

IMPROVEMENT IN VISUAL PERCEPTUAL SENSITIVITY IN CHILDREN FOLLOWING YOGA TRAINING

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A sample of 14 children with ages ranging from 12 to 17 years (6 females) who received 10 days of yoga training and another 14 age and sex matched controls who did not receive yoga training were assessed on Day 1 and Day 10 for visual perceptual sensitivity through Critical Flicker Fusion Frequency (CFF) and degree of illusion. Yoga group practised yogasanas, pranayama, kriyas, meditation and bhajans along with specially designed games to improve memory and attention. The control group carried on with their routine Activity. Following 10 days of yoga training, yoga group showed a significant increase in CFF (9.2%) and decrease in degree of illusion (24.89% for in trails and 31.05% for out trails), while the control group showed no change. Thus the present study suggests that younger subjects can show better improvement in performance in a relatively short duration as compared to previous reports.

Meditation has been shown to bring about significant changes in perception, attention and cognition (Brown, 1977). That yoga practice increases visual perceptual sensitivity, has been experimentally proved using different methods of assessment. Meditators were found to be more sensitive to, subtle aspects of color and shading of the Rorschach test inkblots than they had been before meditation (Brown, 1980). Two separate studies on Critical Flicker Fusion Frequency (the frequency at which a flickering stimulus is perceived to be steady, with higher values suggesting greater perceptual accuracy) have shown that perceptual sensitivity is not restricted to subtle aspects of the stimulus alone, as detection of a high frequency flickering stimulus was found to improve following yoga training (Ramana et al., 1997; Telles et al., 1995). A study on degree of visual geometric illusions, based on the Muller-Lyer apparatus suggested that a combination of focusing and defocusing through yoga reduces optical illusion more than focusing alone (Telles et al., 1997). These studies were conducted on adult subjects with varying durations of yoga training. Hence the present study was planned to assess visual perceptual sensitivity to Critical Flicker Fusion Frequency and degree of optical illusion in children following 10 days of yoga training.

METHOD

Subjects

14 children (6 female) with ages ranging from 12 to 17 years (group mean = 14.5, SD + 1.5 years) received 10 days training in a combination of yoga practices. A group of 14 age and sex matched children who did not receive training in yoga were followed up for comparison and to see the retest effect. All subjects had normal vision without correction and none of them had color blindness. The latter was measured in view of the fact that the color of the stimulus has been reported to influence the CFF (Ali, Jahan & Chowdary, 1986).

Design

Both groups (yoga and control) were assessed on Day 1 and Day 10. The yoga group was attending a 10-day residential yoga camp, while the control group carried on with their routine activities.

Assessments

(i) Critical Flicker Fusion Frequency (CFF): CFF was measured using a standard electronic apparatus (Fritze & Simonson, 1951) (Anand Agencies, Pune, India). This apparatus consists of a

red stimulus (6 mm in diameter) in the center, with a luminous intensity of 50 mcd and flicker frequency, which can be, adjusted from 12 to 95 Hz. A white background with illumination of 150 lux surrounded the stimulus. The subject was seated at ease 50 cm in front of the apparatus (i.e., 80 cm from the stimulus). The experiment was conducted with a minimal illumination of a 40-w bulb fixed behind the subject and the light dark ratio was kept as 1 (50:50). The binocular response of all subjects was assessed in both ascending and descending trials as described, according to the standard methodology (Ramana et al., 1997).

(ii) Muller-Lyer Apparatus: The degree of optical illusion was measured using the Muller-Lyer apparatus (Anand Agencies, Pune, India). The Muller-Lyer lines though of equal length, appear unequal due to the two different types of arrows drawn at both ends of the line: closed-ended arrows making an acute angle or open-ended making an obtuse angle with the shaft. One line was of fixed length with close-ended arrows giving it an illusionary shorter appearance, while the length of the other line could be varied. This line had open-ended arrows giving it a longer appearance. The subjects were seated 1.8 m away from the apparatus, while the experimenter manipulated the length of the line according to the subject's specifications. The exact position at which the subject perceived the two lines to be of equal length was noted, i.e., subjective reading ("Sr"). The difference between the 'Sr' and the reading, at which the lines were actually of equal length, gave the degree of illusion ("di"). The degree of illusion perceived using Muller-Lyer lines in both ascending and descending trials were recorded using method described previously (Telles et al., 1997). Data at the end of 10 days were compared with initial data using the 't' test for paired data.

Yoga Training

The yoga group received yogic training for approximately 8 hours a day, aiming at their all round (physical, mental, intellectual and spiritual) development. The 10-day Program consisted of (1) Yogasanas, specialized physical postures; (2) Pranayama or voluntary regulation and slowing of the breathing; (3) Kriyas, internal cleansing practices including eye-cleansing techniques (trataka); meditation and bhajans. In addition to these specialized practices, the training also included games to improve the attention span and memory as well as telling of meaningful stories to foster a sense of values and feelings of responsibility (Telles et al., 1993).

RESULTS

There was a significant increase in Critical Flicker Fusion Frequency in the group who received yoga training ($P < .005$, 't' test for paired data) and a significant reduction in the degree of optical illusion perceived by the same group ($p < .005$, for In trials and $p < .005$ for out trials, 't' test for paired data). The control group (without yoga training) showed no significant change.

The group mean values of CFF and degree of illusion ("di") for both in and out trails \pm SEM of both yoga and control groups on Day 1 and Day 10 are provided in Table1.

DISCUSSION

Yoga training of children for 10 days resulted in a significant improvement in, visual perceptual sensitivity as measured through Critical Flicker Fusion Frequency and the degree of optical illusion. The control group who did not receive yoga showed no change.

Table 1 Group Mean Values of CFF and Degree of Illusion ("di") for both In and Out Trials \pm SEM of Yoga and Control Groups on Day 1 and Day 10

CFF		Day 1	Day10
(n= 14)	Yoga group	35.55 \pm 2.30	8.42** \pm 1.80
	Controlgroup	35.54 \pm 1.90	35.42 \pm 1.40
Degree of Illusion (di) (in min) (n=14)	In trials	Yoga group	38.36 \pm 2.10
		Controlgroup	36.06 \pm 0.90
	Out trials	Yoga group	29.40** \pm 3.10
		Controlgroup	43.91 \pm 0.90

Previous studies on adults with varying durations of yoga training showed improved visual perception (Ramana et al., 1997; Telles et al., 1997). There was a graded increase in CFF on days 20 (11.16%) and 30 (14.96%) as compared to day 10 (9.2%). The present study showed similar percentage of improvement in CFF (9.2%) after 10 days, as compared to the previous study (Ramana et al., 1997), and was statistically significant. The increased CFF following yoga could be attributed to the effects of yoga in reducing physiological signs of stress, such as decrease in heart and breath rate and in oxygen consumption (Joseph et al., 1981), as CFF was found to be lower during specific stressors, such as food and water deprivation (Ali & Amir, 1989). The non-significant improvement in CFF in the previous study on Day 10 as compared to another study (Telles et al., 1995), which showed a significant improvement on Day 10, was correlated to the difference in their age groups. The subjects of the former study were of the age group 25-39 years while the latter study had subjects of 17-22 year age group. Hence the significant changes in CFF in the present study suggests that younger age group could improve in performance following a shorter duration of yoga, compared to older subjects.

A previous report on optical illusion suggests that one month of yoga brings about an 86.2% decrease in the degree of illusion perceived (Telles et al., 1997). The present study in children following 10 days of yoga also showed similar results, but was of lesser magnitude (27.9 %).

The decrease in the degree of illusion perceived over a short period would be mainly due to cognitive judgemental factors, but not retinal or cortical factors as generally understood (Coren & Girgus, 1973). The cognitive judgmental factors involve the way in which the subject interprets incoming visual information based on experience, hypothesis and strategies of judgement. Hence the training through yoga to focus and defocus might have influenced the cognitive judgmental factors of the subjects, to significantly reduce the degree of illusion perceived.

Hence yoga training showed improvement in the subjects visual perceptual sensitivity. The present study suggests that younger subjects can show better improvement in performance following yoga training of a relatively short duration.

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