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Smartphone Usage Effect on Physical-Mental wellbeing and Academic performance of Secondary Level Students: An Empirical Study

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Abstract

Smartphone is the most popular electronic gadget in the present time. On one hand it helps out the students to learn and solve their academic problems through various online applications and online resources. The increased use of Smartphone by children of all ages has raised the eyebrows of parents. Everyday evidences of negative and positive impact of Smartphone on academic performance, mental health and physical health are being highlighted by the researchers. This study has been carried out secondary level students of all the streams (commerce, science, humanities). The aim is to analyze impact of Smartphone on physical and mental health and academic performance. The study also compares the said impact on the basis of gender. The survey was conducted in selected Kendriya Vidyalays of Delhi (NCR). The sample size of the study was 150 students (75 girls and 75 boys). The data collection tool used was a questionnaire developed by researcher on the basis of inputs from the extant literature. The data analysis tools used in the study were Chi-square test, one way MANOVA and one way MANCOVA.

Key words: Impact, Smartphone, physical-mental health, academic performance.

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1. Introduction

The invention of the small yet highly portable, intelligent and effective device – Smartphone has confined the world in its trap of attractive features. People irrespective of age are seen to be glued at their respective mobile screens. The infinite features and entertainment facilities provided by the tiny piece of technology is incredibly enough to replace the need of a companion. Alarmingly, it has been noticed that have the maximum number of mobile usage and are caught to be suffering from signs of mental and physical discrepancies due to its excessive use. There is an increase in Smartphone users with every passing generation.

In spite of the innumerable contributions of the internet to the field of education, there are some negative repercussions that are associated with the use of internet by school going students. Apart from being the caterer of infinite information, Smartphone also provides a lot of distractions and amenities that are pessimistically effective to a child's academic health. Students

are seen to waste a lot of time playing games, chatting, face timing, listening to music and surfing through the internet. The quality time and attention that is needed to improve academic efficiency is lost due to the technological distractions which further leads to poor academic performance.

2. Literature Review

Mobile phone has been used by people for an average of 5 hours per day. The growing symptoms of recklessness, anxiety and anger are some of the features that can be notice with its excessive use. There have also been cases of compulsive behaviour of users. The internet is a virtual platform that drives gullible teenagers to perform things according to trend. Students are seen to be a victim of alcohol abuse and depression **(James 2005)**. Increasing involvement of video games is affecting the academic performance of the students. It has also been noted that the video games are direct exposure violence and it diminishes the time that is required for a student to spend on school activities, assignments and physical interaction with people (**Jaruratanasirikul, 2009)**. The influence of Smartphone has a very bad impact on people of all age groups. Its addiction is pejorative and is seen to have been increasing substantially. The constant use of social media and Smartphone has led to the increase of communication addiction disorder. It is seen that people wants to stay in constant interaction with people although there is no genuine need. It is serious threat and will have a major consequence in future (**Lee 2012).** Internet has been the greatest evolution in the history of mankind. A Smartphone has got no efficiency and operation without the use of internet. The increasing addiction of Smartphone is directly proportional to the increasing demand for internet. The biggest drawback of both the invention has given birth to impulse control disorder and many other dangerous impacts on its users (**Goldberg 1996 and Young 1998).** It is seen that people cannot restrict the use of cell phones even after knowing its unconstructive implications. The use of Smartphone lessens the feeling of stress for the moment, creates pleasure and makes people devoid of feelings. It is also seen to have affected the physical, mental, social and psychological spheres of life **Shaffer, (1996); Van Deursen et al.,(2015); Young (1999).** The growing use of mobile phones has left to an inconsistency in a healthy sleep cycle. The signs of head ache, frustration, hearing loss and visionary issues are associated with improper sleep. The issues are prevalent in adolescents and are related to extreme use of phones **(JH 2008).** Smartphone is a threat to the academic performance for students who will appear for the higher secondary examination. The vast curriculum in a limited span of time needs proper attention but the time invested in the use of Smartphone and the internet affects the routine resulting in poor results. The increased alliance with these devices also leads to a detachment with a social world resulting in loneliness (**Laskar, 2019)** Things communicated through Smartphone have a negative impression on the teenagers. The boosting symptoms like irritation, bad temperament are seen to have been multiplying with its constant usage. Studies have proved that restlessness and laziness are the two most common factors affecting the life of heavy users (**Acharya, 2013).** The social media applications ensnares

people in its entertaining world and results in the loss of common activities that is required to survive a healthy life. Unlimited scrolling and chatting in between class intervals and also during food breaks is a result of a loss of diet and can severely distress the appetite (**Volkow, 2011)** Though Smartphone are a great invention for students to procure education related information but it is noted that the students are influenced with the other distractions that comes with it. Students utilize these devices to play games, communicate in the virtual world instead of gaining knowledge that is beneficial for their studies. The activities results in falling academic results along with physical and mental implications **(Woodcock, 2012).** There is always a limitation of student in distance learning that he or she cannot go to the college, hence Smartphone can help him out to learn through various online sources and notes. Briefly Smartphone are the blessing for the students who wish to learn through distance mode (**Kumar, 2011).** Kids have fallen into the fake social connect. Kids generally become so busy in games etc. that they avoid the physical or face to face interaction with their friends and other people around them **(Sarwar, 2013).**

There is a need to study the behavior of secondary school students that how Smartphone affects the different aspects of their life. The present study is an effort to highlight the various affects of Smartphone usage on academic performance and physical and mental health of the students.

3. Objectives of the study

- To ascertain the effect of Smartphone on Physical health of the secondary level students
- To measure the effect of Smartphone on Mental Health of secondary level students
- To find the effect of Smartphone on Academic Performance of the secondary level students
- To compare the effect of Smartphone on Physical Health, Mental Health and Academic Performance on the basis of Gender.

4. Research Methodology:

Research Design: The design for this study is descriptive. The study finds the impact/relation of usage of Smartphone on academic performance, physical health and mental health. The study also checks the interaction effect of Gender between the impact of Smartphone usage on mental and physical health.

Sampling Design: Purposive sampling was used to collect the data from selected Kendriya Vidyalays of Delhi, NCR. The sample size of the study was 150 students (75 girls and 75 boys). The data collection tool used was a questionnaire developed by researcher on the basis of inputs from the extant literature.

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Data Analysis tools: To check the impact of Smartphone usage on academic performance Chi-square test used, one way MANOVA was used to find the impact of Smartphone usage on mental and physical health and to check the interaction effect of Gender One-way MANCOVA was used.

5. Data Analysis and Findings:

5.1 Demographic Characteristics

Table 1 Demographic Profile of the Respondents

Demographic Characteristic	Categories	Number of Respondents	% age of Respondents
Academic Standard	11^{th}	75	50
	12^{th}	75	50
	Total	**150**	**100**
Gender	Boys	75	50
	Girls	75	50
	Total	**150**	**100**

Table 1 shows the Demographic profile of the respondents. Equal number of students (50%) was chosen from 11^{th} and 12^{th} standard.

5.2 Smartphone Usage behavior

Table 2 Time period since the Secondary school Students have been Using Phone

Usage Duration	No. of Respondents	Percentage of Respondents
6-12months	11	7.33
1-2years	21	14
2-3years	54	36
3-4years	40	26.67
More than 4years	24	16
Total	**150**	**100**

The above section deliberates upon the Smartphone usage behavior of school children. Table 2 shows that maximum students (36%) have been using the Smartphone for 2-3 years followed by 3-4 years (around 27%). 16% of the students have been using Smartphone for more than 4 years and 14% have been using for 1-2 years. Only, 7% have been using since 6 to 12 months.

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Table 3 Smartphone Usage per Day (in Hours)

Usage Duration	No. of Respondents	Percentage of Respondents
Less than 1hour	27	18.00
1-2 hours	34	22.67
2-3 hours	45	30.00
3-4 hours	28	18.67
More than 4 hours	16	10.67
Total	**150**	**100**

Table 3 shows the Smartphone usage per day by the secondary school students. It may be found from the table that around 30% of them worm of 2 -3 hours per day followed by 1-2 hours per day by around 23% of the respondents. Almost equal number of respondents (around 18%) uses the Smartphone less than 1 hour per day and more 3-4 hours per day. However, only around 11% use the Smartphone for more than 4 hours per day.

5.3 Effect of Smartphone on Academic Performance of the secondary level students:

Table 4aAcademic Performance * Smartphone Usage – Crosstabulation

Academic Performance * Smartphone Usage							
Count							
		Smartphone usage Duration per day					Total
		Less than 1hour	1-2 hours	2-3 hours	3-4 hours	More than 4 hours	
Academic Performance	40-60	7	7	15	8	5	**42**
	60-80	15	20	22	15	6	**78**
	80-100	5	7	8	5	5	**30**
Total		**27**	**34**	**45**	**28**	**16**	**150**

Table 4b Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.567[a]	8	.894
Likelihood Ratio	3.523	8	.897
Linear-by-Linear Association	.014	1	.905
N of Valid Cases	150		

Table 4a and 4b shows the crosstabulation and Chi-Square test results for measuring the effect of Smartphone use on academic performance of the secondary students. The value of Person Chi-

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Square(table 4b) on '8' degree of freedom is 3.567 and significance value is 0.894 which is greater than the critical value of p viz. 0.05, hence ***it is concluded that there is no impact of Smartphone usage on students' academic performance.***

5.4 Effect of Smartphone on Physical Health of Secondary Level Students

The impact of Smartphone on Physical Health has been investigated with the help of one way MANOVA. A prime assumption of MANOVA is that the covariance matrices of the dependent variables should be equal across groups. It is found from the Table 5 that the value against 'significance' column is .073 which is greater than the critical value i.e. 0.05 which shows that the data satisfied the Box's test of equality of covariance Matrices and fit for applying MANOVA.

Table 5 Box's Test of Equality of Covariance Matrices[a]

Box's M	83.926
F	1.277
df1	60
df2	19833.140
Sig.	.073
a. Design: Intercept + Smartphone Usage	

Table 6 Results of Multivariate Tests[a] for One Way MANOVA

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.974	1067.420[b]	5.000	141.000	.000
	Wilks' Lambda	.026	1067.420[b]	5.000	141.000	.000
	Hotelling's Trace	37.852	1067.420[b]	5.000	141.000	.000
	Roy's Largest Root	37.852	1067.420[b]	5.000	141.000	.000
Smartphone Usage	Pillai's Trace	.524	4.341	20.000	576.000	.000
	Wilks' Lambda	.532	4.914	20.000	468.594	.000
	Hotelling's Trace	.779	5.435	20.000	558.000	.000
	Roy's Largest Root	.635	18.278[c]	5.000	144.000	.000
a. Design: Intercept + Smartphone Usage						
b. Exact statistic						
c. The statistic is an upper bound on F that yields a lower bound on the significance level.						

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Table 6 shows the results of various measures by referring which it is assessed that whether the Independent variable (one) has significant effect on the dependent variables or not. The second part of the table 6 shows the results of Pillai's Trace, Wilks' Lambda, Hotelling's Trace and Roy's Largest Root. The significance value of all the measures is below the critical value of p (0.05), which signifies the independent variable has significant impact on dependent variables. However the above measures do not show how many dependent variables (There are five dependent variables in the category of physical health in this paper) are significantly affected by the independent variable. Two explore this Table 7 'Tests of Between – Subjects Effect' has to be referred.

Table 7 Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Smartphone Usage	I feel strain/itching in my eyes.	24.181	4	6.045	4.944	.001
	When I am indulging in it I skip my meal.	46.050	4	11.512	9.450	.000
	I feel backache/ back pain after spending time on it.	23.828	4	5.957	3.919	.005
	I feel fatigue next day due to late night Use of Smartphone	34.658	4	8.664	8.890	.000
	It helped me to improve my physical activities (like exercise, sports, etc.).	3.201	4	.800	.569	.686

a. Design: Intercept + Smartphone Use

Table 7 shows that for impact of physical health there were 5 statements depicting the physical health. The value in the significance column for the statements that *I feel strain/itching in my eyes, When I am indulging in it I skip my meal, I feel backache/ back pain after spending time on it and I feel fatigue next day due to late night Use of Smartphone, is below 0.05 (refer significance column of table 7),* ***which shows The usage of Smartphone has significant impact on the mentioned physical health issues.*** However, it can be observed from the table that the significance value of the statement that *'It helped me to improve my physical activities (like exercise, sports, etc.)*'is 0.686 which is above the critical value of p viz. 0.05 hence it is concluded that ***'Smartphone usage does not improve physical activities (like exercise, sports, etc.).***

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5.5 Effect of Smartphone on Mental Health of Secondary Level Students

Table 8 Box's Test of Equality of Covariance Matrices[a]

Box's M	108.300
F	1.155
df1	84
df2	19024.836
Sig.	.157
a. Design: Intercept + Smartphone Use	

Table 8 shows the Box's Test of Equality of Covariance Matrices value against 'significance' column is 0.157 which is greater than the critical value i.e. 0.05 which shows that the data satisfied the Box's test of equality of covariance Matrices and fit for applying MANOVA.

Table 9 Results of Multivariate Tests[a]for One Way MANOVA

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.966	662.260[b]	6.000	140.000	.000
	Wilks' Lambda	.034	662.260[b]	6.000	140.000	.000
	Hotelling's Trace	28.383	662.260[b]	6.000	140.000	.000
	Roy's Largest Root	28.383	662.260[b]	6.000	140.000	.000
Smartphone Usage	Pillai's Trace	.473	3.196	24.000	572.000	.000
	Wilks' Lambda	.563	3.657	24.000	489.612	.000
	Hotelling's Trace	.715	4.127	24.000	554.000	.000
	Roy's Largest Root	.617	14.694[c]	6.000	143.000	.000
a. Design: Intercept + Smartphone Usage						
b. Exact statistic						
c. The statistic is an upper bound on F that yields a lower bound on the significance level.						

It is found form the table 9 Pillai's Trace, Wilks' Lambda, Hotelling's Trace and Roy's Largest Root. The significance value of all the measures is below the critical value of p (0.05), which signifies the independent variable has significant impact on dependent variables(The Smartphone usage effects the mental health significantly). However, to check the individual affects Table 10, 'Tests of Between – Subjects Effect' has to be referred.

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Table 10 Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Smartphone Usage	I feel irritate/restless when I am away from it.	30.875	4	7.719	5.345	.000
	I use it as a way to escaping from problems (like reliving from stress/anxiety).	35.561	4	8.890	5.546	.000
	I prefer to spend my time on it when I am sad.	52.861	4	13.215	11.197	.000
	I feel angry when someone/something interrupting me when I am operating it.	30.671	4	7.668	5.236	.001
	I use it by concealing my parents.	17.166	4	4.292	3.084	.018
	I feel angry when my parents catch me as the moment I start using it.	32.919	4	8.230	5.134	.001

Table 10 shows that for impact of mental health there were 6 statements depicting the mental health. The value in the significance column for the statements that, *is below 0.05 (refer significance column of table 10),* ***which shows the usage of Smartphone has significant impact on the mentioned physical health.*** However, it can be observed from the table that the significance value of the statements that *I feel irritate/restless when I am away from it, I use it as a way to escaping from problems (like reliving from stress/anxiety), I prefer to spend my time on it when I am sad, I feel angry when someone/something interrupting me when I am operating it, I use it by concealing my parents and I feel angry when my parents catch me as the moment I start using it is below 0.05 (refer significance column of table 10),* ***which shows The usage of Smartphone has significant impact on the mentioned mental health.***

5.6 Interaction effect of Gender between the Impact of Smartphone on Physical Health

The study further finds that whether there is an impact of Gender on the various physical and mental health aspects for this purpose MANCOVA was applied.

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Table 11 Interaction Effect of Gender between Smartphone Usage effects on Physical Health

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Smartphone Usage * Gender	I feel strain/itching in my eyes.	11.823	4	2.956	2.513	.044
	When I am indulging in it I skip my meal.	6.522	4	1.630	1.094	.362
	I feel backache/ back pain after spending time on it.	1.111	4	.278	.195	.941
	I feel fatigue next day due to late night Use of Smartphone	.241	4	.060	.060	.993
	It helped me to improve my physical activities (like exercise, sports, etc.).	8.043	4	2.011	1.665	.162

Table 11 shows the results for interaction effect of Gender for Physical health. It may be observed from the table 11 that there are 5 different statements related to physical health. The significance value for statement 2 to 5 are above the critical value of p (.05), hence for all those statements the researcher concluded that ***there is no interaction effect of Gender with respect to the impact of Smartphone Usage on Physical health.*** In other words it may be said that the Impact of Smartphone usage is same on the physical health of boys and girls. However, regarding the statement ***I feel strain/itching in my eyes. It was observed that the significance value is*** 0.044which is below the critical value of p, hence it may be concluded that the Gender has significant interaction effect between Smartphone usage and physical health with respect to this aspect. The comparative mean values show that the strain / itching is felt higher by those boys who use the phone for longer hours - 3-4 hours and More than 4 hours(refer annexure 1 for details).

Table 12 Interaction Effect of Gender between Smartphone Usage effects on Mental Health

Source	Dependent Variable	Type III Sum of Squares	Df	Mean Square	F	Sig.
Smartphone Usage * Gender	I feel irritate/restless when I am away from it.	2.368	4	.592	.400	.808
	I use it as a way to escaping from problems (like reliving from stress/anxiety).	.986	4	.247	.151	.962
	I prefer to spend my time on it when I am sad.	10.148	4	2.537	2.207	.071

	I feel angry when someone/something interrupting me when I am operating it.	7.128	4	1.782	1.216	.307
	I use it by concealing my parents.	15.435	4	3.859	2.906	.024
	I feel angry when my parents catch me as the moment I start using it.	10.222	4	2.555	1.612	.174

It may be observed from the table 12 that there are 6 different statements related to mental health. The significance value for all the statements except 5th are above the critical value of p (.05), hence for all those statements the researcher concluded that ***there is no interaction effect of Gender with respect to the impact of Smartphone Usage on mental health***. In other words it may be said that the Impact of Smartphone usage is same on the mental health of boys and girls. However, regarding the statement ***I use it by concealing my parents*** *the significance value is* 0.044which is below the critical value of p, hence it may be concluded that the Gender has significant interaction effect between Smartphone usage and mental health with respect to this aspect. The comparative mean values show that when it comes to the light usage of Smartphone, the boys use it more by concealing their parents and when it comes to the medium usage (2-3 hours) then girls use Smartphone more by concealing their parents (Refer annexure 2 for more details on mean values).

6. Conclusion

Smartphone usage is the most common habit of school students. However, contrary to college students, school kids cannot carry their phones in the school and virtually their usage time reduces. This study reports that all the school kids reported in the study use the Smartphone. The study finds that Smartphone do not affect the academic performance. The study gives strong evidences of the impact of Smartphone on physical and mental health. Barring small exceptions it has been found that there is a significant impact of Smartphone on mental and physical health of the secondary students. The students feel irritation when they are away from it and they become angry when someone interrupts them using phone. They use it to escape from problems and also when they are sad. In case of impact of Smartphone on physical health it was observed that the secondary school students feel strain/itching in eyes, they skip mean, feel backache or back pain, feel fatigue etc. However, no positive contribution towards health was observed from usage of Smartphone. The study finds no major difference based on gender with respect to the impact of Smartphone usage on physical and mental health of the students.

7. Academic Implications and Scope for Future research:

The study has a large number of academic implications. The study finds that academic performance is yet to be influenced by Smartphone significantly. Since Smartphone help the students in studies also, their negative impact could have been nullified. The study indicates that impact of Smartphone on academics cannot be studied in isolation and many other variables such

as parents' participation in the studies, I.Q. level of the students, teachers' ability, number of hours a student devotes on studies etc. The future studies may consider these aspects.

The study also indicates that there is a serious negative impact of Smartphone on health, and needless to say that in the long term it may affect the studies. The researchers and educationalists may incorporate physical and mental health deterioration as a mediator between impact of Smartphone and academic performance.

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Annexure 1

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Smartphone Usage	I feel strain/itching in my eyes								
	Boys			Girls			Total		
	Mean	N	Std. Deviation	Mean	N	Std. Deviation	Mean	N	Std. Deviation
Less than 1hour	1.5455	11	.52223	**2.5000**	16	1.36626	2.1111	27	1.18754
1-2 hours	3.0556	18	.99836	3.0000	16	1.15470	3.0294	34	1.05845
2-3 hours	3.1739	23	1.02922	3.1818	22	.85280	3.1778	45	.93636
3-4 hours	**3.7333**	15	1.22280	3.0000	13	1.41421	3.3929	28	1.34272
More than 4 hours	**4.5000**	8	.75593	3.7500	8	1.16496	4.1250	16	1.02470
Total	**3.1600**	**75**	**1.25246**	**3.0267**	**75**	**1.19654**	**3.0933**	**150**	**1.22253**

Annexure 2

Smartphone Usage	I use it by concealing my parents.								
	Boys			Girls			Total		
	Mean	N	Std. Deviation	Mean	N	Std. Deviation	Mean	N	Std. Deviation
Less than 1hour	**2.6364**	11	1.12006	2.3750	16	1.08781	2.4815	27	1.08735
1-2 hours	**3.3889**	18	1.03690	**2.2500**	16	1.06458	2.8529	34	1.18404
2-3 hours	**2.7391**	23	1.21421	**3.3636**	22	1.13580	3.0444	45	1.20521
3-4 hours	3.4000	15	1.18322	3.4615	13	1.33012	3.4286	28	1.23013
More than 4 hours	3.5000	8	1.30931	3.5000	8	1.06904	3.5000	16	1.15470
Total	**3.0933**	**75**	**1.18747**	**2.9467**	**75**	**1.24002**	**3.0200**	**150**	**1.21219**