CHAPTER 2
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Internet usage is growing explosively worldwide and has become an integral part of our everyday life. Playing online games, reading, exchange of emails, online shopping are some of the common online activities. According to the preliminary studies conducted by the National Centre of Education Statistic shows that a large number of American children and adolescents with age around 5 to 17 years old have access to the internet and are exposed to the internet at a very early age (Mythily, Qiu and Winslow, 2008).

The latest edition of the Diagnostic and Statistical manual of mental Disorders (DSM-V) includes internet addiction as disorder that needs further study and research. A research study conducted by the department of Adult psychiatry in the Poland Medical University, reported that internet addiction was quite popular and common among young people.

Problematic internet use is increasing due to easy access to the internet. Research studies have suggested that excessive internet use could lead to addictive behaviour with mental health implications and has negative impact on psychological well-being. An internet addict may typically spend 40 to 80 hours weekly online. Researchers point that than any other addiction, Internet addiction may be seen in both sexes at earlier ages.

Significant research on Internet addiction has been expanded over the last decade (Bayraktar & Gun, 2007; Huang, Wang, Qian, Zhong, & Tao, 2007). Internet dependents (Kubey, Lavin, & Barrows, 2001; Yuen & Lavin, 2004), Problematic
internet users (Davis, Flett, & Besser, 2002; Shapira et al., 2003), or Pathological internet users (Davis, 2001; Lin & Tsai, 2002; Morahan-Martin, 1999; Morahan-Martin & Schumacher, 2000) are some of the wide range of terms used for internet addicts.

The aim of this literature review is to examine the works of a number of investigators, methodologists, and scholars who have explored different concepts with various approaches and theories related to impact of Internet addiction on some of the select psychomotor functions such as visuo-motor coordination, psychomotor speed, attention and auditory memory among adolescents. Some studies have focused on internet addiction in context of gender difference and developmental span. They have given different opinions related to the subject of present study based on their findings. The review of a few studies will provide framework for this research that will help the researcher in planning the study design for the problem at hand that supports the theoretical base for the study. For the present study, the review is done under the following categories.

- Internet addiction and Adolescents
- Internet addiction, Gender difference and Developmental Span among Adolescents
- Internet addiction and Psychomotor functions among Adolescents
REVIEW STUDIES ON INTERNET ADDICTION AND ADOLESCENTS

Researchers have identified that Internet addiction appears as a potential problem in adolescents there by influencing the life style of them. Ko, Yen, Liu, Huang, and Yen, (2009) Research study found that 19.8% of adolescent in the world have internet addiction and furthermore, Studies suggested that internet addiction was also associated with hostility. According to eMarketer (2004), study the number of pre-adolescents and adolescents online addiction in United State is growing steadily from 26.6 million in 2000 to 34.3 million in 2003. Lin & Yu, (2008) research study revealed that nearly one half of all youngsters were addictants to online. A survey conducted by Forrester Research (2005) revealed that consumer between the age of 12 and 17years in North America were often connected to online daily and spent an average of 11 hours per week.

Internet addiction has reported many negative consequences which have influence on sleeping pattern, eating habits, and quality of life, social relationship, interpersonal relationship and communication problems among adolescents. Keeping this in view the present section literature review in connection with the impact of internet addiction on adolescents has been focused.

Chacko et al., (2015) investigated the impact of knowledge regarding ill effect of internet addiction on nursing students. The majority (67%) of the sample had moderately adequate knowledge regarding ill effects of internet addiction. Majority (77%) of the sample showed favourable attitude towards ill effects of internet addiction. In this study there was a significant association between knowledge and
selected demographic variables and the attitude and the selected demographic variables. There was also a significant correlation found between the knowledge and attitude of the nursing students regarding ill effects of Internet addiction. Hence the study concluded that the nursing students have moderately adequate knowledge and favourable attitude towards ill effects of internet addiction.

Chathoth et al., (2014) conducted a cross-sectional comparative study on impact of internet addiction between addictive internet users and non-addictive internet users among undergraduate medical students between the age group of 18 to 20 years. The two groups addictive internet users (score ≥ 50) and non-addictive internet users (score < 50) were compared for environmental stressors and lifestyle factors such as sleep, dietary pattern, physical activity and hobbies. The findings of the study revealed that the addictive internet user group had a statistically significant impairment of sleep (94.11% Vs 45.2%) and excessive daytime sleepiness (88.23% Vs 39.72%) and presence of environmental stressors (76.47% Vs 36.98%) as compared to non-addictive internet users.

Kodvanji et al., (2014) study aimed to investigate the impact of internet use on lifestyle of undergraduate medical students in India. This cross-sectional study involved 90 undergraduate medical students between the age group of 18 to 20 years. The two groups addictive and non-addictive were compared for environmental stressors and lifestyle factors such as sleep, dietary pattern, physical activities and hobbies. The addictive internet user group had a statistically significant impairment of sleep and excessive day time sleepiness and presence of environmental stressors when compared to the non-addictive internet user group. This review helped to gain the
knowledge of negative impact of internet addiction on adolescent’s population in Indian context.

Taqavi et al., (2014) examined impact of parenting styles on excessive internet addiction on 379 university students by multi-phase clustery sampling method. Problematic Internet Use Questionnaire and Schaefer Parenting Style were used as the measures and ANOVA test was used as a statistical tool. Permissive and Authoritative parenting styles had the least and the Authoritarian style had the most effect on Problematic Internet Use. Impact of Kindness was negative whereas of Control was neutral. This study concluded that adolescents from warm family were unlikely addicted to internet and kindness was a preventive factor for Problematic Internet Use.

Rae et al., (2012) study gave a preferably brief overview of research on IAD and theoretical considerations from a practical perspective based on years of daily work with clients suffering from Internet addiction. Result indicated that Internet Addiction Disorder (IAD) ruins lives by causing neurological complications, psychological disturbances, and social problems. Surveys in the United States and Europe have indicated alarming prevalence rates between 1.5 and 8.2%.

Kim et al., (2010) study aimed to assess the effects of Internet Addiction on the Lifestyle and Dietary Behaviour of Korean Adolescents. 853 Korean junior high school students took part in the study. The results of the study found that high risk Internet users drank and smoked more and had a poorer quality diet and higher frequency of meal skipping than no risk Internet users. High risk Internet users reported more irregular sleep patterns and more episodes of sleep disturbance than no risk Internet users. The results of the study suggest that children should be educated
about balanced diet and optimum physical activity which help them remain healthy and grow.

Lam (2010) Study aimed to assess the Pathological Internet Use in connection to Teen Depression. 1,041 Chinese adolescents with an average age of 15 years took part in this study. Results of the study confirmed that 62 adolescents (6.2%) were classified as having moderately pathological use of the Internet (based upon a survey designed to identify pathological usage patterns), while 2 (0.2%) were at severe risk. The adolescents were assessed for anxiety and depression after nine months and the research report revealed that Eight (0.2%) had significant anxiety while 87 (8.4%) had developed depression. Those who had been identified as having pathological Internet use were at about two and half times more risk of having developed depression than those who had not exhibited pathological use. No relationship was observed between pathological Internet use and anxiety. The result suggests that young people who are initially free of mental health problems but use the Internet pathologically could develop depression as a consequence.

Choi et al., (2009) Study on Internet overuse and excessive daytime sleepiness among Adolescents, in which 2336 High School Students in South Korea took part. Results showed that the proportions of boys who were classified as Internet addicts and possible Internet addicts were 2.5% and 53.7%, respectively. For girls, the corresponding proportions were 1.9% and 38.9%, respectively. The prevalence of Excessive Day Sleep (EDS) was 11.1% (boys, 11.1%; girls, 11.1%). When Internet addicts were compared with non-addicts, it was found that boys were more prone to IA. The prevalence rate of EDS for Internet addicts was 37.7%, whereas that for possible Internet addicts and non-addicts was 13.9% and 7.4%, respectively. With
adjustment for duration of Internet use, duration of sleep time, age, gender, smoking, taking painkillers due to headache, insomnia symptoms, witnessed apnoea, and nightmares, the odds of EDS were 5.32 fold greater in Internet addicts and 1.9 fold greater in possible Internet addicts compared to non-addicts. The study suggests that clinicians should consider examining Internet addiction in adolescent cases of EDS.

Huang and Leung (2009) study aimed to assess Instant Messaging Addiction among Teenagers in China in relation to Shyness, Alienation, and Academic Performance Decrement. 330 adolescents from China took part in the study. The study revealed that 95.8% of participants use IM, and 9.8% of them can be classified as IM addicts. Factor analysis identified four major IM addiction symptoms among teenagers they are (1) preoccupation with IM, (2) loss of relationship due to overuse, (3) loss of control, and escape. Results also showed that shyness and alienation from family, peers, and school are significantly and positively associated with levels of IM addiction. Regression analysis statistic showed both the level of IM use and level of IM addiction are significantly linked to teenagers’ academic performance decrement.

Ko et al. (2009) conducted a two year prospective study on predictive values of psychiatric Symptoms for Internet Addiction in Adolescents. 2293 Adolescents in Southern Taiwan took part in the study. The findings showed that depression, attention deficit hyperactivity disorder, social phobia, and hostility were found to predict the occurrence of Internet addiction. In the two year follow-up, hostility and attention deficit hyperactivity disorder were the most significant predictors of Internet addiction in male and female adolescents, respectively. These results suggest that attention deficit hyperactivity disorder, hostility, depression, and social phobia should be detected early on and intervention has to be carried out to prevent Internet addiction.
addiction in adolescents. Further, the study emphasised that sex differences in psychiatric co-morbidity should be taken into consideration when developing prevention and intervention strategies for Internet addiction.

Ko et al. (2009) Study aimed to assess the associations between aggressive behaviours and Internet addiction and online activities in adolescents. 9405 adolescents took part in the study. The findings of the study demonstrated that watching violent TV programs, adolescents with Internet addiction were more likely to have aggressive behaviours during the previous year. The association was more significant among adolescents in junior high schools than in senior high schools. Online chatting, adult sex web viewing, online gaming, online gambling, and bulletin board system were associated with aggressive behaviours. The results suggest that preventive programs for aggressive behaviours should pay attention and conducted among Internet addict adolescents.

Stefanescu et al., (2009) conducted an observational study which focused on the factors that influence adolescents’ engagement in risky Internet behaviour among Romanian adolescents. 283 Teenagers in Lasi of Romania participated in the study. Frequency of Internet use, parental rules, type of personal information given out, frequency of chatting, inappropriate websites have been visited, and type of Internet advice heard were found to be predictors of adolescents development. Research results showed a high tendency of students to spend more time online, giving up their social or family duties. Boys were significantly more likely than girls to be pathological Internet users and girls were more likely than boys to have no symptoms. The study concluded a significant positive correlation between measures of Internet
use and time spent online for the Internet. These results suggest that the Internet may be an important aid for teenager as they searched for a young identity.

Seo et al. (2009) Conducted a Study on Internet Addiction and Interpersonal Problems in Korean Adolescents in which 676 Korean Middle School Students participated. The cross-sectional survey found that the 547 (80.9%) participants were identified as general users. 108 (16%) were potential risk users and 21 (3.1%) were high-risk users. There were statistically significant positive correlations between Internet addiction and interpersonal problems. There were significant positive correlations between Internet addiction and hours spent playing games. Internet addicted adolescents also had more interpersonal problems. The study suggests that it is important to raise awareness about Internet addiction, and close attention must be paid not only to students at risk of Internet addiction but also to students at low risk to prevent students from becoming addicted to the Internet..

Aslanidou and Menexes (2008) study investigated the concept of Youth and the Internet - Uses and Practices in the Home. 418 High School Students from Four Greek Cities were selected as the participants of the study. The main findings of the study revealed that (a) Internet access remains at a very low level and is insufficiently used for school purposes, (b) younger students use it more frequently than older ones for information seeking concerning school work, (c) the Internet is an indicator of social and economic stratification since most young people with access to it come from family environments with a higher educational and socioeconomic background and live in urban and semi urban areas, (d) boys make up the majority of systematic users, mainly for entertainment purposes, (e) the Internet is a place and space safeguarding the privacy of young people with the majority of them preferring to surf
alone, (f) parental supervision and monitoring seems to be absent largely from the relationship between youth and the Internet, and (g) in general the frequency and type of Internet use are not significantly affected by students’ places of residence or the educational level and profession of their parents.

Long & Chen (2007) study aimed to assess the impact of Internet usage on the self-identity development in 10 students between the age group of 12 and 18 years. Using Erickson's Ego Identity Theory, the computer mediated communication (CMC) students from private and public schools are evaluated through in depth interviews. All students are frequent users of instant relay chat (IRC) and have a minimum of one year of experience with Instant Messenger. Identity development was examined using questions generated from a modified form of the objective measure of ego Identity Status developed by Adams and Ryan (2000). The four dimensions of Identity Development examined in the present study are avoidance decision-making, identity formation, self-reflection and ego strength or fidelity. The results of the present research indicated that Internet usage has impact on adolescents four dimensions of identity development namely avoidance decision-making, identity formation, self-reflection and ego strength or fidelity.

Nalwa and Anand (2004) study aimed at examining the effect of internet addiction on loneliness among the adolescents. The participants of the study were between the age group 16 to 18 years old from India. Two groups were identified dependents and non-dependents. Significant behavioural and functional usage differences were revealed between the two groups. Dependents were found to delay other work to spent time online, lose sleep due to late night logons and feel life would be boring without internet. The results of the present study revealed that on loneliness
measure, significant differences was found between the two groups, with the internet dependents scoring higher than the non internet dependants.

Liau et al., (2005) Study was conducted to explore the effects on the Internet on the adolescents between the age group of 12 to 17 years. Study was initiated to investigate the factors that influence adolescents' engagement in risky Internet behaviour, in particular, meeting face-to-face someone they first encountered online. The statistical report of the study emphasised that with a mean of 14.32 (SD = 1.37), 49.6% of the adolescents were girls. Results indicated that 16% of adolescent Internet users in Singapore have had a face-to-face meeting with someone first encountered online.

Heitner (2002) Research aimed to assess the relationship between use of Internet and social development among Adolescence. 104 adolescents took part in the present study. The results of the study indicated that time spent on the Internet during the weekdays was significantly negatively correlated with limited peer status. Time spent on the World Wide Web was significantly positively correlated with limited peer status and social skills deficits. Time spent on E-mail was significantly positively correlated with limited peer status, social skills deficits, social introversion, and social withdrawal. Time spent in Chat Rooms was significantly positively correlated with limited peer status and social skills deficits. Time spent on Instant Messenger was significantly negatively correlated with limited peer e-status, social introversion, and social withdrawal. Time spent on Multi-player On-line games was significantly negatively correlated with limited peer status. Not Social Internet users primarily surfed the World Wide Web and played single-player on-line games, Asynchronous social Internet users primarily communicated with others through e-mail and posted to
message boards, and Synchronous social Internet users primarily communicated with
others through Instant Messenger, participated in Chat Rooms, and played multi-
player on-line games. A 2 x 3 ANOVA found a main effect for type of Internet use for
limited peer status, social skills deficits, social introversion, and social withdrawal.
The results of this investigation can be utilized by school and child and clinical
psychologists to identify adolescents who may be experiencing social difficulties.

Review of literature on Internet addiction and adolescents, It is evident that
Internet addiction is a psychological dependence on the Internet characterized by an
increasing investment of resources on Internet related activities, unpleasant feelings
when off-line, an increasing tolerance to the effects of being online, and denial of the
problematic behaviours (Kandell, 1998). It is apparent that compared to non-addicts,
Internet addicts tended to be adolescents between the age group of 12 to 18 years
(Ghassemzadeh et al., 2008; Hollingsworth, 2005; Lam et al., 2010). Adolescence is
the age where process of psychological maturation and solidifying of personality
takes place. Adolescents are particularly vulnerable to developing addictive
behaviours (Kim et al., 2010; Lam et al., 2009). They often have easy access to the
Internet and highly flexible schedules that makes adolescents particularly vulnerable
to develop Internet addiction (Choi et al., 2009; Nalwa and Anand, 2003; Tsitsika et
al., 2009).

From the above collection of research reviews it is apparent that Internet has
both positive and negative effects. Internet is beneficial in everyday life. It is used for
entrainment purpose, providing knowledge, reservation, online shopping etc.
Excessive use of internet creates problem in life. The adolescents are the age group
where chance of internet addiction is high because of the easy access to internet on
the mobile and computer or laptop. It is evident from the above research studies that excessive use of internet showed some type of problems like neurological complications, psychological disturbance, social problems, dietary problems, disturbed sleep pattern and physical activities, depression, disturbed life style, social phobia, attention, hostility, ADHD etc. Studies also indicated that the major group of excessive use of internet is adolescent’s between the age group of 13 to 19 year old. The above collection of studies indicates that there are no or few studies which focused their attention towards Internet addiction in connection to their psychomotor abilities hence there exists a clear research gap and have paved the way to take up the research study in connection with internet addiction and its effects on psychomotor functions.

**REVIEW STUDIES ON INTERNET ADDICTION, GENDER AND DEVELOPMENTAL SPAN AMONG ADOLESCENTS**

It was found that 86.5% of the students used the Internet at home. Significant differences between boys and girls were found in terms of number of hours spent on the Internet and purpose of use, and changes over time in hours spent. Daily and weekly Internet use is more frequent among boys than girls. Boys visit cyber-sex sites more than girls.

The present research review section emphasised to find out the gender difference between internet addiction and also focused on assessing interaction effect of developmental span (Early adolescents and late adolescents) and internet addiction.
Silvana Karacic and Stjepan Oreskovic (2017) study aimed to assess Internet Addiction through the Phase of Adolescence. The present study identified the possible differences in the purpose of Internet use among adolescents with respect to age subgroup and the study also determined if there is a correlation between the purpose of Internet use and age and if this interaction influences the level of addiction to the Internet. The study included a simple random sample of 1078 adolescents out of which 534 boys and 525 girls aged between 11 to18 years attending elementary and grammar schools in Croatia, Finland, and Poland. Adolescents were insisted to complete an anonymous questionnaire and were provided with a socio-demographic sheet to know the demographic details such as age, gender, country of residence, and purpose of Internet use i.e. school or work or entertainment. Collected data were analyzed with the statistical chi-square test for correlations. The Adolescents mostly used the Internet for entertainment purpose (905/1078, 84.00%). More female than male adolescents used it for school work (105/525, 20.0% vs. 64/534, 12.0%, respectively). Polish adolescents mostly used the internet for the purpose of school work (71/296, 24.0%), followed by Croatian (78/486, 16.0%) and Finnish (24/296, 8.0%) adolescents. The level of Internet addiction was the highest among the 15 to16 year old age subgroup and was lowest in the 11 to12 year old age subgroup. There was a weak but positive correlation between Internet addiction and age subgroup (P=.004). Male adolescents mostly contributed to the correlation between the age subgroup and level of addiction to the Internet (P=.001). The above study helps to gain the knowledge that adolescents aged 15 to16 years, especially male adolescents, are most prone to the development of Internet addiction, whereas adolescents aged 11 to12 years show the lowest level of Internet addiction.
Dangwal and Srivastava (2016) study investigated the impact of emotional maturity of internet users and gender difference in emotional maturity among the internet users. Research results indicated that emotional maturity was influenced by internet use, thus those who were high social network users had less emotional maturity and further researcher found that female internet users were better in exhibiting emotional maturity compared to male internet users.

Anwar (2014) conducted a study on internet addiction and gender difference among 300 male and female students. The results of the study revealed that there was a significant difference found on internet usage pattern between male and female students. Male students were quite higher in internet usage than the female students. The study also found that high use of internet positively influenced the academic achievements and extremely high usage had a negative impact on academic achievements of the students.

Sharma et al., (2014) research was examined to assess the gender differences in internet addiction. 391 students of both male and female were participated in the study. Mean age of students was 19.02(±1.450) years. The findings of the study revealed that males were more addicted to the internet than female. According to statistics of the study, the mean time spent on internet was 1.29(±1.251) hours per day by the students. The internet addiction test scoring revealed that 57.3% as normal users, 35.0% as case of mild, 7.4% as moderate and 0.3% as severely addicted to Internet.

Lajwanti and Sharma (2013) aimed to study the effect of internet use on study habits and adjustment of higher secondary students. The sample of the study consisted of 480 students (240 boys and 240 girls) studying in various secondary schools of
Agra city in India. Self developed S.H.I.C.S. was used to know the study habits of higher secondary students. Tool measured the study habits of students from eight different dimensions namely- Comprehension, Concentration, Task-Orientiation and Sets, Interaction, Drilling, Writing, Supports and Recording. The mean scores of the results revealed there was a significant difference between the study habits and adjustment scores between male and female internet and non-internet users.

Belanger et al., (2011) examined the impact of internet addiction on health factors among adolescents of both the genders. 3906 adolescent boys and 3305 girls were selected for the study and they were categorized into four groups according to their intensity of Internet use namely - heavy Internet users (HIUs, >2 hours/day), regular Internet users (RIUs- several days per week and ≤2 hours/day), occasional users (≤1 hour/week), and non Internet users (NIUs- no use in the previous month). Perceived health, depression, overweight, headaches, back pain and insufficient sleep were the health factors analysed in the present study. Multivariate analysis statistics using RIUs as a reference, HIUs of both genders reported the higher depressive scores, whereas only male users were found at increased risk of overweight and female users at increased risk of insufficient sleep. Male NIUs and female NIUs and occasional users also were found at increased risk of higher depressive scores. Back pain complaints were found predominantly among male NIUs.

Kim (2011) Conducted a study on gender difference in which 609 adolescents studying in 10th and 11th grades and their parents were recruited from five high schools in Seoul, Korea. Findings of the study indicated that Korean boys and girls differed in the ways that they used the Internet. Girls were more likely to use the Internet to watch online education classes and blog more frequently and longer than
boys, whereas boys were more likely to use the Internet for playing Internet games than girls. According to results the pathways did not vary for boys and girls. Parent-child relationships in terms of closeness and conflict were found to be vital to adjustment among adolescents and played a significant role in the association between adolescent Internet use and academic and behavioural outcomes.

Lam et al., (2009) investigated study on the factors associated with Internet addiction among adolescents. 1392 Adolescents in Guangzhou City of Southeast China took part in the research study. The study classified normal (89.2%), moderate (10.2%) and severely addicted (0.6%) Internet users. Multivariate logistic regression analyses found a 50% increased odds for males to be addicted to the Internet when compared to females. Other potential risk factors included drinking behaviour, family dissatisfaction, and experience of recent stressful events. Stress related variables were associated with Internet addiction among adolescents as they are also related to other addictions. From the above study it is suggested that clinicians need to be aware of potential co-morbidities of other problems such as stress and family dissatisfaction among adolescent Internet addiction patients.

Yen et al., (2009) Study aimed to assess Multi-dimensional Discriminative factors for Internet Addiction among Adolescents regarding Gender and Age. 8941 Taiwanese Adolescents took part in the study. The statistical analysis of Chi-square test showed that depression and low family monitoring were the discriminative factors for Internet addiction in gender and age specified groups of adolescents. Low connectedness to school, high family conflict, having friends with habitual alcohol drinking, and living in rural areas also had discriminative effects on adolescent Internet addiction in different gender and age. The present study identifies and
suggests that parents and health and educational professionals should monitor the Internet using behaviours of adolescents who have the factors discriminating for Internet addiction.

Ko et al. (2008) Research on The Association between Internet Addiction and Belief of Frustration intolerance in connection to the gender difference, which included 2114 Students as participants. The results of the study clearly found the significant gender difference on the association between Internet addiction and frustration intolerance. The association was higher in male adolescents. Regression analysis statistics revealed that male adolescents with Internet addiction had higher intolerance to frustration of entitlement and emotional discomfort, and female adolescents with it had higher intolerance to emotional discomfort and lower tolerance to frustration of achievement. The study also suggests that frustration intolerance should be evaluated for adolescents with Internet addiction, especially for males and rational emotive behaviour therapy focusing on different irrational beliefs should be provided to male and female adolescents with Internet addiction.

Liu and Huang (2008) study aimed to assess the differences between male and female in web searching materials and the study focused on the online reading environment which showed that there is a significant difference between genders in which female readers have a strong preference for reading paper than male readers. On the other hand male readers had greater sense of satisfaction with online reading. Thus the findings of the study reported that there are some significant differences between male and female behaviour in the online reading environment.
Livingstone and Helsper (2007) Study aimed to assess The Role of Offline Social- Psychological Factors in Young People’s Vulnerability to Online Risks. 1375 adolescents between the age group of 9 to 19 years old took part in the study. Findings show that early adolescents engage in more online communication activities when compared to the younger children and encountered more communication risks. Although girls communicate more on the internet, this seems not to put them more at risk. It was found that children’s offline social psychological characteristics, particularly their levels of life satisfaction and risk taking, influence their online communication, with different online communication activities being predicted by different patterns of off and online characteristics. There are weak indications that, in families which have a more conversational style of communication, teens may take fewer risks online, including a lower likelihood of meeting online friend’s offline. Multiple regression statistical analyses of the present study show that those children and adolescents who are less satisfied with their lives and who have become more frequent and skilled internet users are more likely to value the internet as a communicative environment in which they feel more confident than they do offline, particularly in relation to the potential for anonymous communication.

Pallanti, Bernardi and Quercioli (2006) research study on internet addiction and gender difference included 275 students with the average of 16.67 ± 1.85 years and consisted of 52.4% males and 47.6% females and the findings indicated that 5.4% of the samples were found to be having internet addiction.

Hupfer and Detlor (2006) study found that there is a clear differences exists between male and female in web searching and the results of the study clearly depicted that women are more into e-mail, chat, and search reference materials about
medical and government information whereas men tend to focus on information about investment, purchase and personal interests. Hupfer and Detlor’s (2006) study findings were similar to Garbarino and Strahilevitz’s (2004) research work which concludes that females perceived Internet as a tool of maintaining social values.

Kim et al., (2006) Research investigated A Questionnaire Survey on Internet Addiction in Korean Adolescents and its Relation to Depression and Suicidal Ideation. 1573 High School students were incorporated in the study. The findings of a correlation survey design found that among the sample, 1.6% was diagnosed as Internet addicts, while 38.0% was classified as possible Internet addicts. The prevalence of Internet addiction did not vary with gender. The study indicates that the levels of depression and suicide ideation were highest in the Internet addicts group.

Peter and Valkenburg (2006) Study aimed to assess the Individual differences in Perceptions of Internet communications on 687 Adolescents. The study revealed that younger, socially anxious and lonely adolescents more strongly controllability of Internet communication and perceive it as broader, deeper and more reciprocal than older, non-socially anxious and non-lonely adolescent respondents. Boys perceive Internet communication as more reciprocal than girls do. The greater the adolescents’ need for affiliation, the more often they regard Internet communication as deeper than face-to-face communication. The findings suggest that a stronger focus on perceptions of Internet communication may improve understanding of the Internet as a social medium.

Kim and Chun (2005) Research on Association of Internet Addiction with Health Promotion Lifestyle Profile and Perceived Health Status in Adolescents for which 769 Adolescents of Kyung Gi Province took part in the study. Multivariate
analysis statistics showed that there was a statistically significant difference in health promotion life style profile according to Internet addiction status. There was also a significant negative correlation between Internet addiction and health promotion lifestyle profile. The study showed that the severe Internet addiction group had the lowest score in health promotion lifestyle profile and perceived health status, which suggest that the addiction could have a negative effect on the health status of adolescents.

Papastergiou and Solomonidou (2005) Study aimed to assess the Gender Issues in Internet Access and Favourite Internet Activities among Greek High School Pupils Inside and Outside School. 340 Pupils aged between 12 to16 Years took part in the study. The results of the study found that more pupils use the Internet outside school (at home, in Internet cafes) than within school and that boys have more opportunities to access the Internet. Both inside and outside school, pupils' favourite Internet activities relate to information gathering for personal purposes and to entertainment. Boys use the Internet for entertainment and Web page creation more than girls do, whereas no other significant gender differences were noted regarding pupils' other Internet activities, such as communication via e-mail, chat or videoconferencing, Web surfing and information search for personal or school purposes.

Griffiths, Davies and Chappell (2004) A comparative study on Online Computer Gaming between Adolescent and Adult Gamers included 540 Online Game Players. The Results of the study showed that adolescent gamers were significantly more likely to be male, significantly less likely to gender swap their characters, and significantly more likely to sacrifice their education or work. In relation to favourite
aspects of game play, the biggest difference between the groups was that significantly more adolescents than adults claimed their favourite aspect of playing was violence. Results also showed that in general, the younger the player, the longer they spent each week playing.

Wolin and Kargaonkar (2003) study aimed at examining the gender differences in beliefs, attitudes and behaviour towards web advertising. The findings of the research reported the slight difference in beliefs, attitudes and behaviour towards web advertising. The results found that males are likely to browse the Internet for functional and entertainment purpose while females are more into shopping reasons.

Mesch (2001) Study on Social Relationships and Internet Use among Adolescents in Israel. 927 Israeli Adolescents took part in the study. The results of the research found that the lower an individual’s level of attachment to close friends and the less pro-social attitudes he/she expressed, the higher was the likelihood of his/her being a frequent Internet user. However, Internet users were more likely than nonusers to participate in social activities such as parties, singers’ performances, and sports activities. The study concluded that contrary to public perception it appears that among the adolescent population of Israel, Internet use is not displacing other social activities. Further, Adolescents who are more socially isolated are more likely to be frequent Internet users.

Sherman, End, Kraan, Cole, Campbell, Birchmeier and Klausher (2000) study clearly indicates that even though the majority of Internet users are men, the study mentioned that gender gap among internet users has narrowed. This result was supported by study of Heimrath and Goulding’s (2001) conducted on students and
members of the public at librarian in Southborough and Slough. The findings of the study concluded that female interest and confidence in using the Internet is high but when a comparison with male respondents is made, the females have not taken Internet rapidly. A differential internet usage pattern in terms of frequency is also noted in the study of gender and Internet.

Teo and Lim’s (1997) study aimed to focus the difference between boys and girls in terms of usage and access to technology in Singapore. The findings of the study indicated that internet users in Singapore are predominantly males and the internet usage by females comprised only about 11 percent. This study also revealed the fact that females and males engage in different activities in usage of internet. According to the present study females spend more time on the Internet for messaging activities, promotional campaigns while males accessed more into internet for downloading and purchasing activities. Thus to certain extent, male and female do use the Internet for different purposes.

A study conducted by Chandra et al., (2005) reported that the number of Internet users in India has grown five-fold since 2005. Mobile Internet usage is growing at the rate of nearly 85% per annum, where video and music streaming are major growth activities. The understanding that the Internet use can be a disorder is still in its initial stages in India. There are limited numbers of studies which address the issue of Internet addiction is in India. The above collection of research studies on gender difference and developmental span among adolescents in connection with internet addiction over past decade have clearly depicted that there exists a gender difference in internet usage patterns - male adolescents used internet for entertainment purpose where as female adolescents used internet for academic purpose. There was
also significant difference found in the extent of internet used (males were quite higher in internet usage), attitudes and beliefs towards internet usage. Adolescents of both the gender differs significantly in their emotional maturity, academic performance, social learning. Studies also indicate that females have not taken internet rapidly. Due to internet addiction males adolescents were more prone to risk of overweight and backache where as female addictants were more to disturbances in sleep. Early adolescents showed lower level of addiction. Late adolescents were more prone to internet addiction. Limited amount of research were found on developmental span and internet addiction, the above collection of research paved the way for further investigation to fill in the knowledge gap by analyzing the Internet usage pattern and the influence of gender role and developmental span on psychomotor abilities. Hupfer and Detlor (2006) emphasised that gender differences in internet usage behaviours have attracted considerable interests for the researchers. Hence the present study has been formulated to find out the interaction effect between internet addiction and gender on some selected psychomotor functions.

**REVIEW STUDIES ON INTERNET ADDICTION AND VISUOMOTOR COORDINATION AND PSYCHOMOTOR SPEED, ATTENTION AND AUDITORY MEMORY SPAN.**

The following review section integrates the latest empirical evidence on Internet use with relevant experimental studies to discuss how online behaviours, and the structure of the online environment, might affect the cognitive development of adolescents. The current review of literature focuses on the few studies that have examined the possible effects of Internet use on cognitive processes in adolescents and emerging adults, including social cognitive processes.
Weinstein, Livny, Weizman (2017) study investigated the new developments in brain research of internet and gaming disorder, the results showed that Internet Gaming Disorder and the neural mechanism of those internet addicts resemble those of drug addiction. The studies of Functional Magnetic Resonance Imaging (fMRI) of the resting state and measures of gray matter volume have revealed that Internet game playing was allied with changes to brain regions in charge for attention and control, impulse control, motor function, emotional regulation, sensory-motor coordination. It was further observed that Internet game playing was also associated with lower white matter density in brain regions that are involved in decision-making, behavioural inhibition and emotional regulation. Thus the study indicated that internet usage had a serious impact on the cognitive functioning of its users.

Sepede G, Tavino M, et al., (2016) in their study on the Functional magnetic resonance imaging of internet addiction in young adults aimed at reporting the results of functional magnetic resonance imaging (FMRI) studies pertaining internet addiction disorder (IAD) in young adults. By analyzing many such relevant article related to IAD and there FMRI report showed that, while in the resting state brain studies indicated that the more relevant abnormalities were localized in the superior temporal gyrus, limbic, medial frontal and parietal regions where as during the task related FMRI studies it was reported that less than half of the papers reported behavioural differences between patients and normal controls, but all of them found significant differences in cortical and sub cortical brain regions involved in cognitive control and reward processing: Orbito frontal cortex, insula, anterior and posterior cingulate cortex, temporal and parietal regions, brain stem and caudate nucleus. Thus from the study it was concluded that, IAD may fatally affecting young adults’ brain functions which includes attention and concentration also.
Luna, Marek, Larsen, Tervo-Clemmens, & Chahal (2015) Research investigated the effects of Internet use on cognition in adolescents. Specific concerns about how the Internet might impact adolescent cognitive development include how having near constant access to information might disrupt memory abilities or the utilization of effortful thinking (Näsi & Koivusilta, 2012), or how the ability to multitask between several online/offline activities could shorten attention spans. While these concerns about altered cognitive abilities are often couched within the idea that ‘Internet use could be rewiring developing brains’, the current review focuses specifically on cognitive processes rather than neural correlates or neural development.

In a recent survey, 50% of adolescents reported that they often or sometimes use social media while doing homework (Common Sense Media, 2015).

Mills et al., (2015) conducted a recent study which investigated specifically how one aspect of the online environment multitasking during social interactions could impact performance in both adolescents and adults. The present study found that adolescents are more sensitive to additional cognitive load requirements than are adults in both social and non-social multitasking situation. However, both adolescents and adults showed performance decrements when multitasking during social interactions that required perspective taking (Mills et al., 2015). These results suggest that social interactions (which can evolve on a millisecond basis) could be disrupted during adolescents or adults who are simultaneously keep track of extraneous information as is often done when using digital devices in social situations.
Fenn, Griffin, Uitvlugt, & Ravizza, (2014) study aimed to assess the formulated hypothesis which states that, Given the high levels of information trafficked through the Internet, there have been concerns that exposure to inaccurate information through social media could encourage false memory formation. This hypothesis was tested in a group of undergraduate students who were exposed to false information through a pseudo Twitter feed compared to a non-social media (but still web-based) source of information. To test how confident adolescents were about specific statements, the group was exposed to false information through the pseudo twitter platform where expressed less confidence in the false information presented than the group exposed to the same information in the non-social media platform (Fenn et al., 2014). These results suggest that individuals familiar with social media platforms take into account the reliability of information presented through them.

Aviv Weinstein and Michel Lejoyeux (2013) study examined the new developments on the neurobiological and pharma cogenetic mechanisms underlying internet and videogame addiction. The results of the research showed that playing videogame and internet addiction may be supported by parallel neural mechanisms underlying drug abuse. Similar to drug and alcohol abuse, internet addiction results in sub-sensitivity of dopamine reward mechanisms, indicating that internet addiction is equivalent to substance addictions. The researchers further stated that through Brain imaging studies of the resting state have revealed that continuing internet game playing affected brain regions responsible for reward, impulse control and sensory-motor coordination.
The research study conducted by Min-Hyeon et al., (2011) emphasises that there are few or no studies which have examined the relationship between internet addiction and psychomotor functions. Psychomotor functioning refers to physical movements which involve conscious cognitive process. In connection with the above definition the present section focuses on finding out the potential relationship between Internet addiction and certain cognitive functions through several studies.

Min-Hyeon Park, et.al (2011) study investigated on potential relationship between Internet addiction and cognitive function in adolescents based on IQ tests. The study screened 253 middle school students and 389 high school students for Internet addiction and compared 59 Internet addicted students with 43 non addicted students using an IQ test. The results of the study revealed that Internet-addicted group had comprehension sub-item scores that were significantly lower than those of the non-addicted group, and the study further emphasised that there may be a relationship between Internet addiction and weak social intelligence. Earlier onset of Internet addiction and longer addiction duration were associated with lower participant performance in areas related to attention. From the above study it could that brain as development remains active during adolescence, the possibility that Internet addiction adversely affects the cognitive functioning of adolescents.

Kuhn et al (2011) conducted the research study on structural and functional neural correlates of Internet or computer gaming on the sample of 154 adolescents indicated that frequent or excessive internet users had showed higher gray matter volume in left ventral striatal region compared to infrequent players, while analyzing functional study of neural correlates of Internet or computer gaming on the same sample showed that activity in the region of the ventral striatum was higher in
frequent compared to infrequent players in the loss condition of a monetary incentive
delay task. Gray matter density was also examined by Yuan et al. (2011).

Sparrow et al., (2011) Study examined how the expectation of having access
to information at a later time affected the memory of undergraduate students. The
results of the study found that when students expected to have future access to
information, they were less likely to remember specific information but more likely to
remember where to find the specific in memory, where the information known by a
group is treated as a memory bank from which individual members can draw
(Wegner, 1987). This result would suggest that near constant access to the Internet
could influence the kind of information an individual chooses to remember.

The present review section expressed that adults behaviours surrounding with
new technologies, such as widespread access and usage of the Internet, could alter the
typical course of cognitive development. The findings of above research review
suggest that cognitive changes are likely taking place, but that these changes are not
necessarily impeding adolescents’ or emerging adults’ ability to successfully navigate
our highly connected world. Adaptation to the new technologies appears to be
associated with greater integration into peer groups and even increased cognitive
abilities such as faster task switching. When Italian adolescents were interviewed on
Internet, they reported that Internet facilitated the tasks of forming one’s identity,
establishing personal autonomy, and strengthening peer relationships (Borca, Bina,
Keller, Gilbert, & Begotti, 2015). Another study that interviewed American
adolescents between the age group of 13 to 14 year olds obtained similar reports, as
these adolescents’ largely expressed positive perceptions of the effects of technology
on their cognitive and social development (Fitton et al., 2013). Perhaps any changes in
cognition that accompany Internet use are not a cause for concern, but rather a positive adaption to a changing environment.

As noted in recent reviews (George & Odgers, 2015; Mills, 2014), there is still a lack of experimental studies examining the impact of Internet use on cognitive development.

It is apparent from the above collection of reviews that adolescents with internet addiction are affected by their sensory motor functions, cognitive functioning, studies also revealed that the internet addiction also led to changes in structural and functional neural correlates, attention and concentration. The above collection of reviews helped the researcher to understand the concept that Internet addiction may adversely affect the adolescent’s brain function such as shorten attention span, affected impulse control. Few studies suggested that internet addiction has improved the multi-tasking among adolescents. However, few or no studies have examined the effects of internet addiction on psychomotor functions hence the present research has been formulated to fill up the lacunae and the present research has been taken up to study internet addiction and its effects on select psychomotor functions among adolescents.

The literature review suggest that many experimental designs have been initiated to test how certain aspects of Internet use can affect cognitive abilities, with this notion the researchers have selected the component of psychomotor speed and visuo-motor coordination, attention and auditory memory as cognitive abilities to know whether the internet addiction really has an impact on the selected cognitive abilities.
SUM UP

As per to literature review and many other secondary source of information identified that it is the adolescents group which makes a maximum use of Internet. This chapter provided literature on the recent studies of Internet addiction, gender difference in internet usage, developmental span and internet usage, influence of internet addiction on cognitive functions among adolescents. It discussed the impact of problematic Internet usage on various aspects of cognitive, neurological, psychological, biological functions. Gender differences were significant in internet usage patterns, duration and attitude. Influence of developmental span (Early & Late) was significant on internet usage among adolescents.