Autokinetic movement as a function of light-dark-ratio (LDR)

Lloyd F. Elfner and Horace A. Page
KENT STATE UNIVERSITY

Abstract

Measures of median latency of autokinetic movement of an intermittent light source demonstrate significant differences as a function of sex and LDR. Women appear to be more resistant to autokinetic movement. Relatively longer periods of darkness (lowering the LDR) in the light source result in an enhancement of the autokinetic effect.

Problem

The enhancement of autokinesis produced by an intermittent light source has been demonstrated by measures of magnitude of displacement by Spigel (1963) and by measures of latency by Elfner and Page (1963a). Spigel's study has also shown, that with an LDR of 1, maximum enhancement occurs when the light source flickers at a rate of 10 cps. This finding was substantiated by the authors in an unpublished study. Bartley (1951) has shown that the above rate of flicker produces maximum brightness enhancement. Bartley's study has also demonstrated greater brightness enhancement with an LDR of 1, than with larger LDRs. The present study was designed to investigate the effects of LDR on autokinesis.

Method

Twenty men and 20 women undergraduate students who experienced autokinetic movement of a fused light source served as Ss. A tachistoscope (Scientific Prototype) fitted with an oscilloscope-type viewing hood was used to present a spot of light (visual angle of 30 min.) at a constant intensity and a constant rate of flicker (10 cps). The LDRs of 3, 1, and 1/3, were programmed by the logic module and lamp-driver unit of the tachistoscope. A flat black stimulus card with a hole in the center was used to produce a spot of light in a completely darkened field. The S activated a standard timer when the stimulus was first perceived and deactivated the timer when the spot first appeared to move. A 120 sec. light-adaptation period was employed before and between conditions. The conditions were presented in random order to each S.

Results

Due to the presence of several extremely long latency scores, median values of the latency of autokinetic movement are reported. Semi-interquartile ranges of the latency measurements are also reported to indicate the dispersion of the scores. Table 1 shows the effect of the LDR and sex of S on the perception of autokinetic movement as indicated by median latency measurements. A reduction in latency of autokinesis as a function of a reduction in the LDR is apparent for both men and women. The results of Friedman two-way rank analyses show that the latency of the autokinetic effect varies

significantly as a function of LDR for men (chi-square = 10.3, 2df, $P < .01$), and for women (chi-square = 13.1, 2df, $P < .01$). Greater resistance to the autokinetic effect by women is apparent for all the LDRs employed in this study. The results of a Mann-Whitney U-test show that the latency of autokinesis is significantly longer for women than for men ($P < .01$). It appears as if men and women react similarly to the reduction in LDR. This observation was not tested statistically; however, it is supported by the fact that 14 women and 13 men demonstrated minimum latency of autokinesis to the LDR of 1/3, and 13 women and 13 men demonstrated maximum latency to the LDR of 3.

Discussion

The Spigel study (1963) and the authors unpublished study have demonstrated that the maximum enhancement of autokinesis effected by an intermittent light source occurs at the rate of flicker which produces maximum brightness enhancement. In this study evidence was obtained to indicate that the smaller LDRs enhance the perception of autokinesis. The enhancement occurs despite the fact that the smaller LDRs produce greater brightness enhancement. Since it has been shown by Edwards (1954) that as brightness increases there is an increase in the latency of the autokinetic effect, it is apparent that the enhancing effect is strong enough to overcome the inhibiting effects of brightness. In fact, the results of the present study and Spigel's findings indicate a strong correlation between brightness enhancement and reduced latency and increased magnitude of displacement of the autokinetic effect.

Our explanation of the enhancing effect of smaller LDRs is made in terms of the relative lack of articulation in the spot of light for the smaller ratios. The

Table 1. Median Latency of Autokinetic Effect. Semi-interquartile range appears in parentheses.

	LDR		
	3	1	1/3
Men	6.4* (3.4)	4.6 (2.2)	4.3 (1.6)
Women	11.1 (4.0)	9.8 (4.0)	8.8 (2.5)

*All latencies are reported in seconds. This is the median of 20 scores.

larger LDRs result in more sharply defined contours of the spot of light. This interpretation is consistent with our explanation of the enhancing effect of flicker, that is; a fused spot of light has relatively more sharply defined contour while a flickering spot has a relatively diffuse contour. The significant difference noted between the men and women cannot be easily or simply explained. Chaplin (1955) and the authors (1963a) report men as showing greater autokinetic responsiveness than women. In two other studies (1963b and an unpublished study); however, the writers failed to note sex differences. A procedural difference, whether or not subjects are presented with a pre-exposure trial, and statistical treatment of the data, parametric or non-parametric tests, serve to differentiate those studies in which sex differences were observed and those where they were not demonstrated. Although subject to further study, it would seem that the pre-exposure serves to reduce sex variance, with women showing a greater "practice effect" than males, and parametric treatment of the data would account for variant latency scores with consequent lowered estimate of the reliability of the observations.

Summary

Twenty men and 20 women who previously experienced autokinetic movement of a fused spot of light were

exposed to a flickering spot of light in a darkened field. A tachistoscope was used to program LDRs of 3, 1, and 1/3 under conditions of constant intensity and constant flicker rate. Median scores of onset of autokinesis demonstrated significantly longer latencies for women than for men under all LDR conditions. Lowering the LDR resulted in a significant reduction in the latency of onset of autokinetic movement. The effect of LDR is explained in terms of stability of the contour of the light source. The effect of sex is explained in terms of practice effect and statistical treatment of the data.

References

- BARTLEY, S. The psychopathology of vision. Handbook of experimental psychology. New York: Wiley, 1951.
- CHAPLIN, J. Sex differences in the perception of autokinetic movement. *J. gen. Psychol.*, 1955, 52, 149-155.
- EDWARDS, W. Autokinetic movement of very large stimuli. *J. exp. Psychol.*, 1954, 48, 493-495.
- ELFNER, L., & PAGE, H. Latency of the autokinetic effect as a function of flicker. *Percept. mot. Skills*, 1963a, 17, 299-301.
- ELFNER, L., & PAGE, H. Latency of the autokinetic effect as a function of pre-exposure. *Percept. mot. Skills*, 1963b, 17, 362.
- SPIGEL, I. Autokinetic movement of an intermittent luminance. *Psychol. Rec.*, 1963, 13, 149-153.