# IMPROVEMENT IN LIGHT AND COLOUR PERCEPTION IN HUMANS WITH PROLONGED USE OF ELEUTHEROCOCCUS

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The chronic use of the eleutherococcus extract in healthy individuals improved light and colour perception of the retina of the eye. Significant changes were found when both morning and evening vision were examined.

Key words: eleutherococcus extract, eye, light perception

## INTRODUCTION

According to commonly held concepts, the specific activity of psychotropic substances of different classes may be associated not only with direct pharmacological interference with the activity of the brain but may also be determined to some extent by changes in vision. Confirmation for this comes from the ability of the psychostimulant caffeine to alter the functional state of the retina of the eye in healthy individuals [2,4]. With this in mind, it is interesting to assess the effect on the visual system of the psychotropic agent eleutherococcus, which, as a plant adaptogen, has moreover positively proved itself in ophthalmological practice [7,12].

As results of a preliminary study showed, after single administration of eleutherococcus, individuals people showed some increase in light sensitivity, but the extent of this effect varied greatly depending on several factors, including the time of day. Bearing in mind the absence of a definite effect and the fact that eleutherococcus is mainly used on a repeated basis for therapeutic purposes, this study investigated changes in light and colour perception in healthy individuals at different periods of wakefulness after the chronic administration of this drug.

## STUDY METHODS

The study was conducted in 27 young (19-24 years) individuals of both sexes without physical or ophthalmological disease (in November/December). With maximum standardisation of the external conditions, the state of their visual function was assessed by campimetry twice daily, in the morning (7.00-8.00 AM) and in the evening (6.00-7.00 PM).

For this purpose, the “Ocular” computer programme [11] was used. This allows automated determination of the threshold of light and colour sensitivity of the retina of the eye and the time for a sensorimotor reaction in response to a visual signal. The implementation of the programme by means of a colour computer display allowed these parameters to be determined at each point of the visual field as a whole and on an isolated basis in the macular region (0-5º) and at the periphery (5-21º) of the retina.

During the investigation, the study individual spent some time (5 minutes) in a special room with medium lighting conditions in a calm environment in order to ensure dark adaptation. The individual’s head was then placed 30 cm from the monitor screen, one

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eye was shut, and the individual was asked to concentrate his gaze on a white spot in the centre of the screen. Then, using a special programme, red signals appeared on the screen sequentially in a random order. In the assessment of the threshold of light sensitivity, after the appearance of the stimulus, its intensity was constantly increased and, once it had been perceived, it was recorded by pressing the keyboard. There were three exposures at each of the 56 points of the visual field (0-21º). At the end of the test, a mean result was automatically obtained for the light sensitivity of the retina at its centre and at its periphery in the form of a sector diagram as well as numerical data in arbitrary units of brightness of the monitor (a.u.b), which could be transformed into kd/$m^2$. In the determination of the latency of the response, the absolute time for the reaction to the bright stimulus in seconds was recorded. For the assessment of the colour discrimination function of the eye, using a special programme, red, green, dark blue and achromatic signals appeared in a random order against the blue background of the screen. The responses to these were recorded using the described method.

After campimetric assessment of vision, the study individuals were given a liquid extract of eleutherococcus (20 drops) orally, then 30 minutes later all measurements were repeated. Subsequently, they took the preparation at the same dose twice daily (in the first half of the day) for a month. Visual function was checked again after the course of administration had been completed. Parallel to this, using a similar design, observations were made on individuals in a control group (5 individuals) who received placebo.

**RESULTS AND DISCUSSION**

In accordance with the results of previous observations [3], the thresholds for light sensitivity of the retina varied greatly from one individual to another. Moreover, judging from the summated data, the light sensitivity of the macular region was on the whole higher than at the periphery of the retinal membrane. When the magnitudes of the thresholds of the retinal responses to visual stimuli at different times of the day were compared, they were found to have relatively higher values on morning measurements compared with the evening (see Table). At the end of the day, the latency of the evoked response was also somewhat lower.

According to the group results, the sensitivity of the retina to signals of different colours in the central zone, where the density of colour-sensitive photoreceptors is particularly high and which was subsequently studied, was found to be non-uniform. Based on the absolute magnitudes of the thresholds, the study individuals showed the weakest response to red light and a somewhat better response to green light (see Figure). In the evening, the sensitivity to each of these colours increased, but the same was not true of the response to dark blue and achromatic white light. The initially lower thresholds of responses to these colours tended to increase at the end of the wakefulness period.

In contrast to a one-off administration, overall the chronic use of eleutherococcus clearly improved the light-sensitive function of the eye. Bright sensitivity increased to a statistically significant degree not only at the periphery of the retina, as in the case of acute administration of the preparation, but also at the centre, which was, moreover, independent of the time of testing. It is true, however, that on the morning measurements the absolute magnitudes of the change brought about by the preparation were somewhat higher (see Table). Interestingly, it was only in the morning that the latent period of the sensorimotor response was significantly shortened (from 0.47±0.03 to 0.43±0.04 ms, *P*<0.05).

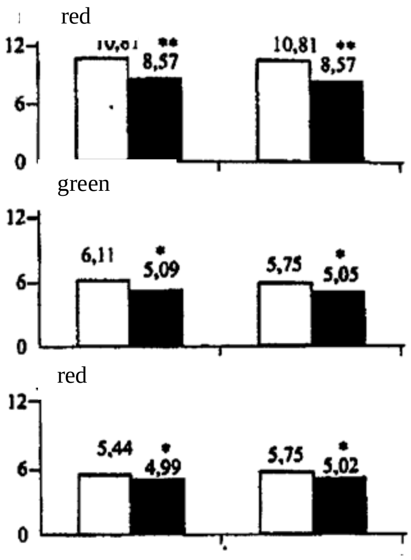


**Figure. Effect of chronic use of eleutherococcus on light sensitivity of the retina of the eye in an individual at different times of the day.**

**Columns: thresholds of bright sensitivity for different colours; light – before; dark – after use of eleutherococcus. * and ** statistically significant changes before and after administration of the preparations (for *P*<0.05 and *P*<0.01, respectively).**

When administered regularly, eleutherococcus also optimised colour perception. The responses to any colour signals were facilitated. The thresholds fell to a particularly marked extent in the case of the presentation of red light, while the response to green and blue stimuli increased to a lesser extent (See Figure). Although such changes were also found at other times of the day, it should be noted that the perception of red and green in the morning hours showed a more marked trend towards improvement.

In the control group, despite clear fluctuations in the thresholds of light and colour sensitivity, the administration of placebo was not accompanied by any statistically significant changes.

Thus, the regular use of the eleutherococcus extract clearly increased the reactivity of the retina of the eye in healthy individuals. Single use of the adaptogen, from the results of the our preliminary tests, was seen to be less effective and depended to a much greater extent on the time of day and nature of the higher neural function of the study individuals. The chronic administration appeared to do away with differences in the pharmacological sensitivity associated with each of these factors.

**Table. Effect of chronic use of eleutherococcus on the thresholds of light sensitivity in different fields of the retina of the eye in individuals at different times of the day**

| Visual field | Morning | | Evening | |
|---|---|---|---|---|
| | Before administration | After | Before administration | After |
| 0-5° | 12.54±0.09 | 12.18±0.04* | 12.41±0.09 | 12.16±0.05* |
| 5-21° | 14.43±0.18 | 13.63±0.14* | 13.97±0.19 | 13.36±0.14* |
| 0-21° | 13.59±0.15 | 12.97±0.12* | 13.30±0.15 | 12.75±0.10* |

**Note: *** comparison of results before and after use of eleutherococcus (for $P<0.05$).

The results obtained highlight, on the one hand, the undoubted value of the study preparation for resolving specifically ophthalmological problems by extending its indications for clinical use and, on the other hand, indicate the significance of the changes in visual perception for the organisation of the psychotropic activity of adaptogens.

The fact that the preparations eleutherococcus, Schizandra and ginseng are approved for use in ophthalmology indicates their usefulness in the treatment of eye diseases such as glaucoma, partial atrophy of the optic nerve and even myopia [7,8]. The data presented obviously add to this list with disorders of light and colour sensitivity of the eye of various aetiology. Moreover, plant adaptogens, based on the same considerations, are appropriate for use in order to increase the efficacy of some forms of professional activity. In particular, there are suggestions that eleutherococcus improves qualitative parameters in work associated with long periods of visual stress, including the need to distinguish between colours [9].

In connection with this, it is interesting that the ability to distinguish between colours visually in some way correlates with psychophysiological characteristics of humans [10]. This finding coincides with other observations that we made previously, whereby single administration of eleutherococcus (in contrast to chronic administration) more selectively increased the responses of the retina to red stimuli and reduced light sensitivity of the retina to a more marked degree only in individuals with a weak type of higher neural activity.

This type of information allows one to raise the question about whether the psychotropic activity of eleutherococcus specifically depends on the state of visual perception. There are indications that infusions of eleutherococcus and Schizandra clearly potentiate the therapeutic potential of tricyclic antidepressants in patients with reactive depression [6]. Furthermore, it is not excluded that this synergism may be partly through a direct effect of the psychotonic substances on the photoreceptor elements in the retina – especially as there are known to be significant changes in the reactivity of the retina in depressive disorders [1]. In the meantime, in vitro experiments have shown that preparations from several plants, including eleutherococcus, may dose-dependently demonstrate photosensitising or photoprotective properties [5].

## CONCLUSIONS

1. After one month's use of the eleutherococcus extract, on campimetric examination healthy individuals showed an improvement in visual perception at different times of the wakefulness period. As a result of the effect of the substance, the thresholds of light sensitivity fell at the periphery of the retina, where they were initially higher, and in the macular region.

2. Eleutherococcus optimised not only light discrimination but also colour discrimination of the eye. After its use, the thresholds of retinal responses to different colour signals, particularly red signals, fell regardless of the time of testing.

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