



Ben Gurion University

# **Selective Visual Attention**

**By: Diana Khinich**

**Project Report**

## Table of Contents

Background.....	3
Experiment .....	4
The goal of the experiment .....	5
General Description .....	5
Test Results .....	7
Conclusions.....	11
Bibliography.....	12

## 1. Background

a fundamental phenomenon in human cognition is its limitation. Despite our impression that we retain all the visual details that we see in our surrounding, surprisingly, in many cases we are unable to detect the changes that are made in it. The name of this phenomenon is "selective attention".

Selective attention is necessary in order to help us decide where to move our eyes next. Our perception of scene is developed by combination of visual attention, eye movement and memory.

In cognitive psychology there are at least two models which describe how visual attention operates:

The first model is named spotlight model (figure 1). The focus is an area that extracts information from the visual scene with a high-resolution, the geometric center of which being where visual attention is directed. Surrounding the focus is the fringe of attention which extracts information in a much more crude fashion (low resolution). This fringe extends out to a specified area and this cut-off is called the margin.

The second model is called zoom-lens model. This model has the same properties as the spotlight model (focus, the fringe and the margin), but it also has property of changing in size, as it is used in cameras. The zoom-lens of attention can be described in terms of an inverse trade-off between the size of focus and the efficiency of processing: the larger the focus is the slower processing will be of that region of the visual scene since this fixed resource will be distributed over a larger area.

Sometime visual attention need to be divided between several tasks. Very often we need to pay attention to more than one task at a time, for example, driving a car causes our focus to be split between several different things at once.

Researchers have describes two different approaches of how our minds come to attend to items presented in the environment and process the information.

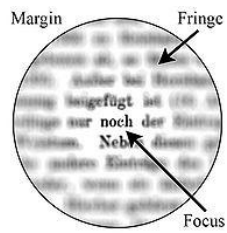
The deductive approach commonly called "top-down" approach, works from the more general to the more specific. In top down approach it is essential to break down of a system to gain insight into its compositional sub-systems. In this approach an overview of the system is formulated, specifying but not detailing any first-level subsystems. Each subsystem is then refined in yet greater detail, sometimes in many additional subsystem levels, until the entire specification is reduced to base elements. This approach helps organize the stimulus. Knowledge, experience and memory play a role in top-down processing.

The inductive approach commonly called "bottom-up" approach refers to the processing of a stimulus in which information form a physical stimulus rather than from a general context. Stimulus information arrives from the sensory receptors (the bottom level of processing). The combination of these simple features allow us to recognize more complex patterns or processes, such as motion or a sudden loud noise, can attract our attention in a pre-conscious, or non-volitional way. We attend to them whether we want to or not.

Sometimes one is focused on stimuli that he cannot notice other stimulus around him.

In my project I wanted to explore this phenomenon and check whether object movement, direction and type have influence on selective attention.

Figure 1:



Spotlight model: The focus is an area that extracts information from the visual scene with a high-resolution, the geometric center of which being where visual attention is directed. Surrounding the focus is the fringe of attention which extracts information in a much more crude fashion (low resolution). This fringe extends out to a specified area and this cut-off is called the margin.

In this project I wanted to explore the Phenomenon that is called "selective attention". I wanted to check whether there is a connection between the object movement, direction and its type and selective attention.

## 2. Experiment

### a. The goal of the experiment

the major goal of the experiment was to check whether object movement, direction and type has influence on selective attention.

### b. General Description

65 people were divided into 5 groups of 13. Each group received a short Slideshow. Each slideshow checked different aspect of the experiment. None of the slideshows suggested about the subject of the experiment or what it was testing. All of the contestants did only one of the experiments. After one watched the slideshow he needed to answer some questions about it.

In the first slideshow, the participant needed to distinguish the word "red" from words that where blinking on the screen and count how many times it blinked. While the participant was counting the blinking words, a zebra picture crossed the screen from the left side to the right side.

On the next slide the participant was asked how many times he counted red and if he saw something beside the blinking words, then the scene of blinking words and zebra crossing the screen from left side to the right side was shown to him again.

The second slideshow was very similar to the first one but this time the zebra moved from the right side to the left side.

The third slideshow was very similar to the first and second, but this time the zebra blinked for few seconds on the left side of the screen. On the fourth presentation the zebra blinked on the right side of the screen.

On the fifth slideshow the participant needed to count how many times he saw the word "red" on screen, as was described in other experiments, but this time instead of a Zebra there was three different pictures that were blinking for few seconds in different parts of the screen, each picture at a time.

after seeing the slideshow the participant was asked to answer the following question sheet:

**For experiment 1 and 2:**

Question	Answer
Enter the number of the experiment	
Did you participate in tests like this before?	
How many "RED" did you count	
Did you notice the moving Zebra in the first time?	
Did you notice the moving Zebra in the second time?	

**For experiment 3 and 4:**

Question	Answer
Enter the number of the experiment	
Did you participate in tests like this before?	
How many "RED" did you count	
Did you notice the blinking Zebra in the first time?	
Did you notice the blinking Zebra in the second time?	

**For experiment 5:**

Question	Answer
Did you participate in tests like this before?	
How many "RED" did you count?	
Did you see the picture; if your answer is "yes" write what have you seen?	

### c. Test Results

in the first, second and fourth experiment the most of the participants noticed the Zebra on the first show of the blinking words.

For the first and second experiment: 73% noticed the Zebra (picture 1), in third experiment 38% noticed the Zebra and for the fourth experiment 73% noticed the Zebra (figure 2).

Some of the participants did experiment like this before. When I checked the results again without those who participated in experiment like this before, the results were completely different: 33% noticed the zebra at the first experiment, 50% in the second experiment, 27% in the third and experiment and 37% in the fourth experiment (figure 3).

Most of the participants that participated in experiment like this before saw the Zebra on the first show of the blinking words. 100% for the first, second and third experiment and 25% for the first experiment (figure 4).

Most of the participants noticed the Zebra at the second show of the blinking words. 100% for the first and second experiment and 7.7% for the third and fourth experiment (figure 5).

At the fifth experiment almost all the participants noticed at least one picture. 98% noticed the Kuala bear (picture 2), 54% noticed the Paris picture (picture 4), and 61% noticed Albert Einstein (picture 3). No one participated in test like this before (figure 6).

Figure 2

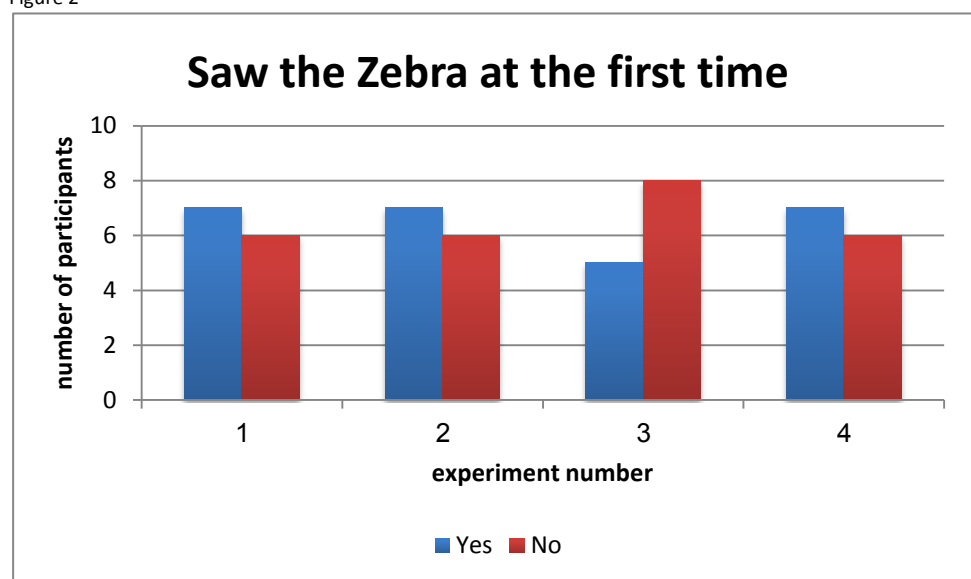


Figure 3

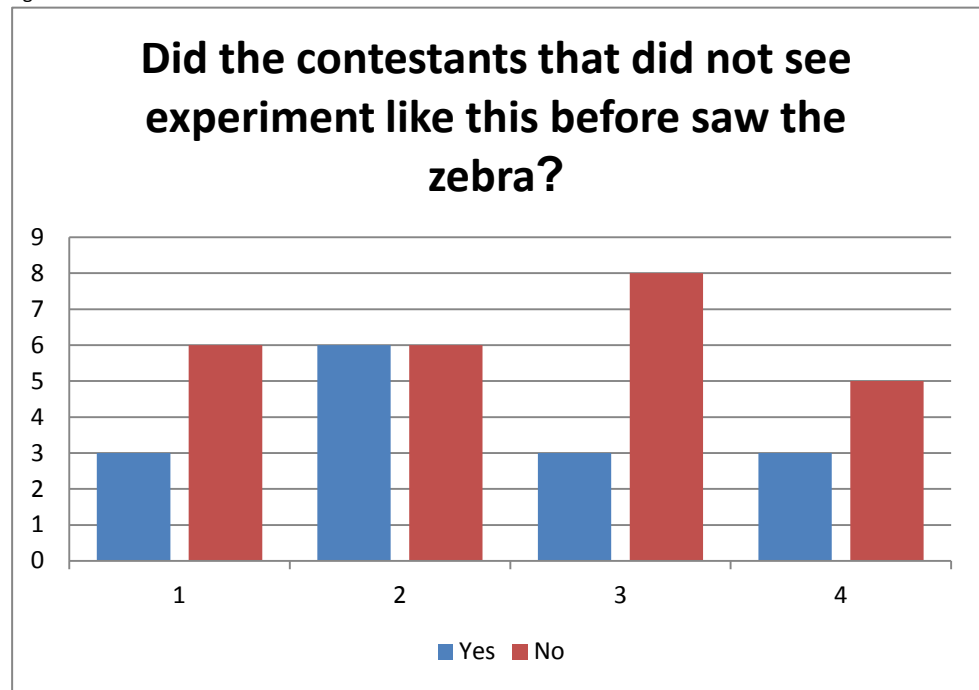


Figure 4

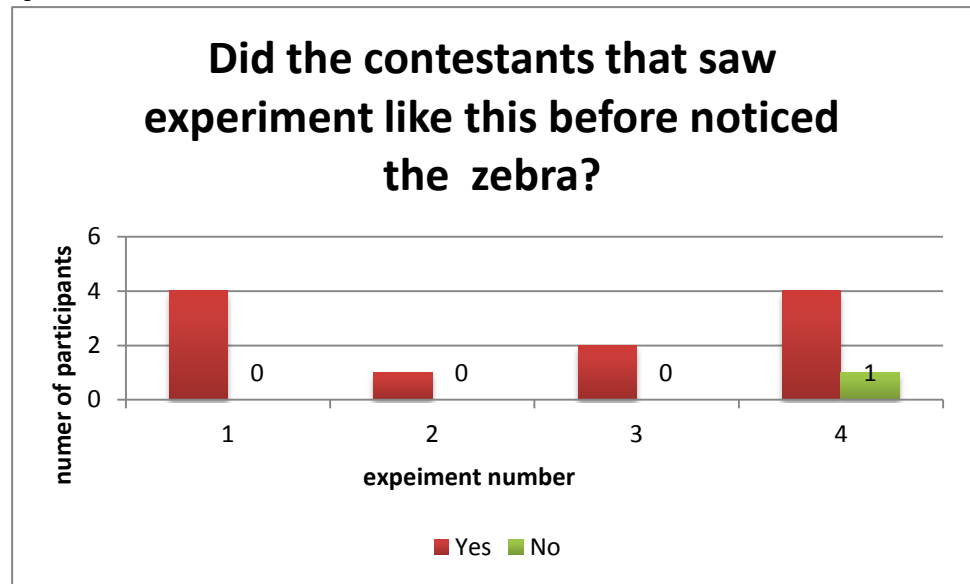




Figure 5

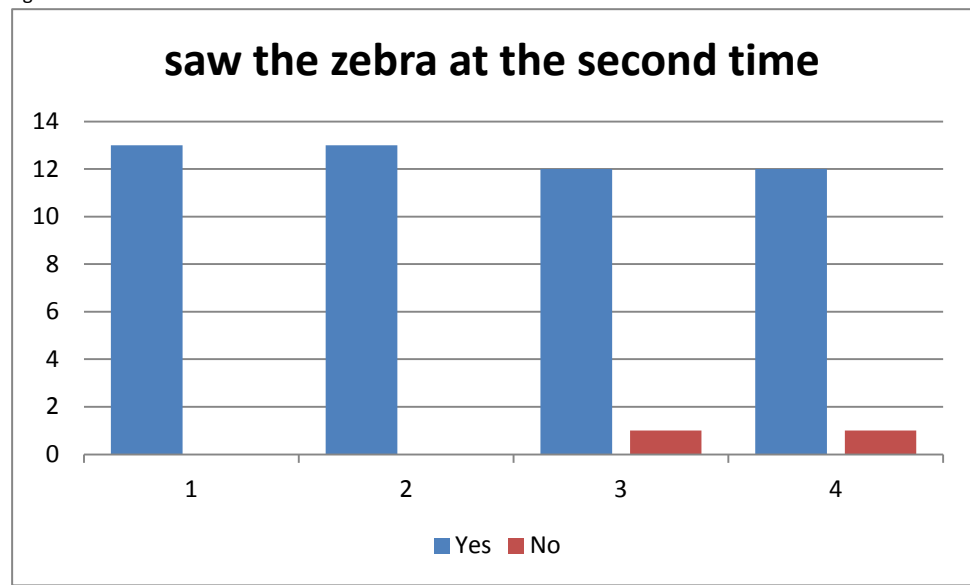
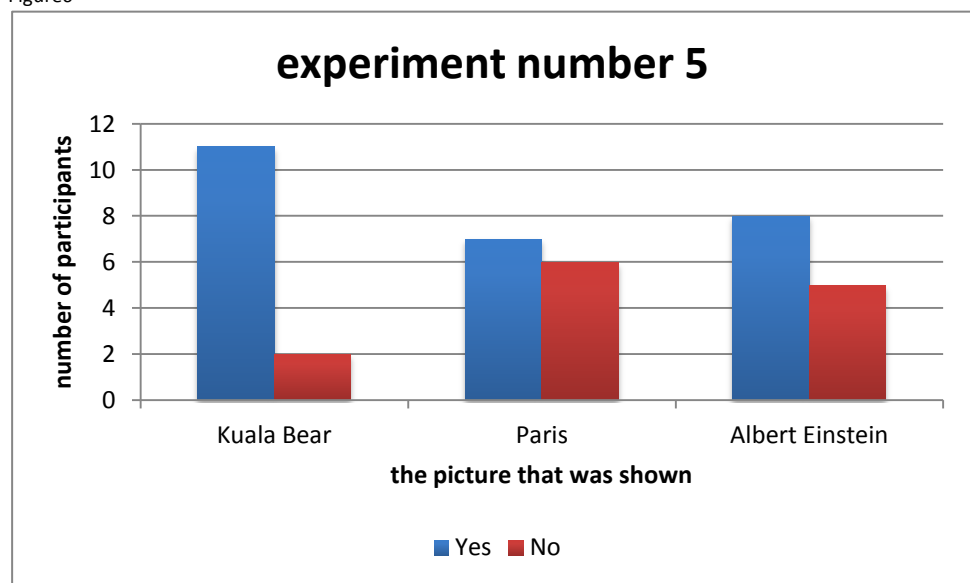


Figure6



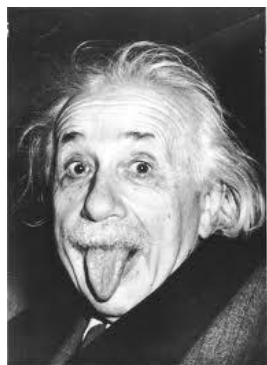
Picture 1



Picture 2



Picture 3



Picture 4



### 3. Conclusions

Most of the participants that participated in experiment like this before recognized the pattern even if they did not know exactly what kind of stimuli it is going to be. Their attention was not fully on counting the blinking words. When the participants were told to watch the blinking words slide again and look for something, Almost all participants recognized the stimuli because their attention was now focused on finding that stimuli. It can be assumed that the knowledge about coming stimuli makes them focus less on the current one.

It can be seen from the experiments that when the stimuli came from the left direction to the right, less participants noticed it. When the stimuli were blinking on the left side less participants noticed it. It can be assumed from here that most of the contestants pay more attention to their right side then to their left.

In the fifth experiment most of the participants recognized the Kuala bear and Albert Einstein but did not recognized the picture of Paris. Although the picture had a very significant symbol of Paris (Eifel tower). It can be assumed that black background of the picture and the black background of the screen made it hard to pay attention to it. The color and texture has impact on our attention even if the stimuli are familiar to us.

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