Comment on "Eye movements and decrement in the Müller-Lyer illusion" [1]

SAMUEL C. McLAUGHLIN,[2] MICHAEL J. DeSISTO, AND MARTIN J. KELLY, JR.
TUFTS UNIVERSITY

Festinger et al confirm the findings of previous investigators that the magnitude of the Müller-Lyer illusion diminishes with prolonged observation of the test figure, but only if gross eye movements are allowed. To explain this phenomenon, they advance the hypothesis that "the perception of length is determined by efferent readiness activated by the visual input." We offer evidence that the hypothesis is incorrect.

In a previous report from this laboratory (McLaughlin, 1967), evidence was presented that parametric feedback is operative in saccadic eye movements. This means simply that if a saccadic eye movement misses the target, subsequent eye movements tend to be programmed in such a way as to reduce the likelihood that the same error will recur.

Festinger, White, and Allyn (1968) looked for and found a similar effect associated with the decrement in the Müller-Lyer illusion: On first observing the test figure, Ss tended to overshoot when scanning the "long" line segment, and to undershoot when scanning the "short" line segment; but these errors diminished over a series of scanning eye movements.

As Festinger et al point out, the "generally accepted" view is that "the illusion determines the eye movement," and, consequently, that "as the illusion decreases, the eye movements also change." They advance, however, a different hypothesis, namely, that the decrement in the illusion results from a change in "efferent readiness." The term "efferent readiness" in this context refers to the preprogrammed pattern of efferent activity which is, so to speak, ready for use should S decide to scan one of the horizontal segments of the test figure.[3]

We accept the principal experimental findings[4]; we are concerned here with the theoretical position stated by Festinger, White, and Allyn. We have performed an experiment which is relevant to this issue and which has been reported (McLaughlin, Kelly, Anderson, and Wenz, 1968), though it was not available to the Festinger group when they published. Our purpose here is to review Festinger's hypothesis in the light of our findings.

Our experiment was as follows: First, S made pointer settings (hand and pointer not seen) under a visual target that was 10 deg to the left of his point of fixation. Next, using the technique which was first described in connection with the initial demonstration of parametric feedback in saccadic eye movements (i.e., high-speed switching of visual targets during the eye movement), we elicited a parametric adjustment such that the target at 10 deg, even though clearly seen in peripheral vision, regularly elicited an eye movement of only 5 deg. We then tested again for any shift in pointer settings underneath the 10 deg target, and found none. Appropriate controls were used to ensure that pointer settings for a target actually at 5 deg were significantly different from those for a target at 10 deg. Not only in this single experiment, which we reported in detail, but also in a series of exploratory experiments lasting approximately one year, we were unable to obtain even a momentary shift in visual localization associated with small or large parametric adjustments.

The independent variable in this experiment was what Festinger would call "efferent readiness," and it turned out to have no effect whatever on perception. We conclude that Festinger's hypothesis regarding the cause of the decrement in the Müller-Lyer illusion is incorrect and must be discarded.

As Festinger and his co-authors are aware, there is no evidence available to refute the conventional view that it is the perception that determines the eye movement. In particular, without the Festinger hypothesis we can still account for the fact that the illusion diminishes only if S is allowed to make gross eye movements while inspecting the figure. These gross eye movements may provide S with information which is at variance with the illusory percept—specifically, information about the veridical lengths of the two line segments. In that indirect way, the eye movements may cause the illusion to diminish; but this is a very different thing from saying that the illusion diminishes because of a change in the way the eye movements are programmed. The situation would be very similar if the test figure were engraved and S were allowed to run his hand over it. The resulting tactile-kinesthetic input might lead to a diminution of the illusory visual percept; but we would not then attribute the diminution to a change in efferent readiness of the hand and arm.

REFERENCES

DeSISTO, M. J., & MOSES, F. L. Saccadic eye movement response to Müller-Lyer stimuli. Paper read at Eastern Psychological Association Meeting, Washington, D.C., April 19, 1968.

FESTINGER, L., WHITE, C. W., & ALLYN, M. R. Eye movements and decrement in the Müller-Lyer illusion. Perception & Psychophysics, 1968, 3, 376-382.

McLAUGHLIN, S. C. Parametric adjustment in saccadic eye movements. Perception & Psychophysics, 1967, 2, 359-362.

McLAUGHLIN, S. C., KELLY, M. J., ANDERSON, R. E., & WENZ, T. G. Localization of a peripheral target during parametric adjustment of saccadic eye movements. Perception & Psychophysics, 1968, 4, 45-48.

NOTES

1. This research was supported by grants from the National Science Foundation and the Public Health Service (Division of Neurological Diseases and Blindness) to the senior author.

2. Address: Institute for Psychological Research, Tufts University, Medford, Mass. 02155.

3. The quotations are from the Festinger, White, and Allyn paper; but the definition of "efferent readiness" is our own interpretation of their hypothesis.

4. M. J. DeSisto and F. L. Moses (1968) have in fact reported from our laboratory a series of observations confirming some of the findings published by Festinger, White, and Allyn.

(Accepted for publication October 9, 1968.)