Spring 2022

The Effect of Student Lifestyle on Days Depressed

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Abstract

The purpose of our paper is to discover what factors about student lifestyles affect how often students experience symptoms of depression, using anonymous survey results from 96 George Fox students. We will explore if how many days a student is depressed per month might be determined by factors such as the number of hours spent in a week doing schoolwork, working, doing something enjoyable, social media usage and their housing status. We determined that our sample of 96 was representative enough of the George Fox undergraduate student population to be able to use in our regressions. Additionally, we found that our data was reasonable to use because it met the assumption criteria for linearity, homoscedasticity, and normality of errors. Through our research we ultimately found four factors that were significant in determining the number of days students are depressed per month: time doing schoolwork, time with friends, time doing something enjoyable, hours of sleep, and living on or off campus.

Disclaimer: Our paper and research does not intend to diagnose depression.

Key Words: Depression, Undergraduate student

JEL Classifications: I1, I2

Introduction

Depression, along with other mental illnesses, are an issue that all humanity hopes to overcome. Our research focuses on this issue but brings it closer to home since it will aim to measure George Fox University undergrad students' days of depression through data from a random sample of George Fox students. Having a better understanding of what factors lead to depression in students is the first step to discovering how to reduce the occurrence of depression. Even though our population of interest is small compared to the entire population that might experience depression, our population of interest still factors into the economic impact of depression. For reference, the total economic burden from depression is $210.5 billion per year (Workplace Mental Health). Additionally, depressive disorders are the sixth most costly medical condition in the United States, having $71 billion go to treatment for these disorders annually (Winerman).

According to the data that we gathered, more than 50% of students experience symptoms of depression more than five days per month. We believe that this is evidence enough that depression within George Fox's student body could use more attention. Our research aims to pinpoint what factors lead to depression so that our data might lead to potential solutions. This gives more importance to the factors that play a big role in affecting how often students feel depressed or not. Our research shows that time doing schoolwork, time with friends, time doing something enjoyable, and on or off campus housing status were key factors. On or off campus housing showed to have the largest impact on frequency of depression with off campus students being depressed less often.

Data Overview and Limitations

We accomplished our data collection through the distribution of a Google survey which asked respondents in a typical month (30 days) how many days on average do they have feelings of hopelessness, emptiness, and a lack of motivation. Therefore, this question served as a basis for our dependent variable in our regression. We believed this was the best way to measure depression since these are symptoms an individual typically has when depressed according to the Mayo Clinic. We also believe this was an accurate measure to quantify depression given that emotions can be abstract and qualitative since we often cannot determine the severity of the emotion. Our independent variables were gathered through questions where students were asked to state their sex, class standing, whether they are an athlete and if they live on or off campus. All these variables: sex, athlete or not, on/off campus, and class standing by a junior class standing being our base will serve as binary variables. We then asked students to give their best estimate on their weekly time spent with friends, working out, social media, working, doing something enjoyable and doing schoolwork measured in hours. Additional questions we asked were average sleep on a typical night and monthly expenses per month. All these questions corresponded to continuous variables, activities were measured in hours and expenses in dollars.

We distributed our survey through different avenues like: The Daily Bruin, asking friends, and having professors share it to our classes. Our collection of data may be subject to bias. For example, students who read and interact with The Daily Bruin may not represent the student body's attitude toward school involvement. Asking friends and professors to share the survey is likely to involve selection bias, as well, since both authors are business majors who are in business courses. This could lead to a lack of diversity in majors that responded to the survey. Having a majority of one academic department might not represent all of George Fox since some

majors may have a heavier or lighter curriculum. To help minimize this we also made sure to distribute the survey to avenues not affiliated with the College of Business by sharing it with those taking part in different academic departments. Since mental health and depression is such a sensitive topic, we intentionally did not give an in-depth description of what the survey was about. Our hope was to get responses from people who have a variety of attitudes about mental health, not only people who are outspoken about the topic.

To further ensure our data was credible for the use of regressions we ran several tests to confirm it met the requirements for most of the ordinary least square's assumptions. However, our regression is likely to have omitted variable bias since depression can stem from a huge number of variables. We are limited on what variables we have since we needed a relatively short survey and we wanted variables that could be affected by policy change. Things like genetics or family income are variables that were omitted but likely influence depression. For all of our regression we decided to use heteroskedasticity-robust standard errors.

Variable Name	**Type**	**Description**	**Units**
Days_Depressed	Continuous	Days in a total month of 30 days a student experiences depression	Days
social_media	Continuous	Hours in a week a student engages on social media sites	Hours per week
school_work	Continuous	Hours in a week a student spends on school related activities such as class, studying, clinicals/externships etc.	Hours per week
work	Continuous	Hours in a week a student spends working for pay. Outside of campus or work study jobs.	Hours per week
enjoyable	Continuous	Hours in a week a student spends doing something they enjoy such as a hobby.	Hours per week
with_friends	Continuous	Hours in a week a student spends quality time with friends (one person or more)	Hours per week
working_out	Continuous	Hours in a week a student spends being active/working out	Hours per week

sleep	Continuous	Hours of sleep in a typical night a student gets.	Hours per night
expenses	Continuous	Total monthly expenses a student has.	Dollars
off_campus	Binary	A student lives off campus such as in own apt/house or with family.	Base group: students living on campus
is_athelete	Binary	A student is a student athlete.	Base group: non-student athletes
Male	Binary	A student identifies as male.	Base group: Students that identify as female
Class Standing *Dclass_standing_2* *Dclass_standing_3* *Dclass_standing_4*	Binary	*Dclass_standing_2- Student is a freshman or other* *Dclass_standing_3- Student is a sophomore or other* *Dclass_standing_4- Student is a Senior or other*	Base group: students with a junior class standing

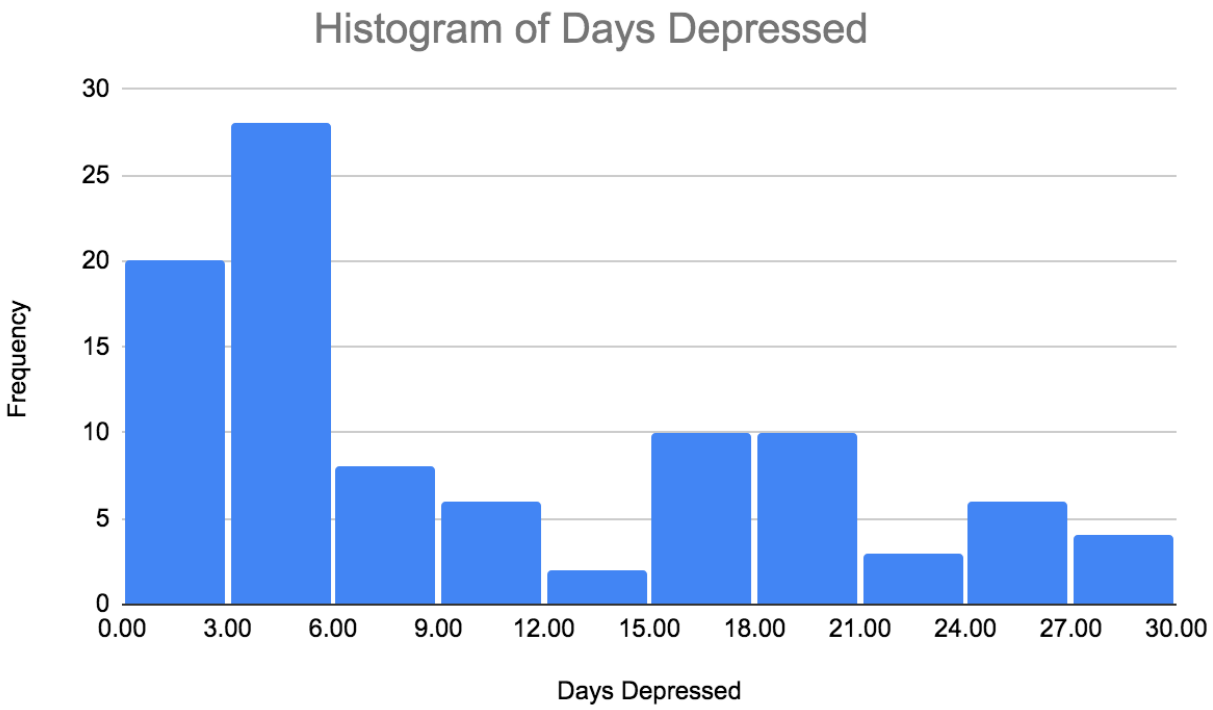
Summary Statistics

	Mean	Median	S.D.	Min	Max
social_media	12.48	10.00	8.896	0.0000	50.00
school_work	33.41	30.00	17.43	1.500	96.00
Work	8.865	8.250	9.320	0.0000	40.00
enjoyable	11.03	10.00	8.450	0.5000	48.00
with_friends	11.84	10.00	10.20	1.500	72.00
working_out	4.711	4.000	4.594	0.0000	25.00
sleep	7.042	7.000	1.104	4.000	10.00
expenses	1037	300.0	5126	0.0000	50000
Doff_campus	0.3750	0.0000	0.4867	0.0000	1.000
DAthlete	0.1354	0.0000	0.3440	0.0000	1.000
Male	0.2708	0.0000	0.4467	0.0000	1.000
Days_Depressed	9.969	6.500	8.447	1.000	29.00

Summary Statistics

For a better understanding of how often students struggle with depression, we will present some data about the responses to our dependent variable. Our survey results showed that 62.1% of respondents experience symptoms of depression 10 days or less out of the month, 24.2% between 11 and 20 days, and 13.7% are greater than 21 days. Additionally, the average number

of days depressed is 10 and the median is 7. Below is a histogram that can help visualize the responses to our dependent variable question. It is good to see that the chart is skewed to the right; however, the data on the right proves that frequent symptoms of depression are prevalent.



As mentioned, we were able to gather 96 responses from the George Fox undergrad student population. These consist of 72.2% female and 27.8% of them being male. Even though our sample does not equal the ratio of that of the population in which it is 60/40 representing both females and males our data is still suitable to use for a representation of the population since the George Fox student population has a bigger population of female students than males. The difference in population representation can be due to the fact that there is typically a higher rate of involvement in females than males according to psychologists Kelvin Seifert and Rosemary

Sutton therefore making females more likely to take our survey. Due to the larger participation of females when creating dummy variables we used females as our base group, giving a true (1) to males.

We proceeded to use our data set due to the overall good representation of class standings with 21.1% being freshman, 16.8% sophomores, 35.8% juniors and 26.3% seniors. The slightly higher numbers in junior and senior participation were due to both authors being junior and senior and having it shared with classmates and friends from those same class standings. Overall, we believed this was an accurate representation of the George Fox student body since it accounted for every class standing. With there being four class standings, our model will consist of multiple dummy variables with Juniors being our base group since they were the largest group.

Whether students were athletes was one of our dummy variables where our base group is the 86.3% of students that are not Athletes. Another dummy variable is whether students live on or off campus. Our base group was on campus students which make up 62.1% of our responses.

Methodology

Initially we determined that the regressors that would be included in our model would be all the variables that were present in our survey, both binary and continuous variables. Such model would be:

$$\begin{aligned}\boldsymbol{DaysDepressed} &= \boldsymbol{\beta_0} + \boldsymbol{\beta_1}(\boldsymbol{OffCampus}) + \boldsymbol{\beta_2}(\boldsymbol{IsAthlete}) + \boldsymbol{\beta_3}(\boldsymbol{ClassStanding}) + \boldsymbol{\beta_4}(\boldsymbol{Sex}) \\ &+ \boldsymbol{\beta_5}(\boldsymbol{WithFriends}) + \boldsymbol{\beta_6}(\boldsymbol{Sleep}) + \boldsymbol{\beta_7}(\boldsymbol{SocialMedia}) + \boldsymbol{\beta_8}(\boldsymbol{WorkingOut}) \\ &+ \boldsymbol{\beta_9}(\boldsymbol{Expenses}) + \boldsymbol{\beta_{10}}(\boldsymbol{SchoolWork}) + \boldsymbol{\beta_{11}}(\boldsymbol{Enjoyable})\end{aligned}$$

To be able to understand how our regressors fit our model we created scatter plots on how our continuous variables like weekly time spent with friends, schoolwork, working, doing something enjoyable, working out, sleep and social media usage affected our outcome variable; monthly days depressed. For example, as the time spent on schoolwork increased, days depressed also increased having a positive relationship. Other positive relationships included time spent on social media. Regressors that have a negative relationship to days depressed were time spent with friends and doing something enjoyable. As time spent with friends increased the number of days depressed decreased.

Even though we found certain regressors to be positively and negatively correlated with our outcome variable, we also discovered that there was no relationship with regressors such as working out and monthly expenses. We were able to also run practice regressions, further proving that working out and monthly expenses did not have any effect on days depressed since neither showed to be statistically significant at any level in all regressions. In these regressions we also included dummy variables that also showed to not be statistically significant, such as a student's class standing and sex. Due to there not being a relationship in class standing, sex, working out and expenses we revised our model to:

$$\boldsymbol{DaysDepressed} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1}(\boldsymbol{OffCampus}) + \boldsymbol{\beta_2}(\boldsymbol{IsAthlete}) + \boldsymbol{\beta_3}(\boldsymbol{WithFriends}) + \boldsymbol{\beta_4}(\boldsymbol{Sleep}) + \boldsymbol{\beta_5}(\boldsymbol{SocialMedia}) + \boldsymbol{\beta_6}(\boldsymbol{SchoolWork}) + \boldsymbol{\beta_7}(\boldsymbol{Enjoyable})$$

We further examined the relationships of our regressions to the outcome variable. We made the decision to take the natural logs of some of the regressors to best fit our model. This was due to the data presented from the variables: to be highly skewed. To completely validate our data when it came to these regressors we created logs for time with friends, sleep,

schoolwork and doing something enjoyable. Doing this allowed us to take better control of our data because by creating logs it transformed the datasets into a more normal distribution. Creating a level-log model made our regressors show more statistically significant results and changed our interpretation into percentage change. Our level-log model would be represented as:

$$\boldsymbol{DaysDepressed} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1}(\boldsymbol{OffCampus}) + \boldsymbol{\beta_2}(\boldsymbol{IsAthlete}) + \boldsymbol{\beta_3}(\ln \boldsymbol{WithFriends}) + \boldsymbol{\beta_4}(\ln \boldsymbol{Sleep}) + \boldsymbol{\beta_5}(\boldsymbol{SocialMedia}) + \boldsymbol{\beta_6}(\ln \boldsymbol{SchoolWork}) + \boldsymbol{\beta_7}(\ln \boldsymbol{Enjoyable})$$

Results and Interpretation

All regressions we ran contained off campus as a regressor since it had a large coefficient that was always statistically significant. There is an interpretation of its effect within the explanation of the first regression. Interpreting its effects will be virtually the same for every regression with only the magnitude of its coefficient changing slightly. Each regression uses all 96 responses; therefore, our n is equal to 96. Multiple regression results for the data gathered from George Fox students are presented in the table below.

Multiple Regression Estimates of Lifestyle and Days Depressed					
Regressor	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
off_campus	-6.746*** (.0000)	-6.730*** (.0000)	-5.645*** (.0000)	−6.550*** (.0000)	-6.806*** (.0000)
school_work				0.181*** (.001)	
ln_school_work	4.766*** (.0000)		3.765*** (.0002)		
with_friends				-.422** (.174)	
ln_with_friends	-2.796*** (.006)				
sq_with _friends				.005** (.002)	
ln_enjoyable			-2.701** (.015)		
sleep					-1.867** (.024)
ln_sleep	-10.484** (0.034)				
Social Media			.183* (.066)		
is_athlete		-4.556** (.036)			
R^2	0.386	0.168	0.327	0.314	0.193
Intercept	23.163** (.023)	13.109*** (.0000)	3.041 (.356)	10.336*** (.0002)	25.671*** (.0000)

Our first regression is as follows:

$$\boldsymbol{DaysDepressed}(\mathbf{1}) = \underset{(.023)}{\mathbf{23.163}} - \underset{(.000)}{\mathbf{6.746}}(\boldsymbol{OffCampus}) - \underset{(.006)}{\mathbf{2.796}}(\ln \boldsymbol{WithFriends})$$
$$\underset{(.034).}{-\mathbf{10.484}}(\ln \boldsymbol{Sleep}) + \underset{(.000)}{\mathbf{4.766}}(\ln \boldsymbol{SchoolWork})$$

It uses three independent variables, the first is the dummy variable *off _campus* where one means they live off campus and zero means they live on campus. The second variable is *ln_school_work* which is the log of hours spent on schoolwork per week and the third is *ln_with_friends* which is the log of hours spent with friends per week. The coefficient of off

campus suggests that on average, living off campus is correlated to a reduction in days depressed by 6.8 per month, ceteris paribus. The coefficient for *ln_school_work* suggests that on average, a one percent increase in time spent on school per week is correlated with an increase in about .05 days depressed per month. This coefficient is small but so is a one percent increase in time. For example, if you go from 10 to 11 hours of schoolwork that is a 10% increase which correlates to a half day of depression increase per month, or six days per year. *Ln_with_friends* has a very similar interaction. An increase of time spent with friends by one percent in a week is correlated with a decrease in days depressed by about .03 days per month. Additionally, a 10% increase in time with friends is correlated with a decrease in a little more than three days out of the year. Using the same logic for *ln_sleep*, a 10% increase in time sleeping is correlated with a decrease in about 12.5 days with symptoms of depression out of the year. Lastly this regression had an R^2 of .386 which was the largest of our regressions and is larger than what was expected considering how many things can cause depression.

DaysDepressed(1)	
Regressor	**Coefficient**
off_campus	-6.746*** (.0000)
ln_school_work	4.766*** (.0000)
ln_with_friends	-2.796*** (.006)
ln_sleep	-10.484** (.034)
R^2	0.386
Intercept	23.163** (.023)

Our second regression is:

$$\boldsymbol{DaysDepressed}(2) = \mathbf{13.109} - \mathbf{6.730}(\boldsymbol{OffCampus}) - \mathbf{4.556}(\boldsymbol{IsAthlete})$$
(.000). (.000) (.036)

This regression looks at the effects of our most significant dummy variables; if a student lives off campus and if they are an athlete. The regressor, *is_athlete* is correlated with a decrease of days depressed by about 4.5 days per month for students that are athletes. For this regression the intercept is 13.109 which represents the number of days depressed for someone who is on campus and not an athlete, also known as the base group. Both regressors will shift this average for the different groups by the magnitude of the coefficient. For example, the average for an off-campus athlete is 1.823, i.e. (13.109 - 6.73 - 4.556 = 1.823). The R^2 for this regression is a bit smaller but that is to be expected considering this regression only considers two factors.

DaysDepressed(2)	
Regressor	**Coefficient**
off_campus	-6.730*** (.0000)
is_athlete	-4.556** (.036)
R^2	0.168
Intercept	13.109*** (.0000)

$$\boldsymbol{DaysDepressed}(3) = \mathbf{3.041} - \mathbf{5.645}(\boldsymbol{OffCampus}) + \mathbf{3.765}(\ln \boldsymbol{SchoolWork})$$
(.356) (.000). (.0002)
$$-\mathbf{2.701}(\ln \boldsymbol{Enjoyable}) + \mathbf{.183}(\boldsymbol{SocialMedia})$$
(.015) (.066)

Our third regression is like the first one in that it uses the log of regressors, but it differs because it adds *social_media*. This regressor *social_media* suggests that for every increase of one

hour spent on social media is correlated with an increase in .183 days in a month depressed. This is small, but if you consider a 10-hour change in time spent on social media, it will be an increase in days depressed by 1.8 per month or 22.0 per year. It is interesting to see that in this regression, the coefficient for *off_campus* decreased by close to one day. Seeing this effect of social media is both practically and economically significant. It is generally understood that social media can take a toll on one's mental health. In fact, McLean Hospital explains that social media has the potential to harm a person's mental health as well as their physical health. This is because social media has a direct impact on the quality and quantity of sleep a person gets, and a lack of sleep is associated with poor mental and physical health (The Social Dilemma). Therefore, the effect of social media has economic significance in both the cost of treatment and the loss of time spent doing something economically productive.

DaysDepressed(3)	
Regressor	**Coefficient**
off_campus	-5.645*** (.0000)
ln_school_work	3.765*** (.0002)
ln_enjoyable	-2.701** (.015)
social_media	.183* (.066)
R^2	0.327
Intercept	3.041 (.356)

$$\underset{(.0002).}{\boldsymbol{DaysDepressed(4) = 10.336}} \underset{(.000).}{\boldsymbol{-6.55(OffCampus)}} \underset{(.001)}{\boldsymbol{+.181(SchoolWork)}}$$

$$\underset{(.174).}{\boldsymbol{-.422(WithFriends)}} \underset{(.002)}{\boldsymbol{+.005(SqWithFriends)}}$$

Our fourth regression uses *off_campus* just like the other regressions. It also uses *school_work* which is hours spent on school related work per week as well as *with_friends* and *sq_with_friends* this is time spent with friends per week and the square of that. *School_work* suggests that an increase of one hour per week spent on school is correlated with an increase in days depressed in a month of .181. If we translate this to days per year it will be an increase of 2.172 days for an increase of one hour spent on schoolwork per week. Therefore, an increase in time spent on school per week by 10 hours is correlated with an increase in 22.8 days of depression per year, this seems more practical than in regression one. *with_friends* is negatively correlated with days depressed, it also has a diminishing effect due to *sq_with_friends*. For an hour increase in time with friends, days depressed is decreased by (.422 - .005*$hours^2$) days. Therefore, an increase in time spent with friends per week from 4 to 5 is correlated with a decrease of .387 days depressed per month, but an increase from 15 to 16 would result in a smaller decrease of .255 days per month.

DaysDepressed(4)	
Regressor	**Coefficient**
off_campus	-6.550*** (.0000)
school_work	.181*** (.001)
with_friends	-.422** (.174)
sq_with_friends	.005** (.002)
R^2	0.314
Intercept	10.336*** (.0002)

$$\underset{(.000).}{\boldsymbol{DaysDepressed(5) = 25.671}} \underset{(.000)}{\boldsymbol{- 6.806(OffCampus)}} \underset{(.024)}{\boldsymbol{- 1.867(Sleep)}}$$

For our last regression we can see the effect that sleep has on the number of days students experience symptoms of depression. The coefficient for sleep is the greatest among our continuous independent variables, being -1.867. Therefore, an increase in one hour of sleep per night is correlated with a decrease in 1.867 days of depression per month. The National Sleep Foundation states that young adults, ages 18 to 25, should get seven to nine hours of sleep per night (Suni). According to our survey results, George Fox students are on the low end of this range with an average of seven hours of sleep a night, so it makes sense that an increase in time sleeping benefits our students. These results are proof that sleep really is important for wellbeing, specifically in overcoming symptoms of depression.

DaysDepressed(5)	
Regressor	**Coefficient**
off_campus	-6.806*** (.0000)
sleep	-1.867** (.024)
R^2	0.193
Intercept	25.671*** (.0000)

Conclusion

Our paper sought out to determine how the hours spent on schoolwork, with friends, doing something enjoyable, sleep, and social media affected a student's depression days per month while comparing if they live on/off campus and if they are an athlete or not. While we do understand some of the factors affecting depression may be out of our control like having a history of family with depression and trauma, we intended to find key factors that would help the George Fox administration to understand what aspects of a student's life might be influencing their mental wellbeing in efforts to better serve their students. As a Christian institution we are

highly encouraged to help our neighbors. That is why our findings are not only aimed at the George Fox administration but also towards the students. Students can use this information to better understand and support their peers and themselves. Additionally, we do take into consideration how some of the factors in our model can only be managed and controlled to a certain extent like schoolwork. Even though these cannot be eliminated, the institution and students can use this knowledge to better support students with depression.

As previously discussed in each our regressions a student's housing status showed to have the greatest impact, showing how students living off campus tend to be less depressed than those who live in on-campus housing. We recommend that the George Fox Housing department should work in collaboration with the Health and Counseling Center, to create more dialogue on mental health issues and to make resources more accessible. We also encourage Residential Assistants to be trained on the topic since they are generally the first point of contact for on-campus students. Currently they are only "briefly" (current GFU RA) trained. Bringing in professionals for in-depth training would be beneficial for students living on campus, and for RA's to be equipped when dealing with depression in students. George Fox could also re-evaluate the on-campus housing requirements for freshmen and consider that it might not be the best fit for all incoming students.

For George Fox students we encourage them to focus their attention on spending more quality time with their friends. Reaching out to friends and doing something both individuals enjoy can help in strengthening a friendship and each person's mental wellbeing. Being cautious about hours sleep, and hours on social media is something else we encourage students to be aware of. Lastly, we encourage students, faculty, and administration to be open about the topic of mental health.

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