

Sustained Attention As A Pertinent Neuro-Cognitive Skill Among Digital And Non-Digital Children.

Dr. Manidipa Baruah*, Fariza Saidin **

* Assistant Professor, Department of Psychology, Gauhati University

** Research Scholar, Department of Psychology, Gauhati University

Corresponding Author: Dr. Manidipa Baruah*,

Abstract: Children aged from 12 to 15 years, (N-160) viz Digital Children (DC) and Non Digital Children (NDC) were tested on sustain attention and was further analyzed to assess which group of children is indeed high in the pertinent motives. DC included 80 participants out of which 40 were male and 40 were female. NDC included 80 participants out of which 40 were male and 40 were female. Color cancellation test is a measure of sustain attention which is taken form NIMHANS Neuropsychological battery (Kapur 1974) for children. Mean, SD, t test were the statically measures adopted. Finding suggests that Digital children(DC) participants scored higher on sustain attention as compared to Non Digital children(NDC) participants. With regard to gender no significance differences have been noted.

Keywords: sustain attention, neuro- cognitive skills, digital children, non digital children.

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I. Introduction

Neuro-cognitive psychology aims to understand the relationship between the brain and behavior by explaining the ways in which the activity of the brain is expressed in observable behavior. There are various ways through which neuropsychologist conduct their investigation about what are the mechanism responsible for human thinking, learning, emotion and how these mechanism operate and influences our behavior. In other words its central focus is the development of a science of human behavior based on the functioning of human brain. Therefore in order to establish facts concerning brain- behavior relationship, often neuropsychologist relies on different neuropsychological assessment to draw conclusion about the structure and functional characteristic of a person's brain. Attention refers to the set of perceptual and cognitive processes that allows us to prioritize certain events for further analysis or action; as such, attentional processes play a role in almost all psychological phenomena (Mike E. Le Pelley, 2016)

Sustain attention is regarded as one of the important neuro-cognitive function that influence other aspects of cognition hold up by the frontal lobe.

The ability to be in focused for a long period of time, maintaining goal directed actions irrespective of numerous distraction is termed as sustain attention. All the activities in our life need proper attention especially when it comes to tedious work. In the existence of sustain attention to a larger extend most of our daily activities are accomplished. Exhibit of sustain attention helps us to carry out different tasks effectively which need long time to complete. Learning any concepts largely depends on attention and with sustain attention the ability to come across, take note and to think appears to be easier.

The importance of sustain attention lies in many aspects such academic setting in order to achieve high as well as follow the instruction given in a class, vocational training to acquaint with various skills, co curricular activities which demands -----, generating motivation in doing practical work, projects etc. most of the higher mental processes are possible scampers because of sustain attention such as problem solving, reasoning, language comprehension and most of the daily activities largely depends on sustain attention terms of continuous focus.

The neuro psychological basis of sustain attention have received very less notice even though failure to the functions of sustained attention in a healthy child, may lead to problems and several negative implications (Riley et al., 2016)

Sustained attention is important to psychologists because it is "a basic requirement for information processing." Therefore, sustained attention is important for cognitive development. When a person has difficulty sustaining attention, they often present with an accompanying inability to adapt to environmental demands or modify behaviour (including inhibition of inappropriate behaviour). Infact without sustain attention one may face exhaustion lack of interest in any activity under taken. Sustain attention also directly related to academic achievement and intelligence (steinmayr, et al 2010) In an investigation, a sample of 11th and 12th grade students (N = 231). An overall performance score and a quality of performance score in sustained attention as

well as verbal, numerical, and general intelligence scores served as predictors. Achievement criteria were grades in math and German as well as Grade Point Average (GPA) obtained after testing. Both types of sustained attention scores were significantly related to school performance, but only the quality of performance score incrementally contributed to the prediction of school performance above and beyond intelligence.

It is pertinent for school authority to focused on sustain attention for overall achievement of an individual though the family environment was largely unrelated to children’s sustained attention(Rachel A. Razza, et al, 2010) but lack of impulsivity was associated with both receptive vocabulary and externalizing behaviors but for the poor families. Findings of the study also indicate sustained attention as a potential target for efforts aimed at enhancing school readiness among predominantly.

Digital students: digital students refer to students who have grown up with active participation in technology as an everyday feature of their lives. Among the features that define digital students are that they take the availability of email, instant messaging, text message and use of unlimited online resources. Children of today’s generation are different. They are growing up in a media-saturated environment with almost universal access to television, internet, video game and other digital gazettes. The most suitable designation for them is digital natives (Mark Prensky, 2001) as they all are native speakers of the digital language of computers, video games and internet. Even at a very young age digital technology is playing an ever-increasing role in their life.

These children are growing up in a media-saturated environment with almost universal access to television, and a striking number have a television in their bedroom. Media and technology are here to stay and are virtually guaranteed to play an ever-increasing role in daily life, even among the very young. Additional research on their developmental impact is crucial to public health. Concern has developed regarding the possible effects (both hazardous and beneficial) on exposure to technology, the area that has received increased attention of parents, teachers and concerned authority. Even if there are a number of studies on the Impact of Technology on cognitive functioning; yet there seems to be paucity on studies related to its relative impact on Neuropsychological Enhancement and Digitalization and also the role of interactive media in promoting cognitive growth.

Participants: Participants are selected from 11 different schools of Guwahati city. Children (N-160) ranging from 12 to 15 years participated in the study. Informed consent along with other ethics of research were taken before processing the study from the concerned children and their authority. Participation was voluntary and without any monetary inducement. Demographic makeup of these school going children reflects diverge age, religion, parental occupation, relationship.School students were purposive which comprised of 80 digital children and 80 non digital children. Out of which 40 boys and 40 girls are digital children and the rest 40 boys and 40 girls are non-digital. The sample is selected from the district of Guwahati metro. The categorization of digital and non digital children was determined by the scale of digital addiction designed by Dr Kimberly S Young, where digital dependent (termed as digital) and non dependent (termed as non digital) included in the study and addicts were eliminated. Table showing mean age of the participants.

Children	Mean age
Digital children	14.03
Digital male	14.32
Digital female	13.75
Non digital children	13.48
Non digital male	13.45
Non digital female	13.52

In the present study 2x2 factorial design has been adopted. Two main independent variables having two different levels are investigated namely,

Children – digital children and non-digital children

Gender – boys and girls

Tool:

The assessment will consist of the following:

A self developed socio demographic data sheet. It includes information like age, gender, education, socio economic details, scholastic history and a self-developed questionnaire. To assess the children about their digital dependency Dr Kimberly S Young’s scale for digital addiction was administered.**Color cancellation test:** color cancellation test is a measure of sustain attention which is taken form NIMHANS Neuropsychological battery for children It is also a measure of accurate visual scanning and activating and inhibition of a rapid response. More number of omissions reflects poor visual scanning and poor selective

attention. Subject is presented with a sheet having 150 circles in 5 different colors i.e. red, yellow, blue, black and gray. Subject is required to cancel only the red and yellow circle as fast as possible. Time taken to complete the test is recorded and errors or omissions and commissions are noted.

II. Statistical Analysis

Descriptive statistics i.e. mean and standard deviation was applied to describe the basic feature of the data by providing simple summary about the sample and measures.

Inferential statistics i. e. t- test was used to make inference about the children tested as sample.

III. Result

As hypothesized that there will be no significant difference in sustain attention among digital and non digital children the finding revealed that DC scored higher on sustain attention compared to NDC hence the hypothesis is not retained. On the other hand in relation to gender that there will be no significant difference in sustain attention among boys and girls (DC) and there will be no significant difference in sustain attention among boys and girls (NDC) were accepted as there were no significance difference found.

The findings are summarized in the following table from I to VI

Table: I
Difference between Digital and Non-Digital Children towards Colour Cancellation Test in terms of time

Picture Cancellation Test (Time)	N	Mean	S.D.	d.f.	't' value	Level of Significance
Digital Children	80	42.91	8.96	158	2.3167	.05*
Non-Digital Children	80	47.46	15.11			

$$df=158 \quad \text{at} \quad .05=1.98 ; \quad .01=2.61$$

From the above table is it can be seen that the calculated 't' value is 2.3 which is significant at 0.05 level. Hence there is a significance difference between digital and non digital children in terms of time taken in colour cancellation test. Thus the time taken by non digital children is higher so their sustained attention in terms of time is low as compared to digital children which are high in terms of time.

Table-II Difference between Digital boys and girls towards color Cancellation Test (Time)

Picture Cancellation Test (Time)	N	Mean	S.D.	d.f.	't' value	Level of Significance
Digital Boys	40	41.86	9.50	78	1.0440	NS
Digital Girls	40	43.95	8.37			

$$df=78 \quad \text{at} \quad .05= 2.00 ; \quad .01=2.65$$

It is clear from the above mention table that the calculated 't' value is 1.04 which is not significant at both the level i.e. 0.01 and 0.05. Therefore from this value it can be concluded that there is no significant differences between these two groups in terms time taken of color cancellation test. Hence, there no difference in sustained attention among digital boys and girl.

Table-III
Difference between Non-Digital Boys and Girls towards color Cancellation Test (Time)

Picture Cancellation Test (Time)	N	Mean	S.D.	d.f.	't' value	Level of Significance
Non-Digital Boys	40	50.6	18.70	78	1.8857	NS
Non-Digital Girls	40	44.33	9.62			

$$df=78 \quad \text{at} \quad .05= 2.00 ; \quad .01=2.65$$

The calculated 't' value of this table is 1.88 which showing no significance differences between the two group showing no difference in sustained attention in terms of time among non-digital boys and girls.

Table-IV Difference between Digital and Non-Digital Children towards color Cancellation Test (Commission)

Picture Cancellation Test (Commission)	N	Mean	S.D.	d.f.	't' value	Level of Significance
Digital Children	80	58.99	4.93	158	0.1739	NS
Non-Digital Children	80	59.09	1.47			

df=158 at .05=1.98 ; .01=2.61

The computed 't' value is 0.17 which is not significant showing no differences between the two group. Therefore there is no difference in sustained attention among digital and non digital children in terms of commission.

Table-V Difference between Digital boys and girls towards color Cancellation Test (Commission)

Picture Cancellation Test (Commission)	N	Mean	S.D.	d.f.	't' value	Level of Significance
Digital Boys	40	58.45	6.92	78	0.9802	NS
Digital Girls	40	59.53	0.82			

df=78 at .05= 2.00 ; .01=2.65

The computed 't' value is 0.98 is not significant indicating no differences between the two group. So there is no significant difference between digital boys and girls in sustained attention in terms of commission.

Table- VI Difference between Non-Digital boys and girls towards Colour Cancellation Test (Commission)

Picture Cancellation Test (Commission)	N	Mean	S.D.	d.f.	't' value	Level of Significance
Non-Digital Boys	40	59.1	1.32	78	0.0605	NS
Non-Digital Girls	40	59.08	1.62			

df=78 at .05= 2.00 ; .01=2.65

The computed value is not significant indicating no significant differences between the two group. The table value is not significant which shows that both the groups match in mentioned functioning.

IV. Discussion

Time taken in seconds and errors of omission and commission comprise the score of color cancellation test. The mean, SD of digital children M=42.91, SD=8.96 and NDC M= 47.46, SD=15.11. And the t value is t=2.3167 which is significant at 0.05 level with regard to time making it clear that DC have scored higher than NDC with regard to time taken in seconds. Thus DC proved to be faster than NDC in this study showing higher scores. With regard to commission the mean and SD of DC, M=59.99 and SD=4.93 and NDC, M=59.09, SD=1.47 and the t value is t=0.1739 showing no significant difference. This indicates that time taken for commission by DC have been better as completion took less time as compared to NDC whose commission scores were insignificant with DC but time score was significant with lower score in NDC time as compared to DC. The children grown up with active participation in technology as an everyday feature of their lives have higher sustained attention as compared to children who are not which is supported by the study of **Chuang, et al** (2007). "Digital games for cognitive learning" examines the influence of compute-based digital games in today's education. This study was developed to investigate the play effect of digital games on children's (elementary school) cognition. The result from this pilot study provided experimental evidence to support the use of digital games can facilitate student's cognitive learning process. Thus uses of digital gadgets do enhance neuro-cognitive skills which is cleared from the presence study in sustain attention.

The mean , SD and t score with regard to male DC, female DC and male NDC, female NDC also shows no significant difference accepting the under taken hypothesis which says that there will be no significant difference in sustain attention among boys and girls (DC) and there will be no significant difference in sustain

attention among boys and girls (NDC). Therefore sustain attention does not show gender difference but digital uses does.

Implication: literature reveals ample studies on sustain attention but the researcher could not find studies in terms of digitalization. There are several arguments and researches on negative impact of digitalization but so far studies on neuro- cognitive skills have not been reported as yet. This study gas far reaching implication as parents and guardian of children are confused whether children should be given access to digital gadgets as there is negativity bias in this regard and most researches are conducted to reveal its negative impact. Excessive indulgence will obviously lead to addiction and negative symptoms but the result from this study is an indicator that digital uses has positive impact as the result of this study depicts sustain attention high in DC as compared to NDC.

Limitation: in the present study only sustain attention which is one among many pertinent neuro cognitive skill was examined. Other skills such as planning, motor speed, visuo conceptual ability, immediate memory which are major neuro-cognitive skills that can be examined with regard to DC and NDC for sound generalization.

Suggestion: children can be allowed to use digital technologies but just as over indulgence is harmful with regard to other pleasure seeking activities, so it is in the case of digitalization. The time frame and the digital activities need mentoring from time to time to avoid its harmful effects.

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