Research Article

The Relationship Between Screen Time, Social Network Usage, and Physical Activity with Depression in Students at Qazvin University

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Abstract

Background: Depression and its related variables are especially interesting and important to study in the context of the virtual world.

Objectives: The purpose of the present study was to investigate the relationship between screen time, the amount of social network usage, and physical activity with depression in students.

Methods: The research method was a descriptive correlation study. One hundred sixty undergraduate students from Qazvin Universities were selected as a sample in the spring of 2022 using multi-stage cluster sampling. After dropping some subjects, the sample size was reduced to 146. The participants completed questionnaires about screen time, social network usage, physical activity, and depression. The obtained data were analyzed using Pearson's correlation coefficient and simultaneous regression.

Results: The results showed a significant relationship between screen time and depression (r = 0.35, P < 0.01). There was also a significant relationship between the use of social networks and depression (r = 0.17, P < 0.05), but no relationship was observed between physical activity and depression (r = 0.08, P > 0.05). Additionally, it was found that the predictor variables could explain 13% of the variance in the depression variable.

Conclusions: The contribution of the screen time variable in explaining depression symptoms was higher than that of the other variables.

Keywords: Screen Time, Social Networks, Physical Activity, Depression, Students

1. Background

University students experience high academic and non-academic stressors, making them vulnerable to developing mental health issues, including depression. Studies indicate that university students have higher levels of depression than other populations (1). Depression, as a set of symptoms, includes low mood, low self-esteem, indifference, low energy levels, social withdrawal, disturbances in sleeping and eating, extremely pessimistic views of the future, and the presence of suicidal thoughts or actions (2). As of 2012, approximately 20% of adolescents reported experiencing a mental health problem each year (3), with depression being one of the most common (4). About 5 - 9% of adolescents are clinically depressed (5), and one in four has experienced an episode of depression in late adolescence (6). Poor mental health among university students has caused global concern (7). A previous review found that college students have higher rates of depression than the general population (8). In most of these studies, the prevalence of depression or anxiety is reported to be over 35% (9, 10).

Some researchers believe that the increase in depression is linked to the amount of time that teenagers and students spend using screens (including mobile phones, TV, computers, etc.) (11) and social media (12). In today's digital age, the concept of screen time remains ambiguous, as its definitions differ from one source to another, causing challenges related to coordination, measurement, and comparison. The

Oxford English Dictionary defines screen time as time spent using a device such as a computer, television, or game console (13), while the latest World Health Organization guidelines define it as "time spent passively watching screen-based entertainment (TV, computer, mobile devices) (14).

Several studies indicate a positive relationship between screen time and depressive symptoms in different groups of adolescents and adults (11, 15-18), although such a relationship has not always been observed (19, 20). Stiglic and Viner stated that there is evidence that higher levels of screen time are associated with various harms for children and adolescents, especially obesity, unhealthy diet, depressive symptoms, and quality of life (15). Boers et al. found similar positive results between increased screen time and depression (11). In Ma et al.'s study, some small and positive associations between depressive symptoms and screen use were evident (21). However, follow-up studies showed no support for a longitudinal association in this study. Madhav et al. found that moderate or severe depression is associated with more time spent watching TV and using the computer (more than 6 hours per day) (17). Kuehner found that each additional hour or day spent watching TV or screen viewing was associated with a greater likelihood of depression in early adulthood (18).

Social media is another source for mental health professionals to infer and find signs of mental disorders, such as depression (22). "Social media" refers to various Internet-based social networks that enable users to communicate verbally and visually with others (23, 24). Mougharbel et al. indicated the relationship between social media and depression in adolescents (23). Yoon et al. found that more time spent on social networking sites (SNS) was associated with higher levels of depression (24). However, the study by Barat Dastjardi and Sayadi did not find a significant relationship between the use of social media and depression (25).

Depression is a significant public health issue associated with physical activity. Given that people are often resistant to using mental health services, alternative interventions, such as physical activity, may be valuable (26). It has been found that men who spend at least 150 minutes of activity per week are less likely to have moderate/severe depression symptoms (26). The results of the Battalio et al. study showed that more

significant amounts of physical activity are associated with a reduction in the severity of depression and anxiety symptoms over four years (27).

In their review, Kandola et al. assessed the critical biological and psychosocial mechanisms through which physical activity exerts antidepressant effects, focusing on exercise (28). They found that exercise, a subset of physical activity, affects a range of biological and psychosocial processes that contribute to the pathophysiology of depression. These include exercise's ability to induce changes in neural plasticity, inflammation, oxidative stress, the endocrine system, self-esteem, social support, and self-efficacy. Wassink-Vossen et al. highlighted the importance of the role of age in the relationship between physical activity and depression. They concluded that physical activity improves severe depressive symptoms in young people but not in older adults (29). Dale et al. also reported that physical activity has positive psychological outcomes for children and youth, particularly in reducing depression/depressive symptoms and improving physical self-concept (a subdomain of self-esteem) (30).

The present study was designed and implemented to investigate the relationship between screen time, the amount of use of social networks, physical activity, and depression among students (1). Despite many studies investigating the relationship between screen time and social media use in non-Iranian populations, conducting these studies on Iranian samples is rare. Examining the studies on the variables of the current research shows that the population under investigation often focuses on teenagers, and conducting such research on the population of young students needs more research. The results also revealed that the relationship between the variables was not always consistent and in the same direction. According to the above, this study aims to answer whether there is a relationship between screen time, the amount of social media use, physical activity, and depression in students.

2. Objectives

Considering the critical role of screen time, the amount of use of virtual space, and physical activity in relation to these last two variables, the present study was designed and implemented to investigate the relationship between these variables.

3. Methods

3.1. Research Type and Sample Selection Process

The present study was a descriptive correlational and predictive study. The statistical population included all undergraduate male and female students of the Islamic Azad University, Qazvin branch, who were studying there in the spring of 2022. The sample size was calculated using Green's formula: 8 + 50 m, where m represents the number of predictor variables, including the components of each variable. Consequently, the sample size was determined to be 82 = 50 + (4)8. Accounting for the possibility of subjects dropping out, the final sample size was set at 120 participants. These participants were selected using a multi-stage cluster sampling method. The clusters included the university, the classroom, and the number of students selected as the final sample. All ethical considerations, including confidentiality, minimal risk, and access to the sample members' results, were observed.

3.2. Research Tool

3.2.1. Beck Depression Test II (1996) (BDI-II)

The Beck Depression Inventory (2nd edition) is a revised version of the original Beck Depression Inventory and serves as a self-report index for measuring depressive symptoms in both clinical and non-clinical populations (31). This edition has been expanded to align more closely with the criteria for major depression as outlined in the fourth edition of the diagnostic and statistical manual of mental disorders. Beck's depression test consists of 21 questions, each scored from 0 to 3, yielding a total score range of 0 - 63. A higher score on this tool indicates a higher level of depression, making it suitable for research purposes, including the present study (31). Upon reviewing the research that utilized this tool, Beck and his colleagues found that its reliability coefficient varied from 0.48 to 0.86, depending on the time interval between implementations and the type of population tested, using the retest method. Additionally, in 1996, Beck et al. reported a test-retest reliability coefficient of 0.93 over a one-week interval. The reliability and validity of this scale have been well-established in the Iranian sample (32).

3.2.2. Screen Time

The screen time variable will be measured using the 18-question questionnaire developed by Vizcaino et al. This questionnaire is designed to assess the exposure of subjects to television, devices related to television (such as game consoles), laptops/computers, smartphones, and tablets. Participants will record the exact time spent using each item by specifying the hours and minutes for an average weekday, an average weeknight, a weekend day, and regular weekdays. According to the study by Vizcaino et al., the questionnaire demonstrates good to excellent reliability (61% to 90%) for questions regarding the use of television, laptops/computers, smartphones, and tablets over one day of the week and for three questions related to screen use (33). The questions investigating screen use during a weeknight showed relatively high reliability (50% to 82%). Questions inquiring about screen use during a weekend day, except for smartphone use (16%), showed excellent reliability (84% to 87%) and reliable results for all types. The Content Validity Index for the Scale indicated 94% overall clarity and representativeness (33). Adolescents found the screen time questions to be comprehensible and clear. In the present study, the reliability of the questionnaire was confirmed by calculating Cronbach's alpha, which yielded a coefficient of 0.74.

3.2.3. The Amount of Use of Social Networks (Media)

The amount of use of social networks will be measured and evaluated using the Ilaghinejad Questionnaire (25). This questionnaire consists of 10 questions designed to measure aspects such as the duration of activity, degree of dependence, volume of activity, etc., on virtual networks, and one question to determine the number of networks users use. The first ten questions are scored on a 5-point Likert Scale from 1 to 5. For the question about the number of networks used, 1 point is assigned for each chosen network, with a maximum score of 5. In Ilaghinejad's research, the face validity verification method was used to measure the validity of the instrument (25). The validity of the questionnaire was determined using face validity and the opinions of five prominent experts in the field (25).

The questionnaire items were evaluated by expert professors. Additionally, the reliability of the questionnaire was investigated in the research, yielding a Cronbach's alpha of 0.766.

3.2.4. International Physical Activity Questionnaire (IPAQ)

The amount of physical activity of the subjects in this research will be calculated using the short version of the International Physical Activity Questionnaire (IPAQ) (34). Ainsworth et al. compiled this questionnaire, and its international version was verified by Craig et al. to compare physical activities in different countries and was validated in 12 countries (34). The IPAQ is a self-report questionnaire consisting of eight items used as a tool for international monitoring of physical activity in adults based on exercise and daily activities in the past week. The concurrent validity of this questionnaire was investigated by calculating the correlation between the short and long versions, reporting an acceptable agreement (34). In a study conducted on an Iranian sample, the test-retest correlation coefficient was 0.860, indicating the test's acceptable reliability (25).

3.3. Data Analysis

To analyze the data, Pearson's correlation coefficient and simultaneous regression analysis were used. The data was analyzed using SPSS^{22} statistical software.

4. Results

In the present study, 146 subjects with an average age of 24.63 ± 3.29 years participated. Tables 1 - 4 present the descriptive statistics of the research variables.

Normality of the data: According to Tables 2 - 4, the skewness values of the data are within the range of ± 2, and the kurtosis values are within the range of ± 3, indicating the normality of the distribution of the research data.

The Durbin-Watson test statistic is used to check for the existence of autocorrelation among the residuals in regression analysis. Generally, there is no need to worry if this statistic is between 1.5 and 2.5. In the present study, the Durbin-Watson statistic was 1.681. In addition to observing the assumption of normality of data distribution, the results presented in Table 2 show that the assumptions of homogeneity of variance were

confirmed through Levene's test (P > 0.05) and the Durbin-Watson statistic with a value of 2.03.

According to the results presented in the correlation matrix of research variables (Table 3), there is a significant relationship between screen time and depression (r = 0.35, P < 0.01), as well as between the amount of use of social networks and depression (r = 0.17, P < 0.05). However, there is no significant relationship between physical activity and depression (r = 0.08, P > 0.05). The relationship between the predictor variables of the research and depression was investigated through correlation and multiple regression analyses.

The significance level obtained in Table 4 shows that the correlation coefficient is significant. According to the results in Table 4, the predictor variables can explain 13% of the changes in the depression variable. Additionally, the obtained effect size (0.56) is above average and satisfactory.

Table 5 shows that screen time, with a beta value of 0.33, is significant in the regression model. However, the amount of social network use and physical activity do not play a significant role in the regression model.

5. Discussion

The positive relationship between screen time and depression aligns with most studies conducted in this field (15-18). Several important points can be mentioned in explaining this finding. Screen time does not require any particular activity from the person using the screen, and this lack of activity can lead to a low mood and even depression. A critical variable between screen time and depression is the level of physical activity. The person exposed to prolonged screen time is usually not engaged in any specific activity, and one of the most prominent behavioral signs of depressed people is the lack of appropriate or sufficient activity. This is why behavioral activation is often recommended for such individuals.

Since the present study measures the correlation between the variables and does not explain the causal relationship, low activity can be considered an influencing variable on both depression and screen time. Another factor is that screen time can disrupt the quality of sleep, and disturbed sleep can also cause depression. Sleep and screen time strongly influence

Table 1. Descriptive Statistics of Research Variables

Variables	M	SD
Physical activity	62.25	30.37
Use of social networks	24.27	4.70
Screen time	30.67	16.35
Depression	11.34	7.60

Table 2. Skewness and Kurtosis of the Distribution of Research Variables

Variables	Skewness	Kurtosis
Physical activity	0.814	1.612
Use of social networks	-0.134	-0.338
Screen time	0.882	0.884
Depression	0.655	-0.184

Table 3. Correlation Matrix of Research Variables

Variables	1	2	3	4
1 Physical activity	1			
2 Use of social networks	0.07	1		
3 Screen time	-0.06	0.38 [a]	1	
4 Depression	-0.08	0.17 [b]	0.35 [a]	1

[a] $P > 0.01$.
[b] $P > 0.05$.

each other and can affect a person's behavior. Lack of adequate sleep can impact behavior and performance during the day (35). Spending too much time on screens is associated with mental health effects such as anxiety and depression (36). Adults who use screens for six hours or more are more likely to suffer from moderate to severe depression (36).

Screen time generally plays a vital role in altering quality of life and lifestyle. People who spend more time on screens are less active (37) and sleep less (38). These individuals are primarily engaged in unreal and virtual spaces, hindering their ability to experience an active and lively role in the real world. This change in lifestyle and quality of life can affect individuals' mood. Therefore, more screen time can lead to more negative mood changes, including depression. As mentioned, the relationship between screen time and depression has been confirmed more in cross-sectional studies than in longitudinal studies.

It was found that there is a relationship between the amount of use of social networks and depression, consistent with some findings (11, 12) but inconsistent with others (15). This disparity of results can have many reasons, including methodological differences across various studies. Different populations and tools used to measure variables can influence the outcomes. While the present study's findings may seem noticeable, they can serve as a basis for further research in this field.

To explain the direct and positive relationship between the amount of use of social networks and depression, several crucial points must be mentioned. Firstly, frequent use of social networks and spending more time in the virtual world significantly reduces the opportunity to engage in real-world social relationships with close family members. One of the critical symptoms of depression is social withdrawal (2). People who engage heavily in social media are more prone to other symptoms of depression due to social withdrawal. Secondly, excessive involvement with social networks

Table 4. Regression Analysis of Variance

Variables	SS	df	MS	F	Sig	R	R^2	Ef
Regression	1077.69	3	359.23	6.98	0.001	0.13	0.36	0.56
Residual	7302.86	142	51.43	-	-	-	-	-
Total	8380.50	145	-	-	-	-	-	-

Table 5. Regression Coefficients for Predicting Depression Based on Screen Time, Amount of Use of Social Networks, and Physical Activity

Variables	B	Std. Error	Beta	Sig
Physical activity	-0.02	0.02	-0.06	0.445
Use of social networks	0.08	0.14	0.05	0.582
Screen time	0.15	0.04	0.33	0.001
Constant	5.72	3.30	-	0.085

leads to inactivity and reduced physical activity. People involved with social networks, such as Instagram and Facebook, often spend long periods sitting or lying down while using their devices. This inactivity can increase the likelihood of experiencing depressive symptoms (39).

Moreover, frequent and continuous use of social networks can disrupt the sleep-wake cycle and lower sleep quality. Insomnia and other sleep-related factors have often been reported as mediators of the association between social media use and depressed mood (40, 41). It is important to note that the present study is descriptive, and the results do not indicate causal effects between the research variables. Many variables can determine the quality of students' sleep, which the researcher could not control. The present study was conducted on a specific population and sample, so caution is needed when generalizing the results to other communities and samples.

Despite its limitations, the current study provides a suitable platform for starting essential research on these variables, especially in Iranian contexts. Future studies with intervention methodologies and effectiveness are suggested to investigate the causal relationship between research variables. Longitudinal studies can provide more accurate and valid results.

Footnotes

Authors' Contribution: The article's author was responsible for carrying out all the research steps.

References

1. Alhemedi AJ, Qasaimeh MG, Abdo N, Elsalem L, Qaadan D, Alomari E, et al. Depression Among University Students in Jordan After the COVID-19 Pandemic: A Cross-Sectional Study. *Psychol Res Behav Manag*. 2023;**16**:4237-49. [PubMed ID: 37873060]. [PubMed Central ID: PMC10590589]. https://doi.org/10.2147/PRBM.S436293.

2. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. Washington DC, USA: American Psychiatric Publishing; 2022.

3. World Health Organization. *Mental health: a state of well-being*. World Health Organization: Geneva, Switzerland; 2014, [cited 2023]. Available from: https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response.

4. Patel V. Talking sensibly about depression. *PLoS Med*. 2017;**14**(4). e1002257. [PubMed ID: 28376089]. [PubMed Central ID: PMC5380305]. https://doi.org/10.1371/journal.pmed.1002257.

5. Goldfield GS, Murray M, Maras D, Wilson AL, Phillips P, Kenny GP, et al. Screen time is associated with depressive symptomatology among obese adolescents: a HEARTY study. *Eur J Pediatr*. 2016;**175**(7):909-19. [PubMed ID: 27075014]. https://doi.org/10.1007/s00431-016-2720-z.

6. Hoare E, Millar L, Fuller-Tyszkiewicz M, Skouteris H, Nichols M, Malakellis M, et al. Depressive symptomatology, weight status and obesogenic risk among Australian adolescents: a prospective cohort study. *BMJ Open*. 2016;**6**(3). e010072. [PubMed ID: 26975934]. [PubMed Central ID: PMC4800126]. https://doi.org/10.1136/bmjopen-2015-010072.

7. January J, Madhombiro M, Chipamaunga S, Ray S, Chingono A, Abas M. Prevalence of depression and anxiety among undergraduate university students in low- and middle-income countries: a systematic review protocol. *Syst Rev*. 2018;**7**(1):57. [PubMed ID: 29636088]. [PubMed Central ID: PMC5894225]. https://doi.org/10.1186/s13643-018-0723-8.

8. Ibrahim AK, Kelly SJ, Adams CE, Glazebrook C. A systematic review of studies of depression prevalence in university students. *J Psychiatr Res*. 2013;**47**(3):391-400. [PubMed ID: 23260171]. https://doi.org/10.1016/j.jpsychires.2012.11.015.

9. Oppong Asante K, Andoh-Arthur J. Prevalence and determinants of depressive symptoms among university students in Ghana. *J Affect Disord*. 2015;**171**:161-6. [PubMed ID: 25305431]. https://doi.org/10.1016/j.jad.2014.09.025.

10. Othieno CJ, Okoth R, Peltzer K, Pengpid S, Malla LO. Risky HIV sexual behaviour and depression among University of Nairobi students. *Ann Gen Psychiatry*. 2015;**14**:16. [PubMed ID: 25873984]. [PubMed Central ID: PMC4396741]. https://doi.org/10.1186/s12991-015-0054-2.

11. Boers E, Afzali MH, Newton N, Conrod P. Association of Screen Time and Depression in Adolescence. *JAMA Pediatr*. 2019;**173**(9):853-9. [PubMed ID: 31305878]. [PubMed Central ID: PMC6632122]. https://doi.org/10.1001/jamapediatrics.2019.1759.

12. Giuntini FT, Cazzolato MT, dos Reis MDJD, Campbell AT, Traina AJ, Ueyama Jó. A review on recognizing depression in social networks: challenges and opportunities. *J Ambient Intell Humaniz Computing*. 2020;**11**(11):4713-29. https://doi.org/10.1007/s12652-020-01726-4.

13. Oxford University Press. *Oxford English Dictionary*. Oxford, UK: Oxford University Press; 2020.

14. Willumsen J, Bull F. Development of WHO Guidelines on Physical Activity, Sedentary Behavior, and Sleep for Children Less Than 5 Years of Age. *J Phys Act Health*. 2020;**17**(1):96-100. [PubMed ID: 31877559]. https://doi.org/10.1123/jpah.2019-0457.

15. Stiglic N, Viner RM. Effects of screentime on the health and well-being of children and adolescents: a systematic review of reviews. *BMJ Open*. 2019;**9**(1). e023191. [PubMed ID: 30606703]. [PubMed Central ID: PMC6326346]. https://doi.org/10.1136/bmjopen-2018-023191.

16. Li L, Zhang Q, Zhu L, Zeng G, Huang H, Zhuge J, et al. Screen time and depression risk: A meta-analysis of cohort studies. *Front Psychiatry*. 2022;**13**:1058572. [PubMed ID: 36620668]. [PubMed Central ID: PMC9815119]. https://doi.org/10.3389/fpsyt.2022.1058572.

17. Madhav KC, Sherchand SP, Sherchan S. Association between screen time and depression among US adults. *Prev Med Rep*. 2017;**8**:67-71.

[PubMed ID: 28879072]. [PubMed Central ID: PMC5574844]. https://doi.org/10.1016/j.pmedr.2017.08.005.

18. Kuehner C. Why is depression more common among women than among men? *Lancet Psychiatr*. 2017;**4**(2):146-58. [PubMed ID: 27856392]. https://doi.org/10.1016/S2215-0366(16)30263-2.

19. Casiano H, Kinley DJ, Katz LY, Chartier MJ, Sareen J. Media use and health outcomes in adolescents: findings from a nationally representative survey. *J Can Acad Child Adolesc Psychiatry*. 2012;**21**(4):296-301. [PubMed ID: 23133464]. [PubMed Central ID: PMC3490531].

20. Hume C, Timperio A, Veitch J, Salmon J, Crawford D, Ball K. Physical activity, sedentary behavior, and depressive symptoms among adolescents. *J Phys Act Health*. 2011;**8**(2):152-6. [PubMed ID: 21415441]. https://doi.org/10.1123/jpah.8.2.152.

21. Ma L, Evans B, Kleppang AL, Hagquist C. The association between screen time and reported depressive symptoms among adolescents in Sweden. *Fam Pract*. 2021;**38**(6):773-9. [PubMed ID: 34160045]. https://doi.org/10.1093/fampra/cmab029.

22. Giustini D, Ali SM, Fraser M, Kamel Boulos MN. Effective uses of social media in public health and medicine: a systematic review of systematic reviews. *Online J Public Health Inform*. 2018;**10**(2). e215. [PubMed ID: 30349633]. [PubMed Central ID: PMC6194097]. https://doi.org/10.5210/ojphi.v10i2.8270.

23. Mougharbel F, Chaput JP, Sampasa-Kanyinga H, Hamilton HA, Colman I, Leatherdale ST, et al. Heavy social media use and psychological distress among adolescents: the moderating role of sex, age, and parental support. *Front Public Health*. 2023;**11**:1190390. [PubMed ID: 37397708]. [PubMed Central ID: PMC10310995]. https://doi.org/10.3389/fpubh.2023.1190390.

24. Yoon S, Kleinman M, Mertz J, Brannick M. Is social network site usage related to depression? A meta-analysis of Facebook-depression relations. *J Affect Disord*. 2019;**248**:65-72. [PubMed ID: 30711871]. https://doi.org/10.1016/j.jad.2019.01.026.

25. Barat Dastjardi N, Sayadi S. [Relationship between using social networks and internet addiction and depression among students]. *J Res Behav Sci*. 2013;**10**(5):332-41. Persian.

26. Currier D, Lindner R, Spittal MJ, Cvetkovski S, Pirkis J, English DR. Physical activity and depression in men: Increased activity duration and intensity associated with lower likelihood of current depression. *J Affect Disord*. 2020;**260**:426-31. [PubMed ID: 31539676]. https://doi.org/10.1016/j.jad.2019.09.061.

27. Battalio SL, Huffman SE, Jensen MP. Longitudinal associations between physical activity, anxiety, and depression in adults with long-term physical disabilities. *Health Psychol*. 2020;**39**(6):529-38. [PubMed ID: 32202825]. [PubMed Central ID: PMC8439002]. https://doi.org/10.1037/hea0000848.

28. Kandola A, Ashdown-Franks G, Hendrikse J, Sabiston CM, Stubbs B. Physical activity and depression: Towards understanding the antidepressant mechanisms of physical activity. *Neurosci Biobehav Rev*. 2019;**107**:525-39. [PubMed ID: 31586447]. https://doi.org/10.1016/j.neubiorev.2019.09.040.

29. Wassink-Vossen S, Collard RM, Penninx BW, Hiles SA, Oude Voshaar RC, Naarding P. The reciprocal relationship between physical activity and depression: Does age matter? *Eur Psychiatry*. 2018;**51**:9-15. [PubMed ID: 29510298]. https://doi.org/10.1016/j.eurpsy.2017.12.029.

30. Dale LP, Vanderloo L, Moore S, Faulkner G. Physical activity and depression, anxiety, and self-esteem in children and youth: An

umbrella systematic review. *Ment Health Phys Act*. 2019;**16**:66-79. https://doi.org/10.1016/j.mhpa.2018.12.001.

31. Wang YP, Gorenstein C. Psychometric properties of the Beck Depression Inventory-II: a comprehensive review. *Braz J Psychiatry*. 2013;**35**(4):416-31. [PubMed ID: 24402217]. https://doi.org/10.1590/1516-4446-2012-1048.

32. Stefan-Dabson K, Mohammadkhani P, Massah-Choulabi O. [Psychometrics Characteristic of Beck Depression Inventory-II in Patients with Magor Depressive Disorder]. *Arch Rehabil*. 2007;**8**(0):82-0. Persian.

33. Vizcaino M, Buman M, DesRoches CT, Wharton C. Reliability of a new measure to assess modern screen time in adults. *BMC Public Health*. 2019;**19**(1):1386. [PubMed ID: 31660931]. [PubMed Central ID: PMC6816215]. https://doi.org/10.1186/s12889-019-7745-6.

34. Craig CL, Marshall AL, Sjostrom M, Bauman AE, Booth ML, Ainsworth BE, et al. International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc*. 2003;**35**(8):1381-95. [PubMed ID: 12900694]. https://doi.org/10.1249/01.MSS.0000078924.61453.FB.

35. Hines J. *Why Too Much Screen Time Can Lead to Sleep Deprivation for Alaskans*. Alaska: Alaska Sleep; 2019, [cited 2023]. Available from: https://www.alaskasleep.com/~alaskasl/.

36. Bates M. *New risk from too much screentime*. Washington, D.C: Science News for Students; 2019, [cited 2023]. Available from: https://www.snexplores.org/article/new-health-risk-too-much-screentime-sitting.

37. Sisson SB, Broyles ST, Baker BL, Katzmarzyk PT. Screen time, physical activity, and overweight in U.S. youth: national survey of children's health 2003. *J Adolesc Health*. 2010;**47**(3):309-11. [PubMed ID: 20708572]. https://doi.org/10.1016/j.jadohealth.2010.02.016.

38. Christensen MA, Bettencourt L, Kaye L, Moturu ST, Nguyen KT, Olgin JE, et al. Direct Measurements of Smartphone Screen-Time: Relationships with Demographics and Sleep. *PLoS One*. 2016;**11**(11). e0165331. [PubMed ID: 27829040]. [PubMed Central ID: PMC5102460]. https://doi.org/10.1371/journal.pone.0165331.

39. Boone JE, Gordon-Larsen P, Adair LS, Popkin BM. Screen time and physical activity during adolescence: longitudinal effects on obesity in young adulthood. *Int J Behav Nutr Phys Act*. 2007;**4**:26. [PubMed ID: 17559668]. [PubMed Central ID: PMC1906831]. https://doi.org/10.1186/1479-5868-4-26.

40. Li JB, Lau JTF, Mo PKH, Su XF, Tang J, Qin ZG, et al. Insomnia partially mediated the association between problematic Internet use and depression among secondary school students in China. *J Behav Addict*. 2017;**6**(4):554-63. [PubMed ID: 29280394]. [PubMed Central ID: PMC6034947]. https://doi.org/10.1556/2006.6.2017.085.

41. Vernon L, Modecki KL, Barber BL. Tracking Effects of Problematic Social Networking on Adolescent Psychopathology: The Mediating Role of Sleep Disruptions. *J Clin Child Adolesc Psychol*. 2017;**46**(2):269-83. [PubMed ID: 27492763]. https://doi.org/10.1080/15374416.2016.1188702.