BOTH SITUATIONAL AND CHRONIC ANXIETY ARE REDUCED BY LEARNED INCREASES IN ALPHA BRAIN WAVE ACTIVITY

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Summary of Two Alpha Anxiety Studies

Two studies were run to test the hypothesis that low anxiety subjects would excel over high anxiety subjects in the task of learning how to increase electroencephalographic (EEG) alpha brain waves through alpha brain wave feedback. The two studies were run in Pittsburgh, Pennsylvania at Carnegie-Mellon University, and in San Francisco, California at Langley Porter Psychiatric Institute (UCSF). **In each study at least 100 college age males** were screened with the first factor of the Minnesota Multiphasic Personality Inventory (MMPI) **to select the highest and lowest anxiety subjects**. To enable the data to also serve other purposes, two pre- and one post-feedback MMPIs were collected to permit later analysis of any personality changes in relationship to any EEG alpha changes.

The most important result, seen in both studies, is this: When high anxiety subjects learn to increase their EEG alpha above their resting baseline levels, they lower their anxiety. This anxiety reduction is therapeutic. There is a significant and negative correlation between alpha changes and anxiety changes, which is so reliable that stress and anxiety can be successfully treated by teaching people to increase their amount of EEG alpha (through alpha feedback). Therapeutically useful alpha increases require extended amounts of feedback training, more than given in most studies. The two studies described below show the evolution of the knowledge of **how much alpha training is necessary to produce useful stress reduction** and therapeutically meaningful anxiety reduction.

In both the Pennsylvania and California studies the subjects were selected in the same way from separate pools of at least 100 volunteers each, and subjects in both studies did 7 days of alpha feedback training. The principal difference between the two studies was in total training time (140 minutes vs 336 minutes). Subjects in Study 1 had only 20 minutes of alpha feedback each day for a total of 140 minutes in the 7 days, whereas the subjects in Study 2 had 48 minutes of alpha feedback each day for a total of 336 minutes in the 7 days. In Study 2, the 48 daily minutes of feedback was divided into 32 minutes of alpha enhancement feedback, followed by 16 minutes of alpha suppression feedback.

When the data from both studies were combined and graphed together, a remarkable similarity appeared. Some trainees call it the "wall". A sharp drop after about 100 minutes of alpha feedback marked the end of gains from "easy" strategies and the frustration preceding the switch to a new paradigm in consciousness. In the new paradigm of consciousness anxiety finds no foothold, and a new pattern of alpha increase emerges which grows into exponential increases out beyond 336 minutes of training time.

The hypothesis that low anxiety subjects would excel over high anxiety subjects was confirmed in the first study and reconfirmed (replicated) in the second study using one way analyses of variance (ANOVAS) on the net alpha change scores. These net change scores are derived by summing up each subject's daily change scores across all 7 days. Recall that the daily change score was simply each subject's average daily alpha feedback score minus the average daily baseline score.

Two years after the second study had been completed, Ome & Paskewitz motivated a retrospective data analysis by publishing a report in Science (Ome & Paskewitz, 1974) suggesting that alpha activity was unrelated

to anxiety. Their report was counter to 35 years of EEG research, and they interpreted their data to "challenge the widely accepted rationale for using alpha feedback as a means of teaching individuals control of anxiety..." The ensuing retrospective analysis of the data from Studies I & 2 found scientific "pay dirt" including: (1) a publication in Science (Hardt & Kamiya, 1978) showing that the Ome & Paskewitz result was accurate only for the extremely low anxiety subjects of Paskewitz & Orne, and (2) the finding that increases of alpha in high anxiety subjects produced reductions in anxiety. In fact **the largest alpha increases among the high anxiety subjects transformed these subjects into low anxiety people**, with post-feedback anxiety scores below average. In other words, **learned alpha increases were a therapy for anxiety.** (3) In addition, the findings of this retrospective analysis led also to a three year, quarter million dollar Federal grant (1979-1982) entitled, *Anxiety and Aging - Intervention with EEG alpha feedback*.

There are important results from the Federal grant involving reversing adverse effects of the aging process, however, the focus here should remain with the summary of the two alpha/anxiety studies and their results. The two studies differed in the percent of high anxiety subjects who increased their alpha above their resting baseline, which is very important, because only the alpha increasers among the high anxiety subjects underwent anxiety reductions. In Study 1, with only 140 minutes of alpha feedback, a bare 12% of the high anxiety subjects increased alpha above resting baseline levels and benefited by lowered anxiety. However, in Study 2, with 336 minutes of alpha feedback, fully half (50%) of the high anxiety subjects increased above baseline alpha levels and lowered their anxiety. The two best alpha producers among the high anxiety subjects actually had post-feedback anxiety levels below average.

There are even preliminary indications from a third study (1983-1988), run after the Federal grant, that perhaps all high anxiety subjects can increase above their resting baseline alpha levels (and thereby benefit by reduced anxiety) if they are given sufficiently long alpha feedback training times. The third study used a modified 7 day training design in which subjects received at least 724 minutes of alpha feedback over 7 days, and could choose longer training times on days 5, 6, and 7 to accumulate up to a maximum of 1,200 minutes of alpha feedback time during the 7 days.

The data points from this study suggested the typical "S" curve for saturation of any population. The clinical meaning of this curve follows from the association between alpha increases above baselines and large reductions in anxiety for high anxiety alpha feedback trainees. If alpha training is done according to the patented methodology of MindCenter Corporation, **we can now look at just the total alpha training time and predict, approximately, the success rate in treating problems of stress and anxiety**.

Any successful non-drug therapy for stress and anxiety will have broad applications. **What is so impressive about the alpha/anxiety results is that alpha increases reduce BOTH state anxiety and trait anxiety**, state anxiety is short term and situation dependent, whereas trait anxiety is long term and related to core personality structure. Conventional wisdom holds that personality traits like anxiety are stable over the adult life span. We now know differently. Indeed, EEG studies of multiple personality people show that when a new personality "clicks in", there are massive and profound changes in the EEG. **We now know part of the code: increase alpha to decrease anxiety**. We found that alpha changes are significantly related to trait anxiety changes, whereas frontal electromyogram (EMO) activity and respiration rate are not. Therefore, EEG alpha feedback will be a more effective anxiety therapy than either breathing or EMG feedback.

Conclusions

1. Alpha EEG feedback training is an effective means of counteracting stress and anxiety.
2. The amount of anxiety reduction and stress reduction is proportional to the amount of alpha increase that a person acquires.
3. Both state and trait anxiety (situational and chronic stress) are reduced by learned increases in alpha EEG activity.
4. Learning to increase one's EEG alpha requires three elements:
   a. Ergonomic (& now patented) EEG technology.
   b. Tuned (& now patented) training protocols.
   c. Paradigm shift perspectives of the trainers.
5. The implementation of intervention and treatment programs is possible, timely, and valuable.
6. A very strong economic model suggests great benefits in the application of these advanced training techniques to police and fire departments.
7. Application to high stress occupations like police and fire departments merits a concerted effort by concerned people in positions of influence.
8. This is a rare and excellent opportunity to build a substantial business that will benefit society.