smaller within-S variance. Such findings suggest that within-Ss designs are eminently applicable to GSR studies.

It is important to note that if these first responses were viewed as CRs, the opposite result would have been expected, i.e., larger first responses would have been expected after a number of conditioning trials than after a stimulation pause.

In contrast to earlier findings by the author (Cook, 1968), there was not a dominant amplitude (discounting zero responses) effect in the larger responses of Group B. In addition to the smaller amplitudes in Group A, there were also four zero responses, as opposed to only one zero response in Group B. This suggests that the larger magnitude obtained in Group B was not only a result of inflated amplitudes, but also reflected increased response probability.

The original hypothesis that Group A second responses on Trials 7, 8, and 9 would be larger than Group B responses on Trials 3, 4, and 5 was not confirmed. The expected effect was found at the earlier Group A trials. The larger second response magnitudes of Group A over Group B appear to be a result of both amplitude and probability, although the probability effect is probably the greater. These findings concur with Prokasy's (1967) data which revealed the second response effect to be almost wholly reflected in response probability.

The second response magnitudes reached a peak in the area from the third to fifth trials. For CRs to peak so quickly seems opposed to conventional reinforcement-repetition effects. However, such findings are not uncommon in the literature (Stewart, Stern, Winokur, & Fredman, 1961; Prokasy & Ebel, 1967). Autonomic phenomena, which are usually given the more positive label of conditioning, might more accurately be termed "lack of habituation." Frequently, differences between conditioning groups and pseudoconditioning controls are obtained less from an increase in the conditioning groups than from a decrement in the pseudoconditioning controls.

A conventional explanation for the lack of conditioning in Group B would be that the interval effected a decrement in associative strength or presented the establishment of substantial associative strength in later trials. The implication is that on Trial 3 (the initial postinterval trial), S in Group B essentially began anew and lacked the sufficient number of trials to display significant learning in the remainder of the series.

Contrarily, an explanation couched in terms of "perceptual awareness" would contend that the interval had a disruptive effect on S's perception of the stimulus contingencies. Again, there were too few trials for S to perceive the contingencies accurately. In the light of Grings' (1965) work, this interpretation is certainly plausible.

The question concerning the source of the large orienting-first response is an interesting one. The author's recent work indicated that large ORs are caused by stimulus uncertainty. It would seem to follow that the greater OR is a function of a greater uncertainty of tone occurrence in Group B (the interval group). In Group A, S could, to a certain degree, predict the time of the occurrence of the tone and, in some manner, prepare for its reception. In terms of Sokolov's theory (1961), S might be said to be set, or "tuned in," on the proper neuronal model. However, such a process would necessitate a more complex cortical system than the one presently espoused by Sokolov.[3]

A closely related, yet somewhat antithetical, interpretation of the new data would be that an opportunity for OR recovery, rather than uncertainty, is the primary determiner of the greater OR. Quite possibly, the habituated OR has sufficient time to recover in the interval.

REFERENCES

COOK, R. F. Pseudoconditioning of the GSR. Unpublished doctoral dissertation, Kansas State University, 1968.

GRINGS, W. W. Verbal-perceptual factors in the conditioning of autonomic responses. In W. F. Prokasy (Ed.), *Classical conditioning*. New York: Appleton-Century-Crofts, 1964. Pp. 71-89.

KIMBLE, G. A. *Hilgard and Marquis' Conditioning and learning*. New York: Appleton-Century-Crofts, 1961.

LYNN, R. *Attention, arousal and the orientation reaction*. New York: Pergamon Press, 1966.

PROKASY, W. F., & EBEL, A. C. Three components of the classically conditioned GSR in human subject. Journal of Experimental Psychology, 1967, 73, 247-256.

RAZRAN, G. The observable unconscious and the inferable conscious in current soviet psychophysiology. Psychological Review, 1961, 68, 81-147.

SOKOLOV, E. N. *Perception and the conditioned reflex*. New York: Pergamon Press, 1963.

STEWART, M. A., STERN, J. A., WINOKUR, G., & FREDMAN, S. An analysis of GSR conditioning. Psychological Review, 1961, 68, 60-67.

TURSKY, B., & WATSON, P. D. Controlled physical and subjective intensities of electric shock. Psychophysiology, 1964, 1, 151-162.

ZIMNY, G. H., & SCHWABE, L. W. Stimulus change and habituation of the orienting response. Psychophysiology, 1965, 2, 103-115.

NOTES

1. This report is based on the author's doctoral dissertation (Cook, 1968) where additional information may be found. The research was performed while the author was a USPHS Predoctoral Fellow. The author would like to thank Merrill E. Noble for his assistance and guidance through all phases of the research.

2. Now at the American Institutes for Research, Washington Office, 8555 16th Street, Silver Spring, Md. 20910.

3. For a more extensive discussion of such processes, the reader is referred to the author's doctoral dissertation (Cook, 1968).

Visual disappearance of a motion pattern

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An experiment, using static and moving patterns of lines, was performed in order to test the hypothesis that fixation results in a perceptual disappearance of the static pattern, but not in a disappearance of the moving pattern. The results which were obtained verify earlier reported effects with regard to static fading, but also show that fixation yields a total disappearance of the moving pattern of lines. This outcome is interpreted as a complication of the notion of changing stimulation as a necessary and sufficient condition of perception.

In connection with the concept of stimulus within the visual modality, it has long been known that, under the conditions of low illumination, static objects tend to disappear when they are fixated or when the retinal image is stabilized. The effect has been obtained under different conditions. Both foveal and parafoveal regions have resulted in the effect of partial or total fading (Goldstein, 1967, 1968; Kirkwood, 1968).

When discussing Troxler's effect, as well as stabilized retinal images, the major point seems to be the concept of changing stimulation, which implies that changing stimulation is considered as a necessary and sufficient condition for a perceptual effect.

This article offers the establishment of an effect which seems to complicate the notion of changing stimulation, because the result which is reported here consists of a

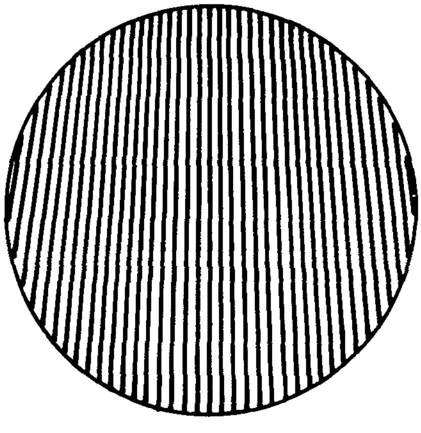

Fig. 1. The S's view of the apparatus.

disappearance of a supraliminal motion of a pattern of straight lines.

APPARATUS

The apparatus consisted of a screen with a head rest, a screen with a circular aperture (60 mm in diam) 35 cm from the left eye, and a stimulus surface 60 cm from the eye. This surface had two fluorescent tubes attached to the vertical sides. The surface was mounted on a horizontal axis and a motor gave it a continuous motion to and fro. The maximal slant (turning point) was 50 deg away from the frontal parallel plane, and the minimum slant (turning point) was 30 deg away from the frontal parallel plane (top receding away). The surface changed direction 44 times a minute.

STIMULUS

The standard stimulus consisted of straight parallel lines drawn vertically with black India ink on a cardboard with imperceptible microstructure. The cardboard was 21 x 30 cm, the width of each line was 1 mm, and the distance between the middle of two lines was 2 mm. The luminance of the white cardboard was 0.61 ft-L, and the luminance of black India ink in the middle of the surface was 0.017 ft-L. The area outside the aperture had a luminance of 0.003 ft-L. When the stimulus surface was set in motion, the pattern in a picture plane underwent a projective transformation which can be described as follows: the middle line was static, but the lines to the left and the right changed their positions in such a way that the upper part of the pattern became more dense (the lines approached each other), while the lower part of the pattern became less dense (the straight lines receded from each other). Thus, the proximal stimulus contained a motion of a synchronized expansion and contraction of the pattern of straight lines (see Fig. 1).

SUBJECTS

Six Ss, with a mean age of 27 years, participated in the experiment.

PROCEDURE

The Ss were told to look into the apparatus which presented the stimulus under monocular conditions (left eye). They were asked to look straight ahead through the middle of the aperture, keep the eye immobile, and then describe what they experienced. The Ss were presented with both static and motion conditions. The order of presentation was static-motion for three Ss and the reverse order for three Ss.

RESULTS

When looking at the line pattern under monocular static conditions, the Ss reported that the whole aperture and all the lines disappeared after only a short time of fixation. It appeared as if they were looking at a homogeneous dark wall. Suddenly the aperture and the lines reappeared and then the stimulus alternated between appearing and disappearing.

When the distal surface was given a motion around the horizontal axis, the Ss reported an elastic line pattern where the lines were changing their convergence angles (any three-dimensional slant could hardly be seen). The motion of the lines was clearly supraliminal. After a while, the straight lines appeared curved in the form of "waves." This distortion changed over time and might be described as a kind of elastic, floating bending of the lines. The lines also appeared less black than in the beginning of the presentation.

After a few seconds, some Ss at first reported that parts of the pattern disappeared and then that the whole pattern and the aperture faded away, while other Ss reported a complete and rather sudden disappearance of both the circular aperture and the moving lines. Although the pattern of lines still was sweeping back and forth across the retina, nothing but "blackness" was seen. When some Ss were blinking or shifting the gaze, they reported that the aperture and the lines reappeared.

After some training, it seemed to be easier and easier for them to get the aperture and the moving lines to disappear. Thus, all the Ss obtained a complete fading of the moving pattern.

DISCUSSION

The total disappearance of the moving pattern contradicts the notion that stimulus *changes* over the receptor mosaic always result in perceptual effects. If the conception of the basic importance of changing stimulation with regard to receptor firing is to be maintained as a general principle, we will need a theory which can account for the results obtained in the present experiment.

One possible theory would be to argue that in static fading the receptors are silent, which would explain the effect of total fading. Then the partial recovery would correspond to either an imperfect stabilization or a change in the sensitivity of the receptors resulting in partial firing which possibly is correlated with central processes, e.g., memory of Gestalt processes (Pritchard, 1961; Evans, 1963; Bennet-Clark & Evans, 1963).

With regard to motion fading, it is reasonably clear that the receptors must be firing all the time. If such is the case, there has to be an inhibition process further up in the neural network. Then such a process would be supposed to create a synchronized pattern of *moving lateral inhibition* (or moving aftereffects), which would counteract and extinguish the input from the receptors. According to such a view, it can be argued that, after some time, every line cumulatively has built up a field of inhibition with a certain threshold, above which inhibition is sufficiently strong and, therefore, a line which moves and reaches such an area becomes inhibited (perceptually extinguished). If the receptors still are firing, the new position of the line creates a new area of inhibition, thus maintaining the suprathreshold field strength. Consequently, every line would create its own moving field of inhibition, which, in combination with the fields that result from the adjacent lines, will produce a continuous inhibition of the moving lines.

Another possible theory would be to assert that binocular rivalry can account for the fading. Explanations with regard to static fading have been suggested by Gerrits, De Haan, & Vendrik (1966) and by Goldstein (1967, 1968). With regard to motion fading, however, no theory seems to have been formulated.

REFERENCES

BENNET-CLARK, H. C., & EVANS, C. R. Fragmentation of patterned targets when viewed as prolonged after-images. Nature, 1963, 199, 1215-1216.

EVANS, C. R. A comparison of the behaviour of geometrical shapes when viewed under conditions of steady fixation, and with apparatus for producing a stabilised retinal image. British Journal of Physiological Optics, 1963, 20, 1-13.

GERRITS, H. J. M., DE HAAN, B., & VENDRIK, A. J. H. Experiments with retinal stabilized images. Relations between the observations and neural data. Vision Research, 1966, 6, 427-440.

GOLDSTEIN, A. G. Retinal rivalry and Troxler's effect. Psychonomic Science, 1967, 7, 427-428.

GOLDSTEIN, A. G. Reply to Kirkwood. Psychonomic Science, 1968, 11, 54.

KIRKWOOD, B. Comment on Goldstein: Retinal rivalry and Troxler's effect. Psychonomic Science, 1968, 11, 54.

PRITCHARD, R. M. Stabilized images on the retina. Scientific American, 1961, 204, 72-78.