MSD

Medical Science and Discovery
ISSN: 2148-6832

Investigation of the effect of technology and internet addictions on the musculoskeletal system in university students during the post-pandemic period

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ABSTRACT

Objective: The COVID-19 pandemic caused the habits of university students to have spent more time with technological devices and the internet. This study is aimed to investigate the effect of technology and internet addictions of university students on the musculoskeletal (MSK) problems during the post-pandemic period.

Materials and Methods: This cross-sectional study was conducted with 368 university students. The Nordic Musculoskeletal Questionnaire, Pain Numerical Rating Scale, Technology Addiction Scale (TAS), Young's Internet Addiction Test-Short Form (YIAT-SF), and Örebro Musculoskeletal Screening Questionnaire-12-TR (Örebro-12-TR) were applied. Multiple linear regression analysis was performed to assess the effect of technology addiction and internet addiction on the MSK problem.

Results: The mean TAS score of the participants was 45.94±15.46, the mean YIAT-SF score was 24.56±9.52, and the mean Örebro-12-TR score was 35.55±17.14. Technology (p=0.037) and internet addiction (p=0.001) variables had a significant effect on MSK problem. This model can explain 18.4% of the total variance in the risk of developing MSK problems (adjusted R2=0.184).

Conclusion: This study showed that internet and technology addictions affected the MSK problems during the post-pandemic period. Interventions and training programs could reduce the risk of MSK problems.

Keywords: Internet Addiction; Technology Addiction; Musculoskeletal Diseases

INTRODUCTION

Technology and internet addiction are non-substance-related behavioral addictions (1). In general, it can be defined as the inability to stop the excessive use of technology and the internet and the desire to gradually increase the time spent with them, the emergence of feelings such as excessive nervousness, tension, and restlessness in their absence. These addictions negatively affect a person's work, school, and social life (2).

Long-term use of technology leads to postural changes, especially in the upper body and head. Maintaining inappropriate postural changes exposes individuals to cumulative musculoskeletal (MSK) injuries (3). Particularly the use of computers for more than 6 hours increases the risk of MSK injury in different anatomical regions, such as the neck, shoulder, wrist, and head (4). The rapid development of the internet and its use on mobile devices have increased the duration of individuals' use of technological devices and led to physical inactivity in individuals (5). A recent study has reported that MSK disorders are common in high school students and elucidated the relationship between low physical activities and back pain (6). Studies confirm that prolonged static posture and increased muscle load associated with computer use can result in musculoskeletal injuries in the neck, shoulders, back, elbows, and wrists/hands (7, 8). Similar to computer use, using mobile phones and playing digital games can involve continuous grip and repetitive movements of the thumb and fingers and elevate the risk of injury (9, 10). Moreover, due to the COVID-19 pandemic, the habits of university students to carry out their leisure activities have changed, and university students have spent more time with technological devices and the internet. This situation may have caused the development of technology and internet addictions in young people during the COVID-19 pandemic (11). Hence, this study aimed to investigate the effect of technology and internet addictions of university students on the MSK problems during the post-pandemic period.

Research Article

Received 16-12-2022

Accepted 23-12-2022

Available Online: 26-12-2022

Published 30-12-2022

MATERIAL and METHODs

Study design

This study was a cross-sectional trial. The research data were obtained between September and December 2022 from students studying at Afyonkarahisar Health Sciences University (AFSU). The Clinical Research Ethics Committee of AFSU (2022/6) approved this study, and it was carried out in line with the Helsinki Declaration. The participants were informed about the content of the study, and their written consent was received.

Participants

The study was conducted at AFSU. The research data were collected by the face-to-face questionnaire method. The inclusion criteria for participants were determined as follows: Being between 18-25 years of age and being a student at AFSU. The following exclusion criteria were determined: The presence of any known orthopedic or neurological pathology affecting the MSK, having undergone a surgical procedure related to the upper and lower extremities or spine in the last 6 months, and the presence of any deformity of the upper-lower extremities or spine.

Sample size

The sample size of the study was assessed with G* Power 3.1.9.7. The level of correlation obtained from the sample study was low (r=-0.17) (12). The calculation was made with the formula f2= R2/1-R2 (f2=0.03) using the correlation coefficient in the reference study (13). Accordingly, to achieve a 95% confidence level and 80% power in multiple linear regression analysis, a minimum of 315 participants should be included in the study.

Data collection tools

In the study, a personal information form, the Nordic Musculoskeletal Questionnaire, Pain Numerical Rating Scale, Technology Addiction Scale, Young's Internet Addiction Test-Short Form, and Örebro Musculoskeletal Screening Questionnaire-12-TR were used.

Personal Information Form: This form consists of 7 questions about age, sex, height, weight, body mass index (BMI), technological device (mobile phone, tablet computer, laptop, desktop computer), and internet use.

Nordic Musculoskeletal Questionnaire (NMQ): In this study, the NMQ was used to identify the body region where MSK problems were observed and calculate their frequency. The NMQ is a self-administered questionnaire, which questions MSK problems within 12 months and the resulting work disability. Furthermore, it questions the pain status in the last week. Each item of the questionnaire is responded as yes/no. Turan et al. performed its Turkish validity and reliability study (14).

Pain Numerical Rating Scale (P-NRS): This questionnaire was used to evaluate the intensity of pain arising after participants used a technological device (mobile phone, tablet computer, laptop, and desktop computer) and the internet. The participant was requested to evaluate the intensity of pain between 0 (I never had pain) and 10 (I had unbearable pain) (15).

Technology Addiction Scale (TAS): This scale consists of 24 items and four sub-sections: Website Addiction, Instant Messaging Addiction, Social Network Addiction, and Online Gaming Addiction. Five-point Likert rating (never=1, rarely=2, sometimes=3, often=4, always=5) is used to measure all the items used to assess technology addiction. The lowest score that can be obtained from the scale is 24, and the highest score is 120. Higher scores indicate higher addiction (16).

Young's Internet Addiction Test-Short Form (YIAT-SF): The Internet Addiction Test was developed by Young (1998), and its short form was created by Pawlikowski et al. (17) The scale comprises 12 questions with five-point Likert rating (1=Never, 5=Very often). The lowest score that can be obtained from the scale is 12, and the highest score is 60. High scores indicate that the level of internet addiction is high. Kutlu et al. showed the Turkish validity and reliability of the scale in university students (18).

Örebro Musculoskeletal Screening Questionnaire-12 Turkish Version (Örebro-12-TR): This 12-item self-report questionnaire evaluates all MSK problems, including the spine, upper and lower extremities, and accordingly aims to predict the severity, dysfunction, status of receiving a report, cost and recovery time of the problem (19). Each item takes a value between 0 and 10 according to the response given. Items 8, 11, and 12 are calculated reversely. 120 is the highest score that can be obtained from the questionnaire. A high score obtained from the questionnaire shows that the individual has a high risk of receiving a report due to the MSK disorder, making high health expenditures, and having a high risk for an MSS problem (20).

Statistical Analysis

The data were analyzed with IBM SPSS Statistics 26.0 (SPSS Inc, Chicago, IL, USA) program. A decision was made according to normal distribution, skewness and kurtosis values. Variables with skewness and kurtosis values between -2 and +2 exhibit the characteristics of a normal distribution (21). As a result of the analysis, it was observed that all variables fit the normal distribution. Continuous data were presented as mean and standard deviation, whereas categorical data were presented as numbers and percentages. Multiple linear regression analysis was performed to assess the effect of independent variables (technology addiction and internet addiction) on the dependent variable (MSK problem). Cronbach's alpha coefficient was calculated to assess the internal consistency of the scales used in the study. Cronbach's alpha values of the TAS, YIAT-SF, and Örebro-12-TR were 0.929, 0.922, and 0.735, respectively. The statistical significance level was accepted as $p<0.05$ (22).

RESULTs

The questionnaire was sent to a total of 385 individuals. Twelve individuals disagreed to participate in the study (3.12%), and 5 individuals (1.30%) could not meet the inclusion criteria (2 individuals were >25 years old, and 3 individuals had a problem affecting the MSK). The study was completed with 368 participants (95.58%) (**Figure 1**). The participants' mean age was 19.96±1.42 years. Of the participants, 74.5% were female.

http://dx.doi.org/10.36472/msd.v9i12.850

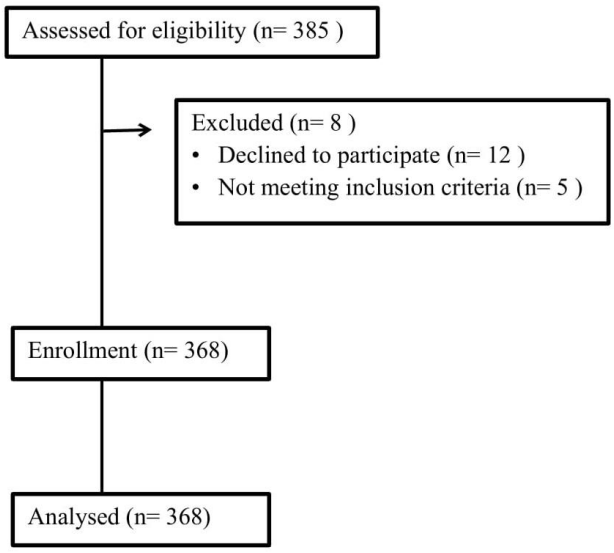

Figure 1. Flowchart of the study

The mean TAS score of the participants was 45.94±15.46, the mean YIAT-SF score was 24.56±9.52, and the mean Örebro-12-TR score was 35.55±17.14. The classifications of the students regarding technology addiction, internet addiction, and MSK problems are presented in **Table 2.**

Multiple linear regression analysis was conducted to examine the effect of technology and internet addiction variables on the MSK problem. The model created according to the analysis results is statistically significant (F=20.218, p<0.001). Technology (p=0.037) and internet addiction (p=0.001) variables included in the model significantly affect the MSK problem. This model can explain 18.4% of the total variance in the risk of developing MSK problems (adjusted R2=0.184) **(Table 3).**

Table 2: Classification of students' technology and internet addiction and musculoskeletal problems

Variables	n(%)
Technology Addiction (scoring) (n=368) (16).	
Not addicted (0-24)	6 (1.6)
Slightly addicted (25-48)	237 (64.4)
Moderately addicted (49-72)	102 (27.7)
Quite addicted (73-96)	20 (5.4)
Highly addicted (97-120)	3 (0.8)
Internet addiction (scoring) (n=368) (17)	
Not addicted (≤37)	338 (91.8)
Addicted (>37)	30 (8.2)
Musculoskeletal problem (scoring) (n=368) (23)	
Low risk (<57)	323(87.8)
Moderate risk (57-72)	33 (9.0)
High risk (>72)	12 (3.3)

Table 1: contains other descriptive variables of the participants.

Variables	
Age (year) (n=368), mean±SD	19.96±1.42
Gender (n=368), n(%)	
Female	274 (74.5)
Male	94 (25.5)
BMI (kg/cm²) (n=368), mean±SD	21.96±3.50
Time spent with technological devices and the internet in a day (min) (n=368), mean±SD	252.02±131,62
Does pain occur at the end of the time spent with technological devices and internet? (n=368), n(%)	
Yes	246 (66,8)
No	122 (33,2)
Distribution of pain at the end of time spent with technological devices and internet (n=368), n(%)	
Neck	238 (64.7)
Shoulders	119 (32.3)
Elbows	23 (6.3)
Wrists/Hands	79 (21.5)
Upper back	132 (35.9)
Low back	110 (29.9)
Hips/ Thighs	24 (6.5)
Knees	14 (3.8)
Ankles/Feet	7 (1.9)
Intensity of pain at the end of time spent with technological devices and internet (n=246), n(%) mean±SD	3.81±1.68
Distribution of those with any problems (pain, discomfort or numbness) at any time in the body parts specified during the last 12 months (n=368), n(%)	
Neck	263 (71.5)
Shoulders	179 (48.6)
Elbows	37 (10.1)
Wrists/Hands	100 (27.2)
Upper back	218 (59.2)
Low back	202 (54.9)
Hips/ Thighs	67 (18.2)
Knees	62 (16.8)
Ankles/Feet	45 (12.2)
Avoided of everyday activities (work, home or leisure) due to pain at any time in the specified body parts during the last 12 months (n=368), n(%)	
Neck	72 (19.6)
Shoulders	39 (10.6)
Elbows	17 (4.6)
Wrists/Hands	26 (7.1)
Upper back	54 (14.7)
Low back	57 (15.5)
Hips/ Thighs	18 (4.9)
Knees	20 (5.4)
Ankles/Feet	20 (5.4)

Table 3. The effect of technology addiction and internet addiction on musculoskeletal problems

Enter Metod	*B*	95.0% Confidence Interval for *B*		SE	β2	t	p	VIF
		Lower bound	Upper bound					
(Constant)	16.957	8.095	18.576	2.665	-	5.004	**<0.001***	-
Technology addiction total score	0.198	0.012	0.384	0.094	0.171	2.097	**0.037***	2.972
Internet addiction total score	0.534	0.233	0.835	0.153	0.283	3.483	**0.001***	2.972

Abbreviations:VIF= Variance Inflation Factor; **B=**Unstandardized Coefficients B; **β2=** Standardized Coefficients **B;** Significant level=*p < 0.05.
Summary of the model: F= 42.249; p<0.001; **R=**0.434; **Adj.R2=**0.184; **SEE=** 16.220; **Durbin-Watson=** 2.073

DISCUSSION

In the present study, university students' technology and internet addictions were researched, and their effects on MSK problems were investigated. Students' technology and internet addictions were found to be at a low level. Students were included in the low-risk group in terms of MSK problems. Moreover, the study showed that technology and internet addictions increased the risk of developing MSK problems. Due to the habits of making use of leisure time, which are predicted to change in university students during the COVID-19 pandemic, there is a need to evaluate students' technology and internet addictions during the post-pandemic period. This study is one of the rare studies investigating the effect of university students' technology and internet addictions on MSK problems during the post-pandemic period.

Modern communication and engagement tools such as video games, social media and online shopping, which young people frequently use nowadays, employ various behavioral techniques to maintain, encourage, and reward frequent use, resulting in addiction (24). The rapid spread of the internet and technological advances in the modern world also contribute to technology and internet addictions (25). Furthermore, students' use of the internet and technological devices (especially smartphones) for purposes such as education, messaging, watching videos, playing games, and using social media accelerated the increase in technology and internet addictions during the COVID-19 pandemic (26). In a study from Bangladesh, a low level of internet addiction was identified in one-quarter of the students, a moderate level of internet addiction was found in more than half, and a high level of internet addiction was determined in 13%. In a study conducted during the pandemic in China, the overall prevalence of internet addiction was 36.7%, and the prevalence of severe internet addiction was 2.8% (27). During the pandemic in Turkey, 4.8% of adolescents had limited internet addiction, and approximately 1% had full addiction symptoms (28). This study was carried out during the post-pandemic period and, unlike other studies, revealed that 9% of university students were internet addicted. Differences between studies may result from the use of different assessment methods, differences between populations, and conducting studies in different periods. However, the internet addiction rate reached in this study was consistent with a study conducted on university students in Turkey prior to the pandemic (9.7%) (29).

In this study, technology addiction was also evaluated with a local scale. According to the results, more than half of the participants had slight technology addiction, one-third had a moderate level of addiction, and approximately one-quarter had a quite/high addiction. Likewise, in a study performed during the pandemic in Turkey, a slight technology addiction was observed in nursing undergraduate students (30).

MSK problems are public health problems that lead to loss of productivity and health expenditures during the treatment process, and they are seen worldwide and in all age groups (31). In this study, students were in the low-risk group in terms of the development of MSK problems. The low internet and technology addiction rate of the Turkish student population in this study may have reduced the risk of MSK. Additionally, university students' most common MSK problems were neck, back, low back, and shoulder problems. The results of this study were similar to studies on the MSK involving university students in the literature (12, 32-35).

In university students, MSK problems arise due to many factors. The present study emphasizes that internet and technology addictions increase the risk of developing MSK problems in university students. The literature focuses mostly on internet addiction (36) and smartphone use regarding MSK problems (12). To spend time on the internet for many reasons such as texting, playing games, watching videos, or social media, students use mobile phones, computers, or laptops for a long time and in a fixed posture (37). Nowadays, university students prefer mobile phones to computers due to the rapid development of mobile phones, their widespread use, availability, and popularity among university students (37). Most studies assert that prolonged stay in a fixed posture with increased neck flexion to see the screen of a smartphone cause cervical and spinal problems (38, 39). According to a study, the use of mobile phones has a higher risk of MSK injury compared to the use of laptops and desktops (40). Working with a laptop on the lap, at an inappropriate table or place causes users to have an inappropriate posture. Repetitive movements in a poor posture result in neck, back, shoulder, and wrist injuries in laptop users (32). According to a study from Hong Kong, university students' poor sitting postures and postures while lying down on one side or face down during the use of electronic devices were associated with MSK injuries (36). In conclusion, studies in the literature support the findings of this study.

The current study has a few limitations. The single-center nature of the study may lead to a selection bias in sample selection. Moreover, in the study, students' income levels, physical activity levels, bag-carrying status, or the posture in which they used technological devices were not taken into consideration.

CONCLUSION

This study showed the effect of internet and technology addictions on MSK problems during the post-pandemic period. This effect can be explained by the prolonged maintenance of a fixed poor posture and repetitive movements while staying in that posture (12, 35, 36). Prolongation of the time spent in front of the screen due to addiction may lead to physical inactivity and pose a risk for MSK problems (40). Also, the fact that the population in this study has a low risk of MSK can be attributed to the low level of internet and technology addiction. Therefore, this study recommends organizing intervention and training programs against internet and technology addictions to reduce the risk of developing MSK problems in students.

Informed Consent: The aim and content of the research were clarified to the individuals included in the study, and voluntary consent forms were signed.

Author Contributions: ETH: Study Design, Data Collection and/or Processing, Analysis and/or Interpretation, Literature Search- **ETH:** Manuscript Preparation, revisions

Ethical approval: All procedures performed in studies involving human participants were in accordance with the institutional and/or national research committee's ethical standards and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

REFERENCES

1. Andreassen CS, Pallesen S. Facebook addiction: A reply to Griffiths (2012). Psychol. Rep. 2013; 113(3): 899-902.
2. Young KS. Internet addiction: The emergence of a new clinical disorder. Cyberpsychol Behav. 1998; 1(3): 237-44.
3. Szucs KA, Cicuto K, Rakow M. A comparison of upper body and limb postures across technology and handheld device use in college students. J Phys Ther Sci. 2018;30(10):1293-300.
4. Borhany T, Shahid E, Siddique WA, Ali H. Musculoskeletal problems in frequent computer and internet users. Journal of family medicine and primary care. 2018;7(2):337-9.
5. Woessner MN, Tacey A, Levinger-Limor A, Parker AG, Levinger P, Levinger I. The evolution of technology and physical inactivity: The Good, the bad, and the way forward. Public Health Front. 2021;9:655491.
6. Aktürk S, Büyükavcı R, Aktürk Ü. Relationship between musculoskeletal disorders and physical inactivity in adolescents. J Public Health. 2019;27(1):49-56.
7. Gerr F, Marcus M, Monteilh C. Epidemiology of musculoskeletal disorders among computer users: lesson learned from the role of posture and keyboard use. J Electromyogr Kinesiol. 2004;14(1):25-31.
8. Szeto GP, Straker LM, O'Sullivan PB. A comparison of symptomatic and asymptomatic office workers performing monotonous keyboard work-1: neck and shoulder muscle recruitment patterns. Man Ther. 2005;10(4):270-80.
9. Briggs A, Straker L, Greig A. Upper quadrant postural changes of school children in response to interaction with different information technologies. Ergonomics. 2004;47(7):790-819.
10. Greig AM, Straker LM, Briggs AM. Cervical erector spinae and upper trapezius muscle activity in children using different information technologies. Physiotherapy. 2005;91(2):119-26.
11. Burkauskas J, Gecaite-Stonciene J, Demetrovics Z, Griffiths MD, Király O. Prevalence of problematic Internet use during the coronavirus disease 2019 pandemic. Curr Opin Behav Sci. 2022;46:101179.
12. İnal Ö, Serel Arslan S. Investigating the effect of smartphone addiction on musculoskeletal system problems and cognitive flexibility in university students. Work. 2021;68:107-13.
13. Green SB. How many subjects does it take to do a regression analysis. Multivar Behav Res. 1991;26(3):499-510.
14. Kahraman T, Genç A, Göz E. The Nordic Musculoskeletal Questionnaire: Cross-cultural adaptation into Turkish assessing its psychometric properties. Disabil Rehabil. 2016;38(21):2153-60.
15. Boonstra AM, Stewart RE, Köke AJ, Oosterwijk RF, Swaan JL, Schreurs KM, et al. Cut-Off points for mild, moderate, and severe pain on the numeric rating scale for pain in patients with chronic musculoskeletal pain: Variability and influence of sex and catastrophizing. Front Psychol. 2016;7:1466.
16. Oğuz E, Ulutaş A, Nisan F, Görgen AN, Cumurcu HB. Üniversite öğrencilerinde teknoloji ve internet bağımlılığı arasındaki ilişkinin incelenmesi. Batman Univ Yaşam Bilim Derg. 2019;9(2):167-82.
17. Pawlikowski M, Altstötter-Gleich C, Brand M. Validation and psychometric properties of a short version of Young's Internet Addiction Test. Comput Human Behav. 2013; 29(3):1212-23.
18. Kutlu M, Savcı M, Demir Y, Aysan F. Young İnternet Bağımlılığı Testi Kısa Formunun Türkçe uyarlaması: Üniversite öğrencileri ve ergenlerde geçerlilik ve güvenilirlik çalışması. Anadolu Psikiyatri Dergisi. 2016;17(1):69-76.
19. Veirman E, Van Ryckeghem DM, De Paepe A, Kirtley OJ, Crombez G. Multidimensional screening for predicting pain problems in adults: a systematic review of screening tools and validation studies. Pain Rep. 2019;4(5):e775.
20. Tasvuran Horata E, Demir P, Yağcı G, Erel S, Eken F, Gabel CP. The validity and reliability of the Turkish version of the 12-item Örebro musculoskeletal screening questionnaire (ÖMSQ-12-TR). Disabil Rehabil. 2022:1-8. doi: 10.1080/09638288.2022.2089918.
21. George D. SPSS for windows step by step: A simple study guide and reference, 17.0 update. 10th Ed. Boston: Pearson Education India; 2011.
22. Cohen J. Statistical power analysis for the behavioral sciences. 2nd ed. New York: Routledge; 2013.
23. Gabel CP, Burkett B, Melloh M. The shortened Örebro Musculoskeletal Screening Questionnaire: evaluation in a work-injured population. Man Ther. 2013;18(5):378-85.
24. Sherer J, Levounis P. Technological addictions. Curr Psychiatry Rep. 2022;24(9):399-406.
25. Ryding FC, Kaye LK. "Internet Addiction": A conceptual minefield. Int J Ment Health Addict. 2018;16(1):225-32.
26. Hosen I, Al Mamun F, Sikder MT, Abbasi AZ, Zou L, Guo T, et al. Prevalence and associated factors of problematic smartphone use during the COVID-19 pandemic: A Bangladeshi study. Risk Manag Healthc Policy. 2021;14:3797.
27. Li YY, Sun Y, Meng SQ, Bao YP, Cheng JL, Chang XW, et al. Internet addiction increases in the general population during COVID-19: Evidence from China. Am J Addict. 2021;30(4):389-97.

28. Ozturk FO, Ayaz-Alkaya S. Internet addiction and psychosocial problems among adolescents during the COVID-19 pandemic: A cross-sectional study. Arch Psychiatr Nurs. 2021;35(6):595-601.

29. Canan F, Ataoglu A, Ozcetin A, Icmeli C. The association between internet addiction and dissociation among Turkish college students. Compr Psychiatry. 2012;53(5):422-6.

30. Guven Ozdemir N, Sonmez M. The relationship between nursing students' technology addiction levels and attitudes toward e-learning during the COVID-19 pandemic: A cross-sectional study. Perspect Psychiatr Care. 2021;57(3):1442-8.

31. Woolf AD, Erwin J, March L. The need to address the burden of musculoskeletal conditions. Best Pract Res Clin Rheumatol. 2012;26(2):183-224.

32. Obembe AO, Johnson OE, Tanimowo TO, Onigbinde AT, Emechete AA. Musculoskeletal pain among undergraduate laptop users in a Nigerian University. J Back Musculoskelet Rehabil. 2013;26(4):389-95.

33. Hendi OM, Alturkistani LH, Bajaber AS, Alhamoud MA, Mahmoud MME. Prevalence of musculoskeletal disorder and its relation to stress among medical student at Taif University, Saudi Arabia. Int J Prev Med. 2021;12:98.

34. Indu PG, Ahmed T, Sivanandam M. To find out prevalence of musculoskeletal pain by carrying heavy handbags among college girls and its relation with their BMI. Int J of Adv Res. 2018;6:783-802.

35. Yang G, Cao J, Li Y, Cheng P, Liu B, Hao Z, et al. Association between internet addiction and the risk of musculoskeletal pain in Chinese college freshmen–a cross-sectional study. Front Psychol. 2019;10:1959.

36. Woo EHC, White P, Lai CWK. Musculoskeletal impact of the use of various types of electronic devices on university students in Hong Kong: An evaluation by means of self-reported questionnaire. Man Ther.. 2016;26:47-53.

37. AlAbdulwahab SS, Kachanathu SJ, AlMotairi MS. Smartphone use addiction can cause neck disability. Musculoskeletal care. 2017;15(1):10-2.

38. Xie Y, Szeto G, Dai J. Prevalence and risk factors associated with musculoskeletal complaints among users of mobile handheld devices: A systematic review. Appl Ergon. 2017;59(Pt A):132-42.

39. Pan F, Laslett L, Blizzard L, Cicuttini F, Winzenberg T, Ding C, et al. Associations between fat mass and multisite pain: a five-year longitudinal study. Arthritis Care Res. 2017;69(4):509-16.

40. Songül K, Serkan İ, Aktuğ ZB, Hasan A. Üniversite öğrencilerinin kas iskelet sistemi rahatsızlıkları ile fiziksel aktivite düzeyi ve internet bağımlılığı arasındaki ilişkinin incelenmesi. UGEAD. 2021;7(2):709-21.