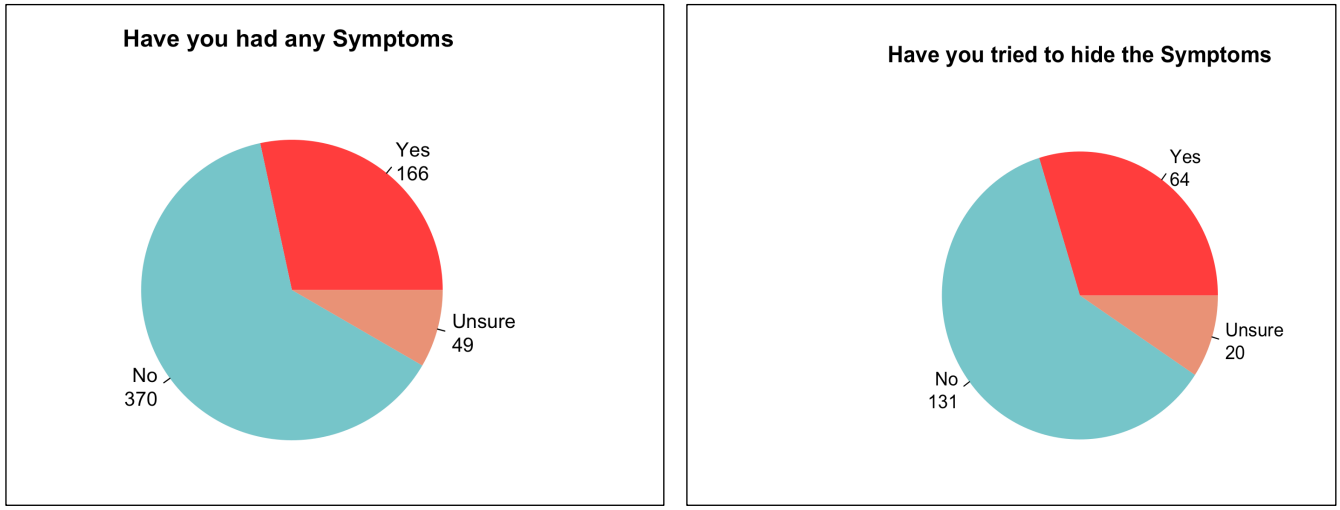
It is now generally accepted that the virus COVID-19 constitutes a great danger to those who suffer from underlying conditions regardless the age of the person (Hilda Razzaghi, et.al, 2020). The following bar chart illustrates some information about the health state of the students, more specifically if they suffer from heart disease, diabetes, high blood pressure and many other health issues. It seems that the majority of the them does not have underlying conditions. Few suffer from obesity (almost 4.6%) and even fewer from lung diseases (3%).

Figure 12 : Frequency of Underlying Conditions Among Students



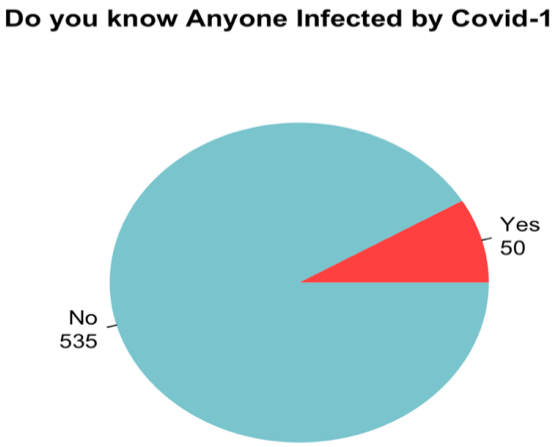
Since none of the students had officially COVID virus, it is important to know how many of them had the symptoms and did not try to find out whether they ail from it or not. Moreover, to discover how many of them tried to hide the symptoms. In the pie charts that are presented below those questions are answered.

Figure 13 : Pie charts of students that had symptoms and tried to hide them



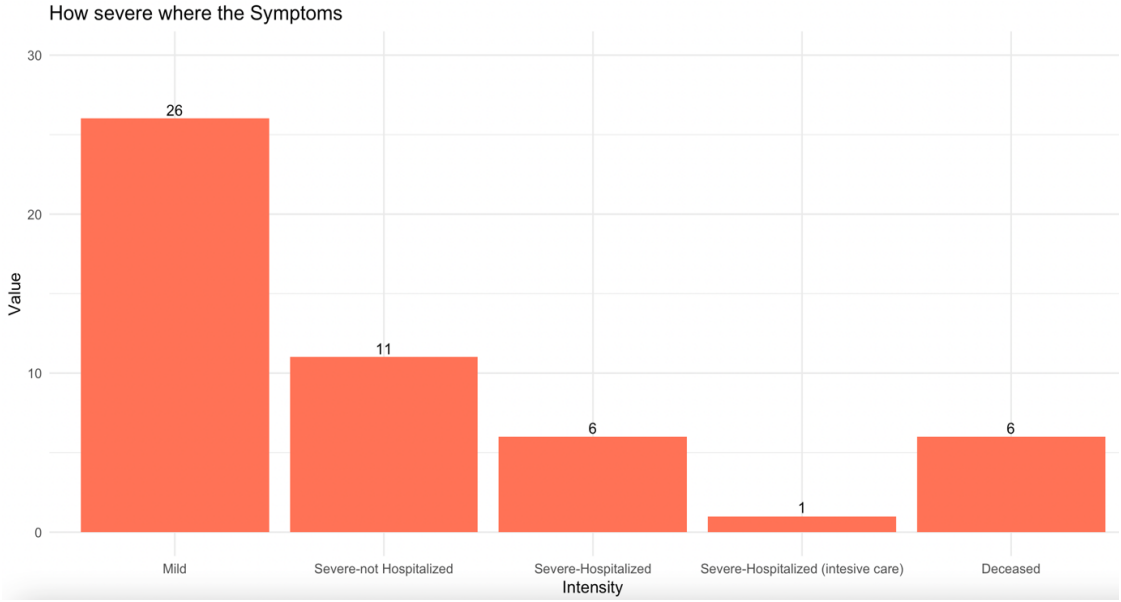
The pie charts inform us that almost the 28.3% (166 people) had noticed symptoms that are like those of the new virus COVID -19 and the 38.5 % of them tried to hide them from the others for many reasons. Although, officially none of them had run the proper test to discover the reality. The majority though, which is concluded of 370 students (63.2%) had no symptoms, while 49 people are not sure (8.8%).

Figure 14 : Pie chart of the students knowing person suffering from COVID-19.



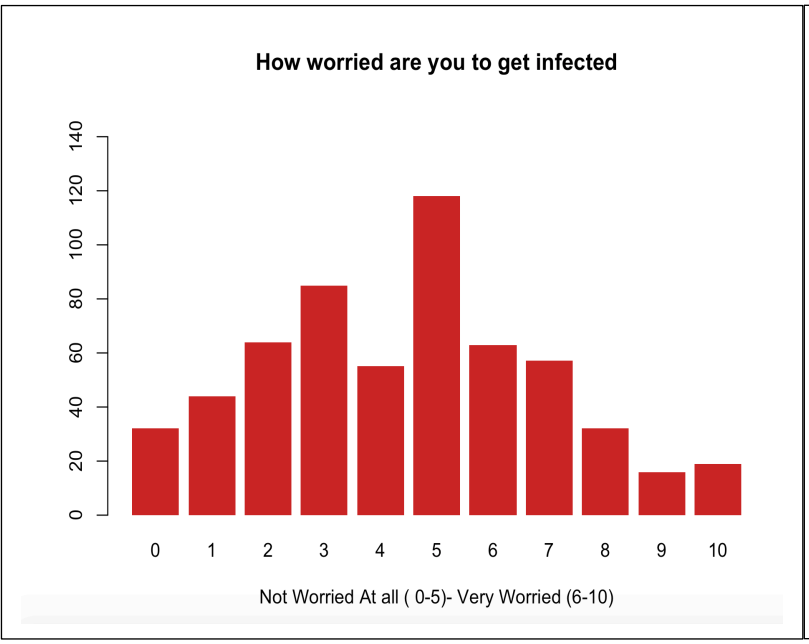
Only 50 students know someone who suffers from the virus, that means that the virus by then was not spread enough.

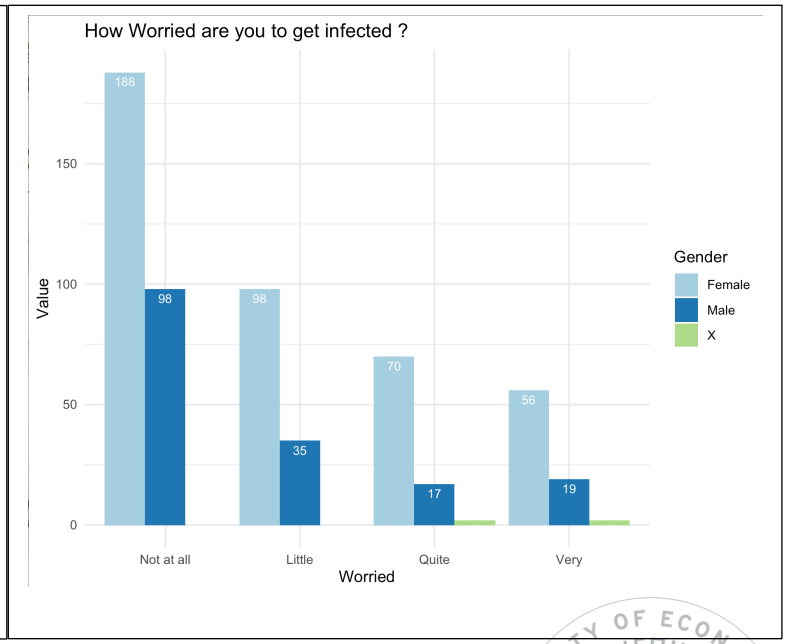
Figure 15 : Intensity of the Symptoms



According to this bar chart 26 out of 50 persons who suffered from the virus (almost 50%) had not severe symptoms. However, 6 persons (12%) deceased, the rest 18 had severe-intense symptoms and some of them needed to be hospitalized .

Figure 16 : Anxiety cause by the virus infection.

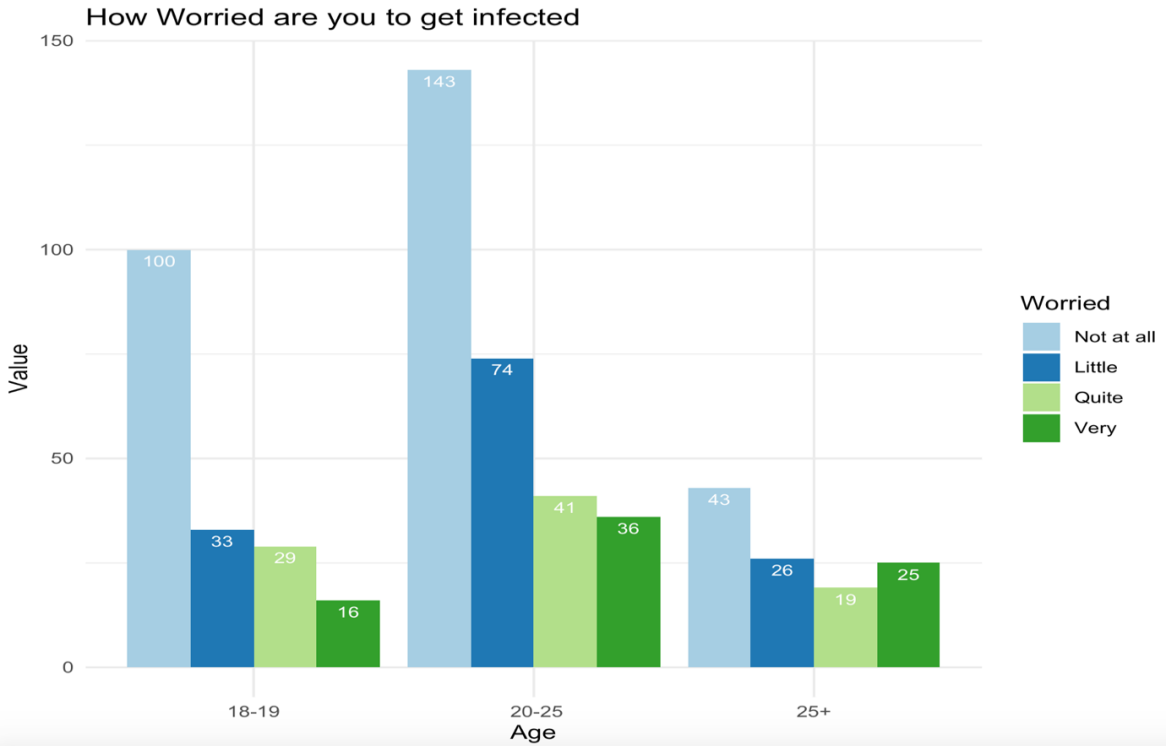




From the figures above we are informed about how worried are the students of getting infected from COVID-19. The scale is increasing, the higher the score the higher the anxiety. According to these figures, it could not be claimed that the students are quite worried. Categorizing the results, it is easier to understand them. It can be concluded that most women are not at all or little worried. So does the majority, namely 286 persons (49%) do not worry at all and the 23% worries little. On the contrary, the students who worry very much constitute the 13%. The significant difference between the worry of male and female, using χ^2 test is confirmed, as the p value is 0.004.

It is of a great interest to examine, how the factor age affects the results and gets the students more worried depending age.

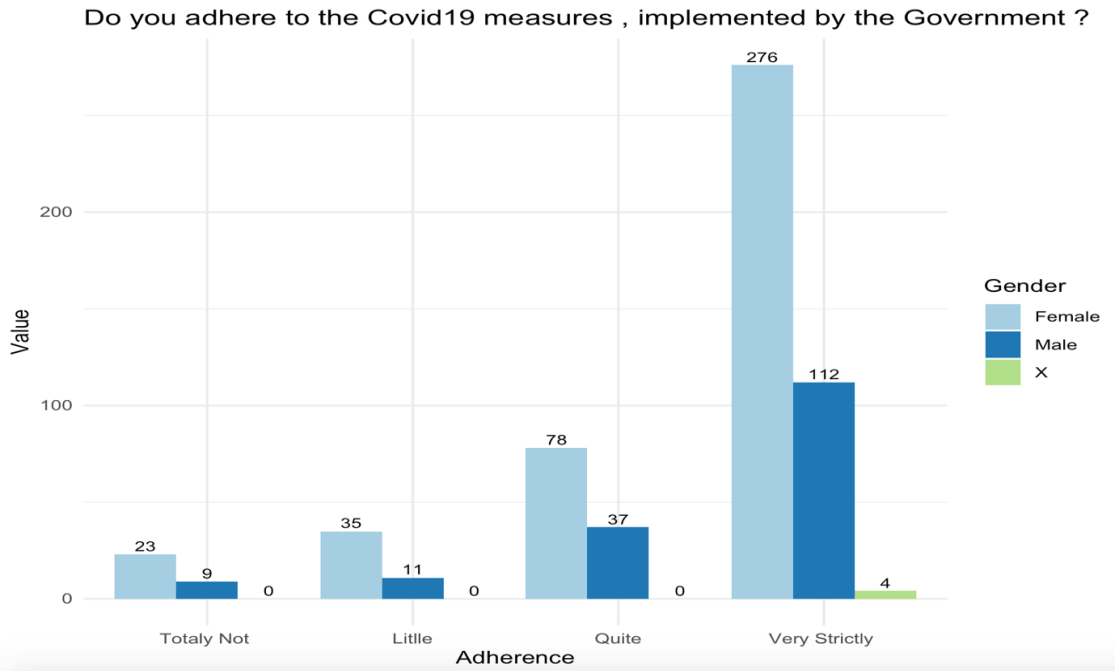
Figure 17 : Bar chart of infection worry depending on the age.



It is observed that mainly most students of ages between 20 and 25 years old do not worry at all or just a little (37%). In the younger ages again, the majority does not worry at all (17%). The ones that worry a lot, consist only the 13.1%. Again, chi squared will be used in order to confirm if there is indeed an significant difference among the ages, as concerns the worry of infection.

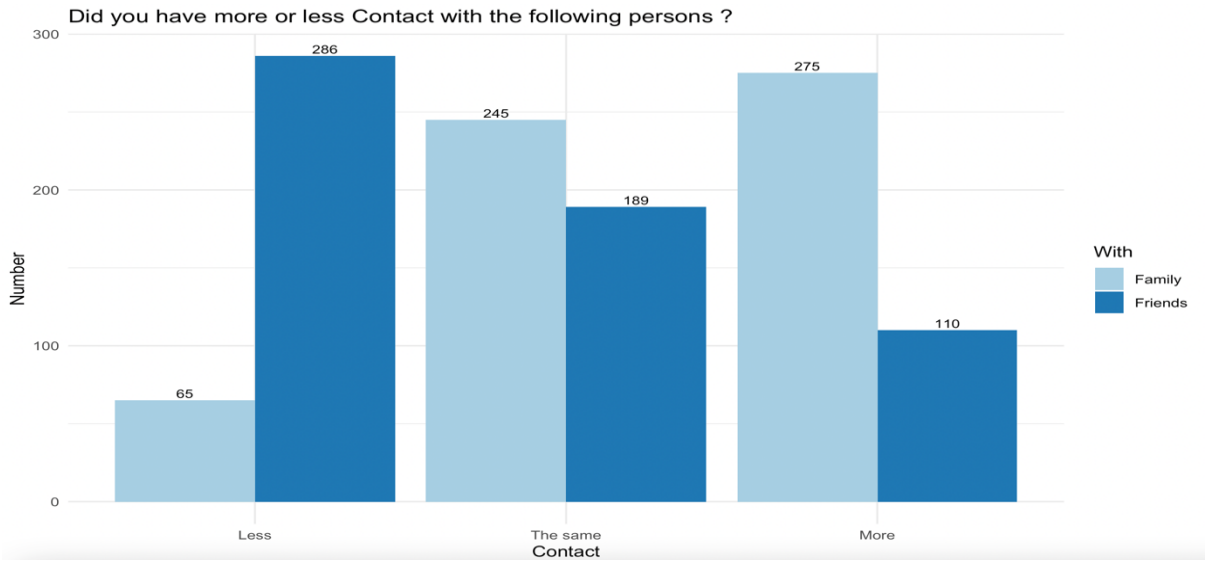
χ^2 test certifies that there is indeed a statistically significant difference between the categories of age and the level of infection worry, as the p value is equal to zero.
It was of a great importance for the reduction of the virus, for as the people strictly to apply the measures, so the adherence of the measures will be examined among the male and the female students.

Figure 18 : Adherence of Governments' measures



It seems that most students adhere to the governments measures, as the 66. 3 % applies them very strictly and only the 5.5% does not obey. To decide whether or not woman or men are more prudent, chi squared test will provide the information. The results inform us that there is not significant difference between male and female as concerns the adherence of the measures as the p value is equal to 0.66.
Generally accepted is the fact that contact with family or friends, theoretically can have a great impact on the psychology of the students, especially in the days with strictly life restrictions (Rubin et.al, 2016). In the following bar charts, it will be concluded if there was contact with the beloved ones therefore this will be evaluated in order to decide whether there is an impact on depression or not. The results are presented below.

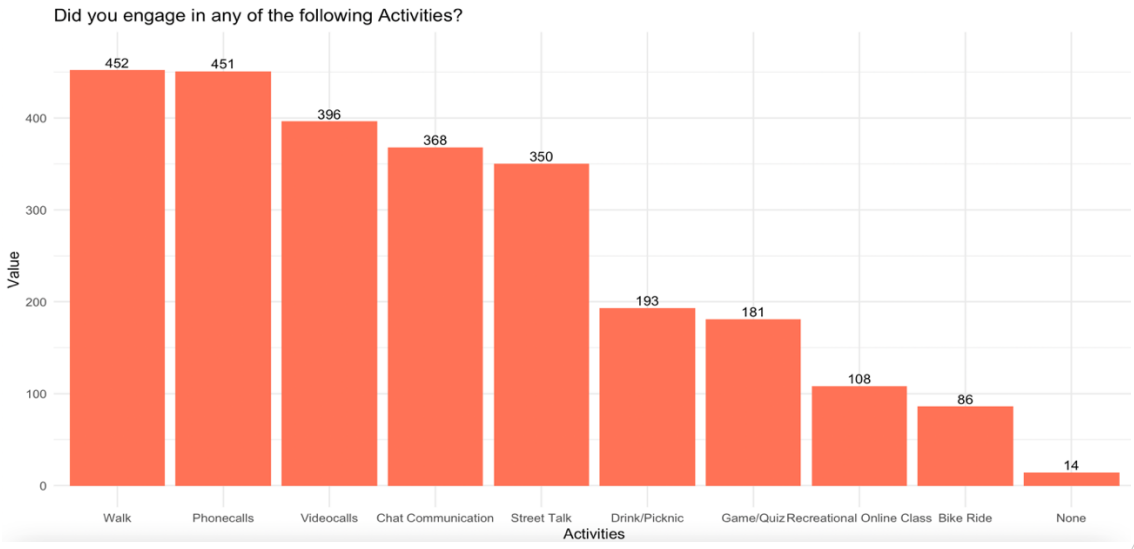
Figure 19 : Contact with Friends and Family



It seems that in most cases, family contact was more or the same. More specific, the 47% of the students declared that family contact was increased, while only the 11.11% had less contact. The rest had the same. On the other hand, as concerns friend contact the 48.8% of the students mentioned that it was reduced, the 18.8% informed us that is was increased and the 32.5% mentioned the same.

Something that has a great impact on the students' psychology is also the different kind of activities that they occupied themselves. Those activities are presented below.

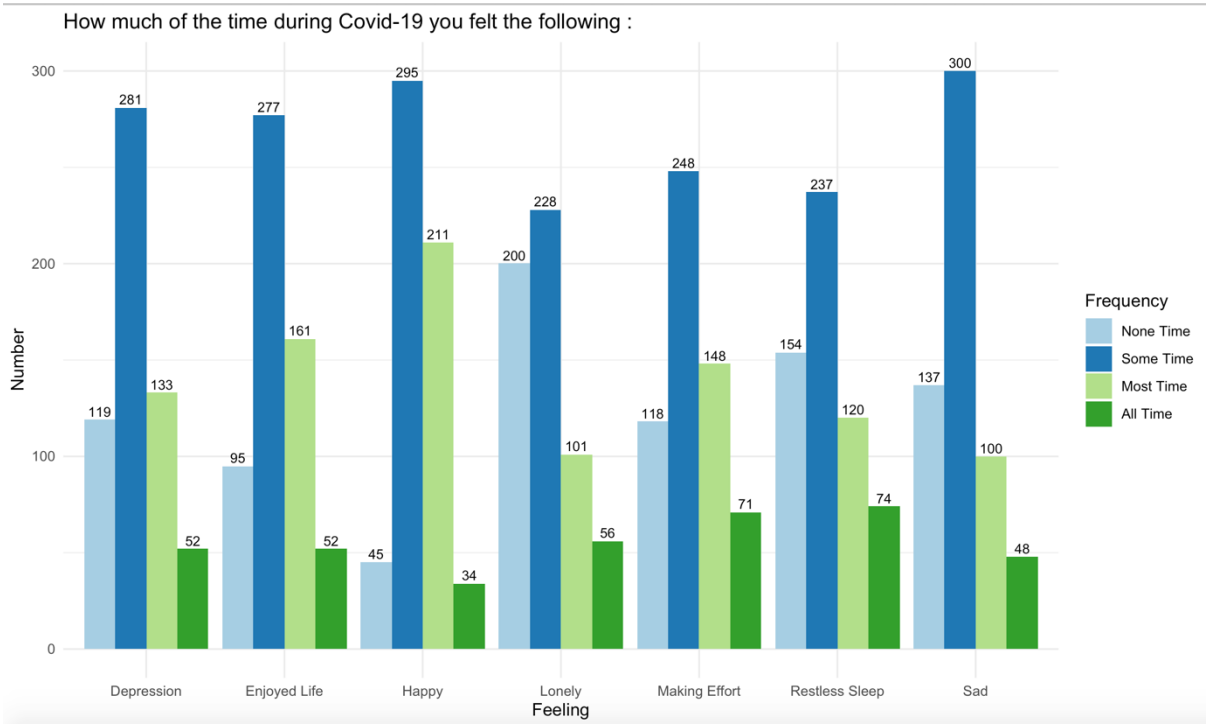
Figure 20 : Engagement with Activities



Students for obvious reasons participated in more than one activity. The most popular activity is the simple walk, which is preferred by 452 students (77%). Videocalls, street talk (respecting social distancing), phone calls, as also the chat communication are famous among the students with percentages 67.7%, 59.8%, 77.1%, 62.9% respectively.

It has been mentioned before that the main aim of this research is to investigate the feelings of the students and how they were affected, in order to guide us to the reasons of depression. Different kind of feelings are directly related to the development of depression. It is generally accepted, that some of them are enhanced due to the restrictions measures (Kumar, Nayar, 2020). The bar charts presented below make us understand the psychology of the students during the outbreak of COVID -19.

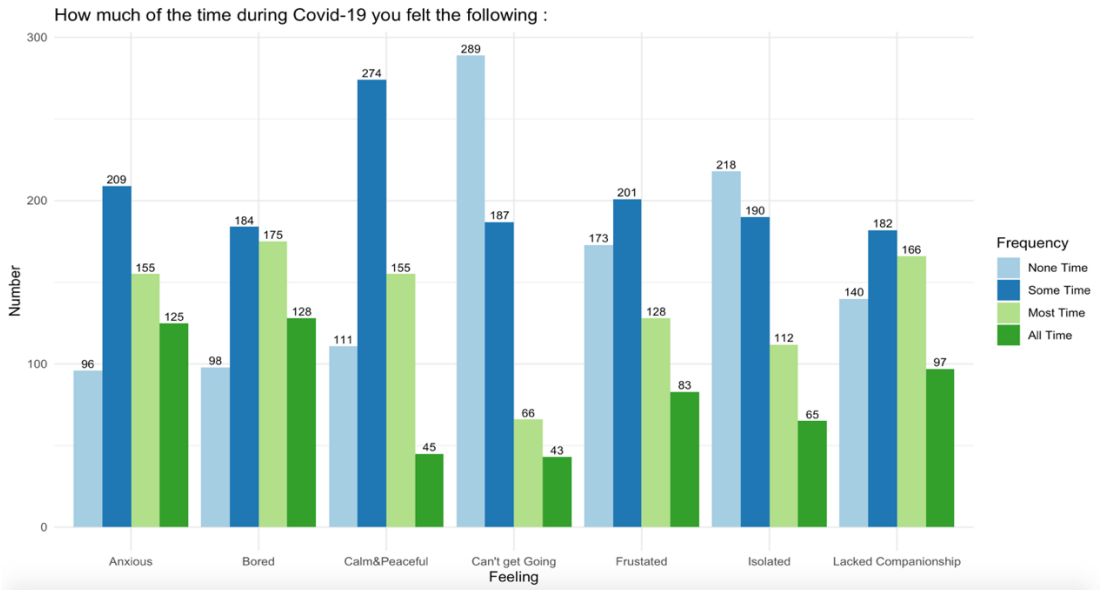
Figure 21.a : Frequency of feelings



As it is realized, the 48% of the students felt sometimes that they suffer from depression, the 31,6 % felt that they were suffering from it all the time or most of the time, while the 20,3 % claims that they did not feel this emotion at all. As concerns the rest of the feelings like joy of life, happiness, loneliness, effort making, restless sleep and sadness, the majority felt it sometimes.

More specifically the highest percentage was that of 51.3%, which was sometimes the feeling of sadness. Moreover, the highest number of the feeling that was felt most time was that of happiness with 36.1%, while respective highest number of the frequency "all time" was that of 12.6% which concerns the restless sleep. Generally, it can be said, that most of the students did not have a feeling all the time but there were feelings that many of them did not feel at all like loneliness 34.1%. There was a minority of 45 students that did not feel at all happiness during COVID restrictions measures. To conclude, the extreme frequencies of those feelings did not concern the majority but the minority of the students.

Figure 21.b



In the Figure above feelings such as anxiety, boredom, calmness and peacefulness, isolation, frustration, lack of companionship and the sense that someone cannot go on are presented. In this bar chart the frequencies are quite different among the different feelings. In respect to the feelings that someone cannot go on and the isolation, the majority (49.4% & 37.3% respectively) did not feel them at all during this specific time period. Regarding to the rest of the feelings, most students felt them most of the time, with the highest percentage to be that of calm and peacefulness (46.8%), in the same frequency the next feeling was that of anxiety (35.7%). Furthermore, boredom was the feeling that the 21.85% of the students felt it all time and second in the row, the one of anxiety with 21.3%.

Next it is going to be found out which of the previously mentioned feelings have a statistically significant difference between the age of the students and their gender. The results are presented below.

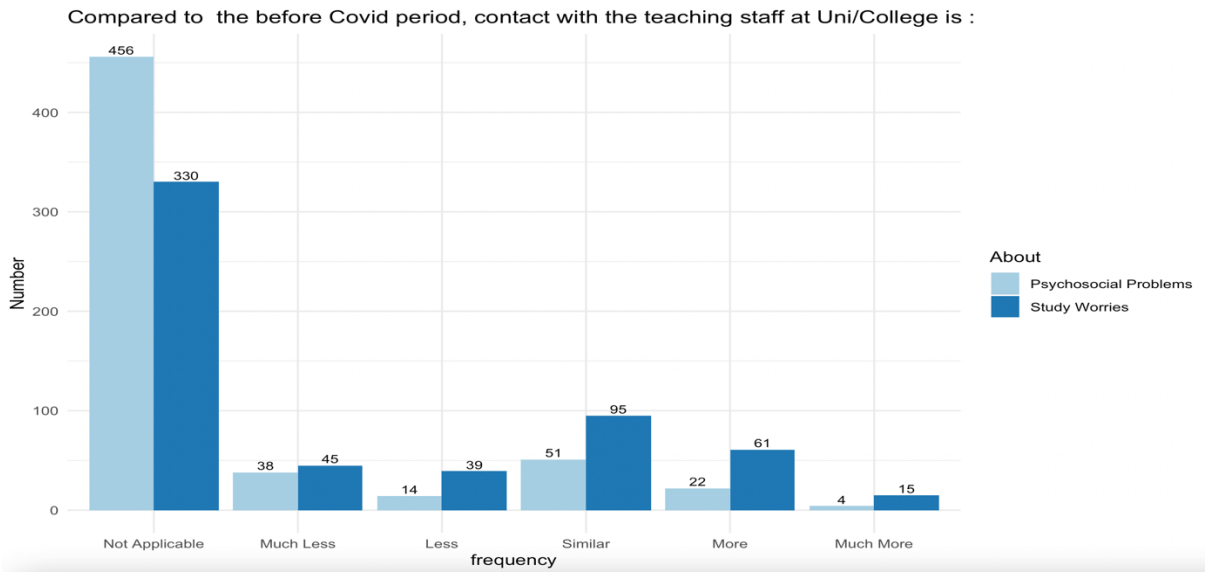
Table 4 : Chi Squared Results Comparing the Feelings Mentioned According to Sex and Age

	Depression	Sad	Bored	Restless Sleep	Frustrated	Anxious
	P values					
Sex	0.00	0.00	0.63	0.00	0.01	0.00
Age	0.56	0.61	0.01	0.65	0.58	0.61

To summarize, the depression differs significantly between male and female students, so does sadness, restless sleep, frustration and anxiety. Generally, it is observed that women tend to feel more negative feelings than men. Finally, the feeling that differs significantly among ages, is boredom as younger ages tend to feel it more.

It is a logic thought someone to believe that the specialized teaching staff at the universities or the colleges may help the students with their psychosocial problems or their study worries. It is a fact that many students in Greece are not informed about these potentials that are provided by their schools. Besides, the contact with the teaching staff may did not be the same due to the virus. In the figure 22, students informed us about their contact with the staff compared to the before COVID outbreak period.

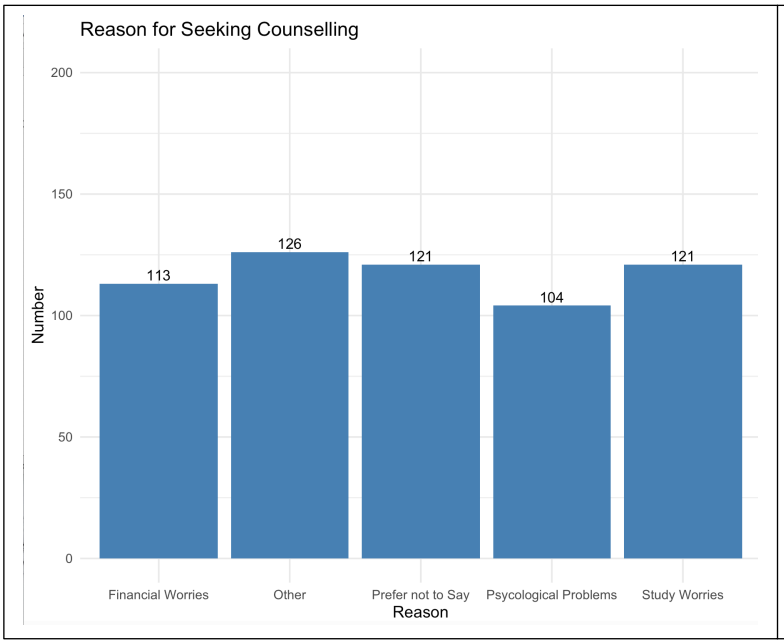
Figure 22 : Contact with the teaching staff at university/college compared to the before COVID 19 period

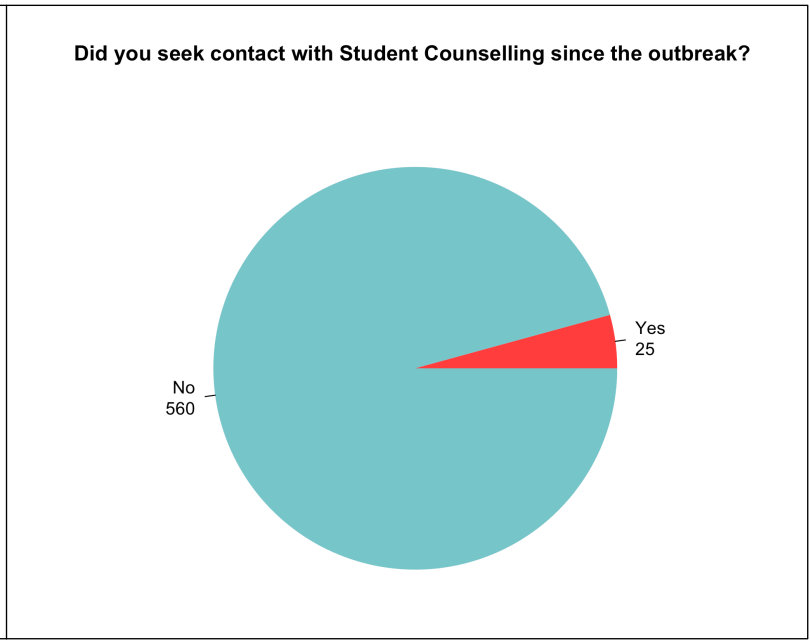


Most students, almost the 77.9%, mentioned that the contact capacity with the teaching staff concerning psychosocial problems is not applicable during COVID period and regarding to the study worries, the 56.4% are of the same opinion. In the contrary, the percentage of the students that had more or much more contact with them about psychosocial problems was 4.4% while for study worries the 13%. The ones that had the same contact about study worries are the 16.2% and 8.7% otherwise. At last those who had less or much less contact, consist the 8.8% for psychosocial problems and the 14.3% for issues that are related to the study worries. As concerns the majority, the contact was not applicable.

In the next figure (23), the reasons for seeking contact with the student counselling or social services of the university or the college are presented and besides the students have answered also whether or not they seek contact since the outbreak of the virus.

Figure 23: Reasons for seeking contact with student counselling/social services





The reasons for seeking contact was for financial worries , psychological problems and study worries almost with equally percentages from 17.7% as concerns the psychological problems to 20.6% regarding to study worries, besides there are many students that did not want to mention the reason and others students that their motives of seeking contact were not included in the choices. Nevertheless, after the breakout of the virus, only 25 students searched for contact with the social services, this percentages constitutes the 4.2%.

3. Depression scores

A self-reported depression will be considered as the depression that is created by the qualification of eight other variables according to the Centre of Epidemiological Studies – Depression (CES-D). Those variables are the ones that have been mentioned before, more specifically, depression, happiness, loneliness, sadness, the feeling that everything a person did was an effort, the sense that they enjoy life, the restless sleep and the idea that they cannot get going. CES-D (depression) is not a clinical, but a screening tool as it is not consisted of all the variables that have an impact on the clinical depression (Stathopoulou, et.al, 2018 a). Nevertheless, it is a very accurate measure to identify the persons that are at risk of developing depression. To construct this measure the eight variables mentioned before are used, as frequencies of occurrence. There are four frequencies referring to the week before the research. The frequencies are “never or almost never”, “sometimes”, “most of the time”, “always or almost always”. Furthermore, the items are recoded with a range from zero to three. Two out of eight variables declare positive feelings, so the encoding was reversed from three to zero. As a result, there is the creation of a new 24 point scaled variable, which is the summarize of the eight items mentioned before. High scores of this variable, suggest that the person suffers from serious sings of depression, namely scores higher than 10 indicate high risk.

Next step is to estimate if there is a relation between the new scaled variable of depression with the rest of our variables starting with the numeric ones. Correlation between sets of data is a measure of how well they are related. The most common measure of correlation in statistics is the Pearson Correlation. The full name is the Pearson Product Moment Correlation (PPMC). It shows the linear relationship between two sets of data. The estimations of this measure are presented below.

Table 5 : Pearson correlation coefficient of continues variables

Pairs of Variables	*P-value*
Depression-Age	0.813
Depression- Number of Person Live tog Before COVID	0.781
Depression- Number of Persons Live tog During COVID	0.846
Depression- Number Alcohol Glasses Before COVID	0.163
Depression- Number of Alcohol Glasses During COVID	0.230
Depression- Number of Cigarettes During COVID	0.000
Depression- Number of Cigarettes Before COVID	0.010
Depression- Worry of infection	0.000

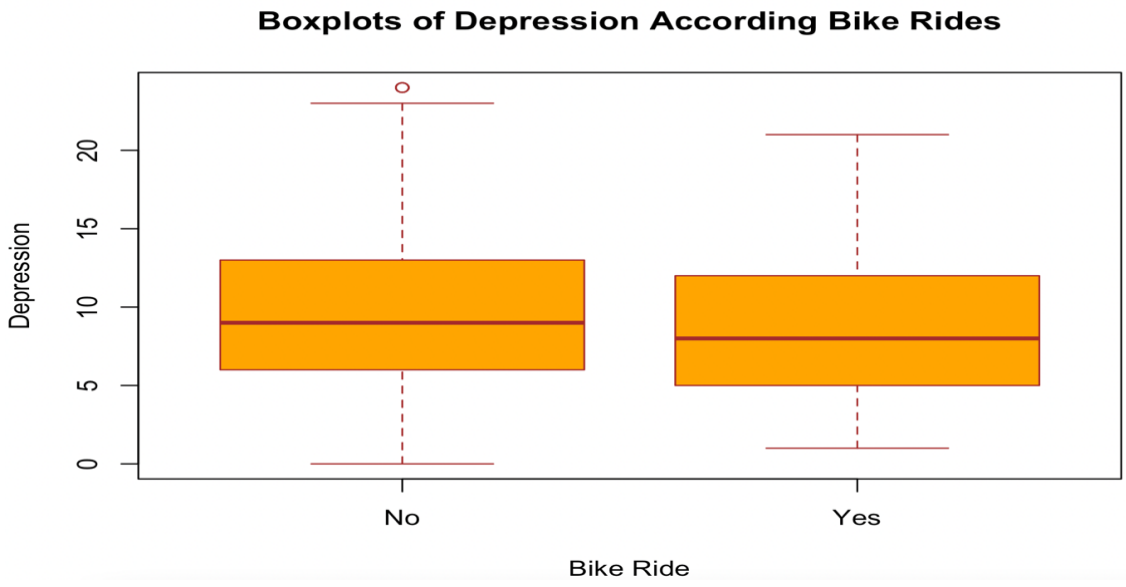
Perceptible is the fact that only three variables seem to have linear correlation with the variable depression. Those three are the number of cigarettes before and during COVID restrictions measures and the worry of someone getting infected by the virus. Since the rest p values of the variables are bigger than a=0.05, the null hypothesis that the correlation is zero is not rejected. Generally, the closer the value of the coefficient (r) to the absolute unit, the stronger the correlation is. Subsequently, the relation between the depression and the variables that are categorical will be examined. The tests that are going to be used in order to evaluate the relations is the ANOVA test for categorical variables with many levels, provided that its assumptions are fulfilled. The assumptions are two. Firstly, the experimental errors of data should be normally distributed and secondly their variances should be equal. Alternatively, a none-parametric test will be used that is Kruskal Wallis Test. One difference between those two tests is that Kruskal Wallis, tests the medians of the groups and not the means. Additionally, if it is about categorical variables with two levels, then a t test will be used with equals or not equal variances. In table 6 , results of those tests can inform us about the relations.

Table 6 : Results of t-test , ANOVA & Kruskal Wallis tests

Pairs of Variables	Test	Results
Depression- Gender	T-test	p-value = 0.07
Depression-Walk	T-test	p-value = 0.67
Depression-Bike Ride	T test	p-value = 0.01
Depression-Smoking Tobacco During COVID	ANOVA	p-value = 0.00
Depression-Personal Study During COVID	ANOVA	p-value = 0.44
Depression-Drinks Occasionally During COVID	ANOVA	p-value = 0.22
Depression-Moderate Physical Activities During COVID	Kruskal W	p-value= 0.35

It is noticeable that only two variables seem to have significant difference among the levels as concerns the depression. Those variables are the smoking during COVID and the bike rides, since the p value of the test is smaller than a=0.05, so the null hypothesis of equal means among the levels of the categorical variable is rejected. So, it can be assumed that students that have bike rides tend to have less risk of depression. The results of variance test suggest that the hypothesis of equal variances is not rejected as the p value is equal to 0.59. Consequently, t test with equal variances was used.

Figure 24 : Box plots of Depression According to Bike Rides



As mentioned before, students that had bike rides seemed to have less risk of depression. More specifically, those who had bike rides had a mean of depression that reaches 8.6, while the ones that did not had 10.1 which is a quite significant difference.

Table 7 : Assumptions of ANOVA- test

Test	**P value**
Levene Test	0.600
Shapiro Test	0.051

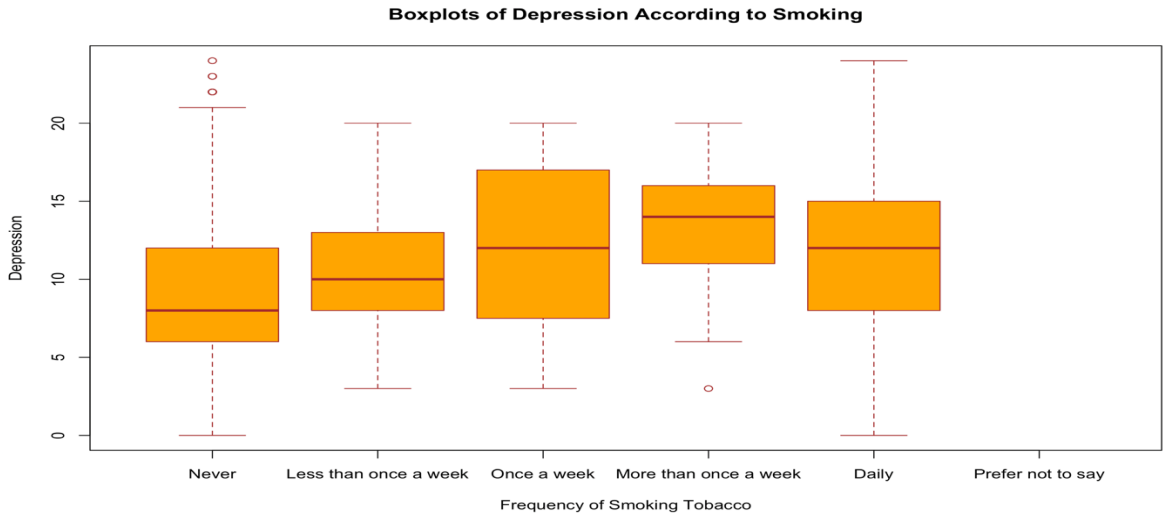
These are the results of ANOVA assumptions. As it can be seen there is no need to use a non-parametric test. To continue, to examine which levels of smoking differ, a pair wise t test should be used. The results are presented in the Table 8.

Table 8 : p values of Pairwise Depression T Test about Smoking Tobacco

	Never	**Less than once a week**	**Once a week**	**More than once a week**
Less than once a week	0.43	-	-	-
Once a week	0.06	0.03	-	-
More than once a week	0.02	0.31	0.37	-
Daily	0.1	0.89	0.87	0.24

It is concluded that the difference of the means of depression exist between the frequencies “more than once a week” and “Never” and between “Once a week” and “Less than once a week”. Students that never smoked seem to have a mean value of depression score close to 9, the ones that smoked more than once a week exactly at 13, those that smoked once a week reached the score of 17 and the those who smoked less than once a week had mean value of depression score close to 10. So, the conclusion is that those who never smoke or do not smoke often have smaller depression scores than the rest. The boxplots following, make it clearer.

Figure 25 : Boxplots of Depression According to Smoking



To have a better sense of view of the 8 – item depression, we are going to categorize it. It should be mentioned again that values over 10, indicate people at high risk of depression. It is known that most students, specifically 59.6% (349 students) are not at high risk of depression. It seems thought that the rest of the students may suffer from it or at least there are important evidence (236 students) .

Another essential point is to investigate the frequencies of the categorical variable of depression according to the other categorical variables that has proved that are not independent. This is a classic case were chi squared test is used. In the cases that expected values are less than 5, then simulated p value is going to be used.

Table 9 : Cross Table of Smoking Tobacco and Depression

	Smoking Tobacco					
Depression *Row %* *Column %*	Never	Less than once a week	Once a week	More than once a week	Daily	Row Total
(0-10]	289 84% 66%	10 3% 59%	3 1% 43%	4 1% 24%	38 11% 41%	344
(10-24]	152 66% 34%	7 3% 41%	4 2% 57%	13 6% 76%	54 23% 59%	230
Column Total	441	17	7	17	92	574
	χ^2= 29.3 p – value=0.003					

χ^2 results confirm our findings. There is a dependency between smoking and depression. There are few students that smoke daily and the 41% is not at high risk of

depression. It is noticeable though that students who never smoke and are at extremely high risk of depression, constitute the 25% of our sample. It could be said that those who never smoke have lower probability of depression. The next variable that worth to be examined combined to depression is the vigorous physical activities. Many studies have documented the positive effects of physical activity on human psychology. In fact, some have showed that in patients with depression, physical exercise was as helpful as antidepressants. Regardless of age or gender, the systematic exercise of the body contributes to better self-assessment and fewer physical and mental health problems. Stress resolves more easily after sporting activity, walking, swimming, cycling or other forms of exercise (Raglin, 2012). Exercise of the body is more effective in reducing stress than other ways of combating stress, such as relaxation techniques.

Table 10 : Cross Table of Vigorous Activities and Depression

	Vigorous Activities					
Depression *Row %* *Column %*	Never	Less than once a week	Once a week	More than once a week	Daily	Row Total
(0-10]	96 28% 52%	38 11% 54%	40 11% 56%	95 27% 66%	80 23% 70%	349
(10-24]	88 37% 48%	33 14% 46%	32 14% 44%	48 20% 34%	35 15% 20%	236
Column Total	184	71	72	143	115	585
	χ^2 = 13.3 p – value=0.01					

It is understandable that students who exercise daily or more than once a week have quite smaller percentages in the categories of depression that indicate high risk. To be more specific in the category of depression which includes the values from 10-20, the percentage of students who never have these of activities is 48%, while those who exercise more than once a week or daily is 34% and 20% respectively.

Fellowship is thought to have a great impact on the psychology of people. Friend contact especially seems to be a depended variable with depression according to the results following.

Table 11 : Cross Table of Friend Contact and Depression

	Friend Contact			
Depression *Row %* *Column %*	More	The same	Less	Row Total
(0-10]	62 18% 56%	131 38% 69%	156 45% 55%	349
(10-24]	48 20% 44%	58 25% 31%	130 55% 45%	236
Column Total	110	189	286	585
	χ^2=10.9 p-value=0.00			

Comparing the percentages of those who have more or the same friend contact with those who have less, it is observed that the column percentages of the second are quite higher in the second category of depression. Students who have less contact and have level of depression above 10, constitute the 55% which is a high percentage comparing to the other categories which have 20% and 25%.

Table 12 : Cross Table of Study Worries and Depression

	Study Worries						
Depression *Row %* *Column %*	Never	Much Less	Less	Similar	More	Much More	Row Total
(0-10]	213 61% 65%	15 4% 33%	18 5% 46%	59 17% 62%	36 10% 59%	8 2% 53%	349
(10-24]	117 50% 35%	30 13% 67%	21 9% 54%	36 15% 38%	25 11% 41%	7 3% 47%	236
Column Total	330	45	39	95	61	15	585
	χ^2= 22.11 p – value=0.001						

In this case, the row percentages that correspond to the students that had from 0 to 10 value of depression, indicate that those who never had study worries are much more. Chi squared suggests that there is a dependency and that study worries have an impact on depression. It seems that the students who don't tend to worry have smaller values of depression.

Table 13 : Cross Table of Boredom and Depression

	Boredom				
Depression *Row %* *Column %*	Never	Some Time	Most Time	All Time	Row Total
(0-10]	60 17% 61%	142 41% 77%	103 30% 59%	44 13% 34%	349
(10-24]	38 16% 39%	42 18% 23%	72 31% 41%	84 36% 66%	219
Column Total	98	184	175	128	585
	$\chi^2 =$ 57.5 p = 0.00				

From the table above, it can be assumed that the less someone feels bored the lower the values of depression are. The column percentage of the students that never felt bored and have depression values from zero to ten is 61% while the corresponding of the category all time is 34%. Even greater is the column percentage of the category some time, which is a usual answer, that reaches the 77%.

Table 14 : Cross Table of General Frustration and Depression

	Generally Frustrated				
Depression *Row %* *Column %*	Never	Some Time	Most Time	All Time	Row Total
(0-10]	148 42% 86%	143 41% 71%	42 12% 33%	16 5% 19%	349
(10-24]	25 11% 14%	58 26% 29%	86 36% 67%	67 28% 81%	219
Column Total	173	201	128	83	585
	$\chi^2 =$ 221.28 p = 0.00				

Again it seems that the less someone feels negative emotions the smaller is the risk of depression. It is observed that the majority of students who never felt frustration, more specific the 86%, have value of depression maximum till 10 while the 81% of those who felt this emotion all time had values of depression from 10 to 24 , which indicates high risk of depression. Furthermore, high-risk values of depression namely 10 and above, are the 67% of the students that belong to the category with the most time frustration.

Table 15 : Cross Table of Anxiety and Depression

	Anxious				
Depression *Row %* *Column %*	Never	Some Time	Most Time	All Time	Row Total
(0-10]	86 25% 90%	165 47% 79%	82 23% 53%	16 5% 13%	349
(10-24]	10 4% 10%	44 19% 21%	73 31% 47%	109 46% 87%	236
Column Total	96	209	155	125	585
	χ^2= 185.8 p = 0.00				

Anxiety often creates feelings that are usually confused with depression. It is a negative emotion and it could be assumed that if there is anxiety there is high risk of depression. The results in the table 15 above, inform us the expected thoughts. Most students that had been feeling anxious all the time (125 persons), had high risk of depression. The 87% of them had over 10 score of depression which is a very high percentage. On the contrary, the 90% of the students who never had this feeling had depression score under 10.

Table 16 : Cross Table of Calmness and Depression

	Calm and Peaceful				
Depression *Row %* *Column %*	Never	Some Time	Most Time	All Time	Row Total
(0-10]	22 6% 20%	146 42% 53%	139 40% 90%	42 12% 93%	349
(10-24]	89 38% 80%	128 54% 47%	16 7% 10%	3 1% 7%	236
Column Total	111	274	155	45	585
	χ^2= 157 p = 0.00				

Regarding to the positive feelings, it is obvious that the 93% of the students who feel all the time calm and peaceful have under 10 the score of depression and only the 20% of those who never feel this way have the same scores.

As it was realized before friend contact was a factor that contributed positively to the depression, now the lack of companionship is going to be examined.

Table 17 : Cross Table of " Lacked Companionship" and Depression

	Lacked Companionship				
Depression *Row %* *Column %*	Never	Some Time	Most Time	All Time	Row Total
(0-10]	119 34% 85%	126 36% 69%	82 23% 49%	22 6% 23%	349
(10-24]	21 9% 15%	56 24% 31%	84 36% 51%	75 32% 77%	236
Column Total	140	182	166	97	585
	χ^2= 106.6 p = 0.00				

In the table 17 above, chi squared results make it clear that there is a direct relation between the lack of companionship and depression. The 85% of the people who never felt the lacked of companionship had scores of depression under 10, while the 77% of the students who lacked of companionship all time had scores over 10.

Table 18 : Cross Table of Isolation and Depression

	Isolated				
Depression *Row %* *Column %*	Never	Some Time	Most Time	All Time	Row Total
(0-10]	177 51% 81%	121 35% 64%	43 12% 38%	8 2% 12%	349
(10-24]	41 17% 19%	69 29% 36%	69 29% 62%	57 24% 88%	236
Column Total	218	190	112	65	585
	χ^2= 124.8 p = 0.00				

Lastly, regarding to the isolation, the results of table 18 are something to expect. Since isolation provokes negative feelings is expected the students who never feel it not to suffer from depression. Indeed, students who never felt this way (218 persons), have depression scores under 10 and this percentages reaches the 81%, which is a very high percentage. On the contrary students who feel it all time or most time (112 and 65 students respectively), have percentages of depression scores under 10 , 12% and 38% respectively.

4.Statistical Modeling

We are interested to model the scaled variable of depression as a function of the rest variables. The first step is to evaluate the model and then make sure that the linear regression's assumptions apply. Running a first summary model with dependent the variable of depression and independent all of the other variables and then using the stepwise procedure (which keeps the variables that contribute to the lowest AIC information criterion), it is found that 52 % of the total variance is interpreted by the model, which is a very satisfying value. Examining the assumptions of the model (linearity of independent and dependent variables, independence, regularity, and residual homogeneity), it is found out that they are all applied except to linearity. Durbin Watson's test informed us that the assumption of independence of the residuals applies (p value=0.059), moreover the homogeneity also is applied (Levene's test p value = 0.52). Shapiro test rejected the hypothesis of normal distributed residuals (Shapiro test's p value= 0.00), but due to the large sample normality can be assumed. On the contrary, hypotheses of linearity is not applied. It is common for such problems to add a polynomial term of the variable in order to correct the results. After adjusting the linearity, our assumptions are checked again. The optimal and corrected model is the following.

Table 19 : Summary of the Optimum Model According to Stepwise Procedure

Coefficients	*Estimate*	*Std.Error*	*t-value*	*p-value*
Intercept	*7.86*	*0.72*	*10.9*	*0.000*
Gender	*-0.59*	*0.33*	*-1.96*	*0.07*
Mothers Education	*0.66*	*0.32*	*2.02*	*0.04*
Fathers Education	*0.68*	*0.31*	*2.22*	*0.03*
Relationship Status	*-0.81*	*0.30*	*-2.78*	*0.00*
Personal Study Time	*0.03*	*0.01*	*1.85*	*0.21*
Importance of Study	*0.81*	*0.30*	*2.80*	*0.00*
Sufficient Financial Sources	*-0.77*	*0.35*	*-2.17*	*0.03*
Symptoms	*0.81*	*0.32*	*2.50*	*0.15*
Worried about Medical Supplies	*0.11*	*0.05*	*2.06*	*0.03*
Bike Ride	*-0.89*	*0.41*	*-1.65*	*0.02*
Close Person	*1.38*	*0.48*	*-2.25*	*0.00*
Bored	*1.51*	*0.38*	*3.81*	$1.1*10^{-7}$
Generally Frustrated	*2.69*	*0.49*	*5.41*	$2.7*10^{-15}$
Anxious	*3.38*	*0.41*	*8.17*	$6.6*10^{-7}$
Calm and Peaceful	*-2.87*	*0.56*	*-5.21*	*0.00*
Lacked Companionship	*1.80*	*0.48*	*3.79*	*0.00*
Isolated	*2.44*	*0.56*	*4.25*	$2.75*10^{-5}$
Smoking Tobacco During COVID	*1.26*	*0.38*	*3.29*	*0.00*
Family Contact	*1.56*	*0.00*	*-0.25*	*0.79*
Residual Standard Error: 3.4 Multiple R^2 :0.53 Adjusted R^2:0.51 F-Statistic:31.6 p-value:< $2.2*10^{-16}$				

We observe that our model also keeps insignificant variables. This is because stepwise procedure using AIC selects the model based on the Akaike Information Criteria, not p- values. The goal is to find the model with the smallest AIC, by removing or adding variables to the scope. As a result, the 53% of the variability is explained by the model. In general, it is believed to be a very good model if it is concerned the fact that depression is explained by many more variables that are not included. This model suggests that depression is modeled by the gender of the students, the feeling of isolation, the worry of the medical supplies, boredom or calmness.

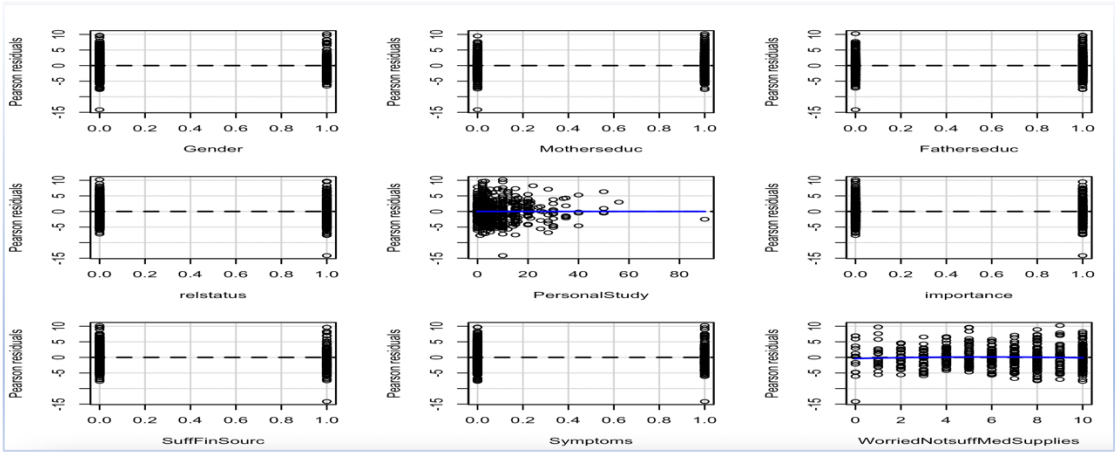
It also suggests that family contact, the number of close persons they had that time, the sense of lacked companionship and frustration have a significant impact on depression. Lastly it is thought that the frequency of smoking, the time they spend on studying and how important is for them as also the bike ride as an activity also affects the depression. Now, the corrected assumptions will be presented.

Table 20 : Linear Regression Assumptions

	P value
Levene test	0.061
Durbin Watson test	0.058
Shapiro test	0.023

Since Levene's test is an inferential statistic used to assess the equality of variances for a variable calculated for two or more groups and the null hypothesis is the equality of variances, p value as it is greater than a=0.05, suggests not to reject the homogeneity of the residuals. In statistics, the Durbin–Watson statistic is a test statistic used to detect the presence of autocorrelation at lag 1 in the residuals (prediction errors) from a regression analysis. The null hypothesis states that the autocorrelation is zero. So, since the p vale is 0.048, the null hypothesis is not rejected. The Shapiro–Wilk test is a test of normality in frequentist statistics. Here, the null hypothesis is this of normality. The p value of this test suggests rejecting the assumption of normality but since there is a great sample, normality can be assumed.

Figure 26 : Residual Plot in order to Check the assumption of linearity



In the model, exist only two numeric variables. The time of personal study and the worry that there is not enough medical supplies. Since in the residual plots the lines are completely straight, that drives to the conclusion that the assumptions of linearity between the depended and the independent continues variables exist.

Table 21 : Presentation of the Final model

Depression = *7.86-0.59*Gender+0.66*MothersEduc+0.68*FathersEduc-0.81*RelationshipStatus+0.03*PersonalStudyTime+0.81*ImportanceofStudies-0.77*SuffiecientFinancialSources+0.81*Symptoms+0.11*WorriedNotSuffMedSupplies-0.89*BikeRide+1.38*ClosePerson+1.5*Bored+2.69*GenerallyFrustrated+3.38*Anxious-2.87*CalmandPeaceful+1.80*LackedCompanionShip+2.44*Isolated+1.26*SmokingTobaccoDur+1.56*FamilyContact+e*

This model states the depression score of a specific profile of a student. Generally, it is referred to a male student whose father and mother have attended the higher education, who does not spend time on personal study during the restrictions but on the contrary believes that studies is more important than other activities and also agrees that his financial sources are enough. Moreover, thinks he may have appeared symptoms of COVID and he is not worried about the medical supplies.

Furthermore, he has no close persons to discuss his problems and he feels most time lack of companionship, frustration, boredom, isolation, anxiety but also calmness. He has bike rides, smokes daily and has less contact with his family. This kind of student is expected to have score of depression that reaches the 20. This model suggests also that if the hours of personal study time are increased by one unit, then the depression score will be increased by 0.03 and also if the scale of worry about the medical supplies is increased also by one unit the depression will be enhanced by 0.11. The variables that have negative coefficients such as gender, calmness, relationship status and sufficient financial sources reduce the depression score. More specifically, when someone reports that he feels calmness most time then the expected score of depression is lower by 2.87 from someone who does not feel that way. It is noticeable and consequence that the negative feelings as it has been ascertained before, increase sharply the score of depression such as anxiety, which adds to the score of depression 3.38 units, if someone feels this way most time.

5.Conclusions and Discussion

The new virus has provoked many changes to the everyday life and the emotions of the responders and not only. They turned to alternative ways of entertainment and workout. Moreover, it cannot be supported that the changes were for the better as the feelings in general were not positive. In conclusion the results from this research suggest that self-reported depression is influenced mostly by the emotions. Feelings just like sadness, boredom, isolation etc. can increase rapidly the depression scores, while the positive ones like calmness can reduce it. Also results show that many negative emotions had a great difference as far as the frequency, more for woman rather than man. This is the main reason why women had higher depression scores. Study difficulties and anxiety of the performance could affect the increase of the score evenly. Activities which are related to exercising such as simple walks and bike rides became daily for many students as a positive effect for their psychology. In general many habits such as smoking and alcohol consumption were not significantly influenced during the periods before and after the spread of the virus. It cannot be supported that the fear of Corona Virus infection had troubled college students even though the majority had taken serious measures. The distance everyone had taken from relatives and friends affected quite the students' mood and so for the previous reason most of them interact via phone calls and videocalls. It can be mentioned that isolation has negatively influenced the psychology and has led with some exceptions according to the gender but had no influence according to the age. Not many responders knew people who were infected, meaning that the virus by then was not spread a lot. As a result, the impact on the psychology and the depression were not caused by the fear of the specific virus, but from the isolation and the restriction measures. In this research 236 students had score over 10, which represents almost the 41% of the sample, which is a quite high percentage. Those students are in great danger of depression. In conclusion, those high scores of depression are something to expect as the daily life of people had changed for the worse in terms of freedom and communication and it is expected the emotions provoked not to be positive.

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