

## A ZOOM LENS BEFORE THE EYES DURING IMAGERY: INDIVIDUAL DIFFERENCES AND STRANGE, UNEXPECTED RESPONSES<sup>1</sup>

VEZIO RUGGIERI

*University of Rome "La Sapienza"*

*Summary.*—The research examined some aspects of an hypothetical involvement of the eyes in the process of imagery and the individual differences in the modulation of the imagery-perception interaction of 59 (7 male and 52 female) undergraduate students in psychology. The subjects were asked to image with open eyes and to project, looking through a zoom lens, the “mental” image onto a white screen. While the subject was imaging, the experimenter moved the lever of the zoom lens in the direction of an hypothetical enlargement. This movement evoked different classes of responses: 46% of the subjects had a loss, even if for a short time, of the image, 37% of the subjects observed a strange and unexpected enlargement of the mental image, 7% did not observe any change in imagery, and 10% had other responses. A psychophysiological discussion concerned the strange phenomena observed in this research that have not yet been explored enough.

In previous researches (Ruggieri, 1991, 1993) some aspects of the interactions between imagery and perception have been examined. Data have indicated that, when a subject imaged with open eyes, a modification in the external stimulation of the retina strongly modified the imaginative activity. The researches showed also the presence of individual differences in the form of the imaginative modification. Another research (Ruggieri & Alfieri, 1992) demonstrated that, during imagery, as in “actual” perception, a mechanism of accommodation of the crystalline lens is present: imaging a “near” or a “far” figure, the bending of the crystalline lens, respectively, increases and reduces. Now it is necessary to investigate the physiological meaning of this involvement of the eyes during imagery. Are the observed modifications only peripheral correlates of central processes or could they have a particular function in the imaginative activity?

To examine this question it is important to explore more deeply how, at the level of the retina, processes of imagery and perception interact when a subject is imaging with open eyes, projecting the so-called mental image onto a white screen. In other words, it is interesting to observe how the process of imagery, which I hypothesize involves the retina, interacts with the activity evoked by external luminous beams coming from outside. In earlier investigations the modification of the imaginative activity was produced by covering the eyes of the subjects, i.e., through an interruption of the external luminous stimulation (Ruggieri, 1991, 1993). In the present experiment the exploration of the interaction between mental imagery and external stimula-

---

<sup>1</sup>Send reprint requests to Prof. Vezio Ruggieri, Via dei Marsi 78, 00185 Roma, Italia.

tion was made by putting a zoom lens before the eyes of the subject, who was imaging with open eyes and projecting the image onto a screen. The experimenter silently modified the focal length of the lens while the subject was imaging. I hypothesize modifications of the images are different forms of responses (individual differences) related to the control and modulation of the stability of the "mental" image.

It was therefore necessary, for this experiment, that the examined subjects should be able to produce "stable" mental images. It was also important that no change should appear in the visual field of the subjects. In particular, because the subject was asked to project onto a white screen his mental images, it was important that, after the zoom lens movement, no change should appear in the size of the texture of the screen. Finally, I think that the zoom movement should be instantaneous because the subjects would not have control of the hypothetical effects of the subliminal stimulation.

The hypothesis of the research was open and focussed on the individual differences in the control of the interaction of imagery and perception.

#### METHOD

Subjects were 52 female and 7 male undergraduate students in psychology who ranged in age from 19 to 25 years and who were selected from a group of 75 subjects on the basis of their ability to image with open eyes and to produce "stable" mental images.

Each subject looked at a white screen 2 m away through a cylindrical viewing tube with a zoom lens (Berthiot PAN-CINOR with focal length from 8 to 40 mm). An external lever of the viewing tube was connected to the zoom lens. The experimenter, by silently moving the lever, modified the focal length of the zoom lens. The movement of the lever was always in the same direction, i.e., in the direction that produced an enlargement of the image of an hypothetical visual stimulus placed in the visual field of the subject. In front of the zoom lens, at a distance of 1.5 m, a white screen was placed. The screen had an absolutely smooth surface so that an enlargement of the image produced by the zoom lens movement showed no perceptible modification of the structure. The subject looking through the viewing tube observed, after the zoom movement, the same white square. In fact, according to the responses of the subjects, who were not informed about the activity of the zoom lens, the movement of the lever in preimagining conditions did not modify the form or the dimensions of the white square. Moreover, subjects never observed an approaching or a moving away of the white square.

The experimenter gave the subjects the following instructions: "Are you able to image with open eyes? Can you please image looking through the viewing tube and project what you are imaging onto the white screen? It is very important you have a very stable image. You can image what you like,

objects, persons, landscape, etc. When you think that your image is stable, say 'yes'." At this signal by the subject, who was not informed about the lever's movement, the experimenter moved the lever of the zoom lens (in the direction of an enlargement of an hypothetical image). After moving the lever, the experimenter asked, "Has your mental image always been stable or have some modifications in color, form, dimension, or clearness appeared? Have you observed other modifications of the image? In particular, can you say if you have observed a loss of the image even if for a very short time?"

### RESULTS

After the zoom movement only four subjects (7%) observed no variation of the mental image, 27 subjects (46%) observed a loss of the image (for 18 subjects the loss was instantaneous followed by reappearance of the previous image), and 22 subjects (37%) observed an enlargement of the mental image (10 subjects of this group observed also an approach of the image). The change in the form of the image was surprising and unexpected. Many subjects observed a sudden enlargement of some details of the imagined figure with disappearance of the other parts of the image (as in perceptual modifications which appear after the movement of a zoom lens oriented toward a "real" stimulus); 3 subjects (5%) observed a decrease in the dimensions of the mental image; 2 subjects (3%) observed a confused image; and 1 subject (2%) a loss of part of the image.

### DISCUSSION

The results indicate that the hypothesized subliminal variations of light associated with movement of the lens placed before the eyes of a subject who was imaging with open eyes produced interesting effects on the subject's imagery and confirmed the hypothesis of individual differences in the style of modulation of the interaction of perception and imagery. The movement of the lens normally produces a perceptual enlargement of a "real" object, but how can the same movement act on imagery in a particular stimulus situation characterized by the absence of any "real" perceptual modification of the visual field? Is it sufficient to hypothesize some subliminal or not consciously perceived stimulation like variation in brightness, etc., or is the phenomenon more complex? Before interpreting it is important to consider the results. The responses are related to the individual differences in the mechanisms of control of the stability of a mental image. In fact, only four subjects did not observe any variation in the mental image, i.e., they were able to inhibit the interfering action of a supposed subliminal stimulus. After the sudden zoom movement the other subjects observed (a) a loss of the mental image. This response was present for the majority of the subjects (45%). The loss of the image was short-lasting; the subjects were often able to reproduce the previous image. This kind of response indicates a particular form of control. (b) An enlargement occurred of the mental image that was present for a large group of subjects (37%). The subjects were surprised by the instantaneous and unexpected change in the dimensions of the image. A qualitative analysis of the responses of this group showed that the "enlargement" was strictly related to the size of the image. In particular, when the mental image represented a relatively near object, subjects observed a sudden enlargement of a detail of the figure and a disappearance of the other parts of the image.

What is strange is that these modifications are identical to the perceptual modifications produced by the movement of the zoom lens when focussed on a detail of a "real" object present in the visual field. For example, a subject said that his image represented a house with many windows. In one window was a dog. The change he observed was characterized, surprisingly, by

a disappearance of the house while the dog in the window occupied the whole image. In this case the subject asserted he could "see" the details of the figure (the dog) which were not previously noticeable. Naturally, when the image was "a remote landscape" the details did not have the same evidence as "near-imaged objects." It is also important to remember that, in this experiment, the subjects were not previously informed about the presence of or the activity of the zoom lens.

So we can say that the zoom movement produced substantially two classes of responses: the first probably was related to an aspecific interfering mechanism with a brief disappearance of the image, and the second was characterized by an enlargement of the image similar to that normally produced by a zoom lens movement. Because this kind of modification was experienced by many subjects (in fact, only three subjects observed a decrease in the dimensions of the mental image), it is necessary to find an interpretation.

I think that a pure so-called "psychological" interpretation is not enough to explain the phenomenon because the zoom movement was instantaneous and the observed change unexpected. One hypothesis is that this group of subjects present a tendency to respond to subliminal stimuli, i.e., not consciously perceived stimulation, always with an enlargement of the image. This hypothesis is naturally possible but not probable.

Now I shall consider the possibility that the stimulus modified the physiological process involved in the production and keeping of the image. How? The literature (Farah, 1984) showed that mental images take place in the cerebral cortex. But in our experiment, to modify the cortical activity the zoom movement must modify the activity of the retina. Moreover, I suppose, following the results of previous researches (Ruggieri, 1991, 1993), that the retina is involved in the imagery processes. So the question is, how could the zoom movement modulate such activity? In this experimental situation the lens was placed between the eyes and the white screen; to produce an enlargement of the real stimulus the zoom lens, in "real" perceptual experience, must act on the luminous beams that reach the retina from a real object. But now where are the beams? Based on knowledge of visual perception and of the activity of the eyes, we must suppose that the eyes are stimulated only by beams coming from outside. If so, the zoom lens movement during imagery does not directly act on beams coming from a stimulus figure, i.e., the "mental image," but aspecifically on luminous beams coming from the white screen, not related to any figure and reaching the retina on which an activity related to imagery hypothetically occurs. Following this hypothesis modification of the image would be the result of an interaction between physical optical external and internal (retinal) biological activities. The enlargement of the image should be produced by the retina following an aspecific external stimulation (zoom lens movement) that modifies the course of the beams of the light present in the experimental room. But I think that also this hypothesis is not satisfactory. Other investigations are necessary. I consider the present only as a preliminary work and I hope that it will be possible soon to elaborate another psychophysiological hypothesis that might explain not only the phenomenon of the enlargement of the image but also the other interesting results. Obviously further researches are necessary to confirm or disconfirm the strange and unexpected phenomena of this investigation.

#### REFERENCES

- FARAH, M. J. The neurological basis of mental imagery: a componential analysis. *Cognition*, 1984, 18, 254-272.
- RUGGIERI, V. On the hypothesized physiological correspondence between perceptual and imagery processes. *Perceptual and Motor Skills*, 1991, 73, 827-830.
- RUGGIERI, V. Immaginazione e Percezione s'incontrano nello sguardo. *Realtà e Prospettive in Psicofisiologia*, 1993, No. 5-6-7, 119-132.
- RUGGIERI, V., & ALFIERI, G. The eyes in imagery and perceptual processes: first remarks. *Perceptual and Motor Skills*, 1992, 75, 287-290.

Accepted January 7, 1994.