

Working memory task performance among media multitaskers

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ABSTRACT

The current study explored the Working memory task performance of media multitaskers. The storage i.e. memory and processes concerned with it i.e. working, is called working memory. Due to the availability and easy accessibility of the media technologies, the youth have been found to squeeze more media content simultaneity (Carrier et al., 2009; Rideout et al., 2010). Using several media types simultaneously, they engage in “media multitasking.” It is problematic due to its adverse consequences for cognitive control i.e. executive functioning (Wallis, 2010). For the purpose of the study, the sample comprised of 80 girl subjects randomly chosen from the Government schools of Chandigarh (Age range =14-18 years; Mean age=16.4 years). The subjects were classified into Heavy, Moderate and Light media multitaskers using Media Multitasking Index questionnaire by Ophir et al (2009) and their working memory functioning was studied using OSPAN task. The results arrived at through ANOVA were found to be insightfully meaningful for use with media multitaskers.

Keywords: *Media multitasking, Working Memory*

The teachers and parents are concerned about the students’ academic performance as the availability of numerous media technologies has made it easy for the students to get distracted easily resulting in the poor academic performance (Patterson, 2017; Wallis, 2010). The easy accessibility and availability of multiple media in the 21st century has led to the increase in the simultaneous consumption of media use very common and this process of consuming more than one media at a time is prevalent among teenagers (Rideout et al., 2010). Vega (2009) defines media multitasking as a phenomenon where an individual is engaged in different types of media simultaneously, including opening of several windows on a single media platform.

According to Bardhi et al., (2010) media multitasking is when an individual participates in several media forms at once, and this rise is common among teenagers (Foehr 2006; Roberts and Foehr, 2008).

Working memory refers to the system or mechanism essential to maintain the task-relevant information while performing a cognitive task (Baddeley and Hitch, 1974).

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Working Memory Task Performance Among Media Multitaskers

In a study conducted by Rosen (2011) found that the performance of the student was low if they were interrupted by text messages during lecture than the students who received fewer text messages.

Oberauer et al., (2003) has found that working memory helps to switch from one task to another while working on several task at a time.

As the ability to actively hold in mind information that is needed to do complex tasks such as reasoning, comprehension and learning and it is limited in both capacity and rate (Seigler & Alibali,2005), working memory helps in performance.

Involvement or engagement in more than one media at the same time while also attending some real time task the lecture (Greenfield, 2010) indicates media multitasking. The function of working memory is to actively hold the needed information to do complex tasks such as reasoning, comprehension and learning. Working memory has been related to the ability to control and focus attention (Gioia et al., 2002).

This burdening of the working memory has an effect on the individuals' performance. For example, assignments take longer time to complete, students become mentally tired and the information will be processed and stored differently in memory which may affect learning and performance of the individual.

Hembrooke and Gay (2003) studied the immediate consequences of media multitasking on working memory e.g. students who are allowed to multitask with their laptops during a lecture score low on measures of memory for lecture content as compared to the ones who were not involved.

It is important, therefore to explore these variables.

Objectives of The Study

Phase 1

1. To categorize subjects into three groups i.e. Heavy(a1) Moderate(a2) and Light(a3) media multitaskers

Phase 2

1. To observe the difference in the working memory performance of the three groups i.e. Heavy, Moderate and Light media multitaskers.

Since the working memory performance of media multitaskers has been studied less, therefore the study in hand is exploratory.

METHODOLOGY

Sample

A sample of 80 female students in the age group of 14-18 years from various Government Schools of Chandigarh was taken randomly.

Measures used

A. Media Multitasking Index Questionnaire (Ophir et al, 2009) - Media Multitasking Index questionnaire by Ophir et al (2009) was used. The MMI, developed by Ophir et al.(2009),indicates the level of media multitasking the subject is involved in during a media

Working Memory Task Performance Among Media Multitaskers

consumption hour. The questionnaire addresses 12 different forms of media including print media, television, computer-based video (such as YouTube), music, and voice calls (to name a few). For each medium, participants provided two pieces of information: (1) the total number of hours per week spent using the given medium and (2) whether, while using the given medium, they simultaneously used each of the other media in the questionnaire; responses were selected from the options “Most of the time,” “Some of the time,” “A little of the time,” or “Never.”

B. Working memory task: - Operation Span (OSPAN) task (Turner and Engle,1989) was used to measure Working memory of the individual. The Working memory capacity task is an extremely reliable measure with good internal consistency.

In this task, the subject shall be asked to verify an equation while maintaining words in memory.

Experimental Design

One way ANOVA comprising of 3 levels of media multitasking (High, Moderate, Low) with working memory task was used.

Procedure

It comprised of two phase,

Phase I-

In this phase, Media Multitasking Index (2009) questionnaire was administered individually on all the subjects. The scoring was done as per the manual. On the basis of the above, two groups comprising of ‘Heavy’, ‘Moderate’ and ‘Light’ media multitaskers were taken. Care shall be taken to keep the groups equal on the basis of minimum subjects in either of the groups. (See Table no.1and 2)

Table no.1: -Mean and SD of media multitasking scores of the initial sample

Mean	S.D
3.23	1.67

Table no 2: -Distribution of the initial sample among the three groups

Heavy Media Multitaskers (A1)	Moderate Media Multitaskers (A2)	Light Media Multitaskers (A3)
Mean + 1/2 S.D 3.23 + 1/2 (1.67) = 4.06	2.41 to 3.9	Mean – 1/2 S.D 3.23 – 1/2 (1.67) = 2.39
N =20 *	N=29**	N =31 ***
*criteria for a1 scores = ≤ 4.06 **criteria for a2 scores = 2.41to 3.9 ***criteria for a3 scores = ≥ 2.39 *Equal number of students each were allocated to the three media multitasking groups.		

Phase II:

Subjects classified as Heavy, Moderate and Light media multitasking groups were administered on working memory task.

Working Memory Task Performance Among Media Multitaskers

In this phase working memory task (OSPAN task) was used to measure the working memory functioning of the individual. The subject were first presented with an equation e.g.(2*1)+1=2) the subject was asked to verify the equation in terms of right or wrong and then an alphabet was presented which the subject had to retain it in memory and again an equation was presented which was then followed by a letter. The subject was then presented with a matrix comprising of alphabets, the subject was asked to identify the alphabets from the given matrix in the series in which it was presented. The number of alphabets presented varied for every trial. The subject was presented with 20 trials. Each slide was presented for 1 sec. Intertrial interval was 2 seconds.

It may be noted that the subjects were given practice on one pilot trial in the beginning of the task in order to facilitate the acquaintance of the subject to the task. Performance of the subject was noted in terms of correct responses.

Precise instructions were given to the subjects and in order to avoid errors of habituation and anticipation proper randomization of conditions, as also mentioned above, was adhered to. The participating subjects were informed about the purpose and potential benefits of the study. The consent of the participants was thus obtained and confidentiality of responses and privacy of the subjects was ensured.

RESULTS AND DISCUSSIONS

The results of the study are given as under:

Table 3: Summary table of One way ANOVA

Source of Variation	SS	df	MS	F
Between groups	1564.10	2	782.05	13.50 **
Within groups (Error)	4458.77	77	57.90	
Total	6022.88	79		

****Significant at .01 level**

As may be seen from above (see Table no. 3), media multitasking has had a significant effect on the working memory task with $F(2, 77) = 13.505^{**}$, $p < 0.01$. The three media multitasking groups were found to influence the working memory task performance significantly.

Clark and Mayer (2008), findings indicated that the individuals who are engaged in media multitasking are overloaded by the spatial information thus it leads to a poor performance as there is a separate storage capacity for verbal and spatial information in working memory.

In the study in hand, media multitasking was negatively correlated with working memory performance. Thus, individuals who were low on media multitasking scored high on working memory task performance as compared to heavy media multitaskers and moderate media multitaskers. The performance of the individuals on the working memory task varied in the three media multitasking groups(See Table No.3).

Studies have been bringing out various aspects of cognitive control, and have shown that heavy media multitaskers perform poorly in tasks involving working memory (Minear et al., 2013).

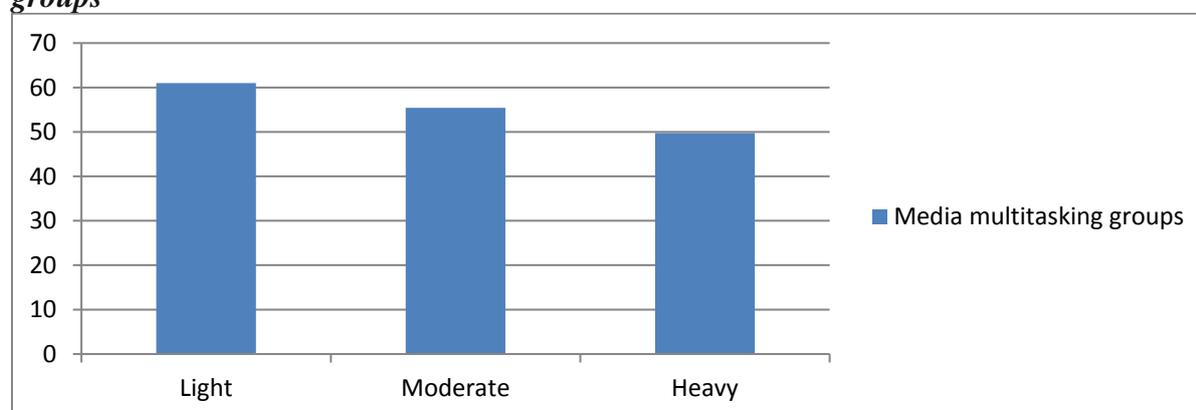
However, moderate media multitaskers have been less studied, the study in hand attempted to study this group as well.

Working Memory Task Performance Among Media Multitaskers

Table No. 4: Showing the mean working memory scores of the three media multitasking groups

Groups (Media Multitasking)	Mean	S.D
Heavy	49.75	8.61
Moderate	55.41	7.85
Light	61	6.63

Figure 1. Showing the mean working memory scores of the three media multitasking groups



The above figure (See figure No. 1) shows the mean scores for the three media multitasking groups and thus the performance of the light media multitasking group was more as compared to the moderate and heavy media multitasking groups respectively. It indicates that the individuals who are light media multitaskers performed better on working memory task as compared to the heavy and moderate media multitaskers.

Adolescents who media multitask often are open to several incoming streams of information. It has been argued that media multitaskers may lose their skill to fully pay attention to one activity because they are used to scattering their attention to several ongoing activities (Wallis, 2010).

Research study by Ophir et al. (2009) claimed that processing multiple streams of information was challenging for human cognition. Many researchers explored relationship between media multitasking and their cognition. Their results indicated that individuals high on media multitasking would have greater difficulty in filtering irrelevant stimuli as well as in ignoring irrelevant representations in memory.

Heavy media multitaskers have been found to be easily distracted by the irrelevant information and also to perform poorly on memory tasks as compared to light media multitaskers (Uncapher et al., 2016).

Other researchers have also indicated, that heavy media multitaskers performance was low, the higher working memory performance in light media multitaskers (Sanbonmatsu et al., 2013).

Media multitasking has been found to affect learning and development among children and adolescents including poor academic evaluations. Heavy media multitaskers showed poorer processing speed as compared to light media multitaskers (Martin-Perpina et al., 2019).

Working Memory Task Performance Among Media Multitaskers

The study in hand shows that even the moderate level media multitaskers perform poorly than light media multitaskers and better than the heavy media multitaskers. This has great implications for Indian set up where many individuals are moderate multitaskers also due to the nature of their jobs.

CONCLUSION

People engaged in different levels of media multitasking differ in their performance on working memory task,

1. Heavy media multitaskers were found to perform low on working memory tasks as compared to light and moderate media multitaskers.
2. The performance of Light media multitaskers was better than high and moderate media multitaskers on working memory task.
3. The mean score of the subjects in the group moderate media multitaskers was better than heavy media multitaskers but the mean score was low when compared to the subjects in the group Light media multitaskers.

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Working Memory Task Performance Among Media Multitaskers

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Conflict of Interest

The author declared no conflict of interest.

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