

EFFECT OF INSTILLATION OF ADRENALIN
ON THE DURATION OF SUCCESSIVE IMAGES
IN HEALTHY PERSONS

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Earlier investigations by the author [4] showed that the instillation of a 1% solution of pilocarpine into the conjunctival sac shortened the duration of successive images in healthy subjects. Since the eye is an organ possessing a dual innervation, it was interesting to study the effect of one of the mediators of the sympathetic nervous system (adrenalin) on the duration of the successive images. It has been noted [5,8] that the instillation of adrenalin into the conjunctival sac of the frog causes movement of pigment in the retina and contraction of the inner members of the cones. Under the influence of adrenalin, the retina of the dark-adapted eye passes from the dark position to the light. Adrenalin acts on the vasomotor endings of the vascular system of the eyes; it has a negligible effect on the lumen of the retinal vessels but causes constriction of the vessels of the ciliary tract. In healthy subjects, the instillation of a 0.1% solution of adrenalin into the conjunctival sac lowers the dark adaptation [7,9], increases the photosensitivity of the eyes to the green-blue rays of the visible spectrum, and lowers its sensitivity to orange-red rays [2]. According to the findings of Altenburger and Kroll [6], instillation of adrenalin increases the time required for perception of a photic stimulus of twice threshold strength, i.e., it increases the adequate optical chronaxie.

It may be supposed that adrenalin, by influencing metabolism and oxidative processes in the retina and the level of sensitivity of the optic analyzer to photic stimulation, may modify the duration of the successive images. In order to test this hypothesis, which is of considerable theoretical and practical interest, at the suggestion of A. V. Roslavitsev, the author has studied the changes in the duration of the successive images in healthy persons under the influence of adrenalin.

EXPERIMENTAL METHOD

The duration of the successive images was first investigated by means of the apparatus and method described by A. V. Roslavitsev [3]. Against a background of uniform brightness (B_0), a bright circular field of about 4° was exposed. The brightness of the background (B_0), was $3 \cdot 10^{-2}$ nit and the brightness of the bright field (B_p) was 12,866 and 42,650 nit.

When the duration of the successive images had been determined in one eye (the second eye was covered with an opaque shield), 2 drops of 0.1% adrenalin hydrochloride solution were instilled into the conjunctival sac of the same eye, and 5 min later the duration of the successive images was again investigated.

The effect of adrenalin on the duration of the successive images was studied in 8 healthy persons between 20 and 35 years of age (4 men and 4 women), with normal visual function and with a normal intraocular pressure (IOP). Eight eyes (4 in men and 4 in women) were investigated. Altogether 171 determinations of the duration of successive images were made.

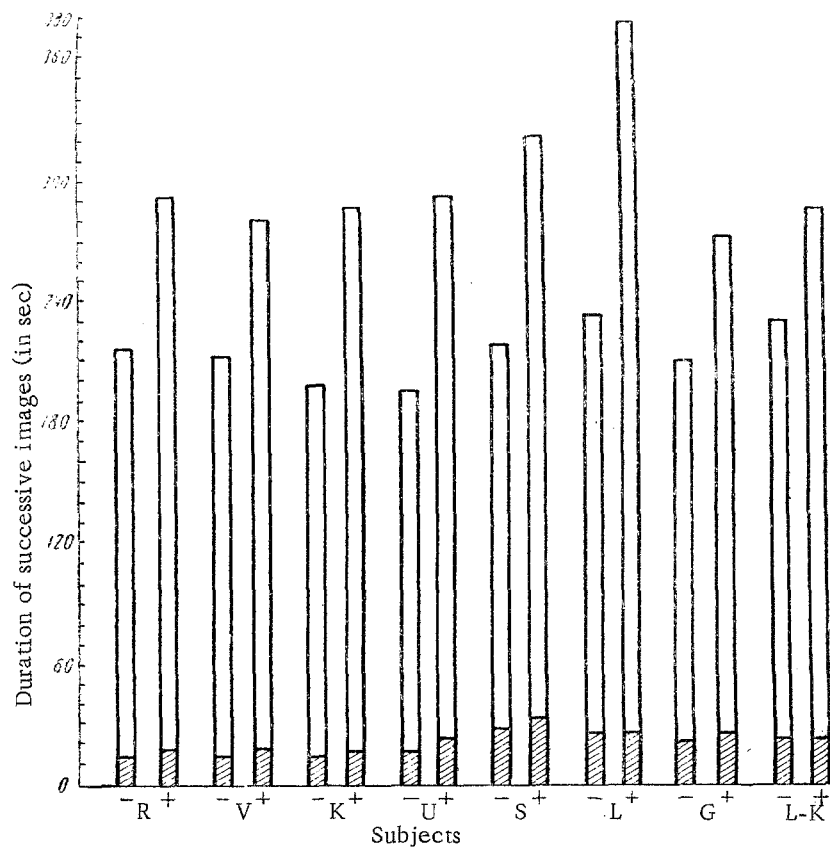


Fig. 1. Effect of instillation of adrenalin on the duration of successive images in healthy persons: $B_0 = 3 \cdot 10^{-2}$ nit, $B_b = 42,650$ nit; - without adrenalin; + with adrenalin. Shaded part of the columns, positive phase; unshaded part, negative.

EXPERIMENTAL RESULTS

The results of the experiments carried out with the background brightness as given above and with a bright field of 42,650 nit are shown in Fig. 1.

It can be seen from Fig. 1 that in all the subjects the duration of the successive images increased after instillation of adrenalin, mainly on account of an increase in the duration of the negative phase; the individual variations in the course of the successive images persisted. In some subjects, the successive images were longer than in others. For example, the longest successive images were observed in L. (without adrenalin 3 min 53 sec, with adrenalin 6 min 18 sec). The shortest successive images were found in V. (without adrenalin 3 min 34 sec, with adrenalin 4 min 40 sec).

Similar relationships were observed when the successive images were of shorter duration and when the bright field was less intensive ($B_b = 12,866$ nit). After exposure to fields of both degrees of brightness, instillation of adrenalin caused a sensation of a green color in three subjects in the form of "colored overflows," not present before the instillation of adrenalin.

The mean duration of the successive images in the whole group of subjects is shown in Fig. 2.

It is clear from Fig. 2 that, under the influence of instillation of adrenalin, with values of B_0 of $3 \cdot 10^{-2}$ nit and B_b of 12,866 nit, the total duration of the successive images increased by 39.5%, and when the value of B_b was 42,650 nit, by 39%.

It may be concluded from the results of these experiments that, under the influence of adrenalin, the duration of the successive images in healthy subjects is increased.

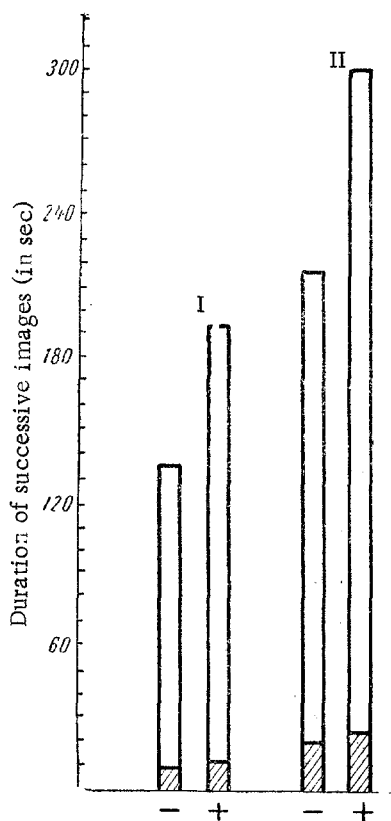


Fig. 2. Mean duration of successive images in healthy subjects before and after instillation of adrenalin: $B_0 = 3 \cdot 10^{-2}$ nit; $B_b = 12,866$ nit (I) and $42,650$ nit (II); - without adrenalin; + with adrenalin. The shaded part of the column represents the positive phase; the unshaded part, the negative phase.

Opinions differ regarding the influence of adrenalin on sensitivity to light. As mentioned above, the experiments of Rothhan [9] and Bietti [7] gave evidence of a lowering of the sensitivity to light after instillation of adrenalin solution; according to the findings of Altenburger and Kroll [6], the instillation of adrenalin prolongs the adequate optical chronaxie. Bietti [7] observed the opposite effect after the subcutaneous injection of adrenalin, an increase in the sensitivity to light. E. B. Babskii [1] found that the subcutaneous injection of adrenalin (0.1%) most commonly causes a shortening of the optical chronaxie. According to his findings, in these circumstances, the sensitivity of the dark-adapted eye to light is also increased.

The author considers that, in the subjects he investigated, the sensitivity to light was increased under the influence of instillations of adrenalin, and as a result they observed successive images for longer periods, mainly in the negative phase.

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