Do we see with our eyes or brain?

Perceiving our world may seem simple and may be taken for granted. Yet, the occipital lobes form the largest part of the cortex and are dedicated to visual perception. As light enters the pupils and hits the retina, a two dimensional image is created and sent to the occipital lobes through geniculate and striate pathways. The occipital lobes process the visual information, deciphering and generating an image which we understand. Thus it is argued that we see with our brain, not with our eyes. This essay will illustrate supporting evidence for this statement found in research of visual illusions. For instance, we will discuss the Ebbinghause illusion as well as Milner and Goodale’s (1995) vision for action and vision for perception model. Additionally, the Müller-Lyer illusion as explained by Gregory (1996) will be discussed as well as the checker shadow illusion (Adelson, 1993).

The Ebbinghaus illusion, is a well-known cognitive illusion whereby two circles are central to smaller or larger circles respectively. These smaller circles surround the central circle. While both central circles are the same diameter, the surrounding circles provide a context which confused our perception of the size of these central circles. Thus, we perceive the central circles to be different in size (Giusberti, Cornoldi, De Beni, & Massironi 1998). Milner and Goodale (1995) suggested the existence of two different visual systems in the brain which fulfil different functions. One system is for vision for action and guides motor actions through the dorsal pathway. This system is active when grasping for items. The second system is vision for perception through the ventral pathway, and controls perception and object recognition (Goodale & Milner, 1992). Supporting the notion of two visual systems, studies (Aglioti, DeSouza, & Goodale, 1995; Vishton, 2004) have shown that participants asked to grasp the central circles in the an Ebbinghaus illusion fashioned from physical disc objects, the scale of their grip aperture was not affected by the illusion and the effect of illusion on their misjudgement of size decreased.

However, this theory has been challenged (Franz, Fahle, Bulthoff, & Gegenfurtner, 2001; Smeets & Brenner, 2006) by contradictory findings reporting no dissociation between action and perception, and which have found grasping to be insensitive to the illusion. Rose & Bressan (2002) state that no single hypothesis has yet sufficiently explain the mechanism behind the Ebbinghaus illusion.

The Müller-Lyer illusion contains two lines of equal length which appear to be unequal when an inward and outward directed angle is placed at the ends. The line with inward pointing angle appears to be longer whereas the line with outward pointing angle appears to be shorter. Gregory (1966) suggests that although what we see is a two dimensional parallel line, our brain uses its knowledge of the third dimension to erroneously add information to the stimuli resulting in our interpretation that one line is longer than the other. Size constancy is explained as the brains ability to estimate size (Weidner, Boers, Mathiak, Dammers, & Fink, 2010). The visual system is able to acquire a stable perceived size, despite the fact the image reflected on the retina changes (Sperandio, Chen, Goodale, 2014). We therefore perceive an image created by our brain by a combination of the retinal image size and distance information.

The checker shadow illusion (Adelson, 1993) relates to our perception of colour and brightness. Visual information processed by our occipital lobes is continually adjusted and colours perceived are due to the interpretation of our surroundings. The illusion is created from a chessboard with varying dark and light squares. In the right top corner is a cylinder which reflects its shadow on the board. Two squares are marked with “ A” and “ B” on the chessboard. Square “ A” is a dark square outside of the cylinder’s shadow. Square “ B” is a light square under the shadow of the cylinder. Square “ A” is perceived as darker than “ B”. However, they are exactly the same colour. Adelson (1993) provides two levels of explanation for this illusion. As per the visual system explanation, cues are used to identify the changes in brightness due to shadows. One of these cues are the local contrasts, the squares on the chessboard are darker and lighter. The light coloured square “ B” is surrounded by dark squares and it appears to be lighter compared to its surroundings, although it is darker due to the shadow. The second cue is variation due to the shadow which has soft edges. The visual system tends to ignore the slight brightness changes, also the object casting the shadow is visible. Hence, the colour variation of the squares with sharp edges is interpreted by our occipital lobes as changes in surface colour. A more general explanation provided by Adelson (1993) suggests it is important to break down the larger image into smaller meaningful components to see the essence of the objects.

The phenomena of visual illusions provide a good examples of the limitation of visual perception. Moreover, it indicates that the brain adds information such as depth cues to the raw visual input from our eyes to make sense of the 2 dimensional retinal images. For instance, as with the Ebbinghaus illusion, the human brain combines context information naturally. The neighbouring smaller and larger circles impact on our judgement of size resulting in the central circles to appear different in size when this is not the case. Goodale and Milner (1994) hypothesized the Ebbinghaus illusion to result from double dissociation between grasping and shape perception. Furthermore, the Müller-Lyer illusion (Gregory, 1968) suggests the brain adds knowledge of third dimension cues to 2 dimensional retinal images. The explanation based on size constancy refers to the brain reinterpreting the scene based on the assumption that inward angles appears to be closer and hence the line appears to be shorter. Adelson’s (1993) checker shadow illusion provides multiple explanations. As per the visual system theory, cues of brightness from the chessboard and shadow, sharp and soft edges of contrast lead to a perceived change in surface colour. While we see with our eyes in the sense that information enters the visual system via this aperture, it is our brain’s occipital lobes which process this information. The examples provided from visual illusions provide supporting evidence of this process.

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The effect of recall latency on primacy and recency effect in a word recall test.

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Abstract

This present study investigates the recency effect in the presence of distracter task which stands in line with the Atkinson and Shiffrin multi store memory model. The serial position effect was observed where 132 randomly selected people were asked to recall simple words in a series of six rounds which included three distracting tasks. A recency effect was observed in the presence of a distracter task. As with previous studies of recency effect was observed contradicting the predictions of the multi store model.

The result of the report is in contrast with the findings of Bjork and Whitten (1970), as they revealed that the interpolated basic mathematics task which creates delay, still resulted in striking recency effect.

Introduction

In free word recall test, the serial position effect produced provides support for the multi store model of memory as it was previously investigated (Deese & Kauffman, 1957, Glanzer & Kunitz 1966).

Atkinson and Shiffrin (1968) explain the U-shape of the serial position as the primacy effect is due to the first words being transferred to the long-term memory and the recency effect emerges from the short-term memory. Higher recall initially occurs due to participants rehearsing of the words at the beginning of the list, allowing encoding these words into long term memory. The decline of the U shape occurs due to insufficient rehearsal time while exceeding the capacity of short term memory which is 7 -+2 as per Miller’s (1976) findings.

However when testing the primacy and recency effects with delayed recall, Whitten and Bjork (1974) found a striking effect of recency during the distraction condition of a free word recall test, thus contradicting the predictions of the multi store model Atkinson and Shiffrin (1960) and suggestions of Rundus (1971).

The present aims to assess the prediction of the Atkinson Shiffrin multi store model in relation to recency effect in the presence of distracting task prior to word recall. Based on the multi store model it is hypothesized that there will be higher percentage of word recall earlier in the list for immediate recall condition thus demonstrating a primacy effect. Furthermore it is predicted that there will be a lower percentage of word recalled after distraction task demonstrating a lack of recency effect.

Methods

Design

A repeated measures experiment was performed using a free word recall test. Recall latency was our 2 level independent variable (immediate recall, and delayed recall at 30 seconds). Percentage of word recalled was our dependent variable.

Procedure

Participants completed the free word recall test, consisting of 6 lists. Each list contained 12 emotionally neutral words. Words were displayed for 2 seconds with 3 seconds interval. Upon display completion, participants were instructed to recall and write down as many words as possible. Every second list contained a distracter task where participants were asked to perform 10 simple arithmetic exercises lasting a total of 30 seconds. Participants could proceed with the next word list once they could not recall any more words.

Participants

Two hundred and sixty-four students from Anglia Ruskin University were randomly contacted via Students Records. Every second person was recruited into the experimental sample providing a total of 132 participants (30 males) aged 18 to 44 years old (M= 19. 87). Participant received course credits for taking part in the experiment. All participants were given written consent and the experiment was approved by the ethics committee of the university.

Materials

The experiment was performed in an Information Technology classroom providing participants with desktop computers to display word lists. The 6 emotionally neutral word lists each consisted of 12 one to two syllable words. The arithmetic exercises provided as a delay task consisted of addition, subtraction, multiplication and division with numbers below 100. Participants were supplied with a pen and answering sheet.

Results

The primacy effect was more prevalent for both immediate word recall (M= 55. 49, SD= 33. 36) and delayed recall (M= 42. 92, SD= 33. 36) than the recency effect for immediate recall (M= 48. 85, SD= 31. 37) and delayed recall (M= 35. 51, SD= 31. 37).

Testing hypothesis 1, a repeated measures t-test was performed comparing primacy (M= 49. 20, SD= 24. 10) and recency (M= 42. 18, SD= 21. 81) effect regardless of recall latency. A significant difference was observed demonstrating a larger effect of primacy on percentage of words recalls, t(263)= 4. 37, p <. 001.

There was a significant difference in the scores for primacy effect immediate and primacy effect delayed conditions (t(132)= 3. 45, p <0. 05) with a greater percentage of words recalled during the immediate condition indicating an effect of the distractor task on primacy effect recall.

A significant difference was also found in recency effect between scores for immediate and delayed conditions (t(132)= 3. 95, p <0. 05) with a greater percentage of words recalled during immediate recall condition demonstrating the effect of the distractor task on recency effect recall.

Discussion

A higher percentage of words were recalled at start than at the end of the word list providing support for our first hypothesis that a primacy effect would be more prevalent than a recency effect. Our second hypothesis was also supported as the percentage of word recall at the start and end of the word lists were both reduced by the distractor task lowering the effect of both primacy and recency. Our findings stand in line with Bjork and Whitten (1974). Differences between Bjork & Whitten study for instance, our study employed 132 participants compared to their 20, reflecting the higher statistic power of our analyses. Furthermore, Bjork and Whitten's distractor task lasted for 12 second compared to our 30 seconds. As such our distractor task would exceed the time of the short term memory (Miller, 1954) while Bjork & Whitten's distractor would not allowing for a greater effect of recency. Our experiment provided additional support (Rundus, 1971) for Atkinson & Schiffrin's multi store model. Our results reflect theoretical predictions based in the model regarding primacy effect as words are transferred to long term memory via rehearsal. Moreover, while a recency effect can be observed this is greatly reduced by a distractor task which fully occupies the capacity of the short term memory hindering recall. We suggest that further experiments be conducted exploring the effect of varying types of distractor task on short term memory. This is suggested due to assertions of the Baddley and Hitch working memory model whereby short term memory processes are split under phonological and visuo-spatial ones.

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from results: Two further repeated measures t-tests were conducted comparing the effect of primacy and recency in immediate recall and delayed recall.

from intro: Rundus (1971) also found evidence which supports that when words which are presented first are rehearsed more often, allowing them to move to long term memory. Rundus suggests if the recall is delayed by a distracting activity which lasts longer than the capacity of the short-term memory, the recency effect is cancelled.