

ALPHA AND THETA RESPONSE TO THE MIND'S EYE PLUS

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SYNOPSIS OF STUDY

Introduction

As early as 1934 Adrian and Matthews showed that the resting rhythms of the brain could be made to assume the frequency of a photic stimulus ("entrainment"). Kamiya (1968) discovered that various EEG frequency states seem to correspond to psychological states. And Green et al. (1977) showed that it was possible to voluntarily control both these states and frequencies. Neher (1961, 1962) demonstrated that entrainment of these states was easily accomplished using photic stimulation.

In recent years a growing number of devices have been produced which claim to use the principle of entrainment for the purposes of enhancing performance, stress reduction, creativity, and a host of

other byproducts.

The aim of this study was to ascertain and analyze the efficacy of The Mind's Eye Plus, a state-of-the-art light and sound brain entrainment machine manufactured by Synthetic Systems in Seattle, Washington, in producing such states.

The Mind's Eye Plus

The Mind's Eye Plus enables the user to program photic (LED equipped goggles) and auditory (a complete sound synthesizer) stimuli to any desired frequency within the Beta, Alpha, Theta, and Delta range. This type of brain stimulation generates a high degree of arousal of the brain's limbic system. Gellhorn (1972) demonstrated that these types of repetitive

stimuli drive the brain's cortical rhythms which in turn produces a pleasurable, ineffable effect. This is one effect that manufacturers of products like the Mind's Eye frequently claim to be associated with the deep relaxation their products seem to yield.

Methods and Materials

The subjects were 15 volunteers, 6 females and 9 males, aged 25 - 38, all of whom were considered to be in good health. The test environment consisted of having the subjects lie on a bed in a dark room, with their eyes shut throughout the session. Three electrodes were placed "left occipital to left parietal." A baseline reading was established with regard to the normal relaxed state of each subject.

The subject was then equipped with a set of stereo headphones through which a 100 cycle tone was filtered (creating a "pink" noise) and modulated at 60 Hz (cycles per second). The average time of stimulation was 20 minutes. During each session the subject's production of Beta, Alpha, and Theta waves were monitored.

EEG sensitivity settings were tested from a level of 3 uvpp through 100 uvpp. Brain wave readings were also taken at 5 minute intervals following the stimulation for a total period of 20 minutes.

The same readings were then taken while subjects were using the Mind's Eye Plus (starting frequency 40 Hz, ramp time 10 minutes, target frequency 05 Hz, target time 15 minutes). Various light patterns and sound sources (both controlled from the Mind's Eye computer) were compared for effectiveness.

Results

As expected, subjects produced a "classic" alpha driving response when they closed their eyes, even though no auditory stimulus was present. A baseline was then established for their resting brain.

Influence of Pink Noise

There was no significant difference between resting wave production and wave stimulation (<0.05). Some increase in alpha waves was noted, but in general the effects of the pink noise alone were not significant.

Influence of Mind's Eye Plus

Immediate visual and auditory indications showed that the Mind's Eye Plus increased beta activity, increased alpha activity, caused some alpha attenuation, and increased theta action. During this latter process of theta stimulation alpha waves were somewhat attenuated.

In order to compare each

subject's susceptibility to auditory stimulation the significance of Mind's Eye Plus stimulation was only considered if it was more than >0.05 above the noise response. The findings seemed to indicate a link between an altered EEG response and the Mind's Eye Plus that could not be evidenced with the pink noise stimulus alone.

Hemispheric Synchronization

One of the most frequently touted claims for light and sound entrainment devices is that they balance the brain's left and right hemispheres. The phenomena associated with the Mind's Eye Plus would seem to validate this claim and be associated with intense discharges from the sympathetic and parasympathetic nervous systems. This simultaneous discharge is indicative of trophotropic (non-dominant) and ergotropic (dominant) hemispheric arousal.

Trophotropic Arousal

Trophotropic arousal can be seen through various parasympathetic changes (reduction in heart rate, blood pressure, and sweat secretion), striated muscle relaxation, and synchronized cortical rhythms. Psychologically, this state is associated with Zazen and yogic Samadhi (Lex, 1979), and the accompanying production of progressively lower brain waves. In addition, Ornstein (1972) has theorized that this hemispheric arousal provides

for a shift from the linear mode of time-bound verbal thought to the timeless, "oceanic" mode of the mystic experience.

Ergotropic Arousal

Ergotropic, or dominant hemisphere arousal results in changes in the sympathetic nervous system that may manifest themselves as increased heart rates, blood pressure, sweat secretion, and increased catabolic hormone secretion, epinephrine, norepinephrine, cortisol, thyroxine, etc.

Psychologically, this state results in an excited cerebral cortex and can include creative, psychotic, and ecstatic experiences.

As these two states are induced by such devices as the Mind's Eye Plus, an interesting combination of effects occurs. In animals, ergotropic arousal leads to rage while trophotropic arousal leads to sleep. In humans, these two states may be interpreted as hyper- and hypo- arousal, or ecstasy and samadhi.

It is interesting to note, although this report does not make such causal claims, that the effects, both psychological and physiological, of the Mind's Eye Plus correspond to what one would expect to find with such stimulation. Comparisons of uvpp sensitivity and EEG wave form production are shown in figure 1.

Figure 1.

	Frequency bands			
	delta%	theta%	alpha%	beta%

Comparisons of relative power				
PN vs. B.				
S= 3	--	n.s.	(+) 5	(+)10.2
5	--	n.s.	(+) 5.8	(+)10
10	--	n.s.	(+) 7.6	(+)8.3
15	--	n.s.	n.s.	(+)2.1
20	--	n.s.	n.s.	n.s.
30	--	n.s.	n.s.	n.s.
60	--	n.s.	n.s.	n.s.
100	--	n.s.	n.s.	n.s.
Mind's Eye Plus @ 40 Hz vs. B.				
S= 3	n.s.	(+)6.8	(+)12.5	(+)7.2
5	n.s.	(+)7.6	(+)14.2	(+)4.3
10	n.s.	(+)6.3	(+)10.2	(+)3.1
15	n.s.	(+)8.1	(+)9.8	(+)5.3
20	n.s.	(+)4.9	(+)8.0	(+)4.0
30	n.s.	(+)3.6	(+)8.5	n.s.
60	n.s.	n.s.	(+)9.8	n.s.
100	n.s.	n.s.	(+)10.5	n.s.
Mind's Eye Plus @ 5 Hz vs. B.				
S= 3	n.s.	(+)18.5	(+)3.6	n.s.
5	n.s.	(+)15	(+)8.8	n.s.
10	n.s.	(+)6.2	(+)5.3	n.s.
15	n.s.	(+)10.3	(-)3.1	n.s.
20	n.s.	(+)5.6	(-)5.5	n.s.
30	n.s.	(+)5	n.s.	n.s.
60	n.s.	(+)4.5	n.s.	n.s.
100	n.s.	n.s.	n.s.	n.s.

 B.= Baseline, S= uvpp sensitivity, PN= Pink Noise,
 (+) = enhancement of power by stimulus, (-) = decrease of
 power by stimulus.

Comments

The Mind's Eye Plus appears to have produced significant changes in the theta band in 81% [13 out of 16] sensitivity frequencies, alpha increase in 68% [11 out of 16], alpha attenuation in 12% [2 out of 16] of the settings, and beta enhancement in 31% [5 out of 16].

In comparison, the test tape which included only pink noise as their sound source showed no significant theta enhancement, some alpha enhancement (37%), and slight beta change [25% or 4 out of 16].

It is suggested that in this test with these subjects the Mind's Eye Plus did assist in the alteration of the subjects' brain wave bands.

Subjective Correlates

Perhaps the most difficult task to undertake is to assign psychological meaning to physiological change. Although the actual meanings of brain waves are not understood, research has permitted a general consensus to be adopted with regard to these states. Cade (1979), building upon the work of Lesh (1970), was able to formulate a relationship between objective and subjective states. His findings indicated, and have been verified by other researchers, that various brain wave states seem to correspond to various psychological ones.

The beta state (13-30 Hz) corresponds to our normal waking consciousness.

The alpha state (8-13 Hz), appears to be the equivalent of relaxation and concentration.

Theta waves (5-7 Hz), are such that they seem to reflect a deeply internalized state, deep relaxation, a sense of quieted emotions, and the production of hypnogogic imagery.

Delta waves (.5-4 Hz), are those which are usually associated with sleep or other similarly unconscious states.

Discussion

Each subject was given a questionnaire at the conclusion of each test in which to report their subjective sensations. The questionnaire included multiple choice questions concerning the general feeling produced by the machine (tense, anxious, uncomfortable, heavy, relaxed, calm, alert, creative, spiritual, none of the above, no change, other), follow up questions on those states, multiple choice questions concerning the light patterns and what each subject thought they saw, questions about the sound pulses, and questions about their physical sensations during the test. Subjects were then given a brief personal interview to expand

upon these thoughts.

The relationship of test subject's subjective reports of their experiences using the Mind's Eye Plus and the pink noise to their brain wave indications appears to verify the findings of researchers such as those mentioned above.

While little significant relaxation occurred during the pink noise sessions, subjects reported feeling marked changes in their bodily sensations during the Mind's Eye Plus sessions. This seems to correspond to an increased production of theta and alpha waves and an occasional attenuation of alpha waves experienced by subjects while using the machine.

While one subject did respond that the Mind's Eye Plus made him feel nervous and uneasy, the remainder of the subjects' comments were such typical descriptions as "I lost all sense of my body," "I felt like I was flying," "I was deeply relaxed," "I felt like I was out of my body," etc. There appeared to be no significant difference in reports by either sex or age.

If these findings are substantiated by future research it follows that the Mind's Eye Plus will be shown to be effective means by which a variety of psychophysiological conditions (stress, anxiety, self-esteem, etc.) may be altered.

While no cause and effect is implied in this research, the high incidence of similar reports among subjects seems to indicate that further studies are necessary to investigate this realm.

No theories about alpha or theta activity can be inferred from this study, but the study of the Mind's Eye Plus with regard to both subjective and objective analysis should prove rewarding.

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