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Background-sound-ambience and its differential effects on comprehension test performance among school children

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ABSTRACT

The purpose of the present paper, based on a study that was designed to see whether different types of background sounds affects the performance of a standardised reading comprehension test of school going adolescent students. The study was conducted with the objective to check the performance level of the students in no sound (control group), constant medium volume soothing music (experimental group I) and different types of changeable audio-visuals (experimental group II). The study tried to find out whether there is any significant differences in the performances of the children's performances depending upon whether they were assigned to control group or experimental group I or experimental group II. The study involved 180 participants from three English medium school in North Kolkata, West Bengal. The children were divided into three groups of equal size (60 in each group) randomly. The participants performed a reading comprehension task in three different environments. The STATA software was used for statistical analysis. The ANOVA conducted showed that there is significant differences in the score of the (experimental group II). The Turkey's HSD further revealed that there is significant differences in the (experimental group II) with control group and (experimental group II) and (experimental group I). However there is no significant differences between the control group and (experimental group I).

Key Words : Reading comprehension, Background sound, Concentration, Preadolescents

INTRODUCTION

Students today encounter and are immersed into more and more technology that allows them to have easier access to different types of media. Urban living compels them to study in crammed spaces and adjust with various kinds of background-sounds. Further, with advancement of technology the various kind of devices at the disposal of these students are also continuously increasing. Kahneman's (1973) in his famous capacity model of attention provides a theoretical base on how music could potentially be distracting to a cognitive task such as reading. Here by attention he refers to the amount as well as intensity which often gets reflected in the results in hand of the task performed. The basic idea behind Kahneman's capacity model of attention is that the amount of attention that can be deployed at any one time is limited. In addition, the amount of attention that is

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required for performing multiple tasks depends on the demand of each single activity performed in isolation. For example, an easy task demands little effort while a complex or difficult task requires more effort. Therefore, according to the capacity model of attention, one may fail to perform an activity because the supply of attention does not meet the demands. In other words, a task or activity fails because relevant information during the input process was not recognized since that person was unable to pay enough attention to process the information.

Based on this theoretical framework there are several studies that looked at the effects of different types of background media on reading and other cognitive tasks such as homework (Armstrong *et al.*, 1991; Cool and Yarbrough, 1994; Pool *et al.*, 2000; and Pool *et al.*, 2003). Several studies have found that many students today are immersed with media technology and this leads to the problem of how well students can study. In a paper by Ballard (2003) surveyed and interviewed students from two Midwestern states in the United Sates. The students gave their self-report of media habits and academic performance. The participants in this study reported and perceived that media have a negative effect on academic performance because it is a source of major distraction when completing homework. Television was perceived as a major source of distraction because having a television in your room makes you want to watch it. According to Azzam (2006), it was found that 68% of the students have a television in their bedroom and the students are exposed to on average six and half to eight and half hours of media a day. Also, nearly one-third of the students reported that they talk on the phone, instant message, watch television, listen to the radio or music, or surf the internet for fun while they are doing homework. This is similar to what Cook (1992) found where more than 70% of teens use the internet regularly and that working on a computer offers its share of distractions. The computers have an amplifying effect on the student's study habit because if the students do not care about what they are learning, they are much more likely to multitask. Parents who often check on their children may find them surfing the internet, listening to music and talking on the phone while trying to finish their schoolwork. The findings from these studies support the idea that many students do have the habit of doing homework while engaging in other types of media. The above studies found the frequency of participants who combine doing homework with background media, there were also a number of studies that dealt with the effects of background media on the performance of cognitive tasks. In another study, Hallam *et al.* (2002) found that playing music that was perceived as arousing, aggressive and unpleasant had a negative effect on the performance of various cognitive tasks and that it also led to a lower level of reported social behaviour. In this case, music can disrupt concentration and becomes a form of non-verbal distraction. The findings from the studies on the effects of background television led to the formulation of the first research question on whether or not background music can affect the learner's concentration like background television. The findings from the studies by Hallam and Price (1998) and Hallam *et al.* (2002) lead to the formulation of the second research question on whether or not light classical music enhances the performance of a reading comprehension task while other types of music such as hip hop decreases the performance of a reading comprehension task.

Unlike the studies found in the review of literature on the effects of background television on cognitive tasks, this study focuses on how different types of sound or specifically audio-visual environment may distract or impair the student's concentration during a reading comprehension task. The main goal of the study is to compare the variables of no sound with soothing background music (audio only) and erratic sounds coupled with visuals to determine which type of background environment creates the most amount of interference and which type of background music creates

the least amount of interference.

Objectives :

a) To look into the performance of pre-adolescent children in a reading comprehension test.

b) To find out whether there is any significant differences in the performances due to the difference in the working ambience of the child in question.

METHODOLOGY

Hypothesis:

HO1: There is no significant differences in the performances of the boys or girls.

HO2: There is no significant differences in the performances of the children due change in the background sound characteristics.

HO3: There is no significant differences in performance in the control group and that of experimental group I.

HO4: There is no significant differences in performance in the experimental group I and experimental group II.

HO5: There is no significant differences in performance in the experimental group II and the control group.

Sample :

Of the stages of child development preadolescence, also is known as the stage of human development following early childhood and preceding adolescence which generally ends with the beginning of puberty, but may also be defined as ending with the start of the teenage years. Preadolescent children in fact have a different view of the world from younger children in many significant ways. Typically, theirs is a more realistic view of life than the intense, fantasy-oriented world of earliest childhood. They have more mature, sensible, realistic thoughts and actions and often they will often have developed a sense of intentionality and have a more developed sense of looking into the future and hence their performance gives us rough overview of the future career prospects of the child in concern. Thus, the target population of the study was primary school going children in the age group of 10 to 12 years in three selective CBSE board affiliated schools of North Kolkata. The schools were selected as per convenience. The sample of the study comprised of 180 school going students. Both boys and girls were selected. Students participated in the study on the performance of reading comprehension test with or without background sound according to the group they were assigned randomly. The participants were all from class IV and V. The average age of all participants was 10.8 years with S.D 0.86 years.

Tools :

The assessment tool for the reading comprehension test that was used in the study was the reading comprehension component from a Junior-TOEFL preparation manual called 30 Days to the TOEFL B. In the TOEFL preparation book, there are five practice sections for reading comprehension. In each practice section, there are five reading passages with ten questions for each reading passage. For this study, three reading passages with questions were selected as the assessment tool. The themes of the reading passages were carefully selected to account for the prior or background knowledge of the participants. Therefore, this study could focus on assessing

the participants' ability to concentrate with background sound rather than on the participants' reading ability in the foreign language. The three selected reading passages were word processed into a document where it was printed and photocopied for use on the day of the experiment. In addition to the assessment tool, this study also used a CD. The CDs were used as the variable during the study. Also a television set with cable connection was used on the day of the experiment.

Procedure :

The main instrument used for this study were three reading passages with the thirty reading comprehension questions from a TOEFL preparation book called 30 Days to the TOEFL CBT. The three reading passages along with its reading comprehension questions were first processed into a Microsoft Word document. Then, the reading passages and the reading comprehension questions were printed out and photocopied into the appropriate number of copies for use during the study. Because there were a total of ten pages for the reading passages and the reading comprehension questions, the documents were made into individual booklets so they could be distributed and collected more easily on the day of the experiment. The scoring of the reading comprehension test was based on the answers provided by the Junior-TOEFL preparation book. The answers were found at the end of each practice tests.

In this study, there were two experimental groups and a control group. The participants in the control group performed the reading comprehension task without any background sound, while the participants in the first experimental group performed the reading comprehension task with rabindra-sangeet (Tagore style soothing music) playing in the background and the second experimental group performed the reading comprehension task with popular soaps and cartoon shows going on at varied noise levels which were changed after a gap of 5 minutes in the background. The participants were randomly assigned to either the control group or one of the two treatment groups. Random assignment was used in order to make sure that all groups were equal since this study did not include a pre-t experiment. The participants were told by the volunteer teachers to try and ignore the music or the television while they were doing the reading comprehension task. After the allowed time was up, all the booklets were collected by the researcher for scoring and analysis.

RESULTS AND DISCUSSION

After the participants finished with the reading comprehension task, the booklets were collected and graded based on the number of correct and incorrect responses. Once the grading was completed, the score of each participant was transferred to a database for analysis in SATA. First the descriptive statistical analysis is performed.

Table 1 shows the age distribution of the preadolescent boys and girls. Next to look into the homogeneity of the sample a t test was performed to look into the significant differences in the performances of the boys and girls if any.

Table 1 : Age distribution of the sample

Gender	N	Mean	Std. Deviation	Std. Error Mean
Boy	98	10.98	0.77	0.51
Girl	82	10.53	0.94	0.38

We see that in Table 2 there is no significant differences in the performance of boys and girls of the control group, experimental group I and experimental group II as well as the total boys and

girls. Thus, null hypothesis is accepted at 0.05% level of significance and alternative hypothesis rejected.

Table 2 : t-test for equality of means gender

	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	
Total	1.415	178	.160	-.089	.063±1.99	Null accepted
Control Group	1.090	58	.050	-.019	.099±1.73	Null accepted
Exp Group(I)	-0.76	58	.050	.005	0.041±1.73	Null accepted
Exp Group(II)	-0.514	58	.009	-.013	.025±1.73	Null accepted

Further the analysis used for this study was a one-way factorial ANOVA. The one-way factorial ANOVA design allows for comparisons of mean scores from multiple groups in a factorial design in order to decide whether the differences between means are due to chance or the effect of the our variable (background sound environment). If a significant difference was found in the ANOVA, a Tukey's HSD (honestly significant difference) was used to determine which of the three groups differ from each other. The purpose of this study was to explore whether background music has a distracting effect during a reading comprehension task. There were a total of 180 participants in the study. The one-way factorial ANOVA was used to analyse the results for the research questions on whether different types of background sound environment, no sound, soothing rabindra sangeet played at a constant low volume and erratic sounds and visuals from the television have an effect on concentration during a reading comprehension task. The mean score for the control group was 67.67 with a standard deviation of 14.293 while the mean score for the rabindra sangeet group (experimental group I) was 64.41 with a standard deviation of 14.019. However, the mean score for the television group (experimental group II) was a bit lower at 58.32 and a standard deviation of 14.412.

Table 3 shows that the descriptive for factorial ANOVA where between component variance for the fixed and random effects are 0.008 ($p<0.05$).

Table 3 : Descriptive for factorial ANOVA

Model	Std. Deviation	Std. Error	95% confidence interval for mean		Between- component variance
			Lower Bound	Upper Bound	
Fixed Effects	3.476	.449	11.15	12.95	
Random Effects		.633	9.33	14.77	.008

In the one-way factorial ANOVA, the comparison of the mean score among the control group (M=67.67, SD=14.293), the experimental group I (M=64.41, SD=14.019) and the experimental group II (M=58.32, SD=14.412) yielded a statistical significance, $F(2,177) = 5.78$, $p<0.05$. This meant that there was a difference in the performance of the reading comprehension task due to the different types of background environment. Because a significant difference was found in the one-way factorial ANOVA, a Post Hoc Test was performed.

Using Tukey's HSD, a significant difference at the .05 alpha level was found between the control group and the experimental group II. However, the reading comprehension score for the control group was not significantly different than the experimental group I. In addition, the reading comprehension score for the experimental group I was also significantly different than the reading comprehension score experimental group II.

Table 5 : Post-Hoc summary (Tukey's HSD)

(I) group	(J) group	Mean difference (I-J)	Std. error	Sig.	95% confidence interval	
					Lower bound	Upper bound
1	2	-.350	1.099	.946	-3.00	2.30
	3	-9.050*	1.099	.158	-4.70	.60
2	1	.350	1.099	.946	-2.30	3.00
	3	-9.700*	1.099	.277	-4.35	.95
3	1	2.050	1.099	.158	-.60	4.70
	2	1.700	1.099	.277	-.95	4.35

Table 6 : Homogeneity scores summary

Group	N	Subset for alpha = 0.05
		1
1	60	11.25
2	60	11.60
3	60	13.30
Sig.		.015

Means for groups in homogeneous subsets are displayed
a. Uses Harmonic Mean Sample Size = 60.00.

This study showed that the performance of a cognitive task such as reading can be affected by the type of back ground environment. In this study, in consistent sound and visuals had a significant effect on the performance of the reading comprehension task when compared to the scores of the participants who performed the reading comprehension task with no sound or low volume music background. This showed that the participant's concentration in the experimental group II with erratic sounds and visuals were more affected as compared to the other groups. According to the results of the study, the findings yielded some important information. It showed that playing soothing background music does not hinder in the comprehension task however television visuals with erratic high volume audio hampered the. However, it was seen to find that the control group did not significantly perform better than the soothing music group. However, this was thus not in accordance with the original hypothesis and with the idea that music that is perceived as distracting will affect task performance and concentration. In the past studies about the effect of background television on different cognitive tasks, the authors found that different types of television programs distract the participants (Armstrong *et al.*, 1991; Pool *et al.*, 2000; Pool *et al.*, 2003). One of the results was that the television programs extended the time used to complete the assignments by exactly the same amount of minutes that the students spent looking at the screen (Pool *et al.*, 2003). This is supported by the present study. From the finding of this study, we can conclude that the best way for students to study is to study in a quiet room. The participants who scored the highest in the reading comprehension task were the control group who performed the reading task in silence. A quiet or silent room would be the best condition for learning because there are fewer distractions that would take the attention or focus away from the task at hand. This is important in today's society since our daily lives are immersed in technology. Sometimes having the television set or the stereo in the study room is a distraction itself because adolescents may be tempted to turn them on while they are trying to study. Once turned on, the attention drainage effect could occur even if the students choose not to pay any attention to them. Perhaps future studies about the attention drainage

effect in other contexts can be explored. With this study, hopefully teachers and students are enlightened and will make better choices to enhance their learning condition. Although this study found that erratic background sound with visuals was more distracting than light melodious music, perhaps future studies could also explore the distraction effects of different types of music and volumes of music that is played.

Conclusion :

There is no significant differences between the comprehension test score of boys and girls. In other words, gender does not have a significant role in differential performance in context of sound ambience for the children. The ANOVA conducted shows that there is significant differences in the scores within the groups. The HSD conducted shows that there is significant differences in the experimental group II (erratic television sound) with control group (no sound) and experimental group I (Tagore Style Music) with experimental group II. However there is no significant differences between the control group (no background sound) and experimental group I.

Shortcomings :

The current study has a number of limitations. First, only two noise levels were investigated. It would be interesting to include a wider range of different levels. Second, only one test of cognitive ability was tested. Another limitation of the present study is that the experiment was not designed to study differential effects of noise on study and recall. Further, the inclusion of varied personality traits of the individuals and their response to such distracting background sounds will be interesting. Moreover, various age groups of the participants could be included in a large scale study to look into their performances.

Recommendations :

In this modern age of urban dwellings and intruding digital world the best way for concentration will be complete silence however a soothing background music too has a positive impact on the cognitive performances of the subjects. However, the study recommends that it is best to avoid the television set or for that matter other gadgets with audio visuals like computer or tabs or mobiles from the study setting of the children. Parents may also encourage the children to study in a proper ambience which may improve their results of a performing a cognitive task.

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