Visual Thought Stopping for Pain Stress and Depression

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A Technique for Pain Control, Depression & Stress Reduction
Visual Perception Afterimage Thought Stopping Originated by Dr Costello in 1998

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Discovered in 1998, the afterimage technique evolved after Dr Brian Costello's diagnosis of an inoperable massive undifferentiated oesophageal adenocarcinoma. On discarding prescribed 24hr slow release morphine in the first week of treatment, this technique amongst 20 others succeeded in excruciating pain control and chronic adrenergic stress reduction. CT's revealed a distance spanning 13cm measuring 8.5cm and 6.4cm side to side. His oncologist told him and his wife that the chance of recovery from this biopsy-proven malignant undifferentiated tumour was 2.5%. There are no survivors of such a massive tumor in Australian Medical records.

There were 4 use-by-dates. It was explained he had only 2 months extended a few times and then finally 12-18 month's life expectancy "at the outer limits" or at best 3-5 years to live, if an esophagectomy was possible but this was highly doubtful. Chemotherapy and then later experimental chemo unfortunately failed. Throughout treatment the tumour actually re-grew aggressively twice, viewed in monthly CT's. During conventional treatment, as a research scientist and neuropsychologist, Dr Costello became his own patient to originate twenty ancillary techniques for main-stream medical treatment.

An afterimage is achieved after focusing on a visual stimulus. Patients then close their eyes specifically to see a beautiful violet afterimage when using a pre-determined fluorescent color. This technique does not resemble color therapy, guided imagery or meditation because it occurs solely through physiological conditioning. The trance-induced state is at the shortest visual wavelength of 400 nanometres. Afterimage duration time increases with daily entrainment through physiological conditioning.

Positive results were achieved for 70 traumatised patients in clinical practice and victims of crime suffering acute/chronic pain and adrenergic stress. The presenter explains his additional measurements in Ph.D. research at Swinburne Graduate School of Integrative Medicine. This replicates the original study (Costello, 1999) with pre-post salivary cortisol analysis (Kirschbaum, & Hellhammer, 1989, 1994; Somer, Ben-Aryeh & Laufer, 1993; Van Eck, Berkhof, Nicolson & Sulon, 1997); Coronary Age Assessment including blood pressure (Cassel, 1985a, 1987; Costello, 1987); and Wahler Physical Symptoms Inventory (Wahler, 1983).

History of the Afterimage Technique:

- Clinical application was discovered in July 1998 on remembering undergraduate laboratory practicums in 1964 for visual perception afterimage. Professor Seagrim and Dr Cook used simple experiments on afterimage retention time in elementary statistics for Psychology 101 Lab-work at the Australian National University.

- In 1998 when diagnosed terminal, as his own patient Dr Costello employed guided imagery using "The Little White Cloud Technique" for stress reduction. This was a visual imagery exercise he developed for patients in clinical practice.
- Although using the technique as a clinical psychologist and psychotherapist for 28 years and taping it hundreds of times, when visualising the “white cloud”, to his horror, it appeared in a “foreboding dark color”. This was unlike any little white clouds previously visualised with patients.
- Startled by this frightening variation, he continued for exploration but somewhat hesitantly. Instead of relaxing, as the dark cloud approached and hovered, he felt heightened apprehension and extreme fear. Although difficult to describe, he explained it was almost like a cold hell enveloping him, similarly depicted in movie visual effects like "Ghost" with Demi Moore or like entering the “bardoo void” of the Tibetan Book of The Dead.
- Feeling absolute terror, he tried to stop the exercise but it continued on “involuntarily”. This produced increased fear, which he explains could never be forgotten, such was his feeling of absolute futility and powerlessness.
- Instead of anxiety absorption in the original technique, the way a cloud absorbs water, the novel imagined cloud enveloped Dr Costello in a “rich indigo-violet colour”. Feelings of unexpected bliss resulted, similarly reported by the famous British neurologist Dr Oliver Sax. He then sobbed with tears of joy for 15 minutes. His wife who was cooking dinner told him that his colour had returned and that he looked like his happy old self and completely different.
- Despairingly, he was unsuccessful in regaining the violet blissful feeling so he replicated the experiment with 80 patients, through guided imagery. They all failed to see the illusive "enveloping indigo-violet" coloured cloud
- Finally a specific fluorescent stimulus was achieved through experimentation in visual perception to find exactly the right colour to generate the rich indigo/violet afterimage. *The technique should not to be confused with guided visual imagery techniques or forms of pseudo colour therapy,* because it uses visual perception physiological conditioning.

The Original Study

Costello (1999) hypothesised that "If the visual cortex can be conditioned with the shortest visual wavelength 400 Hz, then, synchronisation may generalise to induce a relaxed cerebrocortical altered state of consciousness". His objective was to originate “a simple cost free technique” with solid experimental design for Complimentary Medicine, not to be confused with “alternative medicine” or any notions of guided visual imagery, colour therapy, chakra, mysticism or the like.

Results N= 70 for pre-post computerised biofeedback measurement showed:
(a) Reduced EMG (frontalis to lower abdominal muscles),
(b) Reduced EDA/GSR,
(c) Increased peripheral body temperature, and
(d) Reduced and stabilised heart rate.

Pre-post assessment using the Lifestyle Analysis Profile revealed increased scores for:
(a) self-esteem,
(b) satisfaction,
(c) involvement,
(d) assertiveness, and
(e) Overall ego-strength.

Reduced scores were recorded for:
(a) depression,
(b) anxiety,
(c) loneliness,
(d) negative attitude, and
(e) Overall stress load.

Finally, self-reported visual analogues and diaries revealed:
(a) Reduced pain perception,
(b) Increased physical relaxation/stress reduction, and

(c) Increased and undisturbed sleep

Anecdotal evidence showed that some patients could reproduce the afterimage spontaneously at will after 2-4 weeks conditioning and lucid type dream states were also recorded. Dr Costello concluded that the technique has solid merit in facilitating mental and physical relaxation or fervent prayer states through thought-stopping, not only for victims of crime but also others in acute or chronic pain, depression or stress. In the original study, pre-post computerised biofeedback showed greatly reduced EMG, GSR/EDA and pulse rate with increased peripheral body temperature. Also the Type A Lifestyle Analysis Profile (Gilley 1976; Gilley & Uhlig, 1985; Cassel, 1990; Cassel & Costello, 1990a, 1991) revealed psychological personality changes. Remarkable pre-post reductions were scored for depression, anxiety, loneliness, negative attitude and overall stress load. Improved scores were evident for self-esteem, satisfaction, involvement, assertiveness and ego-strength. Daily visual analogues and diaries recorded reduced pain and adrenergic stress with increased quality and duration of sleep.

Ongoing Replication Research Results

(a) Anecdotal evidence: Clinical practice indicates the afterimage is effective in reducing physical pain symptoms, depression, anxiety, physiological & psychological stress and heart risk factors, including blood pressure and pulse. Additionally evidence suggests the technique improves quality and duration of sleep, and enhances personality factors contributing to the ego strength of individuals - their ability to handle personal problems. The technique can be applied to people suffering from any of the above conditions in an "integrative" approach with their existing treatment methods.

(b) Particular disorders: Application of the afterimage technique in clinical practice, in conjunction with psychological guidance techniques such as CBT and RET, has demonstrated particular success for patients suffering from Generalised Anxiety, Chronic and Acute Depression, Panic Attacks, Bipolar Disorder and PTSD. The technique is effective with these particular disorders because of its ability to reduce psychological and psychophysiological adrenergic stress, depression and anxiety, often associated with these DSM-IV disorders.

The technique has not been applied with many patients suffering from mental illnesses such as Schizophrenia because they typically seek psychiatric help rather than psychologists. Thus it is currently difficult to assess the effectiveness of the technique with such cases, even in an anecdotal manner. There can also be confounding variables such as the use of medication.

Case Study 1: The afterimage technique was recently used with a patient bordering on Bipolar disorder and having florid paranoid delusional episodes. 20 years previous she had been admitted to a psychiatric hospital for one week. Serapax had been prescribed in small doses for 20 years and occasionally Melloril. Her GP had re-prescribed Melloril because of the recent symptoms and later changed this to Serequil. The afterimage assisted in reducing her psychophysiological stress, anxiety, depression, manic states and paranoia. It is somewhat difficult to assess the degree to which her reduced symptoms were due to the afterimage technique, as opposed to medication, but improvement had not previously been achieved in the month she displayed these symptoms before her first consultation. The GP is slowly reducing her Serapax dose in a controlled manner and will then wean her from the Serequil prescription, while she continues using the afterimage technique with therapy.

Sleep Improvement: All patients reported improved quality and length of sleep after several weeks of daily afterimage use. In particular, patients having difficulty sleeping found that they were able to fall sleep more easily, remain asleep for longer and felt less tired during the day. The improved sleep occurs because they achieve deep, theta states of relaxation, induced through daily conditioning with the afterimage.
This conditioning makes easier for people to relax and enter deep states of sleep, as it is the depth rather than length of sleep that is important for individuals.

Case Study 2: A Returned Vietnam Veteran was referred recently for psychological treatment of flashbacks and stress reactions related to his service in Vietnam. This was caused by three

triggers and resulted in poor sleep and nightmares about his service. In conjunction with CBT, the afterimage successfully improved his quality and length of sleep and the nightmares ceased. His pre-post Lifestyle Analysis Profile *(See Appendix C)* showed reduced depression and anxiety from above to below average and a reduced overall stress load. His self-esteem improved from below 97.5% of the male population to slightly above the male norms. Likewise his involvement in interacting with others and assertiveness increased from below to within the male norms. Satisfaction with life increased to above the norms and ego-strength was increased from below the norms to within them.

(c) Pain Control: The afterimage has assisted many people suffering from physical pain symptoms by assisting them in controlling and dealing with it. The technique does not remove the pain but people can control it and cope better, achieved through thought stopping, often with complete distraction. Additionally, by inducing an altered state of consciousness at the 3-12Hz-brainwave level, participants can escape the pain temporarily by leaving their body. The Vietnam Veteran, discussed in the previous paragraph was also suffering from many physical pain symptoms such as arthritis in the knees, shoulders, neck and back. He had suffered a stroke in 1998 and bowel cancer in 2000. His converted pre-test score of 1.71 on the Wahler Physical Symptoms Inventory *(See Appendix F)* was at the 9th decile rank when compared to the psychiatric clinic outpatient sample, indicating a high level of somatic complaining. However after daily use of the afterimage technique for one month he reduced this score to 1 which was at the 6th decile rank, indicating a much lower level of somatic complaining. His intestinal/stomach trouble disappeared, muscular tension improved, headaches reduced, shakiness stopped and he no longer felt tired or had difficulty sleeping. He was still experiencing aches and pains in the neck, shoulders and back caused by the arthritis, which would not be expected to disappear. However, he was able to control this pain and cope more easily.

Case Study 3: Refer to the ten pain-control experiments, notably in www.cassel.edu.au clicking on “2001 Update”.

(d) Medication reduction: The technique's ability to alleviate symptoms of pain, depression, anxiety and adrenergic stress has assisted patients in the reduction and controlled eradication of prescribed medications, such as anti-depressants and pain-killers.

Case Study 4: One patient presented suffering severe depression, high anxiety and high overall stress load, and below average satisfaction with life and involvement with others. Her GP was prescribing 75mg of Zoloft at the time.
She used the afterimage technique daily along with several sessions of CBT. Within one month of afterimage conditioning her symptoms of depression, anxiety and stress had significantly reduced. Her involvement with others and satisfaction with life increased with efforts such as starting a coffee and chat group as well as a part-time TAFE course. She was seeing an afterimage every time she looked at bright lights. Friends and others were commenting on her improved behaviour and happiness. In coordination with the GP, her Zoloft medication was reduced from 75 to 50 to 25mg and then discarded within one month. In a similar way, the technique's ability to reduce blood pressure and pulse could minimise or eliminate the need for blood pressure medication for individuals.

(e) Difficulty in obtaining the afterimage: There are particular cases where patients have had great difficulty seeing or holding the afterimage because:

(i) They are looking at the image with bad lighting, ie. Not enough natural, filtered light shining through a window behind them
(ii) They are exhibiting extreme adrenergic stress: biofeedback EMG T-Scores at 80.
(iii) When brain damage has occurred such with TBI/ABI cases, or acute stress.

Case Study 5: One terminally diagnosed patient, receiving radiotherapy and chemotherapy at the time, could only retain the afterimage for about 3 seconds but still found it helpful in extending life expectancy another six months beyond main-stream medicine prediction. This occurred for

another with liver cancer metastases, extending for three additional months beyond imminent expectation.

(f) Length of afterimage duration: The initial length of afterimage duration for individuals varies from person to person. The average length of time is between 10 to 30 seconds, but with daily physiological conditioning the duration increases to around 1.5 to 2 minutes within four weeks of practice. Additionally, many people can produce the violet afterimage spontaneously, at will following this increased conditioning.

Case Study 6: One particularly fervent spiritual lady, who happened to be related to the recently sainted Franciscan monk and mystic Padre Pio, held the afterimage for an unbeaten record of three minutes on her first attempt. She appeared to go into a state of ecstasy, later reporting feelings of absolute bliss and joy. Contrastingly, in an experiment to induce external stress in empathy with another sitting beside her, she could retain the afterimage for only seconds. When questioning other individuals with long initial afterimage duration times, the majority had previously used meditation, prayer or relaxation techniques. Individuals who presented in highly stressed states usually had very short retention times in their initial attempts. This indicates a negative correlation between high levels of stress or anxiety and length of afterimage duration.

Case Study 7: An Indian woman, diagnosed with cancer and experiencing severe pain, went straight into a deep trance-like state on her first afterimage attempt with noticeable muscle relaxation to the point where she dropped the afterimage stimulus sheet. Her face broke into a smile, giving the impression she was in a state of ecstasy. She held the violet afterimage for over 3 minutes before I shook her arm gently and brought her out of her altered state. When questioned she revealed that she had considerable previous experience with self-hypnosis, attending lecturers and also used meditation techniques regularly. She experienced difficulty with logical, rational thought processes for at least ten minutes following the experience, due to the deep state of relaxation achieved.

(g) The Spontaneous Afterimage Appearance:

Case Study 8: A devout Christian who had been following the afterimage program rigorously for about three weeks was lying in bed after his evening prayers. He tried to purposefully bring up the violet afterimage circle and sure enough it appeared. As he maintained concentration on the afterimage, it began to expand, break into fragments, swirl around, and reform. He was not sure how long this continued, possibly several minutes, but the only reason it went away was because he consciously decided to break it off. Along with this experience, he felt an unusual level of calm and relaxation, then fell asleep. Many other participants' have also produced the afterimage at will or seen it spontaneously after 3-4 weeks of conditioning.

(h) Traumatic & Acquired Brain Damage:

Case Study 9 & 10: Two patients with brain damage consistently reported darker after-images of deep burgundy shades. It is plausible that the international color-coding index may offer a fast test for comparison, correlated with psycho-organicity damage location maps similar to Luria or Luria Nebraska Neuropsychological Batteries.

Research Objectives of the Replicated Study 2002:

The aim of the present research is to provide further scientific validation of the effectiveness of the afterimage technique for pain control, depression and stress reduction, through replication of the original study (Costello, 1999) with the following additional pre-post assessments:

(a) Salivary cortisol analysis used frequently in research as a reliable indicator of physiological stress levels (Kirschbaum, & Hellhammer, 1989, 1994; Somer, Ben-Aryeh & Laufer, 1993; Van Eck, Berkhof, Nicolson & Sulon, 1997).
(b) Coronary Age Assessment (Cassel, 1985a, 1987; Costello, 1987) including nutrition, blood pressure, pulse rate and peripheral body temperature measurements.
(c) Wahler Physical Symptoms Inventory (Wahler, 1983).

The additional assessments above will provide data for statistical analysis on a broader range of factors measuring physical pain, physiological as well as psychological stress and 23 heart-risk factors.

Modified Research Design:

This study will be longitudinal (four weeks), using a *"repeated measures design"* to examine pre-post intervention changes in assessment scores (N=200-300). Control groups are un-necessary because instruments have been standardised and published for both Australian and U.S. samples for male and female norms (Gilley 1976; Wahler, 1983; Gilley & Uhlig, 1985; Cassel, 1990; Costello, 1987; Cassel & Costello, 1988, 1990a, 1990b; Cassel, Costello & Pullar, 1993).

Participants are trained in the afterimage technique and required to use it twice in a row, 3 times each day for four weeks (See Appendix A: Instructions). Participants are pre-post tested with standardised, validated assessments (described below). Each evening participant's rate their perceived levels of pain, stress and quality and duration of sleep on visual analogue sheets provided. They record afterimage retention times after each trial on the back of these visual analogue sheets. Any significant dreams or spontaneous afterimage appearances are also recorded in a diary provided. Analysis of Variance and Factor Analysis ANOVA will be used for statistical analysis of the data to examine “where the chips fall” rather than generating prior hypotheses that may influence the research and results.

Psychometric Instruments: The Coronary Age Assessment (CAA)

The CAA is designed to assess the “coronary age” of individuals by utilising 23 risk factors associated with coronary heart disease (Cassel, 1985a; Cassel, 1987; Costello, 1987). Coronary age depicts best the level of “wellness” for individuals, and is computed by adding the number of risk factors possessed to the patient's regular age (See Appendix B for Pre-post CAAP examples). Heart risk factors are assessed through the following modules:

Lifestyle Analysis Profile: This computerized personality test (Cassel, 1985a) (Gilley and Uhlig 1985, and in (Cassel and Costello,1987-1990) and was later related by (Cassel, Costello and Puller, 1992). is designed to assess comparisons between the positive and negative areas of one’s life space, and identifies personality types associated with critical heart risk factors (See Appendix C for Pre-post test examples)***.***

Positive Lifestyle

Positive lifestyle is a personal projection of the person’s “ego” strength or ability to cope with problems in one’s life space, as a measure of fitness (wellness). Four separate sub-tests, each containing 25 true/false items are administered.

SELF-ESTEEM: Perceived importance in relationship to group.
SATISFACTION: Contentment with present life situation.
INVOLVEMENT: Degree or incidents of interaction with others.
ASSERTIVENESS: Amount of personal initiative.

TOTAL SCORE - EGO STRENGTH:
Ability to handle personal problems when they arise.

Each of the four subtest scores depicts a positive source of power for negotiating barriers in the life space. Together, they reflect the present strength of individuals for productive work, learning or adapting to life arenas (Gilley John, 1976 and Cassel & Costello, 1991).

Negative Lifestyle

Negative lifestyle is a personal projection of one's perceived stress load, and constitutes a negative force inhibiting the potential for productivity of an individual. Concerning our feelings of wellness, depression is by far the critical indicator because it reveals an attitude of

hopelessness, defeat and futility. Similar to positive lifestyle it involves four subtest's, each containing 25 true/false questions.

LONELINESS: Lacking friends and a purpose in life.
ANXIETY: Presence of anxiety and frustration.
NEGATIVE ATTITUDE: Over concerns about health.
DEPRESSION: Futility, despair and hopelessness.

TOTAL SCORE: STRESS LOAD: Perceived stress being carried.

Each one of the four subtest scores represents a high priority in terms of demands of the patient's energies for containment. Together these determine the present stress load with priority demands of energy in the work and the learning place.

The imperative element of LAP is the most critical balance of forces represented by comparison of positive lifestyle (Ego-strength) and negative lifestyle (Stress-load). Individuals with twice the Ego-strength in comparison to Stress-load are expected to be relatively productive in learning, work and social interactions. Conversely, when the Stress-load score is higher than the Ego-strength, clearly such patients will be largely preoccupied with factors related to containment in elements of his/her negative lifestyle (Cassel, 1985a).

1. Computerised Biofeedback Voluntary Control Assessment (RELAX)

This 12-minute test is designed to determine the degree to which individuals are able to relax; thus assessing the degree and nature of harmony of one's inner states. Effectiveness of voluntary relaxation is determined solely on the basis of exercising control over one's neural functioning (Chung & Costello, 1993). (See Appendix D for Pre-post RELAX examples). The biofeedback RELAX test has been used in previous research studies and standardised for Australian samples with male and female norms (Cassel, 1985b, Cassel & Costello, 1987, 1990b; Cassel, Costello & Pullar, 1993).

Four different computerised biofeedback instruments are interfaced to read changes in the four secondary vital signs. In the first 6 minutes the individual is given standardised taped instructions in progressive relaxation, representing dominant brain. During the second 6 minutes the subject simply listens to "non form" Chinese music, with a minimum rhythm representing the non-dominant brain for non-musicians. The following four modalities are measured simultaneously:

(a) Surface Electromyography (S-EMG): Measures neuromuscular tension, indicative of stress. Two electrodes, placed on the forehead directly above the eyes, pick up these minute signals to measure surface frontalis to the lower abdomen tension in relation to smooth and striated muscles (Chung & Costello, 1993).

(b) Epidermal Skin Activity/Galvanic Skin Response/ (EDA/GSR): Measures levels of emotions and feelings using two electrodes, one on the index and the other on the ring finger (Chung & Costello, 1993). EDA is mediated by the sympathetic nervous system and arousal states result in a direct impedance change between the two electrode sites on the skin (Kopelman, 2001).

(c) Pulse Rate (PUL): A measure of the physical or psychophysiological stress load being experienced in heart rate change (general harmony of inner states), (Chung & Costello, 1993). The sympathetic nerve to the heart (autonomic nervous system) causes the heart to accelerate while the parasympathetic nerves cause it to decelerate (Kopelman, 2001).

(d) Peripheral Body Temperature (TEM): A valid measure of presence and functioning of the sympathetic nervous system, directly associated with the "fight or flight" pattern or emergency state (Chung & Costello, 1993). A sympathetic mediated activity will increase vasoconstriction and lower skin temperature (Kopelman, 2001).

2. **Standardized Interview:** measuring self-imposed lifestyle factors such as positive and negative diet, substance use, weight, exercise and previous heart conditions or strokes. Additionally blood pressure, pulse rate, and average of right and left-hand peripheral body temperature are measured as important heart risk-factor indicators, related to the individual's level of stress (See Appendix E: Coronary Age Assessment Profile).

4. Whaler Physical Symptoms Inventory (WPSI).

The WPSI is a brief internally consistent questionnaire designed to measure the level or intensity of somatic complaining (Wahler, 1983). A measure of the expression of physical distress, the instrument successfully differentiates between normal, healthy individuals and those individuals who manifest somatic complaints in conjunction with psychiatric disorders. This questionnaire has many purposes and uses, including as a research instrument to provide a quantitative measure of physical complaints. It can be used in pre-post testing to evaluate the impact of a particular intervention on the level of somatic complaining (See Appendix F: Pre-post WPSI examples).

5. Pre-Post Salivary Cortisol Analysis.

Pre-post saliva samples will be analysed to examine cortisol levels. Cortisol is a steroid hormone made in the adrenal glands, which are small glands adjacent to the kidneys. Cortisol secretion increases in response to any stress in the body, whether physical or psychological. The pituitary gland, a small gland at the base of the brain, makes and secretes a hormone known as *adrenocorticotrophic hormone*, or ACTH. Secretion of ACTH signals the adrenal glands to increase cortisol production or secretion. The pituitary, in turn, receives messages from the hypothalamus of the brain in the form of the hormone CRF, or *corticotrophic releasing factor*, which signals the pituitary to release ACTH (Lamb, Ingram, Johnston & Pitman, 1980, pp.339-340). Salivary Cortisol Analysis has been used frequently in research as a reliable indicator of stress levels (Kirschbaum, & Hellhammer, 1989, 1994; Somer, Ben-Aryeh & Laufer, 1993; Van Eck, Berkhof, Nicolson & Sulon, 1997).

6. Previous Related Research.

When inquiring into the lack of research publications in this area since the 60's, Dr Costello discovered that photography, cinematography, advertising, television and the media had exhausted the topic. Also, US Military research applications in targeting had been naturally classified for 30 years. Cox, Shealy, Cady & Liss (1996) reported using brain synchronisation techniques since 1975 to assist chronic pain patients to achieve relaxation and detachment from their preoccupation with pain. They conducted a study using a Brain Wave Synchroniser (BWS) to simultaneously flash lights at alpha (10Hz) and Theta (5.5Hz) into the patient’s eyes via photo-stimulation goggles. They reported reduced blood pressure and pulse - 4% to 10% in 58 patients, and pain decreased 30% to 100% in 60 patients (average over 50%). Combining BWS with self-hypnosis tapes was more effective than either alone. Blood pressure and pulse reduction was compatible with the relaxation music control group, however pain relief was greater with BWS. Additional noteworthy research confirms brainwave activity "follows" repetitive light and sound frequencies (Cox, Shealy, Cady & Liss, 1996). The 400nm-violet afterimage frequency induces low EEG brainwaves between 3-12Hz (Costello, 1999). At this low level, an altered state of consciousness trance is attained. The optic nerve relays messages from the retina to two thirds of the brain.

Morse (1993) examined the effectiveness of BWS in reducing anxiety for patients undergoing root canal dental work, both alone and in combination with an alpha relaxation tape. Similar to the first study, the best results were achieved with the combination of the BWS and relaxation tape. Budzynski, Jordy, Kogan Budzynski, Tang, & Claypoole (1999) tested the hypothesis that training with a Biolight, a combined audiovisual stimulation (AVS) and electrodermal response (EDR) feedback device, would result in positive changes in academic performance. Their results indicated that the biolight training can increase academic performance in comparison to the control group who received no training. Although a few other studies examining afterimages were located, they were not specifically investigating the effect of the violet afterimage frequency (400nm) or other light frequencies on pain control, depression, stress reduction, heart-risk factor reduction, personality factors or quality of sleep.

Light waves and processing visual information

Light consists of particles called photons, each one of which can be regarded as a packet of electromagnetic waves. Light is defined as what we can see. Colour is our perceptual response to a very narrow span (less than 1%) of the total electromagnetic radiation emitted by the sun at wavelengths between 400 and 700 nanometres (billionths of a meter), known as the visible spectrum. There is little sensitivity to infa-red and ultraviolet light outside these limits.

The chosen afterimage, resulting from the 50mm diameter, fluorescent yellow circle on a white background produces the shortest visual wavelength of 400nm (Violet). This visual wavelength induces an altered state of consciousness trance with low brainwaves between 3-12Hz (Costello, 1999). The *retina* of the each human eye contains approximately 125 million light sensitive *rods* and *cones* and 1 million *ganglion cells*. Cones are responsible for our ability to see fine detail and colour and are present throughout the retina but are more densely packed in the fovea. (Hubel, 1988, pp.36-37). Information from both retinas travel along the *optic nerve fibres*, the collected axons of the ganglion cells, to the base of the front of the hypothalamus where the optic nerves come together in the *optic chiasm*. Here a partial crossover of fibres, called the *optic decussation*, takes place.

The continuation of these axon bundles, now again separated is called the *optic tract*. Axons of the optic tract run to one of four - second level receiving and integrating centres. The *lateral geniculate nuclei* and the *superior colliculus*, within the thalamus, are the targets most critical to carrying out the function of seeing. The *lateral geniculate nuclei* pass information along the *optic radiation* to the tertiary target cells in the *primary visual cortex*. The fibres that reach the *superior colliculus* are thought to represent retinal receptive fields that are in the rod-rich peripheral zones where visual acuity is less, while fibres that reach the *lateral geniculate nuclei* represent the cone-rich areas of high visual acuity and colour.

The third centre, the *suprachiasmatic nuclei* in the hypothalamus, uses information about light intensity to coordinate our internal rhythms. A fourth target, the *extraocular-muscle*, or *motor-nerve nuclei* keep the movements of the eye coordinated as we shift our gaze. (Bloom & Lazeron, 1988, pp.48-49). Two thirds of the brain consists of visual cortex (Costello, 1999) and thus plays a role in the processing of visual information. Although still to be specifically tested, the violet afterimage travels from the retina along the optic nerve fibres and optic tract to eventually be processed by the above integrative centres. In particular the lateral geniculate nuclei to reach the primary visual cortex and the suprachiasmatic nuclei.

Conclusion

The study current study will provide further evidence of the technique's effectiveness through additional pre-post measurements. Visual Afterimage is safely non-invasive and may be used in conjunction with orthodox mean-stream medical treatment, medications and ancillary Mind/Body techniques. It can be applied to disorders without harm, and then assessed to see if it is beneficial. In terms of larger scale validation for specific disorders, more research will be ongoing with a solid pre-post test design, using samples of people suffering from DSM-IV criteria based disorders.

Original study results and anecdotal evidence in clinical psychological practice, revealed the technique can be applied to reduce physical pain symptoms, depression, anxiety, physical and psychological stress load, medication and heart risk factors, including blood pressure and pulse. Additionally there is evidence that this technique improves quality and duration of sleep and enhances personality factors contributing to ego strength; ability to handle personal problems. The technique may be applied to people suffering from any of the above conditions in an “integrative” approach.

Symbols: Using only a circle for afterimage, Dr Costello posited that other symbols with powerful meaning for particular individuals could be printed in the yellow-green stimulus color to produce the violet afterimage and facilitate prayer or meditation. Similarly for example, symbols of "faith" such as a picture of a Cross for Christians, the Star of David for Jewish people, a Square and Compass for Mason's, or the "Ohm" for Buddhist's will facilitate a relaxed powerful prayerful or meditative state of mind. Carl Jung (1953) highlights the Christ-symbol is of the greatest importance for psychology in so far as it is perhaps the most highly developed and differentiated symbol of the self, apart from the figure of Buddha. In Man and his Symbols (1964.) Carl G. Jung explains that we use symbols to represent concepts that we cannot define or fully understand, which he believes is one reason why all religions employ symbolic language or images. Symbols can be absorbed subliminally, according to Jung, and also produced unconsciously and spontaneously, in the form of dreams. The personal significance of particular symbols printed to produce the afterimage may cause greater positive effects on the individual, in terms of pain control, depression and stress reduction than the circle.

Positive Affirmation Techniques: Affirmations such as "I can stop pain", printed as a yellow-green stimulus to produce the violet afterimage, may achieve positive results in subliminal pain control. However, statements such as "Stop Stealing" and "Don’t drink and drive” may also produce compliance at subliminal levels, similar to Costello’s 1978 research addressing techniques of projection and identification in Health Education. This relates to Kelman's (1961) model of social interaction, in which he discusses three psychological processes: compliance, identification and internalization referenced in Costello’s (1978) ICP Munich article. With processes of compliance individuals are concerned with gaining approval and avoiding disapproval from the influencing agent. This process could be utilized by afterimage messages that are designed to induce wholesome compliance.

> The degree to which compliance can be achieved depends in part on the individual. Rotter (1966) suggests the effects of reward or reinforcement on preceding behavior depends in part on whether the person perceives the reward as contingent on his own behavior or independent of it.
>
> He goes on to discuss how people differ in generalized expectancies for internal vs. external control of reinforcement and describes his development of tests to determine individual differences in a generalized belief in internal-external control. Afterimage affirmations that are designed with an internal locus of control/reinforcement will achieve greater success with people who predominantly have an internal locus of control and visa-versa for those who have an external locus of control. Plausible applications worthy of research using afterimage with Budzynski's subliminal tapes (Costello, 1988, Doche-Budzynski & Budzynski, 1989) are highly possible.

Military and Law Enforcement: Afterimage techniques could have applications for local police or even Military and Law Enforcement Officers with respect to America's "War on Terrorism" and numerous wars around the world as we speak. The technique reduces anxiety, adrenergic stress and the amount of time needed for sleep while allowing the individual to still feel rested. In times of crisis, this could improve concentration and effective decision making skills, to avoid knee-jerk reactions or bad decisions caused by high levels of stress and pressure or lack of sleep.

Low theta brainwave frequencies induced by consistent afterimage use, allows one to enter lucid dream states for potential remote viewing, with practice, like any skill being mastered. We have achieved space travel and even attempted communication through NASA projects like Voyager 7 for the UN and later, questionable CETI projects. Possibilities on inner space exploration may be achieved through lucid dreaming/remote viewing EEG altered states of consciousness. In such

altered states, previously un-dreamed creative problem solving ability is increased like waking up with a solution.
This may assist individuals in reaching personal insights leading to long-term change. Likewise, while humanity's problems of it collective psychopathology are precariously balanced in this age of turmoil, timely creative solutions may arise from lucid states of consciousness that are effective in achieving advanced, positive, social change.

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