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Research Paper

Internet addiction and three cognitive functions

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ABSTRACT

The aim of the present investigation is to study the effect of excessive use of internet upon cognitive performance (working memory, problem solving and Abstract reasoning) of adolescents. In the present study a sample of 200 adolescents, age range from 12 to 18 years was taken from Prem Vidyalaya Girls Inter College Dayalbagh, Agra and Baluni Public School, Agra. Out of 200 adolescents, 100 students both boys and girls were randomly treated as internet addictors and 100 were treated as non-addictors. Both the groups were matched on the basis of socio-economic status, age and education. Internet Addiction Test (IAT) by Young (1996) was used to assess the internet addiction. To measure working memory Wechsler Intelligence Scale for Children (WISC), developed by David Wechsler (2004), has been used. Problem Solving Ability Test by Dubey (1971), is used to measure the problem solving ability of internet adictors and non-addictors and the Differential Aptitude Test (1947) for Abstract Reasoning was used to measure the abstract reasoning of internet addictors and non-addictors. t-test was used for measuring the cognitive performance (working memory, problem solving and abstract reasoning) of internet addictors and non-addictors. The results indicate that there is no significant difference between internet addictors and non-addictors on working memory test ($P > 0.05$). There is marked significant difference between internet addictors and non-addictors on problem solving behaviour ($p < 0.01$), and there is a significant difference between internet addictors and non-addictors on abstract reasoning ability, ($p < 0.01$).

Keywords: *Internet Addiction, Cognitive Performance, Working Memory, Problem Solving, Abstract Reasoning*

Now-a-days it can be seen that internet use is very common among all the people in different age groups. Internet use helps us in different work and development such as in academic work for student and in professional work as well. The internet has served to be more useful in maintaining the contact with our relatives, friends who live at a distance. Communication like chatting, emails, twitter, Facebook is the easiest and most common thing used by people. Internet also gives us the most fun in the form of games, songs, online movie etc. to eradicate the boredom from our lives.

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But beside this, internet is harmful too. It can be very difficult for young generation to live without texting massage, online chatting etc. Now at the present scenario the use of internet is the part of their life. Young people's frequent use of the internet affect their brain development, too much of internet use can lead to the lack of span of attention, memory distortion, the feeling of dependency (decision making), unable in solving a new problem. The present research is an effect in this direction.

Internet addiction was known as a psychological disorder for the first time in 1990s. Internet addiction disorder (IAD) is also known as problematic internet use, compulsive internet use, internet overuse, and pathological computer use. Ivan Goldberg in satiricalhoax in 1995, proposed internet addiction as a disorder for the first time. IAD also includes activity such as gaming, online social networking, blogging, emails, excessive or inappropriate internet pornography use and internet shopping. Adolescents are at the risk of developing internet addiction due to variability in their cognitive control and boundary setting skills. **(Leung, 2007).**

Only gambling disorder is the behavioural (non-substance related) addiction that has been include in DSM-5. **Block (2008)** has pointed out that IAD should be included in DSM-5 as a disorder. **Young (1999),** a founding member of 'The Centre for Online Addiction', argued that internet addiction is a term that includes a vast variety of behaviours an impulse control problem. She also proposed five kinds of internet activity as cyber sexual addiction (cyber porn), cyber-relationship addiction (online relationship), net compulsion information overloaded (compulsive web surfing), computer addiction (obsessive computer game playing). **Young (1998)** found that most of the internet addicted people are internet dependent and new user of the internet and therefore more frequent to use internet regularly. If an individual feels all these symptoms like losing track of time online, having trouble completing tasks at work or home, isolation from family and friend, feeling guilty or defensive about internet use, feeling a sense of euphoria while involving in internet actives, anxiety and depression when not online, might be internet addicted.

Internet use may develop impairments like disrupted relationship, financial, occupational and other cognitive functioning of a user. Many brain changes occur as a result of using too much internet. One imaging study has been done by **Ko et al. (2009)**, found that male age from 20 to 25 craved playing online game, and these craving were similar to those experiences faced by individuals who were substance addictors. The study conducted by **Zhou et al. (2011)** suggested that brain imaging studies also indicate some abnormalities in adolescents suffering from internet addiction, including lower grey matter and structural brain changes over the duration of the addictive behavior.

Cognitive processes including working memory, problem solving ability, and abstract reasoning is also affected by the use of heavy internet. **Richtel et al. (2010)** found that regular stimulation by email, text messages, and online video games produce a profound blockage to the focus and productivity of both young people and adults. Furthermore, young individuals are particularly disadvantaged by the technology because of their developing minds are much more susceptible to developing a short attention span in response to the stimuli. Even without the internet as a distraction, many young individuals struggle as is to manage time wisely and resist impulsive behavior.

Crean et al. (2011) applied The Wisconsin Card Sorting Test (WCST) to the internet addictors to measure the frontal lobe functions including strategic planning, organized

searching, utilizing environmental feedback to shift cognitive sets, that direct individual's behavior in achieving a goal, and modulating impulsive responding. Individuals with internet addiction presented working memory impairments as well as executive dysfunctions, which include reasoning, problem solving, inhibitory controlling, and decision-making.

Aim

The aim of this investigation is to study the effect of excessive use of internet upon cognitive performance (working memory, problem solving and Abstract reasoning) of adolescents.

Objectives

1. To compare the working memory of internet addictors and non- addictors.
2. To compare the problem-solving ability of internet addictors and non- addictors.
3. To compare the Abstract reasoning ability of internet addictors and non-addictors.

Sample

In the present study a sample of 200 adolescents, age range from 12 to 18 years was taken from PremVidyalaya Girls Inter College Dayalbagh, Agra and Baluni Public School, Agra. Out of 200 adolescents, 100 students both boys and girls were randomly treated as internet addictors and 100 were treated as non-addictors. Both the groups were matched on the basis of socio-economic status, age and education.

Instruments

Internet Addiction Test (IAT) by Young (1996) was used to assess the internet addiction. To measure working memory Wechsler Intelligence Scale for Children (WISC), developed by David Wechsler (2004), has been used. Problem Solving Ability Test by Dubey (1971) is used to measure the problem-solving ability of internet addictors and non-addictors and the Differential Aptitude Test (1947) for Abstract Reasoning was used to measure the addictors reasoning of internet addictors and non-addictors. t-test was used for measuring the cognitive performance (working memory, problem solving ability and reasoning) of internet addictors and non-addictors.

Analysis of results

The present research is aimed to study the comparison of working memory, problem solving ability and abstract reasoning of internet addictors and non-addictors. The comparison has been made between two groups (internet addictors and non-addictors) on the basis of three cognitive abilities (working memory, problem solving ability and abstract reasoning).

RESULT

Result Table No. -1. Mean, SD and t value of internet addicted and non-addicted students for working memory test.

Group	N	Mean	SD	DF	SE	t	Level of significance
Internet Adictors	50	38.06	4.24				
Non-addictors	50	38.29	3.52	98	0.39	0.29	P > 0.05

Result table no.1 shows that there is no significant difference ($t = 0.29$, $p > 0.05$) between the two group as internet addicted and non-addicted, which indicates that excessive use of internet does not affect the working memory. Several studies have reported that action video

games seem to improve visuospatial working memory capacity, selective attention, and task-switching ability in healthy individual (**Bavelier et al. 2012**). **Roy (2009)** in his investigation found that internet addictors may feel self- development, huge range of exploration, entertainment and leisure, and a big platform to exchange information and views.

Result Table No. -2 Mean, SD and t value of internet addicted and non-addicted students for problem solving ability.

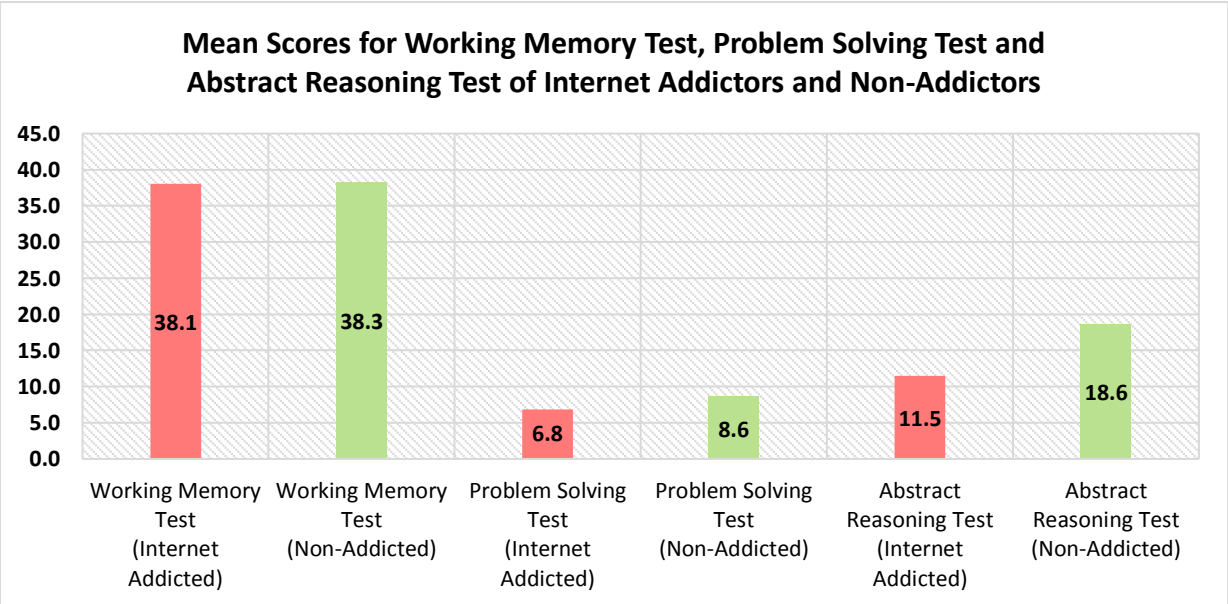
Groups	*N*	*Mean*	*SD.*	*df*	SE_D	*t*	Level of significance
Internet addicted	50	6.82	2.75	98	.585	3.01	$p < 0.01$
Non-addicted	50	8.58	3.09				

Result table no. 2 indicates the internet addicted group scored higher on problem solving questionnaire (M = 6.82) as compared to non-addicted group (M = 8.58). Table no. 2 indicates that there is a significant difference ($t = 3.01$, $p < 0.01$) between the two groups, which shows that overuse of internet affect the problem solving ability. **Sun et al. (2009)** studied on neuro-imaging indicated that individuals with IAD present executive dysfunctions including attention selections decision-making and problem solving.

Result Table No. -3 Mean, SD and t value of internet addicted and non-addicted students for abstract reasoning ability.

Groups	*N*	*Mean*	*SD*	*df*	SE_D	*t*	Level of significance
Internet addicted	50	11.56	7.33	98	1.37	5.139	$p < 0.01$
Non-addicted	50	18.6	6.34				

Result table No. 3 indicates that there is a significant difference ($t = 5.139$, $p< 0.01$) between the two groups (internet addicted and non-addicted). The significant difference shows that excessive use of internet affect the abstract reasoning ability. **Dong et al. (2011)** suggested that individuals with IAD shared impulsivity features of individuals and executive dysfunctioning with substance dependence.



On the basis of above results it can be concluded that overuse of internet affect the cognitive abilities or executive functioning such as problem solving ability and abstract reasoning. In other words excessive use of internet can affect overall brain functioning, as the graph of mean scores of working memory test, problem solving test and abstract reasoning also showing the effect of heavy internet use.

Interpretation

After the analysis of the present investigation, the following conclusions were drawn:

1. There is no significant difference between internet addictors and non-addictors on working memory test.
2. There is marked significant difference between internet addictors and non-addictors on problem solving behavior.
3. There is a significant difference between internet addictors and non-addictors on abstract reasoning ability.

It is important to note that internet use has become an increasingly popular pastime since the inception of the World Wide Web in the late 1980's. Approximately 69.7% or over 250 million people in the United States now use the internet (Internet World Stats, 2009).

Beck (1963) has been shown that cognitive distortions correlate with emotional disorders.

Zillman and Bryant (1982) have suggested that pathological behavior, such as pornography use, has been result in adverse consequences such as trivialization of rape, increased callousness towards women, increased desire for more unusual kind of pornography, devaluation of marriage, less interest in having children, and lack of satisfaction with a partner's physical appearance, in sexual performance.

The majority of the cognitive distortion literature has been conducted by **Aaron Beck (1993)**, the founder of cognitive behavioral therapy and the first to identify errors in thinking and associated dysfunction. The errors in thinking or the content of these maladaptive thoughts that were observed by Beck became known as cognitive distortions. Beck identified several cognitive distortions that can occur on a regular basis; these include: magnification and minimization, dichotomous thinking, personalization, arbitrary inference, selective abstraction, and overgeneralization.

According to **O"Reilly et al. (1996)** too much internet use of certain types such as viewing pornography, gambling, and gaming can be associated with marital discord, inter-personal dysfunction, reduced work productivity, academic failure, reduced quality of life, physical complaints, and many negative outcomes. Excessive, pathological internet use has resulted in significant dysfunction in the lives of many individuals. According to **Young (1998)** individuals with pathological internet use found dysfunction in five different realms: academic, occupational, financial, social, physical, and cognitive distortion. **Schneider (2000)** has suggested that online pornography increased social isolation, career losses, decreased job performances, financial difficulties, sexual difficulties, and negative relationship effects.

Implications

The present investigation has lots of implications for treatment and prevention. Adolescents (who suffer from internet addiction) and their parents may be approached by teachers and educated about the problems their internet usage may cause. With regards to prevention,

raising awareness and providing education for both adolescents and their parents appear as key themes. The excessive gamer may be aided by supporting the discovery of alternative adventurous activities (such as offline and browser games) that provide the possibility of achievement and rewards. So far, treatment research indicates that cognitive behavioral therapy in combination with family or group therapy appears beneficial for adolescents suffering from internet addiction.

CONCLUSION

Thus, on the basis of above findings it can be concluded that internet affect problem solving ability and abstract reasoning as well. Internet also reduced the quality of life, academic performance, physical dysfunction, and work productivity and may also produced other negative outcomes.

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Conflict of Interest

The author declared no conflict of interest.

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