

# Prevalence of excessive internet use and its correlation with associated psychopathology in 11th and 12th grade students

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## ABSTRACT

**Background** Globally, the number of internet users has crossed the three-billion mark, while in India users grew over 17% in the first 6 months of 2015 to 354 million. This study presented a background on internet use and the existence of excessive internet use.

**Aim** To study the extent of internet use in 11th and 12th grade students and the psychopathology, if any, associated with excessive internet use.

**Methods** 426 students who met the inclusion criteria were recruited from 11th and 12th grade classes from Kendriya Vidyalaya, New Delhi, India, and were assessed by Young's Internet Addiction Test and the Strength and Difficulties Questionnaire.

**Results** Among the 426 students, the mean internet addiction total score was 36.63 (20.78), which indicated mild level of internet addiction. 1.41% (six students) was diagnosed as excessive internet users, while 30.28% and 23.94% were classified as moderate and mild internet users, respectively. The prevalence of internet addiction between gender was 58.22% in males and 41.78% in females. While both positive (prosocial) and negative (hyperactivity, emotional, conduct and peer problem) impacts of internet use were reported by students, in the current study excessive use of internet had a negative impact on students' lives as compared with positive impact, which was statistically significant ( $p < 0.0001$ ).

**Conclusion** Excessive internet use led to abnormal behaviours which cause negative consequences to users. Early diagnosis of risk factors related to excessive internet use, provides education about responsible use and supervision of students by family members.

## INTRODUCTION

In 2017, global internet users were 48.7% in Asia, 17% in Europe and 10.9% in Africa (Internet World Stats, 2017). Due to the development and spread of cheaper and more user-friendly computer technology and software (eg, portable computers, Microsoft Word), the use of the internet has increased dramatically. The penetration of the internet increased from 0.5% of the population in 2000 to 34.1% in 2017.<sup>1</sup> Due to the popularity

of the internet and the issue on the negative impact of its use, internet addiction (IA) has received critical consideration.

Many studies are still ongoing on the concept and the definitions of Internet addiction in the literature, controversy around suggested diagnostic criteria, and whether IA truly exists as a diagnosable addiction or not. Indeed, most IA theorists have based their definitions of IA on established addiction conceptual frameworks; for example, IA has been recognised as a potential problem since the introduction of the term by Ivan Goldberg in 1996.<sup>2</sup> Davis<sup>3</sup> preferred the term 'Pathological Internet Use (PIU)' instead of IA as it resembles psychoactive substances dependency, and is defined as an inability to control internet use and leads to psychological, social, family, school and work impairment.

Young<sup>4</sup> linked excessive internet use to pathological gambling disorder under the Diagnostic and Statistical Manual-IV (DSM) and modified it to make diagnostic criteria for 'problematic internet use'. Previous self-report surveys indicated the prevalence rate of IA among adolescents ranges from 0.9% to 38%.<sup>5</sup> Excessive internet use, as defined by Ran Tao and colleagues,<sup>6</sup> is considered as an impulse-control disorder that includes salience, mood modification, tolerance, withdrawal symptoms, conflict and relapse. The eight IA disorder symptoms are (1) preoccupation with the internet, (2) withdrawal symptoms, (3) tolerance, (4) unsuccessful attempts to control internet use, (5) continued excessive internet use despite knowledge of negative psychosocial problems, (6) loss of interests, previous hobbies and entertainment as a result of internet use, (7) use of the internet to escape or relieve dysphonic mood, and (8) deception of family members, therapists or others. Many

epidemiological studies done on students from schools in various countries have found the prevalence rates of IA from a low of 1% in Greece<sup>7</sup> to a high of 36.7% in Italy.<sup>8</sup> IA has also drawn attention from health professionals, educators and the public as this phenomenon has been found to result in negative consequences for IA sufferers. School children are the most vulnerable to internet use due to the following factors: ease of use, availability of time, limited parental supervision, route of escape and social interaction.<sup>9</sup> Excessive internet use is associated with attention-deficit/hyperactivity disorder,<sup>10</sup> depressive symptoms,<sup>11</sup> anxiety disorder,<sup>12</sup> low self-esteem,<sup>13</sup> shyness,<sup>14</sup> social anxiety<sup>15</sup> and suicidal ideas.<sup>16 17</sup> IA is not recognised by the DSM-V as a disorder, but it is considered as an area of further research.<sup>18</sup> A number of studies have been conducted worldwide but used inconsistent criteria to check the level of addiction. The main use of the internet for students is interpersonal communication through email, instant messaging and chat programs.<sup>19</sup> This study presented a background on the internet and how this has expanded in use and has led to the existence of IA.

Previous Indian researches have not conducted studies on school students to find out prevalence of internet use and its effect on them. Our study found out that excessive Internet use led to the abnormal behavior which causes negative consequences to its users. Early diagnosis of risk factor related to excessive internet use, provide education about responsible use and supervision of students by family members.

## METHODS

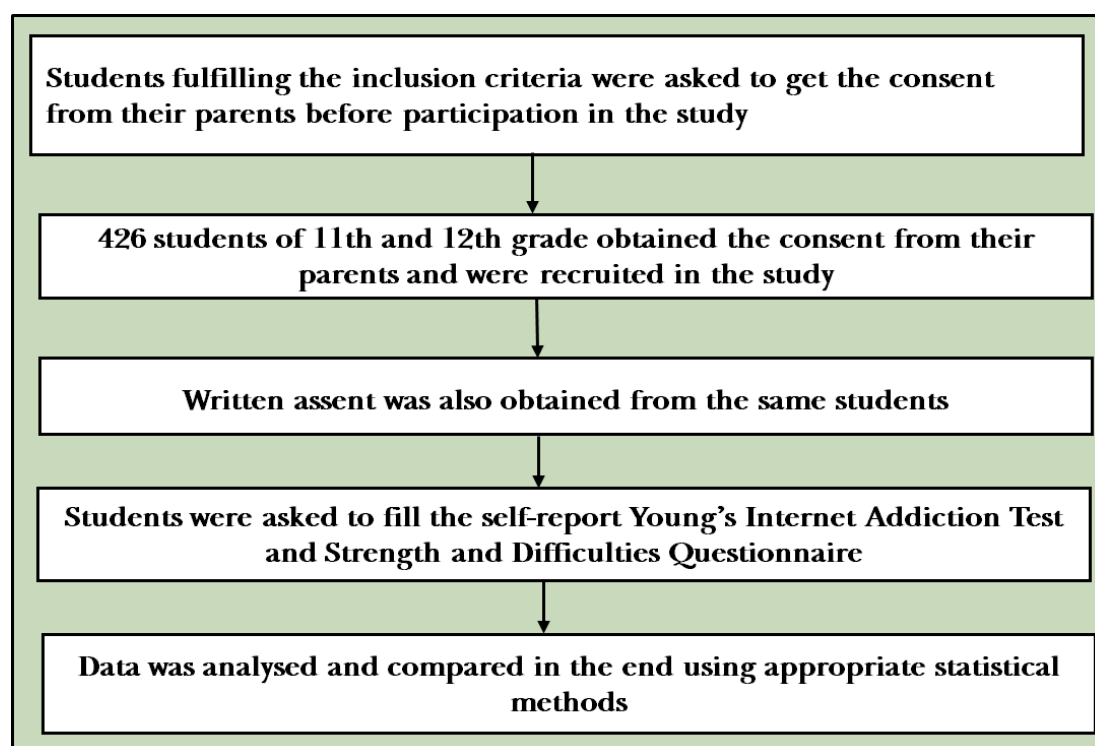
This cross-sectional study was carried out in 426 students of senior secondary school of 11th and 12th grade classes from Kendriya Vidyalaya, and conducted by the Department of Psychiatry, from 1 November 2016 to 31 March 2017. Participants who were willing to give assent and with their parents giving consent through a parent-teacher meeting were included. Permission from the school board was taken to conduct the research, and assenting students were assessed by Young's Internet Addiction Test (IAT)<sup>20</sup> and the Strength and Difficulties Questionnaire (SDQ)<sup>21</sup> (figure 1).

The IAT was developed by Young (1998)<sup>4</sup> to measure the presence and severity of IA. The IAT measures self-reported compulsive use of the internet and assesses symptoms of IA. The test includes 20 items, with each item rated on a 5-point Likert scale ranging from 0 to 5, with the maximum score being 100. The IAT has the following ranges of scores:

1. A total score of 0–30 points indicates normal internet usage.
2. A total score of 31–49 indicates mild level of IA.
3. A total score of 50–79 indicates moderate level of IA.
4. A total score of 80–100 indicates excessive internet use.

The associated psychopathology of the same group of students was assessed using the SDQ.

The SDQ is a mental health screening tool used among children and adolescents aged about 2 to 17 years old. It exists in several versions to meet the needs of researchers, clinicians and educationalists. Each version includes 25 items on psychological attributes.



**Figure 1** Flowchart of the study.

**Table 1** Frequency distribution of demographic variables

Baseline variables	Frequency (N=426)	Percentage
Sex		
Male	248	58.22
Female	170	41.78
Grade		
11th	246	57.75
12th	180	42.25
Stream		
Humanities	151	35.54
Commerce	135	31.69
Science	140	32.86

All versions of the SDQ ask about 25 attributes, some positive and others negative. These 25 items are divided among five scales: emotional symptoms (five items), conduct problems (five items), hyperactivity/inattention (five items), peer relationship problems (five items) and prosocial behaviours (five items).

Students were asked to respond to a Likert scale with the following responses—not true, somewhat true and certainly true—and then four band categorisations of SDQ scores were done as follows:

1. close to average category;
2. slightly raised;
3. high;
4. very high category.

### Statistical analysis

Data were entered in MS Excel spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) V.21.0. To compare qualitative variables among groups,  $\chi^2$  test was used. For quantitative variables, t-test was used to compare the means between two independent groups with normal distribution. Spearman rank correlation coefficient and Kruskal-Wallis test were used. For all analyses, the level of significance was set at  $p < 0.05$ .

### RESULTS

A total of 426 students were enrolled in this study and assessed by the IAT and SDQ scales. Among the enrolled 426 participants, there were 58.22% males (248) and

41.78% females (178), respectively. Most of the sample were from 11th grade accounting with 57.75%, and the remaining 42.25% was from 12th grade. With regard to this, 35.54% belonged to humanities, followed by 31.69% from commerce and 32.86% from the science stream (table 1). According to IAT score, the positive rate of excessive internet use among school students found in this study was 1.41%, while the median and quartile range were 35 and 19–53, respectively (table 2).

Out of six excessive users of internet, four students were male and two were female. In addition, this study found that excessive use of internet was associated with the stream of students they chose. There was no excessive user that belonged to the science stream (0%) as compared with both commerce (50%) and humanities (50%). However, the overall findings estimated that moderate users were higher in the commerce stream, at 44.44% (60 out of 135), as compared with humanities, at 27.15% (41 out of 151), and science stream, at 20% (28 out of 140), respectively. Normal users were higher in science, with 54.29% (76 out of 140), followed by 49.01% (74 out of 151) in humanities and 28.89% (39 out of 135) in commerce, respectively.

This study found that excessive internet use had both negative impact on student lives, including emotional, conduct, hyperactivity and peer problems, as well as positive impact, such as prosocial behaviour. The mean values (SD) of emotional, conduct, hyperactivity, peer problems, prosocial and Total Difficulty Score (TDS) were 3.87 (2.28), 2.98 (1.7), 4.15 (1.97), 2.95 (1.73), 8.02 (1.7) and 13.95 (5.04), respectively, in students of 11th and 12th grade. The mean IA total score in this study was 36.63 (20.78), which indicated a mild level of IA among the 426 students. Out of the six excessive internet users, four students had emotional, one student had conduct, three had hyperactivity, three had peer problems and five had high score on prosocial. It signified that in the current study excessive use of internet had negative impact on students' lives, with a higher score on TDS compared with prosocial mean score ( $p < 0.0001$ ,  $\chi^2 = 56.119$ ). Hence, students who had problems caused by internet use were more likely to be classified as excessive internet users than students who did not have problems. However, this study found that behaviours such as emotional, conduct, hyperactivity, peer problems and prosocial were associated with excessive internet use (table 3).

**Table 2** Prevalence of internet use with median and quartile range

19–53 IAT score	Frequency	Percentage	Median	Quartile range
0–30 (normal user)	189	44.37	35	19–53
31–49 (mild user)	102	23.94		
50–79 (moderate user)	129	30.28		
80–100 (excessive user)	6	1.41		
Total	426	100.00		

IAT, Internet Addiction Test.

**Table 3** Domains of SDQ and IAT with percentage of internet use,  $\chi^2$  and p values

SDQ categories	IAT categories					Total score	P values	χ <sup>2</sup>
	Normal user	Mild user	Moderate user	Excessive user				
Emotional	Close to average	131 (69.31%)	60 (58.82%)	76 (58.91%)	2 (33.33%)	269 (63.15%)	0.019	19.776
	Slightly raised	15 (7.94%)	13 (12.75%)	17 (13.18%)	0 (0.00%)	45 (10.56%)		
	High	19 (10.05%)	15 (14.71%)	17 (13.18%)	0 (0.00%)	51 (11.97%)		
	Very high	24 (12.70%)	14 (13.73%)	19 (14.73%)	4 (66.67%)	61 (14.32%)		
Conduct	Close to average	149 (78.84%)	68 (66.67%)	63 (48.84%)	4 (66.67%)	284 (66.67%)	<0.0001	52.298
	Slightly raised	27 (14.29%)	21 (20.59%)	20 (15.50%)	1 (16.67%)	69 (16.20%)		
	High	8 (4.23%)	6 (5.88%)	20 (15.50%)	0 (0.00%)	34 (7.98%)		
	Very high	5 (2.65%)	7 (6.86%)	26 (20.16%)	1 (16.67%)	39 (9.15%)		
Hyperactivity	Close to average	164 (86.77%)	77 (75.49%)	88 (68.22%)	2 (33.33%)	331 (77.70%)	<0.0001	42.290
	Slightly raised	13 (6.88%)	11 (10.78%)	19 (14.73%)	1 (16.67%)	44 (10.33%)		
	High	7 (3.70%)	10 (9.80%)	10 (7.75%)	0 (0.00%)	27 (6.34%)		
	Very high	5 (2.65%)	4 (3.92%)	12 (9.30%)	3 (50.00%)	24 (5.63%)		
Peer problem	Close to average	96 (50.79%)	53 (51.96%)	34 (26.36%)	0 (0.00%)	183 (42.96%)	<0.0001	37.039
	Slightly raised	43 (22.75%)	22 (21.57%)	28 (21.71%)	1 (16.67%)	94 (22.07%)		
	High	25 (13.23%)	15 (14.71%)	34 (26.36%)	2 (33.33%)	76 (17.84%)		
	Very high	25 (13.23%)	12 (11.76%)	33 (25.58%)	3 (50.00%)	73 (17.14%)		
Prosocial	Close to average	160 (84.66%)	81 (79.41%)	97 (75.19%)	5 (83.33%)	343 (80.52%)	0.524	8.102
	Slightly raised	13 (6.88%)	14 (13.73%)	19 (14.73%)	1 (16.67%)	47 (11.03%)		
	High	10 (5.29%)	5 (4.90%)	7 (5.43%)	0 (0.00%)	22 (5.16%)		
	Very high	6 (3.17%)	2 (1.96%)	6 (4.65%)	0 (0.00%)	14 (3.29%)		
TDS	Close to average	139 (73.54%)	60 (58.82%)	47 (36.43%)	1 (16.67%)	247 (57.98%)	<0.0001	56.119
	Slightly raised	31 (16.40%)	20 (19.61%)	33 (25.58%)	1 (16.67%)	85 (19.95%)		
	High	6 (3.17%)	6 (5.88%)	15 (11.63%)	1 (16.67%)	28 (6.57%)		
	Very high	13 (6.88%)	16 (15.69%)	34 (26.36%)	3 (50.00%)	66 (15.49%)		
Total score		189 (100.00%)	102 (100.00%)	129 (100.00%)	6 (100.00%)	426 (100.00%)		

IAT, Internet Addiction Test; SDQ, Strength and Difficulties Questionnaire; TDS, Total Difficulty Score.



There was a significantly positive correlation between conduct, emotional, hyperactivity and peer problem domains of SDQ with the total IAT score, and there was a significantly negative correlation between prosocial domain of SDQ with the total IAT score. In addition, there was a significantly positive correlation between anticipation, excessive use, lack of control, neglect of social life, neglect of work and salience domains of IAT with conduct, hyperactivity and peer problem, while only three domains of IAT (i.e., excessive use, lack of control and salience, had significantly positive correlation with the emotional domain of SDQ. There was a significantly negative correlation between all domains of IAT and prosocial domain of SDQ. Furthermore, all the domains of IAT as well as the total IAT score positively correlated with TDS ( $p < 0.001$ ) (table 4). Comparison of IAT categories with TDS day was also found to be significant ( $p < 0.0001$ ) (table 5).

## DISCUSSION

### Main findings

The positive rate of excessive internet use among school students found in this study was 1.41%, which was closely related to some other studies done on student internet use worldwide, such as 1% in Greece<sup>7</sup> and 4.6% in Australia.<sup>22</sup> The only published study from India, which evaluated IA using the Davis Online Cognition Scale in school-going children aged 16–18 years, reported a prevalence of 18%. In the study of Goel and colleagues<sup>23</sup> (using Young's original criteria), 74.5% of internet users were moderate users, 24.8% were possible addicts and 0.7% were addicts. In the study of Sharma and colleagues<sup>24</sup> (IAT scoring), 57.3% were normal users, 35.0% were mild, 7.4% were moderate and 0.3% were severely addicted to the internet, while a low rate of IA was expected due to the still limited access most Indian students had to the internet compared with Western countries, and differences in cultural and social traditions in India.

Participants who took part in the study comprised 58.22% males and 41.78% females; the mean IAT score in males was 40.43 (SD=20.2) and the mean IAT score in females was 31.33 (SD=20.46). The  $p$  value was  $< 0.001$ , which was statistically significant. It implies there is difference in the IAT scores across both genders. Some researchers have found that male internet users were more prone to excessive internet use.<sup>25–27</sup> In contrast Young (1996)<sup>28</sup> stated that women were more subjected to excessive internet use than men. However, Brenner<sup>29</sup> found no gender differences in relation to IA. Few Indian studies also suggested that males were more prone to excessive internet use than females (Grover *et al*, 2010),<sup>30</sup> and Goel and colleagues<sup>23</sup> reported that males in comparison with females were significantly more likely to be addicted ( $\chi^2=10.2$ ,  $p=0.006$ ). This study supports the general literature that males tend to be more subjected to excessive internet use. It may be due to greater availability

of internet-associated devices, time and money to males as compared with females in the Indian society.

In addition, this study found that IA was associated with the stream of students they chose. Excessive internet users were more in commerce and humanities as compared with science, and majority of science students were normal users as it may be due to more study materials in their curriculum and number of competitive exams they had to take, hence these students had less free time to spend on the internet.

In the current study, excessive use of internet had negative impact on students' lives as shown by a higher score on TDS (mean=13.95, SD=5.04), which was higher compared with the prosocial mean score. Hence, students who had problems caused by internet use were more likely to be classified as excessive internet users than students who did not have problems. Most of the findings from this study are consistent with the literature. However, this study found that behaviours such as emotional, conduct, hyperactivity, peer problems and prosocial were associated with excessive internet use. These behaviours have not previously been identified as predictors of IA in the Indian literature. But one study conducted in secondary school students in Thailand reported that IA had been associated with both positive and negative impacts, including improving relationships between friends and family as positive impact, and low academic achievement, health, personal relationships problems and social problems as negative impact.<sup>31</sup> Thus, more research needs to be done to explore it in greater detail and to what degree specific internet activities may influence the development of IA and the associated behaviours. The potential negative impact of internet use on students' lives should be considered more seriously. Although excessive internet use rate was only 1.41% among senior secondary school students, they were classified as excessive internet users and reported having difficulties in their emotional, conduct, hyperactivity and peer problem behaviours. Similarly, student respondents reported having emotional problems, such as frequent complaints of headache, worrying a lot, remaining unhappy and being downhearted, and becoming nervous in new situations. Students also reported having symptoms of peer problems, such as usually remaining alone, having few friends and generally being bullied by others. These problems, as discussed above, should be considered together with the total IA score when classifying internet addictive behaviours.

### Limitations

1. The sample size was small. Larger sample size could add power to the study.
2. We are not able to assess the short-term and long-term impact of internet use on students.
3. Several other factors like economic condition, family relation, time spent on internet and accessibility of internet also have huge impact on IA, which should be incorporated in future research.

**Table 4** Spearman rank correlation between the components of IAT and SDQ of the participants

		Anticipation	Excessive use	Lack of control	Neglect social life	Neglect work	Salience	Total
Conduct	Correlation coefficient	0.255	0.309	0.24	0.241	0.236	0.265	0.327
	P values	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	n	426	426	426	426	426	426	426
Emotional	Correlation coefficient	0.085	0.157	0.112	0.074	0.033	0.129	0.128
	P values	0.0807	0.0012	0.0209	0.1287	0.4914	0.0077	0.0083
	n	426	426	426	426	426	426	426
Hyperactivity	Correlation coefficient	0.22	0.313	0.235	0.188	0.234	0.256	0.309
	P values	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001
	n	426	426	426	426	426	426	426
Peer problem	Correlation coefficient	0.159	0.282	0.128	0.173	0.234	0.25	0.272
	P values	0.001	<0.001	0.0084	0.0003	<0.001	<0.001	<0.001
	n	426	426	426	426	426	426	426
Prosocial	Correlation coefficient	-0.117	-0.141	-0.112	-0.117	-0.187	-0.171	-0.178
	P values	0.0158	0.0035	0.0207	0.0159	0.001	0.0004	0.0002
	n	426	426	426	426	426	426	426
TDS	Correlation coefficient	0.27	0.395	0.265	0.229	0.279	0.335	0.383
	P values	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	n	426	426	426	426	426	426	426

IAT, Internet Addiction Test; SDQ, Strength and Difficulties Questionnaire; TDS, Total Difficulty Score.

**Table 5** Comparison between TDS and IAT categories

IAT categories	Normal user	Mild user	Moderate user	Excessive user	P values
TDS	12 (9–15)	13 (11–17)	16 (13–19)	22 (16–26)	<0.0001
Total IAT score	17 (10–25)	40 (35–45)	59 (54–65)	85 (83–90)	<0.0001

IAT, Internet Addiction Test; TDS, Total Difficulty Score.

## Implications

Excessive internet use causes negative consequences to users, such as emotional, conduct, hyperactivity and peer problem behaviours. These problems should be considered together with excessive internet use when classifying internet addictive behaviours. To avoid negative consequences, we should promote education about responsible use and supervision of students by family members, so that problem should be identified by addictive users themselves.

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