Short Term Memory Based on Gender

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Abstract

It has been a long belief that women have better multi-tasking skills than men. Multi-tasking involves doing several tasks at once, which would involve the use of short term memory. If women are better at multi-tasking than men, it would seem that they would have better short term memory as well. After running male and female subjects into a virtual room environment with pictures and testing their knowledge of the environment, would females also dominate this type of short term memory use, or would males show better usage of their short term memory?

Keywords: VR, Eye Tracking.

1 Introduction

Goals

To prove by analysis of the data collected from the experiment to discover whether there exist a difference in the short term memory of male and female college students.

Motivation

We wanted to find out if gender made a difference in how much a person could retain information about what they saw. Using this knowledge we can learn more about the extent of our short term memory.

Hypothesis of Study

We hypothesize that our female subjects will prove to have better short term memory than our male subjects.

2 Background

While researching previous experiments for information related to short term memory, Psychological Science's Research Report on, *The Role of Fixation Position in Detecting Scene Changes Across Saccades*, proved to be a valuable source. In their experiment, the subjects were exposed to color images of a believable space, i.e. living room, dining room, etc., where items within the image were deleted or rotated during a saccade (Henderson & Hollingworth, 1999). Even though the participants were asked to memorize the scene and all of its details, the test subjects still were reluctant to notice the changes. Three factors in the experiment affected the participants ability to detect the changes: their accuracy increased when the distance between the fixation and changing region decreased, occasionally, the initial changes were missed only to be recognized when the changing region returned to its original orientation, and the detection of deleted items improved when the viewer's saccades were in the direction of the items being removed. These findings support conclusions that fixation position and saccade direction have a major affect in the detection of scene changes and change blindness.

"Subjective experience leads viewers to believe that their visual system delivers a complete and veridical representation of the scene before them–a representation akin to a relatively detailed color photograph. This phenomenology forms the basis for the majority of the oretical work in both human and machine vision." (Henderson & Hollingworth, 1999)

3 Methodology

Apparatus

A Pentium 4 workstation with a NVIDIA 4600 graphics card. A Head Mounted Display (HMD) binocular eye tracker having 640 X 480 resolution per eye with separate left and right eye feeds and equipped with head phones for audio localization.

Stimulus

We have used a virtual room with three pictures placed on each wall. Each wall has a label (LEFT, RIGHT, FRONT, and BACK) indicating its position.

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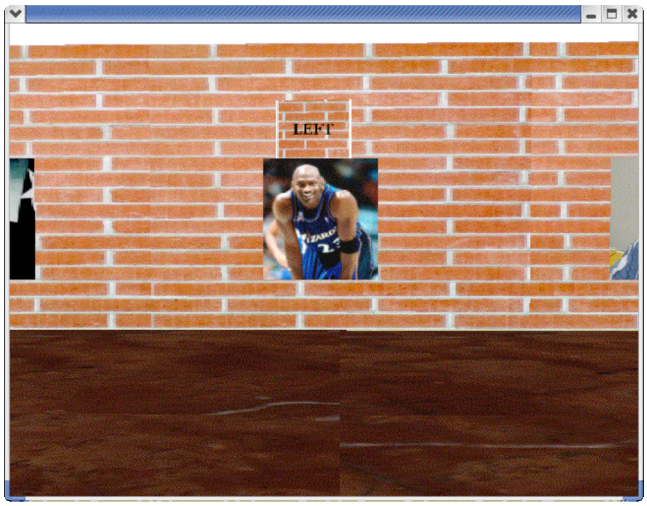

Figure 1. The Virtual Room

Subjects

Total no. of subjects used will be six, i.e. 3 male and female college students. Our experiment is designed to ultimately make assumptions on the short-term memory capability of college students based on gender. Therefore, we will record and keep track of the observation of each gender and draw conclusions based on the results.

Experimental Design

Stats will contain data from the eye tracker and the program which will denote the gaze points of the subjects and information about the gaze points which coincide with the position of pictures in the virtual world.

Experimentation will include one level of difficulty, and every subject will undergo the test under the same level of difficulty.

Procedure

We will first ask our subjects to fill out a pre-run questionnaire, asking them various questions such as "Do you have 20/20 vision?" Once this is done, our subjects will enter our virtual room with the eye tracker in place to observe what he or she is looking at. We will tell our subjects to explore the virtual room. While the subjects are exploring the virtual room, our program will be recording the trial sessions for us to analyze later. Each picture in the virtual room will be incased in a sphere that will be use to determine the location of the picture. We will determine when a subject is looking at a picture by calculating when the ray (the eye point and the normalized gaze vector) and sphere intersects. The subject will remain in the virtual room for about sixty seconds. Afterward, we will give the subject a post-run questionnaire to fill out, asking them which wall they saw the specified painting on (left, right, front, or back wall).

Analysis

After running all of our subjects through the experiment, we were able to observe how they explored the virtual room by replaying each subject's trial run. The replay of the subject's session was subdivided into four sections. The lower left hand corner of the replay was the subject's view of the virtual room (the frontal view). The other three sections, which were out of the subject's line of sight, was the view from the left, right, and back. A red square in the frontal view indicated the subject's eye position in the virtual room. When a picture came into a subject's line of sight, a small red vertical rectangle formed in the upper left hand corner of the picture. This was done to show us that the eye tracker was accurately following the subject's eye movements. In general the male subjects looked at each painting in a much faster rate than the females. The female subjects, on the other hand, focused more heavily on each picture and wall label.

Male	**4/12**	**2/12**	**2/12**
Female	**9/12**	**8/12**	**5/12**

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Even with this small amount of data, we can see a huge difference in the short term memory differences between males and females.

5 Discussion

The results from our experiments show that gender has an affect on short term memory. We ran the same experiment with all subjects and there was a significant gap in the accuracy of men in comparison to women. Our male subjects averaged an accuracy percentage of 21.2%, and our female subjects averaged an accuracy percentage of 61.1%. These figures were calculated by averaging the number of correct responses over the total number of pictures, for each gender. This is almost a 40 percent difference in the efficiency of short term memory between the sexes. Our hypothesis stated that our female subjects will prove to have better short term memory than our male subjects. This is definitely the case in our results.

Although, this experiment yields in favor of the females by 40 percent, this figure may be inflated due to the number of subjects that participated in this experiment. With 20 subjects in each category, the accuracy percentages would be closer, therefore decreasing the margin between the two groups.

Effective studies in gender and the affects on short term memory can lead to determining which gender has a better short term memory, why this is the case, and what can be done to bring the other gender up to par. Hopefully our experiment will inspire more focus in this area of research.

6 Conclusion

Since our experiment generated results for us to draw a conclusion from, we consider the experiment to be a success. Based on the results that we gathered from the experiment, we were able to conclude that our hypothesis was correct. Being that none of our male subjects were able to compete with our female subjects in the amount of questions they got correct, suggests that females definitely have better short term memory than males. Therefore, it would seem that gender does play a role in the usage of short term memory.

References

Henderson, J.M., & Hollingworth, A. (1999) Research Report: The role of fixation position in detecting scene changes across saccades. *American Psychological Society,* VOL.10, NO. 5, 438 – 443.

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