Predictors of internet addiction among medical students of North India

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Research Article

Keywords: undergraduate medical, internet, discriminant analysis, time, cross sectional study

Posted Date: June 9th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-526585/v1

Abstract

Background The prevalence of internet addiction in India varies from 20% to 59% in undergraduate medical students. Therefore this study was planned to assess the prevalence, pattern and reason of internet usage and to assess predictors of internet addiction in medical undergraduate students.

Material and Methods A cross-sectional study was conducted on 201 medical undergraduate students in a medical college of North India from April 1st to May 31st, 2019.A self-designed semi-structured and pre tested questionnaire was used to know pattern and reasons associated with internet addiction (IA) and Dr. Kimberly Young's Internet Addiction Test (IAT) tool was used to measure level of IA. Discriminant analysis was used to assess predictors of internet addiction. Data was recorded in MS Excel and trial version of Statistical Package for Social Sciences (version 27.0; SPSS Inc., Chicago, IL) software was used for statistical analysis.

Result Prevalence of internet addiction was found to be 90%, where prevalence of mild IA was 48.8% followed by moderate and severe IA, 38.8% and 2.4% respectively. Predictive accuracy of model based on socio-demographic, social media applications usage, Entertainment site usage, Educational site usage and final model were found to be 61.2%, 63.7%, 63.2%, 61.7% and 66.2% respectively.

Conclusion Medical undergraduate students are highly vulnerable for internet addiction. We should create awareness among medical students regarding internet addiction and its potential harms; this could be included in foundation course of curriculum implementation support program (CISP) for MBBS students.

Background

Use of the internet has increased dramatically over the past two decades. Recent Global Internet Statistics by Global Reach show over 803 million people have online access around the world [1]. The benefits of the internet have been widely researched and include education and research, communication, health related services, online monetary transactions, trade, buying goods, and entertainment etc [2]. Globally, due to population diversity the prevalence of internet addiction changes from 1.5–25% [3–6], whereas In India, it ranges from 20–59% in undergraduate medical students [2–7].

Researchers have suggested various socio-demographic, personal and internet-related factors are associated with internet addiction. Male gender [8–9], initial years during study course, influence of peers, always logged in status, online interaction with friends, chat, watching porn, online new friendships or relationships, online shopping, average daily time spent on internet and internet access modalities were some of the risk factors for internet addiction [2, 7, 9–10]. Researcher found that 73% of college students accessed the internet at least once a day and spent approximately 1.6 to 4.5hrs a day online, preferably during night [2, 7–8, 11].

Researchers found that scores of various psychiatric scales like anxiety, depression, paranoid ideation and obsessive compulsive scores are lower in individuals without internet addiction vis-a-vis with internet

addiction [12, 13]. Deteriorating effects of internet addiction were seen on psychological health of the students [14]. Hence it is important to analyze the prevalence, pattern of internet use and factors associated with internet addiction among medical undergraduate students as they are vulnerable group on account of the time they spend on the internet. There is paucity of data regarding predictors of internet addiction in medical undergraduates. Therefore this study was planned to assess the prevalence of internet addiction, pattern and reasons of internet usage and to assess predictors of internet addiction in undergraduate students of a medical college of North India.

Material And Methods

A college based cross-sectional study was conducted on 201 undergraduate students in a medical college of North India from April 1st to May 31st, 2019. **Inclusion criteria**: All the undergraduate students studying in a medical college of North India and using internet at least for last 6 months were selected for the study. **Exclusion criteria**: those who do not give consent.

Sample size calculation: The sample size was calculated by taking the minimum prevalence of internet addiction as 20% at a level of 95% significance and 6% precision [7]. The calculated sample size was 171 by using formula Z^2Xp X q/ I^2, Considering 10% non response rate the final minimum sample size was 189. We have studied and analysed data from 201 students. We have also stratified undergraduate students according to year of admission and enrolled at least 50 students from each strata.

Questionnaire design and validation: A semi-structured and pre tested questionnaire was used to collect information regarding: age, gender, socio-economic status, place of residence, year of admission, ownership of gadget (computer, laptop, mobile, tablet) and questions related to internet use; do you use the internet?, preferred place of internet access (home, cybercafé, or others), for how long have you used the internet?, on an average, how much time per week do you spend on the internet?, on an average, how much money per month do you spend on the internet. Questions related to reasons for internet use; why do you use internet (for communicating with friends and family, required for course work/ assignments, research on new developments/ in areas of interest, browsing, news updates, recreation or relaxation, meeting new people, chatting with others to share interests/ ideas or fantasies, time pass, emotional support, job search, gambling, adult only content, games and shopping etc). on an average, how much time per week do you spend on the internet sites like WhatsApp, online movies, online shopping, search tool (Google/Bing etc), adult content site, Email, torrent download, duration of internet use, money spent on internet per month, Snapchat, Twitter, Youtube, Facebook, Newsgroup, Gaming sites, Spiritual content, Music/songs and Instagram. To measure level of internet addiction Dr. Kimberly Young internet addiction test (IAT) scale was used [15]. The IAT is a 20-item 5-point Likert scale that measures the severity of self-reported compulsive use of the internet. The marking for this questionnaire ranges from 0–100; the higher the score range, the greater the level of addiction; Normal Range: 0–30 points, Mild: 31–49 points, Moderate: 50–79 points, Severe: 80–100 points. The overall Cronbach's α computed from the studies was 0.889 [95% confidence interval (CI) 0.884–0.895]. The standard deviation of the alpha was low, at

0.049 [16]. In present study we have found high internal consistency, with an alpha coefficient of 0.889 (CI 0.867–0.911).

Data collection

A self-designed semi-structured and pre tested questionnaire was distributed in classes to various semesters, using a stratified random sampling technique to incorporate as representative a sample as possible. The questionnaire was distributed in the classes with the permission of each faculty, and participation was voluntary. The participants were asked to fill the questionnaire once. The researcher had introduced himself to the participants and explained the purpose and objectives of the study. He also informed participants that participation is voluntary, will not affect their grades in this course, and is expected to take approximately 15 minutes.

Data management and statistical analysis

Confidentiality of all the data was ensured by keeping the responses anonymous. Moreover, the collected data was stored under secure settings. Data was recorded in MS Excel and trial version of Statistical Package for Social Sciences (version 27.0; SPSS Inc., Chicago, IL) software was used for statistical analysis. Qualitative data was analyzed using proportions and percentages. Two-group Discriminant analysis was used to assess the predictive accuracy of various discriminators for internet addiction. We have also prepared various models by combining different discriminators and calculated the predictive accuracy of each model. Stepwise discriminant analysis was performed to assess the most significant discriminators of internet addiction. Total 5 models have been prepared i.e. consisting of socio-demographic factors (model 1), Social media applications usage (model 2), Entertainment site usage (model 3), Educational site usage (model 4) & final model consisting of most important discriminators (model 5).

The analysis creates a discriminant function which is a linear combination of the weightings and scores on these variables. The maximum number of functions is either the number of predictors or the number of groups minus one, whichever of these two values is the smaller.[17] DA involves the determination of a linear equation like regression that will predict which group the case belongs to. The form of the equation or function is:

$$Z_{jk} = a + W_1X_{1k} + W_2X_{2k} + \ldots + W_nX_{nk}$$

Where:

Z_{jk} = Discriminant Z score of discriminant function j for object k.

a = Intercept.

W_i = Discriminant coefficient for the Independent variable i.

X_{ik} = Independent variable i for object k.

n = number of predictor variables

Result

In present study we have analyzed data of 201 subjects and prevalence of internet addiction was found to be 90%, where prevalence of mild IA was 48.8% followed by moderate and severe IA, 38.8% and 2.4% respectively (Fig. 1).

Table 1 shows that majority of the study subjects were 20 years or more i.e. 70.6% and 29.4% were less than 20 years of age. Approximately 2/3rd of the subjects were males (65.7%) and app. 1/3rd was females (34.3%). Most of the study subjects (96%) were belongs to Hindu religion followed by Muslim and Sikh religion (4%). Majority of the subjects (76.1%) were belongs to nuclear family and 23.9% belongs to joint family. Most of subjects (84.6%) belongs to upper or upper middle SES followed by lower middle or lower SES (15.4%). Approximately 3/4th of the study subjects (74.1%) had permanent residence in Delhi and rest had permanent residence outside Delhi. More than half of the subjects (55.7%) were staying in hostel and 44.3% were non hosteller. According to year of study 36.8% of the study subjects were in third year, 36.3% in second year and 26.9% in first year students.

Table 1
Distribution of study subjects according to socio-demographic characteristics (N = 201)

Variable	Total n = 201 (%)
Age	
< 20 years	59 (29.4)
≥ 20 years	142 (70.6)
Gender	
Male	132 (65.7)
Female	69 (34.3)
Religion	
Hindu	193(96)
Muslim or Sikh	8 (4)
Type of family	
Nuclear	153(76.1)
Joint	48 (23.9)
Socio-Economic Status	
Upper & Upper Middle	170 (84.6)
Lower & Lower Middle	31 (15.4)
Permanent residence	
Delhi	149 (74.1)
Non Delhi	52 (25.9)
Hostel accommodation status	
Hosteller	112 (55.7)
Non Hosteller	89 (44.3)
Admission year	
2018 (First year)	54 (26.9)
2017 (Second year)	73 (36.3)
2016 (Third year)	74 (36.8)

Two third of the study subjects were started using internet during their early adolescent period and 15.9% of study subjects during late adolescence, rest 17.8% of subjects started internet uses before adolescent period. Most of the study subjects (60.7%) used internet for period of 6–10 years, 27.9% for 1–5 years and only 11.4 % study subject's used internet more than 10 years. Almost all the study subjects had smartphones (99%), 51.7% had laptop, 31.3% had computer and 24.4% had tablet. Only 15.4% subjects had all the above electronic gadgets. Almost all the subjects (99%) preferred smartphone for the internet access except for 2 subjects who preferred computer to access internet. Majority of subjects access internet daily i.e. 95.5% followed by 4.5% subjects those access internet 2–6 days in a week. More than half (51.7%) of the study subjects preferred night time to access internet followed by evening and morning i.e. 39.3% and 9% respectively. Majority of subjects (72.1%) used internet less than 5 hours a day, 21.9% used internet 6–10 hours a day and only6% used internet for more than 10 hours a day. More than half (50.7%) of the study subjects had spent less than INR 150 per month on internet,23.9% spent INR 151–300, 15.4%spent INR 300–500 and only 10% of study subjects had spent more than INR 500 per month on internet. 60.7% study subjects were permanently logged in and 39.3% study subjects uses internet on and off (Table 2).

Table 2
Pattern of Internet use among study subjects (N = 201)

Variable	Frequency	Percentage
Age at first internet use		
5–10 years	32	15.9
11–15 years	133	66.2
16–20 years	36	17.9
Duration of internet use		
1–5 years	56	27.9
6–10 years	122	60.7
> 10 years	23	11.4
Ownership of electronic gadget with internet access*		
Smartphone	199	99
Laptop	104	51.7
Computer	63	31.3
Tablet	49	24.4
All	31	15.4
Most common mode of internet access		
Smartphone	199	99
Computer	2	1
Internet use per week		
7 days	192	95.5
2–6 days	9	4.5
Preferred time to use internet		
Day (6am to 5pm)	18	9
Evening (5pm-10pm)	79	39.3
Night (10pm-5am)	104	51.7
Internet use per day		
≤ 5 Hours	145	72.1

Variable	Frequency	Percentage
6–10 Hours	44	21.9
> 10 Hours	12	6.0
Money spent on internet per month		
INR 1-150	102	50.7
INR151-300	48	23.9
INR 301–500	31	15.4
INR > 500	20	10
Log in status		
Permanently login	122	60.7
On and off	79	39.3

Common reasons for the internet usage found to be work or assignment, communication with friend, browsing, recreational or relaxation purposes, time pass, shopping and news update i.e. 99%, 98.5%, 98%, 97.5%, 96%, 92.5% and 90% respectively. Many subjects usage internet for chatting, research, online games, emotional support, meeting new people and watching adult content i.e. 88.6%, 88.6%, 84.1%, 76%, 70.6% and 65% respectively. About 21% of the subject's usage internet for gambling (Table 3).

Table 3
Reasons of internet usage among study subjects

Variable	Frequency	Percentage
Work or assignment	199	99
Communication with friend	198	98.5
Browsing	197	98
Recreational or Relaxation	196	97.5
Time pass	193	96
Shopping	186	92.5
News update	181	90
Chatting	178	88.6
Research	178	88.6
Games	169	84.1
Emotional support	153	76
Meeting new people	142	70.6
Adult content	131	65
Gambling	42	20.9
*Multiple responses		

Table 4 provides the predictive accuracy of various discriminators. Most important discriminators for moderate or severe internet addiction were found to be WhatsApp usage, watching online movies, online shopping, search tool, watching adult content site and Email usage.

Table 4
Predictive accuracy of various discriminators to discriminate no or mild internet addiction and moderate or severe internet addiction

Variables	Percentage Correctly Classified
WhatsApp	64.2
Online movies	62.2
Online shopping	61.7
Search tool (Google/Bing etc)	61.2
Adult content site	61.2
Email	60.7
Torrent download	60.2
Duration of internet use	59.7
Money spent on internet per month	59.7
Snapchat	59.7
Twitter	59.7
Family Income	59.2
Youtube	59.2
Facebook	59.2
Newsgroup	59.2
Gaming sites	59.2
Spiritual content	59.2
Age	58.7
Music/songs	58.2
Instagram	58.2

Prevalence of internet addiction was found to be 90%, where prevalence of mild IA was 48.8% followed by moderate and severe IA, 38.8% and 2.4% respectively. Predictive accuracy of model based on socio-demographic, social media applications usage, Entertainment site usage, Educational site usage and final model were found to be 61.2%, 63.7%, 63.2%, 61.7% and 66.2% respectively.

Predictive Modeling Using Discriminant Analysis

Model 1. Socio-demographic factors; In this model we have included age, total family income, duration of internet use in months and monthly expenditure on internet. The equation of the model while considering only socio-demographic factors is as follows:

D1= (0.160* Age) + (0.000* Family Income) + (0.016* Internet duration in months) + (0.002* monthly expenditure on internet) -4.068

Table 5 shows that 61.2% of respondents were correctly classified into categories of internet addiction by socio-demographic factors. This model correctly predicts 94.1% of subjects with no or mild internet addiction.

Table 5
Classification result table of model including Socio-demographic factors

Original classification	Predicted Group Membership		Total
	No/ Mild Internet Addiction (%)	Moderate/ Severe Internet Addiction (%)	
No/ Mild Internet Addiction	112 (94.1)	7 (5.9)	119 (59.2)
Moderate/ Severe Internet Addiction	71 (86.6)	11 (13.4)	82 (40.8)

Model 2. Social media applications usage; In this model we have included weekly average time spent on Facebook, Whats app, Twitter, Instagram and Snapchat. The equation of the model while considering only social media applications usage is as follows:

D2= (0.007* Facebook) + (0.080* Whats App) + (0.129*Twitter) + (-0.043* Instagram) + (0.003* Snapchat) − 0.653

Table 6 shows that 63.7% of respondents were correctly classified into categories of internet addiction by socio-demographic factors. This model correctly predicts 95.8% of subjects with no or mild internet addiction.

Table 6
Classification result table of model including social media application usage

Original classification	Predicted Group Membership		Total
	No/ Mild Internet Addiction (%)	Moderate/ Severe Internet Addiction (%)	
No/ Mild Internet Addiction	114 (95.8)	5 (4.2)	119 (59.2)
Moderate/ Severe Internet Addiction	68 (82.9)	14 (17.1)	82 (40.8)

Model 3. Entertainment site usage; In this model we have included weekly average time spent on playing online games, watching youtube videos, listening online music/songs, watching online movies, download and watching adult sites. The equation of the model while considering only entertainment site usage is as follows:

D3= (-0.021* Game site) + (0.051* You Tube) + (0.006*Music/song) + (0.072* Online Movie) + (0.182* Download) + (0.048* Adult Site) − 0.981

Table 7 shows that 63.2% of respondents were correctly classified into categories of internet addiction by entertainment site usage. This model correctly predicts 89.9% of subjects with no or mild internet addiction.

Table 7
Classification result table of model including Entertainment site usages

Original classification	Predicted Group Membership		Total
	No/ Mild Internet Addiction (%)	Moderate/ Severe Internet Addiction (%)	
No/ Mild Internet Addiction	107 (89.9)	12 (10.1)	119 (59.2)
Moderate/ Severe Internet Addiction	62 (75.6)	20 (24.4)	82 (40.8)

Model 4. Educational site usage; In this model we have included weekly average time spent on emails, search tools (Google or Bing), News groups, Pubmed or Google scholar and watching spiritual site. The equation of the model while considering only educational site usage is as follows:

D4= (0.401* Email) + (0.040* Search tools) + (-0.043*Newsgroup) + (0.122* Pubmed or Google scholar) + (0.014* Spiritual site) − 0.822

Table 8 shows that 61.7% of respondents were correctly classified into categories of internet addiction by educational site usage. This model correctly predicts 92.4% of subjects with no or mild internet addiction.

Table 8
Classification result table of model including Educational site usages

Original classification	Predicted Group Membership		Total
	No/ Mild Internet Addiction (%)	Moderate/ Severe Internet Addiction (%)	
No/ Mild Internet Addiction	110 (92.4)	9 (7.6)	119 (59.2)
Moderate/ Severe Internet Addiction	68 (82.9)	14 (17.1)	82 (40.8)

We have further performed stepwise discriminant analysis to know the most significant discriminators of moderate to severe internet addiction. We have found that total family income, internet usage for emails and whatsapp were most significant discriminators among all the discriminators, hence we have used these three discriminators for our final model.

Model 5. Final model; In this model we have included total family income, weekly average time spent on internet usage for emails and whatsapp. The equation of the model while considering these three variables is as follows:

D5= (0.000* Family Income) + (0.448* Email) + (0.060*Whatsapp)– 0.315

Table 9 shows that 66.2% of respondents were correctly classified into categories of internet addiction by final model. This model correctly predicts 92.4% of subjects with no or mild internet addiction.

Table 9
Classification result table of final model

Original classification	Predicted Group Membership		Total
	No/ Mild Internet Addiction (%)	Moderate/ Severe Internet Addiction (%)	
No/ Mild Internet Addiction	110 (92.4)	9 (7.6)	119 (59.2)
Moderate/ Severe Internet Addiction	59 (72.0)	23 (28.0)	82 (40.8)

Figure 2 shows the discriminant scores of 201 subjects. The centroid value for no or mild internet addiction is -0.278 whereas for moderate or severe internet addiction is 0.404. So in this case the cutoff score will be 0.123. Hence the cutoff values above 0.123 are classified as moderate or severe internet addiction and values below 0.123 are classified as no or mild internet addiction.

Conclusion

Medical undergraduate students are highly vulnerable for internet addiction. We should create awareness among medical students regarding internet addiction and its potential harms; this could be included in foundation course of curriculum implementation support program (CISP) for MBBS students.

Discussion And Conclusion

In our study prevalence of internet addiction is 90%, whereas some other studies prevalence of IA ranges from 20%-46% [7, 10]. High prevalence of internet addiction in this study might be due to demographic profile of study subjects as majority (84.6%) belongs to upper or upper middle SES, moreover we have also included mild category of internet addiction.

We have developed different discriminant models using parameters like socio-demographic factors (model 1), Social media applications usage (model 2), Entertainment site usage (model 3), Educational site usage (model 4) & final model consisting of most important discriminators (model 5) to discriminate no or mild IA and moderate and severe IA. Predictive accuracy of model based on socio-demographic, social media applications usage, Entertainment site usage, Educational site usage and final model were found to be 61.2%, 63.7%, 63.2%, 61.7% and 66.2% respectively.

Predictive accuracy of individual discriminators like WhatsApp usage, watching online movies, online shopping, search tool, watching adult content site and Email usage were found to be 64.2%, 62.2%, 61.7%, 61.2%, 61.2% and 60.7% respectively to discriminate no or mild IA and moderate or severe IA. To assess the internet addiction status of the undergraduate medical students we can use these discriminators.

Medical undergraduate students are highly vulnerable for internet addiction. We should create awareness among medical students regarding internet addiction and its potential harms; this could be included in foundation course of curriculum implementation support program (CISP) for MBBS students. Initiative should be taken to provide ample opportunities for students to involve in extracurricular activities and interact with friends. There should be provision of counsellor for emotional and mental support of medical students as they are overburden with studies and long posting schedules.

Abbreviations CISP: Curriculum Implementation Support Program; IA: Internet Addiction: IAT: Internet Addiction Test:

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Declarations

Acknowledgements My sincere thanks to all students who participated in this study **Authors' contributions** DD and SS prepared the study concept and design. DD and SS wrote the main manuscript text. DD and SS analyzed data and edited the draft. DD conducted investigation and data collection. Both authors had full access to all data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. The author(s) read and approved the final manuscript.

Funding Nil

Availability of data and materials The study datasets are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate The informed written consent was obtained from all the participants. This study was conducted following the Declaration of Helsinki and was approved by the Institutional Ethical Committee of Dr Baba Saheb Ambedkar Medical College and Hospital, Delhi (DBSAMC/10/EC/2019).

Consent for publication Not applicable.

Competing interests The authors declare that they have no competing interests.

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Figures

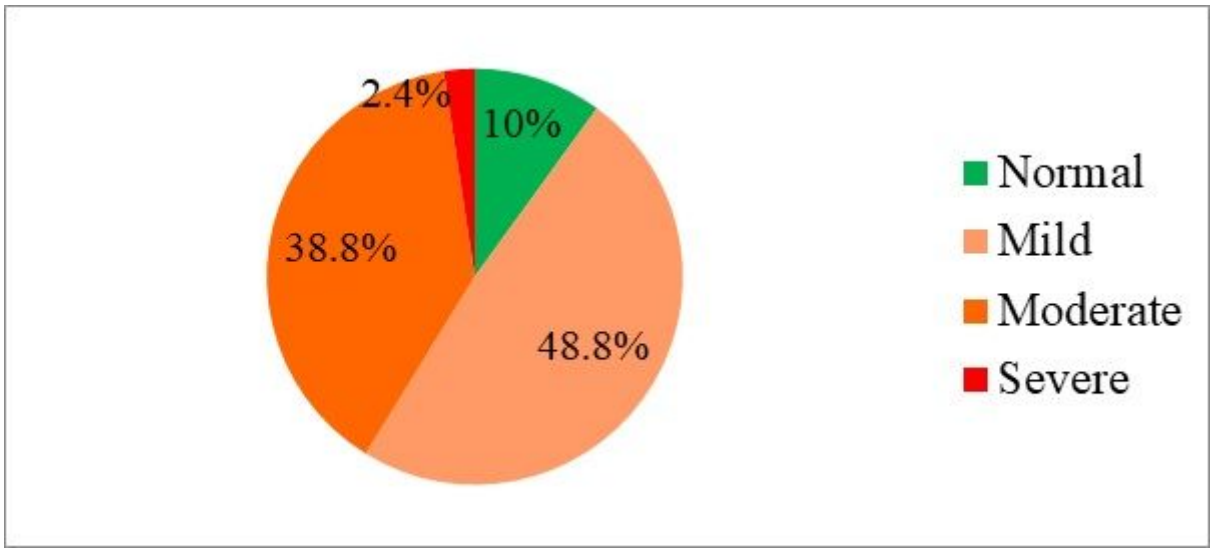

Figure 1

Pie chart showing prevalence of internet addiction among study subjects (N=201)

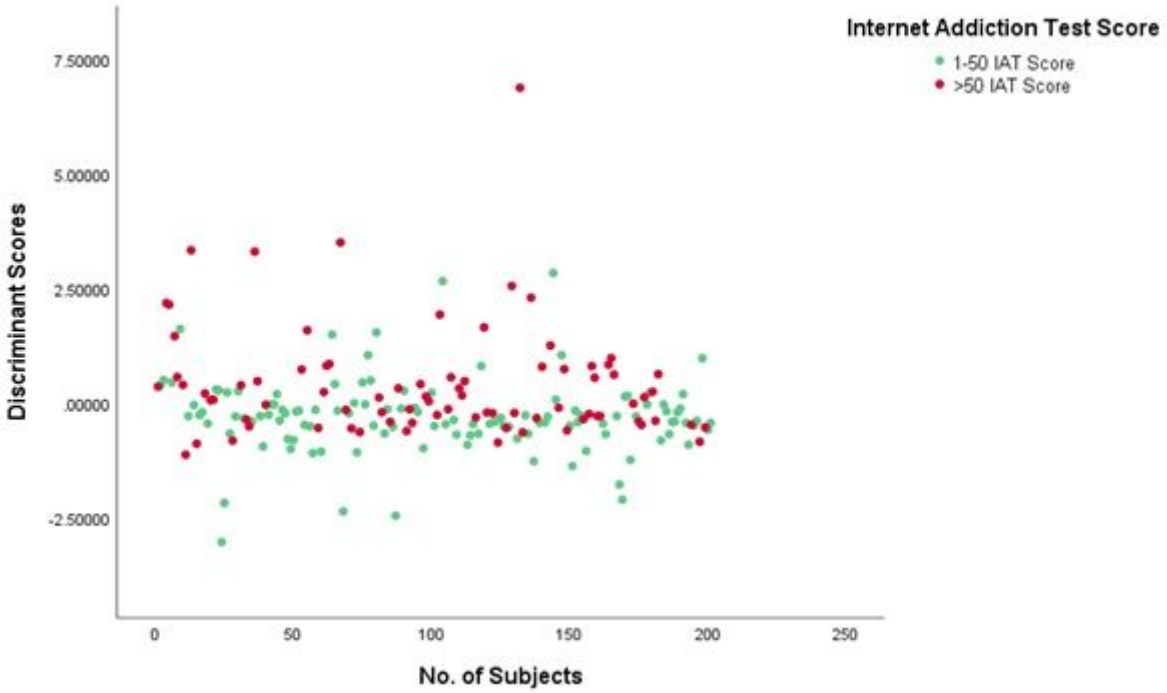

Figure 2

Scatter plot of discriminant scores of each subjects for final model