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General

# Assessing the Impact of Technology Use, Social Engagement, Emotional Regulation, and Sleep Quality Among Undergraduate Students in Jordan: Examining the Mediating Effect of Perceived and Academic Stress

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The quality of sleep is affected by several psychological factors. University students experience different types of stress and develop various strategies to cope with it. This study assesses the impact of technology use, social engagement, emotional regulation, and sleep quality among undergraduate students in Jordan, while examining the mediating effect of perceived and academic stress. A convenience sample of 308 undergraduate students was selected from the University of Jordan. The results indicated that the study model was fit, with significant direct negative impacts of social engagement, time management, and emotional regulation on perceived stress. Additionally, there was a significant direct negative relationship between technology use, time management, and emotional regulation on academic stress. The results show indirect significant standardized effects of social engagement, time management, and emotional regulation on the quality of sleep through the mediation of perceived stress.

Research has consistently shown that university students often exhibit shorter sleep durations and more irregular sleep patterns. Researcher[1] found that 34.2% of women and 22.2% of men among a sample of over 50,000 university students experienced insomnia, with a 7.9% increase in sleep problems between 2010-2018. A global study by[2] revealed that 21% of university students slept less than 7 hours a night. Another research[3] also found that most adolescents have trouble adjusting their sleep patterns and wake up multiple times after sleeping, which negatively affects school attendance. Furthermore study[4] found that up to 60% of college students experience poor sleep, and 7.7% of them meet the criteria for an insomnia disorder. Additionally,[5,6] it was found that 50% of college students reported feeling sleepy during the day and 70% slept insufficiently.

Sleep is essential in personal well-being and recovery from everyday fatigue and exhaustion. The quality and patterns of sleep are determinants based on individual's mental and physical health across the lifespan. Poor sleep quality can affect susceptibility to psychiatric issues such as anxiety, poor emotional regulation, and negative perceptions of neutral stimuli, in addition to undesirable mental health outcomes including elevated negative mood states, aggression, irritability, and emotional reactivity towards different stimuli.[7,8] Furthermore, another research[9] found that 60% of college students were poor-quality sleepers and reported more health problems in physical and psychological levels than good-quality sleepers. Some studies have linked poor quality of sleep to factors such as greater daytime dysfunction, sleep-enhancing medication use, and some specific mental disorders like depression and anxiety[10,11]

Research results have also shown that technology use can negatively impact sleep quality. A group of researchers[12] found that increased use of electronic devices at night was a factor that predicts poor sleep quality and increased insomnia symptoms. Moreover,[13] it was found that excessive levels of technology use during the day were associated with longer latency of sleep onset and shorter total sleep duration at night. Furthermore,[14] it was concluded that the blue light emitted by electronic devices can suppress the amount of produced melatonin and disrupt circadian rhythms, leading to insomnia and other sleep disorders.

Furthermore, it seems that university students and adolescents are major consumers of technology.[15] Electronic devices have also considered as important predictor of increased risk of short line of sleep duration, long sleep onset latency, and increased sleep deficiency.[16] A study of 1040 college students by[17] revealed that poor sleepers have a 2.03 times higher chance of being internet overuses and a 3.25 higher chance of being internet addicts. Similarly, another study[18] found a valuable association between inter-

net overuse and poor sleep quality in students at medical school. Other studies have focused on mobile phone use and sleep quality, in addition to other factors like the number of devices in the bedroom, and internet usage.[12,19,20]These issues are particularly exacerbated by the addictive qualities of technological tools, which make it harder for people to keep them away when it's time for bed.[15] Additionally, exposure to blue light from technology screens before bedtime can suppress melatonin production, the hormone produced by the brain at night to regulate the sleep cycle, resulting in lower melatonin levels and leading to disturbances in sleep pattern[21]

Emotional regulation can also affect sleep habits, behaviors, and attitudes that contribute to poor sleep quality. A study[22] have highlighted the mediating role of emotional regulation between sleep and mental health related disorders. A correlation was found by other studies between poor sleep quality and negative emotions, aligned with lower emotional regulation.[23] Sleep deprivation also negatively impacts emotional regulation by affecting brain regions which cause higher reward-seeking behaviors, emotional disinhibition, and increased responses to negative stimuli.[24]Review has also found that sleep deprivation leads to changes in brain regions such as the amygdala and the anterior cingulate cortex, resulting in increased emotional reactivity and negative mood.[25] A meta-analysis result[26]found that sleep deprivation has a greater impact on mood than on cognitive or behavioral performance. Another research[27] that studied adults population found that 24-hour sleep deprivation significantly impacted distraction and regulatory reappraisal abilities among habitually good sleepers, but not among habitually poor sleepers.

Time management skills and sleep quality is not well-examined in the literature; however, research suggests that insufficient skills in time management can interfere with poor sleep quality. Studies have found that poor time management is associated with lower academic performance and higher stress levels.[28] One study specifically concludes that a time management training program that was provided to women with premenopausal syndrome significantly improved sleep quality and decreased anxiety and depression.[12] Additionally, patients with sleep disorders tend to have poor time management skills.[1] Emotional regulation skills also can help in developing good time management skills.[29] As students transition from high school to university, they face greater time management challenges although they obtain more control over their time.

Studies have consistently shown that high-stress levels negatively impact students' health and sleep quality. For example, in a study conducted on[9] college students, 24% of the variance in disturbed sleep was attributed to tension and stress. Similar findings were also reported in other university populations,.[30,31] Additionally, a study[32] found that among a sample of 225 university students, 79.82% reported insomnia as a symptom of stress, which was the second most reported symptom after binge eating. The relationship between sleep quality and stress is mediated by several factors, such as academic performance. Poor sleep quality negatively impacts academic performance[5]

One coping mechanism for stress is participating in different supportive social activities or engagement and developing a social network. Research has shown that positive social interactions are correlated with improved sleep quality, while negative social interactions are correlated with low sleep quality.[33] Another research[34]found that poor social support correlates with poor sleep quality among university students, and similar findings have been reported in other populations such as adolescents, older adults, and the elderly.[34-36] Moreover,[35] it was found that social support can moderate sleep quality and duration among adolescents, particularly during high-stress periods. Another research[37] conducted a three-year longitudinal study of university students, demonstrated a bidirectional relationship between sleep problems and social ties, mediated by emotional regulation. They found that higher sleep quality led to improved emotional regulation, which in turn led to more positive social ties and improved emotional regulation, ultimately leading to better sleep quality.

Previous literature has consistently shown that university students often exhibit shorter sleep durations and more irregular sleep patterns. Research has also shown that university students often have poor sleep quality, which can lead to increased susceptibility to mental health issues such as anxiety and depression. The use of technology would cause sleep disturbances. Emotional regulation skills play a role in regulating sleep habits, behaviors, and attitudes that contribute to poor sleep quality. Furthermore, poor time management skills and stress can have a negative impact on mental health and negatively impact sleep quality. Therefore, this study aims to assess the impact of technology use, social engagement, emotional regulation, and sleep quality by examining the mediating effect of perceived and academic stress.

The literature highlights the combined influence of many social and psychological factors, including self-regulation, on the sleep quality of university students. Technology use, poor emotional regulation and poor time management skills can indirectly affect sleep quality through the mediating effects of stress. Therefore, the current study will focus on answering two research questions:

1. What is the direct effect of technology use, social engagement, emotional regulation, and self-regulation on perceived and academic stress?
2. What is the indirect effect of technology use, social engagement, emotional regulation, and self-regulation on sleep quality through the mediation of perceived and academic stress?

## RESEARCH METHOD

### PARTICIPANTS

A sample of 308 undergraduate students from the University of Jordan was selected from a general elective course, such as "Introduction to Psychology," during the first semester of the 2020-2021 academic year. The sample was chosen through convenience sampling, which only included students who were enrolled in the elective course and did not take into consideration the college they were studying

in. The study sample consisted of 83.1% females from various academic years, with 44.8% being in their first year, 17.9%in their second year, 20.8%in their third year, and16.6%in their fourth year. The average age of the student participants was 20.1, with a standard deviation of 1.88.

INSTRUMENTS

Seven questionnaires were used to measure sleep quality, technology use, perceived stress, social involvement, self-regulation, academic stress, and time management.

*THE SLEEP QUALITY SCALE*

Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI).[38] The PSQI comprised nine items that evaluate sleep-related behaviors during the most recent month. The first four items are open-ended questions inquiring about sleep habits. Items 5, 6, and 7 use a 4-point scale that ranges from '3 or more times per week' (4 points), 'once or twice per week' (3 points), 'once a month (2 points), and 'never during the past month (1 point) to measure sleep-related issues. Item 8 measures the level of self-motivation in task performance using a 4-point scale that ranges from 'Severely' (4 points), 'Moderately' (3 points), 'Slightly' (2 points), or 'Not at all' (1 point). Similarly, item 9 evaluates general sleep quality using a 4-point scale, ranging from 'Very bad' (4 points), 'Bad' (3 points), 'Acceptable' (2 points), and 'Good' (1 point). The item-total correlation between the item and the total score ranged from 0.34-0.67, showing the scale's reasonable internal validity. Also, the Alpha Cronbach reliability coefficient for the scale is 0.82.

*THE TECHNOLOGY USE SCALE*

The authors developed the Technology Use Scale. It includes 18 items that measure behaviors related to electronic device use; items examples (I browse websites using my mobile phone, I record videos using your mobile phone; items); items are "rated on a 5-point scale ranging from 'Very often' (5 points), 'Often' (4 points), 'Moderately' (3 points), 'Rarely' (2 points), and 'Very rarely' (1 point)". Thus, the overall score ranges from 18-90 points, where a higher score indicates a higher degree of technology utilization and dependence. Cronbach's alpha was 0.90.

*THE PERCEIVED STRESS SCALE*

The *Perceived Stress Scale* (PSS)[39] includes ten items that measure symptoms of perceived stress; items example (during the past month, how many times have you felt nervous and stressed, during the past month, how often have you felt in control of the events that upset you), items are rated on a 5-point scale ranging from 'Always' (5 points), 'Often' (4 points), 'Sometimes' (3 points), 'Rarely' (2 points), and 'Never' (1 point). Thus, the overall score ranges from 10-50 points, where a higher score indicates higher levels of perceived stress. The PSS was translated into Arabic for this study by the authors, who have language proficiency in both Arabic and English and professional expertise in psychometrics scales transition and development. The scale reliability in the original version was 0.90. In the current study, Cronbach's alpha was 0.79.

*THE SOCIAL INVOLVEMENT SCALE*

The authors developed the Social Involvement Scale. It includes ten items that measure various social behaviors practiced weekly; items examples (providing help and support to friends or a family member, carrying out activities with social organizations); items are rated on a 5-point scale ranging from 'Always' (5 points), 'Often' (4 points), 'Sometimes' (3 points), 'Rarely' (2 points), and 'Never' (1 point). Thus, the overall score ranges from 10-50 points, where a higher score indicates a greater level of social engagement, and in the complying study, Cronbach's alpha was 0.81.

*THE SELF-REGULATION SCALE*

The Self-Regulation Scale, this scale was developed by the authors. This scale includes 12 items that measure various indicators of emotional regulation competencies; items example (When I am upset (annoyed), I find it difficult to get things done, When I'm upset, I take time to know what I'm feeling ); items are rated on a 5-point scale ranging from 'Always' (5 points), 'Often' (4 points), 'Sometimes' (3 points), 'Rarely' (2 points), and 'Never' (1 point). Thus, the overall score ranges from 12-60 points, where a higher score indicates lower levels of self-regulation abilities. Cronbach's alpha was 0.89.

*THE ACADEMIC STRESS SCALE*

The *authors developed the Academic Stress Scale*. It includes 11 items that measure various indicators of academic stress; items example (I feel much pressure in my daily study schedule, I feel I have much homework); items are rated on a 5-point scale ranging from 'Always' (5 points), 'Often' (4 points), 'Sometimes' (3 points), 'Rarely' (2 points), and 'Never' (1 point). Thus, the overall score ranges from 11-55 points, where a higher score indicates higher levels of academic stress. Cronbach's alpha was .79.

*THE TIME MANAGEMENT SCALE*

The *Time Management Scale* was developed by the authors and consists of 11 items that measure various indicators of time management skills; items example (I plan daily tasks, I make a schedule of the activities I intend to do); items are rated on a 5-point scale ranging from 'Always' (5 points), 'Often' (4 points), 'Sometimes' (3 points), 'Rarely' (2 points), and 'Never' (1 point). Thus, the overall score ranges from 11-55 points, where a higher score indicates higher levels of time management skills. In the current study, Cronbach's alpha was .88.

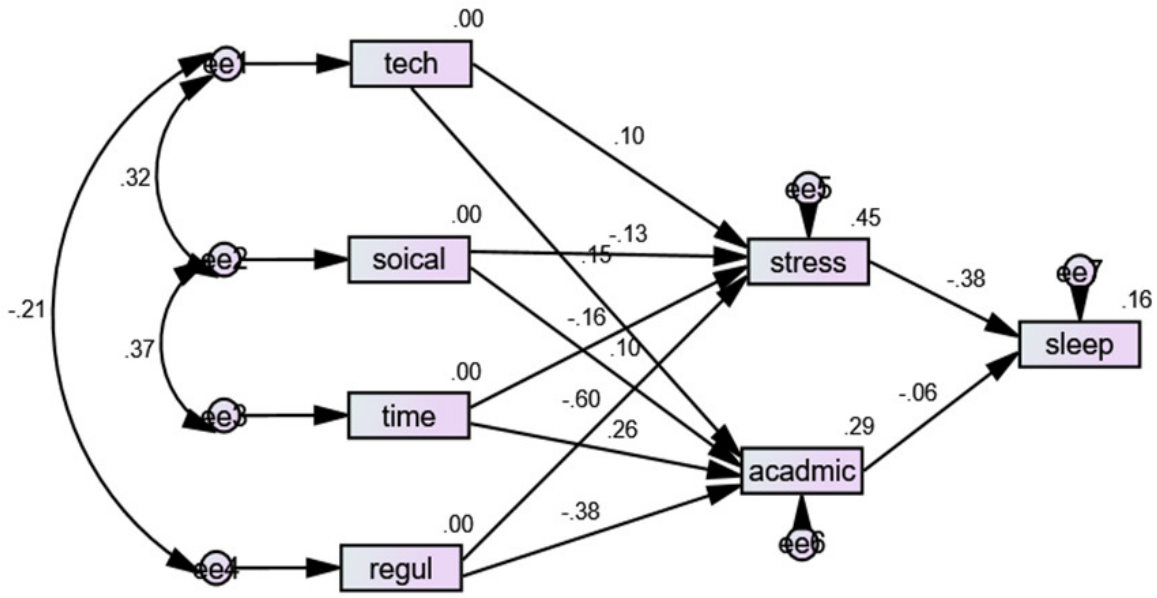


**Figure 1. Path analysis for the study variables**

DATA ANALYSIS

Ethical approval by an IRB for the current study was obtained from the University of Jordan's ethical research committee. "Participants were informed of the study's objectives, and informed written consent was obtained from them. They were free to withdraw from the study at any stage; their information was kept confidential and used for research purposes only.

Data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS), Version25.0. In addition, the structural equation model was analyzed using SPSS AMOS version 25.0. The Estimand plugin was used to find the statistical significance of the indirect path coefficients.

## RESULTS

The proposed study model reveals that technology use, social engagement, time management and emotional regulation directly impact perceived academic stress. Moreover, perceived stress and academic stress have a direct impact on sleep quality. Technology use, social engagement, time management and emotional regulation also impact sleep quality indirectly through perceived stress and academic stress. The path analysis was used to examine the proposed study model using Amos v.25.0 (See Figure 1). Pearson's product-moment correlation coefficients were also calculated between independent, moderator and dependent variables.

Pearson correlation analyses were used to examine the bivariate correlations among the proposed model variables. Correlations between technology use, social engagement, emotional regulation, perceived stress, academic stress, and quality of sleep were as follows ($r$ = 0.354, $p \leqslant 0.05$; $r$ = -.237, $p \leqslant 0.05$; $r$ = .186, $p \leqslant 0.05$; $r$ = .281, $p \leqslant 0.05$). The relationship between social engagement, time management and academic stress was ($r$ = 0.381, $p \leqslant 0.05$; $r$ = -.287, $p \leqslant 0.05$). The correlation between time management with perceived stress and academic stress are ($r$ = -.162, $p \leqslant 0.05$, and $r$ = .287, $p \leqslant 0.05$). The relationship between self-regulation and perceived stress, academic stress and quality of sleep was ($r$ = -.608, $p \leqslant 0.05$; $r$ = -.437, $p \leqslant 0.05$; $r$ = .209 $p \leqslant 0.05$). The correlation between perceived stress, academic stress and quality sleep was ($r$ = .232, $p \geqslant 0.05$ and $r$ = -.389, $p \leqslant 0.05$). Lastly, the correlation between academic stress and sleep quality was ($r$ = -.143, $p \leqslant 0.05$). All correlations were found to be statistically significant.

Next, path analysis was performed to test, trim, and modify the hypothesized model. The primary model testing showed the fitness indices of the model were ($\chi 2$ = 97.53, $\chi 2/df$ = 8.86, NFI = .74, CFI = .75, GFI = .90, RMSEA = .176). All the fitness indicators showed inadequate values except GFI. Therefore, the model-modified indices were used to improve the quality of the relation between the model variables. Many new covariance relations were added to the modified model (e.g., technology use, social engagement, time management, emotional regulation). The value of the correlation between emotional regulation and technology use was ($r$ = -.205, $p \leqslant 0.05$), time management and social engagement was ($r$ = -.37, $p \leqslant 0.05$), and social engagement and technology use was ($r$ = -.32, $p \leqslant 0.05$). All correlations were statistically significant. For the goodness of fit, the value of CMIN/DF = 1.27, equaling < 3, indicating a good model fit. Additionally, the model incremental fit indices were calculated, (CFI = 994, GFI = .988, NFI = 973, RFI = 0.929, IFI = 0.994, and TLI = 0.984). All the incremental indices' values were ⩾0.90 and close to 1, which shows the model fits the data well. Furthermore, the RMSEA value

**Table 1. Standardized Direct Coefficients of Independent Variables on Perceived Stress, Academic Stress, and Sleep Quality**

| Independent Variables | Perceived Stress (β) | Academic Stress (β) | Sleep Quality (β) |
|---|---|---|---|
| Technology use | -.10 (p ≥ 0.05) | -.10 (p ≥ 0.05) | -.06 (p ≤ 0.05) |
| Social engagement | -.13 (p ≤ 0.05) | -.10 (p ≥ 0.05) | -.38 (p ≥ 0.05) |
| Time management | -.16 (p ≤ 0.05) | -.26 (p ≤ 0.05) | - |
| Emotional regulation | -.60 (p 0.05) | -.38 (p ≤ 0.05) | - |

= .033 is less than the cut-off value, close to 0.06.[40] The final model accounted for 44.9% of the variance of perceived stress, 28.9% of academic stress and 15.7% of the variance in sleep quality. The standardized direct effect coefficients were calculated to examine the direct impact of the independent model variables (technology use, social engagement, time management, and emotional regulation) on both moderator variables (perceived stress and academic stress) and the direct impact of the moderator variables on the dependent variable (quality of sleep).

In table 1 the independent variables were revealed to have a direct impact on perceived stress ($\beta$ = -.10, $p \geqslant 0.05$; $\beta$= -.13, $p \leqslant 0.05$; $\beta$= -.16, $p \leqslant 0.05$; $\beta$= -.60, $p \leqslant 0.05$). All $p$-values were statistically significant, except for technology use on perceived stress. The significant standardized direct coefficients illustrate the negative impact of social engagement, time management, and emotional regulation on perceived stress. The direct impact of the independent variables on academic stress was ($\beta$ = -.15, $p \leqslant 0.05$; $\beta$ = -.10, $p \geqslant 0.05$; $\beta$= -.26, $p \leqslant 0.05$; $\beta$= -.38, and $p \leqslant 0.05$). All $p$-values were statistically significant, except for social engagement on academic stress. The significant standardized direct coefficients illustrate the negative impact of technology use, time management and emotional regulation on academic stress. There was no significant impact of technology use on academic stress. Additionally, the direct impact of the moderator variables on sleep quality were ($\beta$ = -.38, $p \geqslant 0.05$; $\beta$ = -.06, $p \leqslant 0.05$). Only perceived stress had a statistically significant negative impact on sleep quality.

As it appears in table 2 the standardized indirect coefficients were calculated to examine the indirect impact of the independent model variables on sleep quality through the moderator variables. Three indirect significant standardized effects (social engagement, time management and emotional regulation) were revealed on sleep quality through the mediation of perceived stress. The value of the indirect impact of social engagement on sleep quality by the mediation of perceived stress was ($\beta$ = .051, $p \leqslant 0.05$). The value of the indirect impact of time management on sleep quality by the mediation of perceived stress was ($\beta$ = -.062, $p \leqslant 0.05$), and the indirect impact of emotional regulation on sleep quality by the mediation of perceived stress were ($\beta$ = .23, $p \leqslant 0.05$). Technology use had an indirect impact on sleep quality by the mediation of perceived stress, which was not significant. Furthermore, none of the indirect impacts of the variables (technology use, social engagement, time management and emotional regulation) on sleep quality by academic stress mediation were significant.

## DISCUSSION

After the study model was modified and fitted, path coefficients were tested. There were significant direct relationships between social engagement, time management and emotional regulation with perceived stress, with these variables explaining almost 45% of the variance of perceived stress. This reflects that increased social engagement, time management and emotional regulation can significantly reduce perceived stress levels. Similarly, the results show the significant direct negative impact of technology use, time management and emotional regulation on academic stress. These variables explained nearly 29% of the variance in academic stress.[9,41,42] This suggests that factors such as technology use, poor time management, and difficulty regulating emotions can contribute to increased academic stress. It is possible that technology use can lead to distraction, poor time management can lead to procrastination and poor planning, and difficulty regulating emotions can lead to heightened stress levels, all these factors can lead to increased academic stress. In such a situation both perceived stress and academic stress had the same.

The results show three indirect significant standardized links of social engagement, time management and emotional regulation with sleep quality through the mediation of perceived stress. In contrast, the indirect impact of technology use on the quality of sleep by mediating perceived stress was insignificant. Furthermore, none of the indirect relationships of technology use, social engagement, time management and emotional regulation on the quality of sleep by academic stress mediation were significant. A significant positive indirect relationship between social engagement and sleep quality was mediated by perceived stress. Previous research has found a positive correlation between time management and sleep quality.[12] These results confirm time management's significant positive indirect impact on sleep quality by perceived stress mediation.[23] These results confirm that there is a direct connection between quality of sleep and emotional regulation, which is mediated by perceived stress, which shows that if emotional regulation reduces stress, this probably helps increase sleep quality.

## LIMITATION AND RECOMMENDATION

The findings of the study have some limitations. One of which is the unequal sample size between male and female groups, with the male group being smaller. This may be a

**Table 2. Indirect Impact of Independent Variables on Sleep Quality through Perceived Stress and Academic Stress**

| Variable | Sleep Quality through Perceived Stress (β) | Sleep Quality through Academic Stress (β) |
|---|---|---|
| Technology use | NS | NS |
| Social engagement | .051 ($p \leq 0.05$) | NS |
| Time management | -.062 ($p \leq 0.05$) | NS |
| Emotional regulation | .23 ($p \leq 0.05$) | NS |

factor that impacts the generalization of current research. Thus, an invariance comparison of the current path model needs to be tested in future research with a balanced sample size representing both male and female students. Additionally, the instruments used in the study (e.g., emotional regulation, technology use) may need further validation, even though in the current study their validity and reliability are within an acceptable range. Due to the potentially applicable values of the research result, it is recommended that similar research variables be replicated within the different university student groups.

The results indicate that social engagement, time management, and emotional regulation have a significant indirect impact on sleep quality through perceived stress. The impact of technology use on sleep quality, however, was not significant. To further understand the relationship between these variables and sleep quality, future research should focus on a larger and more diverse sample. The application of these findings could benefit not just undergraduate populations but also other groups with poor sleep quality.

The researchers recommend the development of counselling program to improve sleep quality by providing training and resources on social engagement, effective time management, and methods of emotional regulation and stress management techniques, which could be helpful to reduce students perceived and academic stress levels, resulting in improved sleep and well-being overall.

# REFERENCES


1. Sivertsen B, Vedaa Ø, Harvey AG, et al. Sleep patterns and insomnia in young adults: A national survey of Norwegian university students. *J Sleep Res*. 2018;28(2). doi:10.1111/jsr.12790

2. Steptoe A. Sleep Duration and Health in Young Adults. *Arch Intern Med*. 2006;166(16):1689. doi:10.1001/archinte.166.16.1689

3. Hysing M, Pallesen S, Stormark KM, Jakobsen R, Lundervold AJ, Sivertsen B. Sleep and use of electronic devices in adolescence: results from a large population-based study. *BMJ Open*. 2015;5(1):e006748-e006748. doi:10.1136/bmjopen-2014-006748

4. Schlarb A, Schnatschmidt M. Variability of sleep and chronotype in adolescents suffering from insomnia: mediating factors for sleep disorders and emotional state. *Sleep Med*. 2019;64:S338. doi:10.1016/j.sleep.2019.11.946

5. Hershner S. Sleep and academic performance: measuring the impact of sleep. *Curr Opin Behav Sci*. 2020;33:51-56. doi:10.1016/j.cobeha.2019.11.009

6. Shelley P, Ronald B. Sleep patterns and insomnia among college students. *J Sleep Res*. 2014;23(5):557-565.

7. Freeman D, Sheaves B, Waite F, Harvey AG, Harrison PJ. Sleep disturbance and psychiatric disorders. *Lancet Psychiatry*. 2020;7(7):628-637. doi:10.1016/s2215-0366(20)30136-x

8. Goldstein AN, Walker MP. The role of sleep in emotional brain function. *Annu Rev Clin Psychol*. 2014;10:679-708. doi:10.1146/annurev-clinpsy-032813-153716

9. Lund HG, Reider BD, Whiting AB, Prichard JR. Sleep Patterns and Predictors of Disturbed Sleep in a Large Population of College Students. *Journal of Adolescent Health*. 2010;46(2):124-132. doi:10.1016/j.jadohealth.2009.06.016

10. Assaad S, Tannous F, Costanian C. Sleep patterns and sleep disorders among university students in lebanon. *Sleep Med*. 2013;14:e282. doi:10.1016/j.sleep.2013.11.689

11. Ghrouz AK, Noohu MM, Dilshad Manzar Md, Warren Spence D, BaHammam AS, Pandi-Perumal SR. Physical activity and sleep quality in relation to mental health among college students. *Sleep Breath*. 2019;23(2):627-634. doi:10.1007/s11325-019-01780-z

12. Wang PY, Chen KL, Yang SY, Lin PH. Relationship of sleep quality, smartphone dependence, and health-related behaviors in female junior college students. *PLoS One*. 2019;14(4):e0214769. doi:10.1371/journal.pone.0214769

13. Lepp A, Barkley JE, Sanders GJ, Rebold M, Gates P. The relationship between cell phone use, physical and sedentary activity, and cardiorespiratory fitness in a sample of U.S. college students. *Int J Behav Nutr Phys Act*. 2013;10:79. doi:10.1186/1479-5868-10-79

14. Baglioni C, Regen W, Teghen A, et al. Sleep changes in the disorder of insomnia: A meta-analysis of polysomnographic studies. *Sleep Med Rev*. 2014;18(3):195-213. doi:10.1016/j.smrv.2013.04.001

15. Mihajlov M, Vejmelka L. Internet Addiction: A Review of the First Twenty Years. *Psychiatr Danub*. 2017;29(3):260-272. doi:10.24869/psyd.2017.260

16. Hysing M, Haugland S, Stormark KM, Bøe T, Sivertsen B. Sleep and school attendance in adolescence: Results from a large population-based study. *Scand J Public Health*. 2014;43(1):2-9. doi:10.1177/1403494814556647

17. Wang Q, Liu Y, Wang B, et al. Problematic internet use and subjective sleep quality among college students in China: Results from a pilot study. *Journal of American College Health*. 2020;70(2):552-560. doi:10.1080/07448481.2020.1756831

18. Mohammadbeigi A, Absari R, Valizadeh F, et al. Sleep Quality in Medical Students; the Impact of Over-Use of Mobile CellPhone and Social Networks. *J Res Health Sci*. 2016;16:46-50.

19. Bruni O, Sette S, Fontanesi L, Baiocco R, Laghi F, Baumgartner E. Technology Use and Sleep Quality in Preadolescence and Adolescence. *J Clin Sleep Med*. 2015;11(12):1433-1441. doi:10.5664/jcsm.5282

20. Cheng SH, Shih CC, Lee IH, et al. A study on the sleep quality of incoming university students. *Psychiatry Res*. 2012;197(3):270-274. doi:10.1016/j.psychres.2011.08.011

21. Touitou Y, Touitou D, Reinberg A. Disruption of adolescents' circadian clock: The vicious circle of media use, exposure to light at night, sleep loss and risk behaviors. *Journal of Physiology-Paris*. 2016;110(4):467-479. doi:10.1016/j.jphysparis.2017.05.001

22. O'Leary K, Bylsma LM, Rottenberg J. Why might poor sleep quality lead to depression? A role for emotion regulation. *Cogn Emot*. 2017;31(8):1698-1706. doi:10.1080/02699931.2016.1247035

23. Weissman DG, Nook EC, Dews AA, et al. Low Emotional Awareness as a Transdiagnostic Mechanism Underlying Psychopathology in Adolescence. *Clinical Psychological Science*. 2020;8(6):971-988. doi:10.1177/2167702620923649

24. Dorrian J, Centofanti S, Smith A, McDermott KD. Self-regulation and social behavior during sleep deprivation. *Prog Brain Res*. 2019;246:73-110. doi:10.1016/bs.pbr.2019.03.010

25. Motomura Y, Kitamura S, Oba K, et al. Sleep debt elicits negative emotional reaction through diminished amygdala-anterior cingulate functional connectivity. *PLoS One*. 2013;8(2):e56578. doi:10.1371/journal.pone.0056578

26. Pilcher JJ, Huffcutt AI. Effects of Sleep Deprivation on Performance: A Meta-Analysis. *Sleep*. 1996;19(4):318-326. doi:10.1093/sleep/19.4.318

27. Zhang J, Lau EYY, Hsiao JH wen. Using emotion regulation strategies after sleep deprivation: ERP and behavioral findings. *Cogn Affect Behav Neurosci*. 2018;19(2):283-295. doi:10.3758/s13415-018-00667-y

28. Macan TH, Shahani C, Dipboye RL, Phillips AP. College students' time management: Correlations with academic performance and stress. *J Educ Psychol*. 1990;82(4):760-768. doi:10.1037/0022-0663.82.4.760

29. Arguedas M, Daradoumis T, Xhafa F. Analyzing the effects of emotion management on time and self-management in computer-based learning. *Comput Human Behav*. 2016;63:517-529. doi:10.1016/j.chb.2016.05.068

30. Almojali AI, Almalki SA, Alothman AS, Masuadi EM, Alaqeel MK. The prevalence and association of stress with sleep quality among medical students. *J Epidemiol Glob Health*. 2017;7(3):169-174. doi:10.1016/j.jegh.2017.04.005

31. Amaral AP, Soares MJ, Pinto AM, et al. Sleep difficulties in college students: The role of stress, affect and cognitive processes. *Psychiatry Res*. 2018;260:331-337. doi:10.1016/j.psychres.2017.11.072

32. Bhargava D, Trivedi H. A Study of Causes of Stress and Stress Management among Youth. *IRA-International Journal of Management & Social Sciences (ISSN 2455-2267)*. 2018;11(3):108. doi:10.21013/jmss.v11.n3.p1

33. Kent RG, Uchino BN, Cribbet MR, Bowen K, Smith TW. Social Relationships and Sleep Quality. *Ann Behav Med*. 2015;49(6):912-917. doi:10.1007/s12160-015-9711-6

34. Yao KW, Yu S, Cheng SP, Chen IJ. Relationships Between Personal, Depression and Social Network Factors and Sleep Quality in Community-Dwelling Older Adults. *Journal of Nursing Research*. 2008;16(2):131-139. doi:10.1097/01.jnr.0000387298.37419.ff

35. van Schalkwijk FJ, Blessinga AN, Willemen AM, van der Werf YD, Schuengel C. Social support moderates the effects of stress on sleep in adolescents. *J Sleep Res*. 2015;24(4):407-413. doi:10.1111/jsr.12298

36. Luanaigh CÓ, Lawlor BA. Loneliness and the health of older people. *Int J Geriatr Psychiatry*. 2008;23(12):1213-1221. doi:10.1002/gps.2054

37. Tavernier R, Willoughby T. A Longitudinal Examination of the Bidirectional Association Between Sleep Problems and Social Ties at University: The Mediating Role of Emotion Regulation. *J Youth Adolesc*. 2014;44(2):317-330. doi:10.1007/s10964-014-0107-x

38. Buysse DJ, Reynolds CF III, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. *Psychiatry Res*. 1989;28(2):193-213. doi:10.1016/0165-1781(89)90047-4

39. Cohen S, Kamarck T, Mermelstein R. A Global Measure of Perceived Stress. *J Health Soc Behav*. 1983;24(4):385. doi:10.2307/2136404

40. Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct Equ Modeling*. 1999;6(1):1-55. doi:10.1080/10705519909540118

41. Doolin J, Vilches JE, Cooper C, Gipson C, Sorensen W. Perceived stress and worldview influence sleep quality in Bolivian and United States university students. *Sleep Health*. 2018;4(6):565-571. doi:10.1016/j.sleh.2018.08.006

42. Herawati K, Gayatri D. The correlation between sleep quality and levels of stress among students in Universitas Indonesia. *Enferm Clin*. 2019;29:357-361. doi:10.1016/j.enfcli.2019.04.044