

Short Reports

Health impact of screen addiction: A cross-sectional comparative study

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ABSTRACT

Background. Prevalence-based, non-comparative studies have been done to assess psychological and physical consequences of social media and gaming addiction. However, similar studies are lacking for binge-watching, especially in India. We compared the physical and psychological health impact between screen addicted and healthy screen users, by minimizing bias due to confounding factors.

Methods. We did this cross-sectional comparative study among 120 participants (60 cases and 60 matched controls) consisting of gamers, social media users and binge-watchers, who were recruited from schools and colleges of Mumbai based on their scores on the Digital Addiction Scale (DAS). Levels of depression, anxiety and stress; sleep quality; and dry eye disease were assessed using pre-validated scales such as DASS-21, Pittsburgh Sleep Quality Index (PSQI), and Ocular Surface Disease Index (OSDI), respectively, while the other variables were assessed using a self-designed questionnaire with a content validity ratio (CVR) >0.65.

Results. The mean (SD) age of the participants was 19.3 (3.2) years, one-third were women; 68% were from medical colleges and 16% each from engineering colleges and high schools. The prevalence and scores of depression, anxiety and stress; poor sleep quality; and dry eye disease; and prevalence of loneliness, aggression and musculoskeletal pain in the wrist, thumb, neck and back were significantly higher in the screen addicted group ($p < 0.05$).

Conclusions. There was a significant difference in the

prevalence and levels of physical and psychological health impact between screen addicted and healthy screen users.

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INTRODUCTION

Over the past decade, use of the internet, video games, downloadable television, music and movies and social media has increased enormously. Worldwide, 4.66 billion people use the internet, of which, a major proportion is from India. The number of social media users and mobile gamers throughout India and the world has also surged. Newer 'social networking applications' are an important part of the daily lives of many teenagers, and video games have exploded in popularity among young children.^{1–3} With the growth of on-demand and streaming services, watching consecutive episodes of a series has become a common form of viewing, popularly known as 'binge-watching' (in this study, we used the definition used by Rubenking and Bracken,⁴ who defined binge-watching as watching 3–4 or more 30-minute-long episodes of TV series or watching 3 or more 1-hour-long episodes).^{5,6} The rising prevalence of screen use for such activities is alarming because these individual attributes, viz. social media, gaming and binge-watching, have a wide and stark impact on health in all its aspects and can hence be brought together under the common umbrella term of 'screen addiction'.

Previous studies have shown that excessive screen use is detrimental to the user's health, with screen addicts having poor physical and mental health scores. Evidence suggests that internet overuse results in high anxiety, depression, irritability, aggression, low mood, and cognitive and socio-emotional development, leading to poor educational performance and suicidal ideation.^{7–10} Higher binge-viewing and prolonged violent video gaming frequency has been associated with a poorer sleep quality, reduced sleep efficiency, increased fatigue, etc.^{11,12} Internet and gaming addiction are also associated with an increased risk of dry eye disease,¹³ altered posture¹⁴ and obesity¹³ as well as a variety of newer pathological traits such as text anxiety¹⁵ and nomophobia.¹⁶

Unfortunately, research about the health impact of excessive screen use is scarce in the Indian population, with almost nothing on binge-viewing. Of the very few studies that dwell on this subject, most are prevalence-based without control groups, and fail to minimize the bias due to confounding factors such as age, gender, type of educational institute (which could be minimized by having a control group based on one-to-one matching of those confounding factors). We did this study to find the prevalence and severity of physical and psychological health impact in screen users with addictive behaviour compared to healthy screen users, and also find an association between these health effects and screen addiction, if any.

METHODS

We did this cross-sectional, comparative study between January 2020 and February 2021 (except during March–October 2020, due to the Covid-19 lockdown), in the districts of Mumbai City, Mumbai Suburban, Thane and Palghar, wherein urban and rural units were considered. Students 13–17 years of age were recruited from schools and junior colleges, and those 18–25

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years of age were recruited from degree colleges for which prior permission was sought. At each of the sites purposive sampling was used to recruit 120 participants, who were divided equally into test and control groups. Individuals who had access to electronic screen devices and were capable of comprehension and verbal communication were included, whereas those with terminal illness, critical conditions or a history of severe psychiatric disorder were excluded. The study tools used to assess different variables are summarized in Table I.

Statistics

To estimate the sample size, a study on comparison of depression among internet addicts and non-addicts was considered¹⁷ and a sample size of 120 (60 each for test and control group) was calculated. For analysis, the data were entered in an Excel sheet and analysed using the SPSS software (Version 26). One-to-one matching was done for each demographic factor. Mann–Whitney U test and chi square test were used to compare the scores and proportions between the two groups. Spearman’s correlation was used to find the correlation of screen addiction with sleep quality, depression, anxiety, stress, dry eye disease and obesity. A p value of <0.05 was considered significant.

Ethical considerations

The procedures followed were in accordance with the Helsinki Declaration of 1975, as revised in 2000. The study commenced after being approved by the institutional ethics committee (EC/OA-134/2019). Informed consent was obtained from those >18

years of age and written assent from individuals between 13 and 17 years along with informed consent from their parents.

RESULTS

The mean (SD) age of the participants was 19.3 (3.2) years, one-third were women; 68% were from medical colleges and 16% each from engineering colleges and high schools. The demographic profiles of both the groups are given in Table II.

On statistical analysis, the difference in the median values and score distribution of the Pittsburgh Sleep Quality Index (PSQI for sleep quality), Ocular Surface Disease Index (OSDI for dry eye disease) and Depression Anxiety Stress Scale–21 (DASS-21 for depression, anxiety and stress) between the addicted and control groups was statistically significant with p<0.05. All the variables (health impact), viz. sleep quality, dry eye disease, neck pain, back pain, depression, anxiety, stress, loneliness, aggression; after categorization (according to pre-defined cut-offs) were significantly associated with screen addiction (p<0.01). The scores of PSQI, OSDI and DASS-21 were positively correlated with scores of Digital Addiction Scale (DAS), indicating that higher level of screen addiction is positively correlated with poorer sleep quality, greater severity of dry eye disease and greater severity of depression, anxiety and stress, which was statistically significant (p<0.01). Screen addiction scores were found to be neither associated nor correlated with body mass index (BMI) scores for obesity (Table III).

TABLE I. Various tools used in the study

Variable	Screening test	Scoring and cut-off value
Screen addiction	Digital Addiction Scale (DAS), 19 items	Scoring range: 1.00–5.00 Cut-off for control: 1.00–3.49 Cut-off for addict: 3.50–5.00
Sleep quality	Pittsburgh Sleep Quality Index (PSQI), 10 items	Scoring range: 0–21 Cut-off for poor sleep quality: >6
Depression	Depression Anxiety Stress Scale-21 (DASS-21), 21 items—7 items each	Scoring range: 0–42 Cut-off for severe depression: >21
Anxiety	Depression Anxiety Stress Scale-21 (DASS-21), 21 items—7 items each	Scoring range: 0–42 Cut-off for severe anxiety: >15
Stress	Depression Anxiety Stress Scale-21 (DASS-21), 21 items—7 items each	Scoring range: 0–42 Cut-off for severe stress: >26
Dry eye disease	Ocular Surface Disease Index (OSDI), 12 items	Score range: 0–100 Cut-off for moderate-to-severe dry eye disease: >23
Obesity	Body mass index (BMI)	Scoring range: 17–40 Cut-off >30
Self-designed validated questionnaire (4 items)		
Content validity ratio (CVR)=+1.0		
Scale level content validity index (S-CVI)–Reliability=1.0		
S-CVI–Clarity=1.0		
Aggression	Internal consistency: Kuder–Richardson 20=0.844 Test–retest reliability: Cohen kappa coefficient=0.85	Categorical cut-off: ‘Yes’ for >3 items
Loneliness	Internal consistency: Kuder–Richardson 20=0.725 Test–retest reliability: Cohen kappa coefficient=0.89	Categorical cut off: ‘Yes’ for >3 items
Back pain	Self-Designed Validated Questionnaire (1 item) CVR=+1.0 S-CVI–Reliability=1.0 S-CVI–Clarity=1.0	‘Yes’ for single item
Neck pain	Test–retest reliability: Cohen kappa coefficient=0.73 Self-designed validated questionnaire (1 item) CVR=+1.0 S-CVI–Reliability=1.0 S-CVI–Clarity=1.0 Test–retest reliability: Cohen kappa coefficient=1.0	‘Yes’ for single item

TABLE II. Baseline demographic data of the two groups studied

Variable	Addicted group n (%)	Control group n (%)
Mean (SD) age (years)	18.6 (2.24)	19.0 (2.07)
<i>Gender</i>		
Men	40 (66)	40 (66)
Women	20 (33)	20 (33)
<i>Educational institute</i>		
Medical college	40 (68)	40 (68)
Engineering college	10 (16)	10 (16)
High school	10 (16)	10 (16)
<i>Most consumed content</i>		
Social media	31 (52)	31 (52)
Gaming	6 (10)	6 (10)
Binge-watching	23 (38)	23 (38)

DISCUSSION

We suggest that excessive and addictive use of screen devices has an association with adverse manifestations of physical and psychological aspects of health. In consonance with previous studies on screen use and internet addiction,^{18,19} unhealthy screen users in our study had more ocular and sleep-related issues, due to prolonged exposure to screen devices, as their scores of dry eye disease and PSQI were significantly higher than the rest. The prevalence of chronic pain in the wrist, back and neck as well as other musculoskeletal issues was also found to be significantly associated with this group of screen addicts, as was also found in the study on handheld devices by Sharan *et al.*²⁰ Surprisingly, our results did not associate obesity with screen addiction. The DASS-21 scale helped us to measure three negative emotional states, viz. depression, anxiety and stress, whose prevalence and median scores were significantly higher in participants with addictive screen behaviour compared to the control group. These findings are in accordance with studies associating anxiety with multi-player online gaming behaviour,²¹ and with other research that significantly associates internet use with depression and increased suicidal tendencies.²² Loneliness and aggression also had a strong association with screen addiction. Such strong associations between a variety of health effects and screen addiction suggest that not only should standard diagnostic criteria be formulated for diagnosing screen addiction, but these health implications should also be included as a part of the diagnostic tool.

TABLE III. Health impact of screen addiction

Variable (health impact)	Group		p value	Odds ratio (95% CI)	Group		p value (Mann-Whitney U Test)	Correlation coefficient (Spearman rho)	p value (Spearman correlation)
	Addicted (DAS \geq 3.5) n (%)	Control (DAS <3.5) n (%)			Addicted (median DAS \geq 3.5)	Control (median DAS <3.5)			
Poor sleep quality	29 (48.3)	9 (15)	<0.001*	5.30 (12.66–2.22)	6	4	0.001*	0.414	0.001*
Dry eye disease	42 (70)	30 (50)	0.025*	2.33 (4.93–1.10)	33	24	0.001*	0.357	0.001*
Obesity	3 (5)	6 (10)	0.298	0.47 (0.11–1.99)	22	26	0.273	0.011	0.901
Depression	19 (31.7)	6 (10)	0.003*	4.17 (11.38–1.53)	16	6	0.001*	0.470	0.001*
Anxiety	26 (43.3)	8 (13.3)	<0.001*	4.97 (12.26–2.02)	12	6	0.001*	0.340	0.001*
Stress	10 (16.7)	1 (1.7)	0.004*	11.80 (95.34–1.46)	16	10	0.001*	0.425	0.001*
Loneliness	31 (51.7)	12 (20)	<0.001*	4.28 (9.61–1.90)	–	–	–	–	–
Aggression	43 (71.7)	22 (36.7)	<0.001*	4.37 (9.42–2.02)	–	–	–	–	–
Back pain	32 (53.3)	22 (36.7)	0.047*	1.974 (4.1–1.00)	–	–	–	–	–
Neck pain	36 (60)	20 (33.3)	0.003*	3.00 (6.32–1.42)	–	–	–	–	–

*p<0.05 is significant

An important component of this study is the inclusion of social media, gaming and binge-watching under screen addiction as a whole, of which binge-watching has possibly not been considered under screen addiction in previous studies. Being a multicentric study with students from various socioeconomic strata, residential and educational backgrounds is another strength of the study. Its comparative study design, with one-to-one matching of the demographic factors to reduce confounding bias (present in previous studies due to lack of control group, due to confounding factors such as age, sex, type of educational institute), adds to the quality of this study. However, the study has some limitations too. The choice of study design does not allow us to derive any causative association. Hence, there is a need for long-term longitudinal studies to establish the same. Moreover, as this study focuses only on the age group of 13–25 years, there is a need for studies on younger and older age groups. Also, non-inclusion of pornography and digital shopping addictions are some drawbacks of the study.

Thus, our study provides a new insight in the field of addiction medicine, by assessing the health impact on screen addiction. Considering previously stated strengths, this study is quite generalizable to the population, except the age groups not studied as these would have different characteristics. There is a need for identification of health problems in screen addicts and appropriate treatment guidelines for the addiction and comorbid conditions associated with it. Any patient presenting with signs and symptoms of these conditions must be assessed for screen addiction and vice versa. Finally, we hope our study increases awareness and brings focus on the health effects caused by screen addiction.

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