DISCLAIMER

The information contained within this document does not constitute medical advice or diagnosis and is intended for education and information purposes only. It was current at the time of publication and every effort is made to keep the document up to date.

The information contained herein includes both psychological and non psychological interventions. The delivery of psychological services requires a medical referral whilst non psychological services do not.

Each person is an individual and has a unique psychological profile, biochemistry, developmental and social history. As such, advice will not be given over the internet and recommendations and interventions within this website cannot be taken as a substitute for a thorough medical or allied health professional assessment or diagnosis.

Audio Visual Entrainment (AVE)

Article QUICK LINKS :

INTRODUCTION

Audio visual stimuli with the use of flashing lights and pulsing tones, has been demonstrated as a means to safely and gently guide the brain into specific brainwave patterns including those body / mind states associated with deep relaxation, meditation, hypnosis, creativity and those associated with reduction of stress and anxiety.

The use of audio visual stimuli to alter states of consciousness is not new, "the knowledge that a flickering light can cause mysterious visual hallucinations and alterations in consciousness is something that humans have known since at least the discovery of fire."[1]

Alpha/theta wave stimulation significantly helps calm people down and has been used to improve sports performance, addictions, sleep disorders, depression, anxiety and chronic pain.[2]

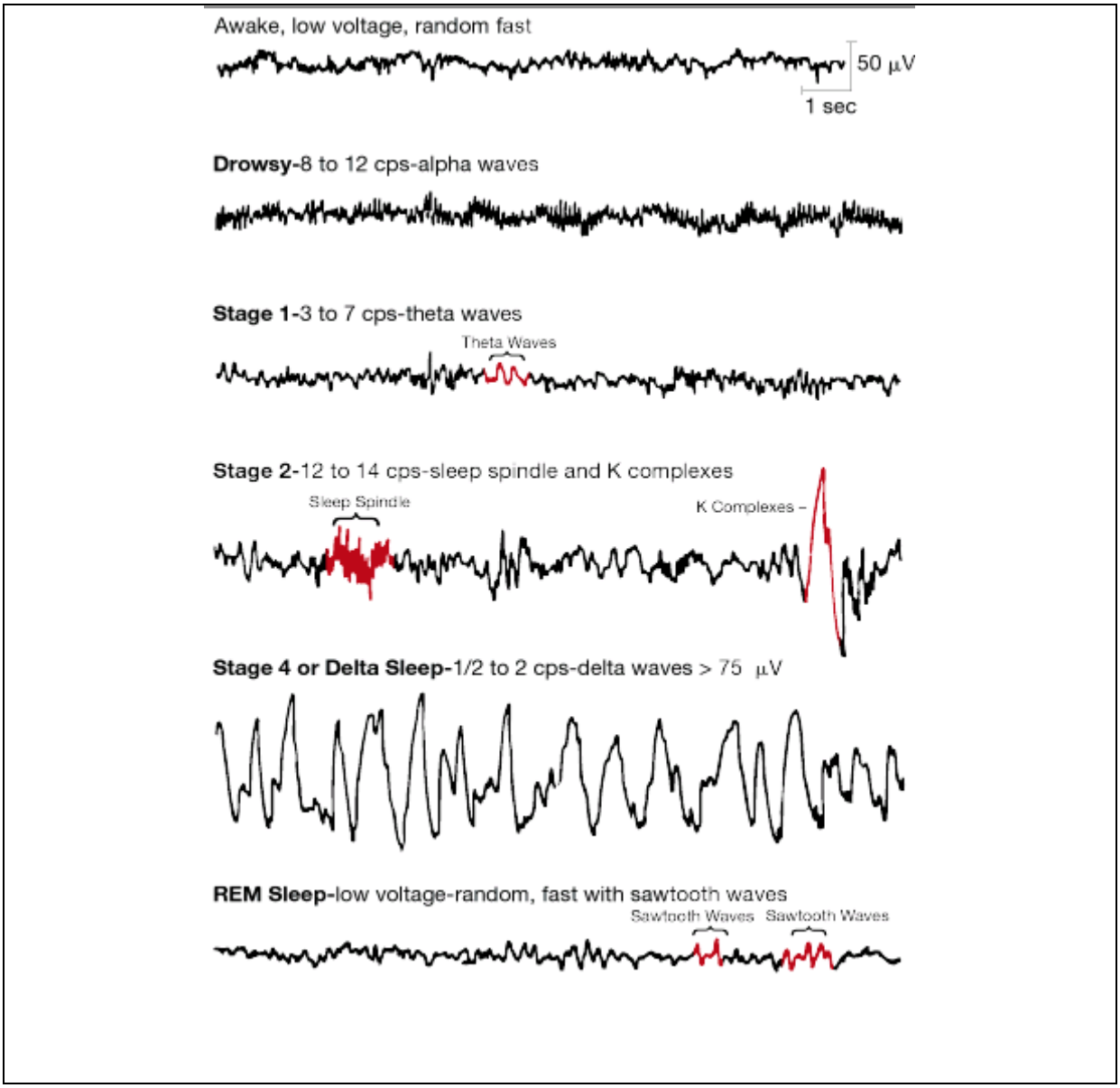
By increasing the stimulation frequency, cognitive function may be enhanced; symptoms such as memory loss have been ameliorated; as well as assisting with slow brainwave disorders such as PMS, chronic fatigue, closed-head injury and ADD.[2]

Brainwaves change frequencies based on neural activity within the brain when it processes signals from the sensory receptors such as those of vision, touch, smell, taste and hearing. Each of our senses responds to stimulus from the environment and transmits that information to the brain.

BRAIN WAVES

Brain Waves are the voltage patterns generated by the brain.

The brain contains some 100 billion neurons which operate by generating and passing on electrical signals. The summation of all this electrical activity results in signals that can be detected and recorded outside the brain. In analogy to the recording of the activity of the heart in an electrocardiogram (EKG), the recording of the brain's activity is called an electroencephalogram (EEG).



The above figure depicts the stages of sleep and corresponding EEG brain wave activity
Image Source : Prentice Hall, www.prenticehall.com

The EEG pattern is referred to as "brain waves". Brain waves appear as irregular, somewhat repetitive waveforms, and are a mixture of many frequencies from less than 1 to more than 40 Hertz.

Different brain wave patterns have been found to be associated with different states of awareness.

Several frequency ranges have been identified as brainwave states and given names by neurologists:

Name	**Frequency Range**	**Subjective Experience**
Delta	0.5-3	Sleep
Theta	3-7	Imagery, suggestibility
Alpha	7-13	Relaxed awareness
Low Beta	13-18	Alert awareness
SMR	12-15	Sensory-motor rhythm
High Beta	18-30	Super alert, tense. High correlation with anxiety when dominant.
Gamma	30 and up	Hyper alert, possible creativity

THE VISUAL PATHWAYS

Our eyes are 'wired' so that the left visual field of our total vision (that is, both eyes), goes to the right side of our brain and vice versa.

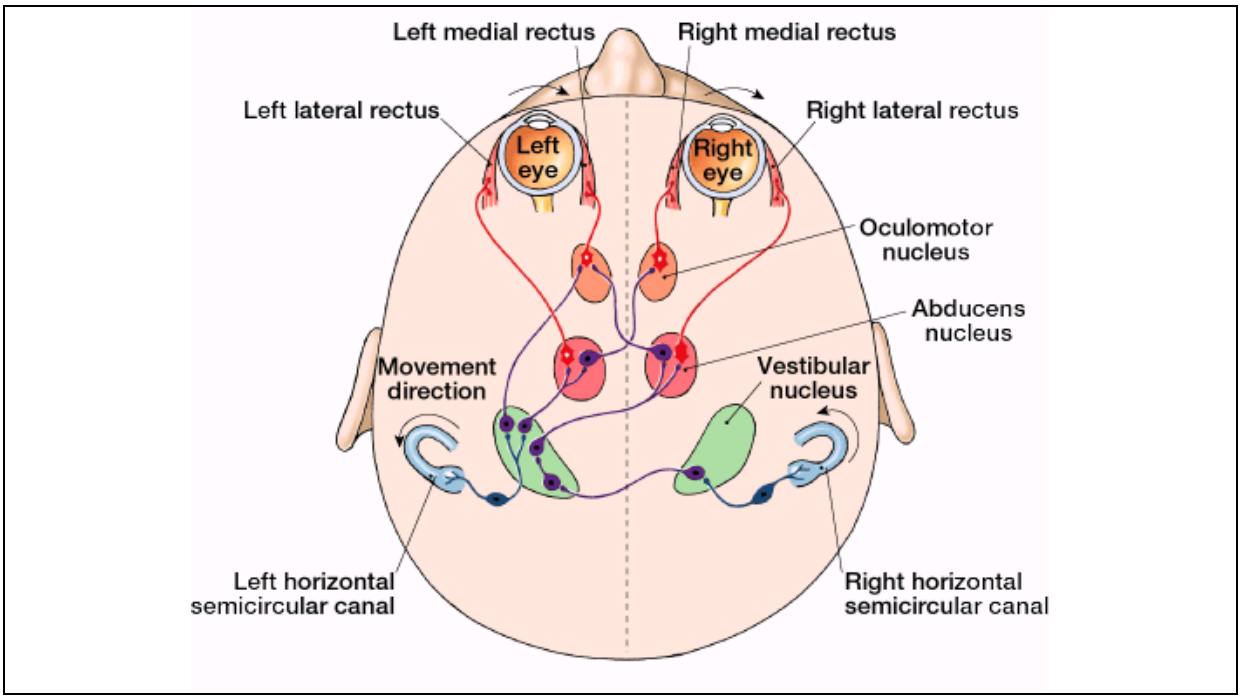
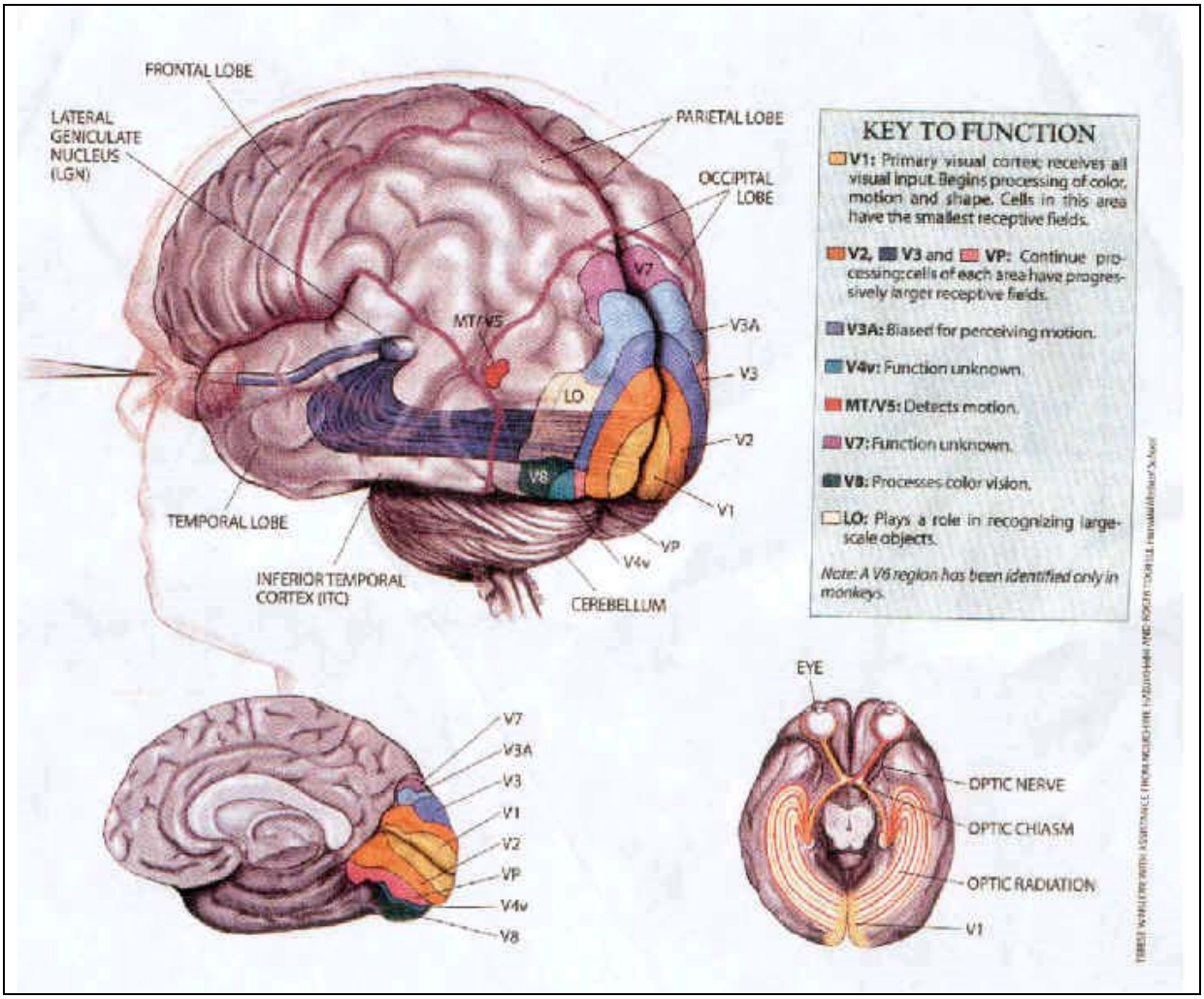


Image Source : Prentice Hall, www.prenticehall.com

The neural pathways start with the rods and cones located at the back of the eye and end at the visual cortex at the back of our brain. Visual signals travel via synapses in the ganglion cells located behind the retina and leave the eye via the optic nerve. During this time the brain has already done a certain amount of visual analysis which delays the signal a few milliseconds.

The optic nerve from each eye splits into what is known as the optic chiasm which is the nerve network that routes the visual image from the right visual fields of both eyes (left half of each retina) to a nest of neurons called the left lateral geniculate and on to the visual cortex. The geniculate cells are connected to the thalamus by synapses forming the brain's sensory coordinating area or 'gateway'. Photic stimulation evokes potentials into the thalamus which then relays the information to the neo-cortex, as well as neighbouring cortical areas and several targets deep within the brain.


FRONTAL LOBE
LATERAL GENICULATE NUCLEUS (LGN)
PARIETAL LOBE
OCCIPITAL LOBE
V7
MT/V5
V3A
V3
LO
V2
V8
V1
VP
V4v
TEMPORAL LOBE
INFERIOR TEMPORAL CORTEX (ITC)
CEREBELLUM
KEY TO FUNCTION
V1: Primary visual cortex; receives all visual input. Begins processing of color, motion and shape. Cells in this area have the smallest receptive fields.
V2, V3 and VP: Continue processing; cells of each area have progressively larger receptive fields.
V3A: Biased for perceiving motion.
V4v: Function unknown.
MT/V5: Detects motion.
V7: Function unknown.
V8: Processes color vision.
LO: Plays a role in recognizing large-scale objects.
Note: A V6 region has been identified only in monkeys.
V7
V3A
V3
V1
V2
VP
V4v
V8
EYE
OPTIC NERVE
OPTIC CHIASM
OPTIC RADIATION
V1

THE AUDITORY PATHWAYS

The outer ear gathers and transmits sound waves down the auditory canal where they reach the tympanic membrane and this vibrating membrane of the ear drum passes the vibration of the sound into the ossicles which consist of the malleus, incus and stapes (hammer, anvil and stirrup respectively).

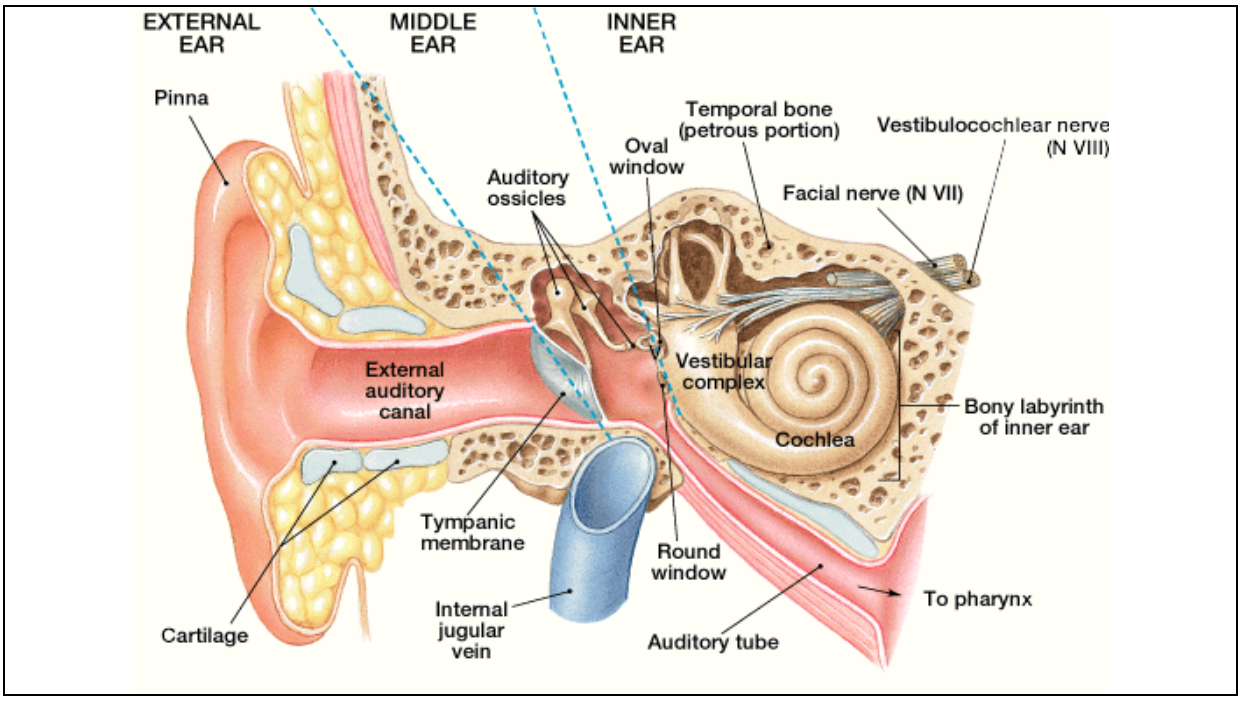


Image Source : Prentice Hall, www.prenticehall.com

The stapes fits into the oval window of the cochlea which responds to different pitches according to the location between the head and tail of the cochlea.

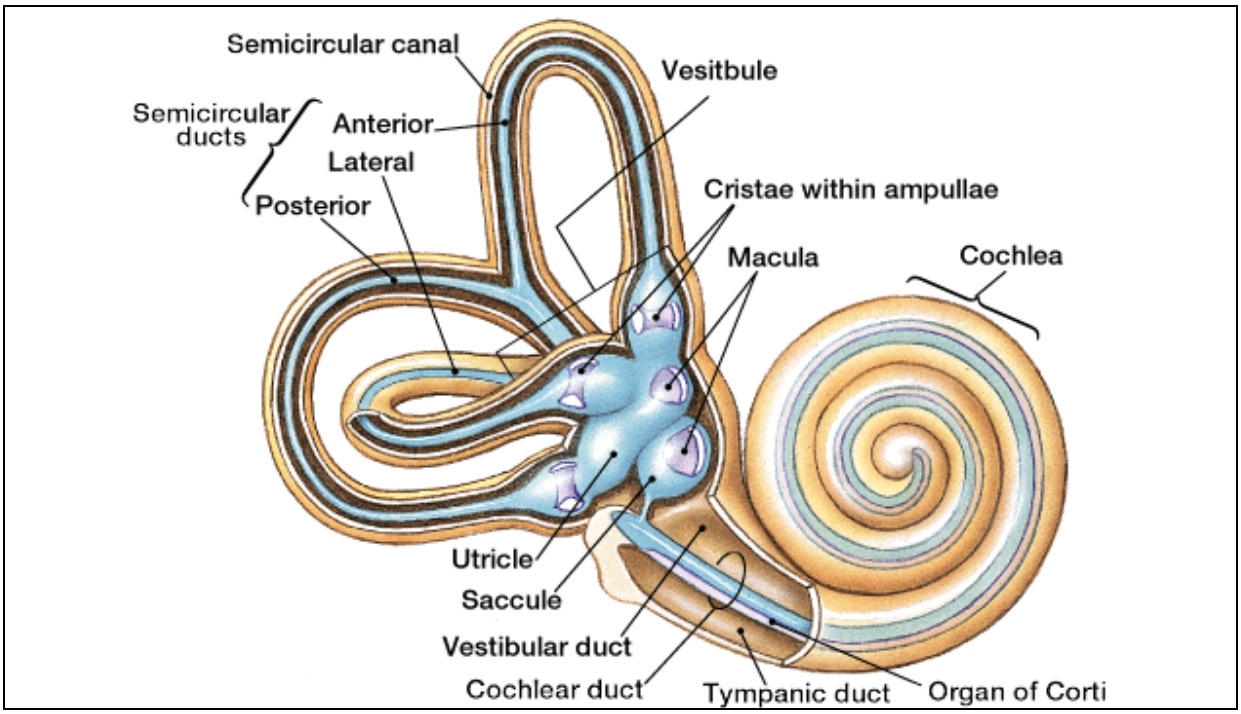
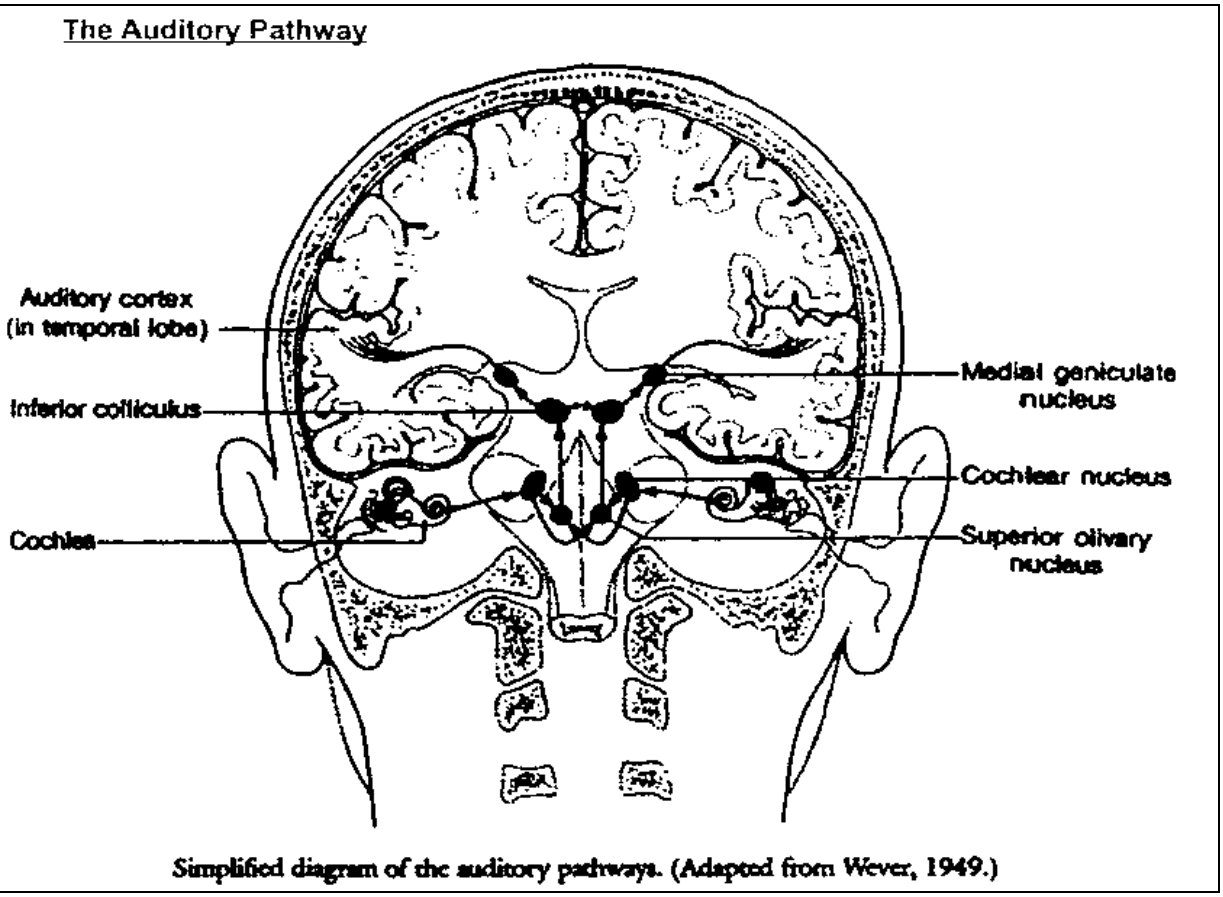


Image Source : Prentice Hall, www.prenticehall.com

The cochlea contains the sensory elements called cilia which send the impulses into dendrites of nerve fibre neurons whose axons make up the fibres of the auditory portion of the VIII cranial (vestibular-cochlear) nerve.

These neurons are the first order neurons of the neural pathway, and proceed toward the brain stem where they form synapses with the cochlea nuclei located in the lower pons and upper medulla and consist of some one dozen different masses of cell bodies concentrated into three main groups of the olivary body.



Simplified diagram of the auditory pathways. (Adapted from Wever, 1949.)

The olivary body sends the auditory signals to the motor system of the ear and may be involved in reflexes. The inferior colliculus is involved in the creation of motor responses to auditory stimuli and the medial geniculate body which is located in the thalamus, serves as a relay station on the way to the auditory cortex. The auditory cortex lies in the temporal lobe, where low frequency sound is discriminated anteriorly, whilst high frequency sound is discriminated posteriorly. The auditory association areas surround the auditory cortex, and it is here that the brain integrates, remembers and analyses various types of sound input - it takes about 10 milliseconds for sound impulses to travel from the outer ear to the auditory cortex.

Sound induces an audio-evoked-response in the EEG and is a powerful psychological test of hearing because it indicates that stimulation by sound has caused a response in the auditory system and the brain. When the brain is exposed to rhythmic, evenly spaced on/off tones, brain wave following or 'entrainment' follows. Following usually occurs within seconds of exposure to the sound, and the 'trance' usually follows after about six minutes.

For more information on the use of sound as therapy, see the article on SAMONAS Sound Therapy

UTILISING THE SENSES OF VISION AND HEARING TO AFFECT THE EEG

The senses of sight and hearing, by their very nature, provide a favourable means for affecting brainwaves. By presenting pulsed and sequenced audio and visual stimulation to the brain for a short period of time, the brain will begin to resonate or 'entrain' or 'follow' at the same frequency as the stimulus. This effect is commonly referred to as brainwave entrainment (BWE), or habituation, whereby the body and mind adapt to the stimulus.

In addition to entrainment, the imagery created by the visual and auditory stimulation provides a focus for the mind and helps to quieten internal dialogue or 'mind chatter'.

It is possible with AVE technology to recreate relaxation and meditation like that achieved by the "masters" and to experience that same peace and tranquility with only a half hour session using the techniques of audio visual and / or electromagnetic stimulus entrainment.

With the development of sophisticated electronic physiological measuring devices, scientists now conduct and record research to show the effects photic stimulation has on humans. Since the discovery of photic driving in 1934, many research articles have been printed in scientific and medical journals on the effects of BWE. In efforts to better understand the brain, most early research only observed the physiological effects of BWE directly and not the clinical benefits of BWE. It has only been more recently that clinical research has been conducted.[2]

NEURAL CIRCUITRY

Effective communication in the brain relies on neural circuitry.

Neurones (nerve cells) consist of a cell body, axon and dendrites (the filament-like extensions of an axon).

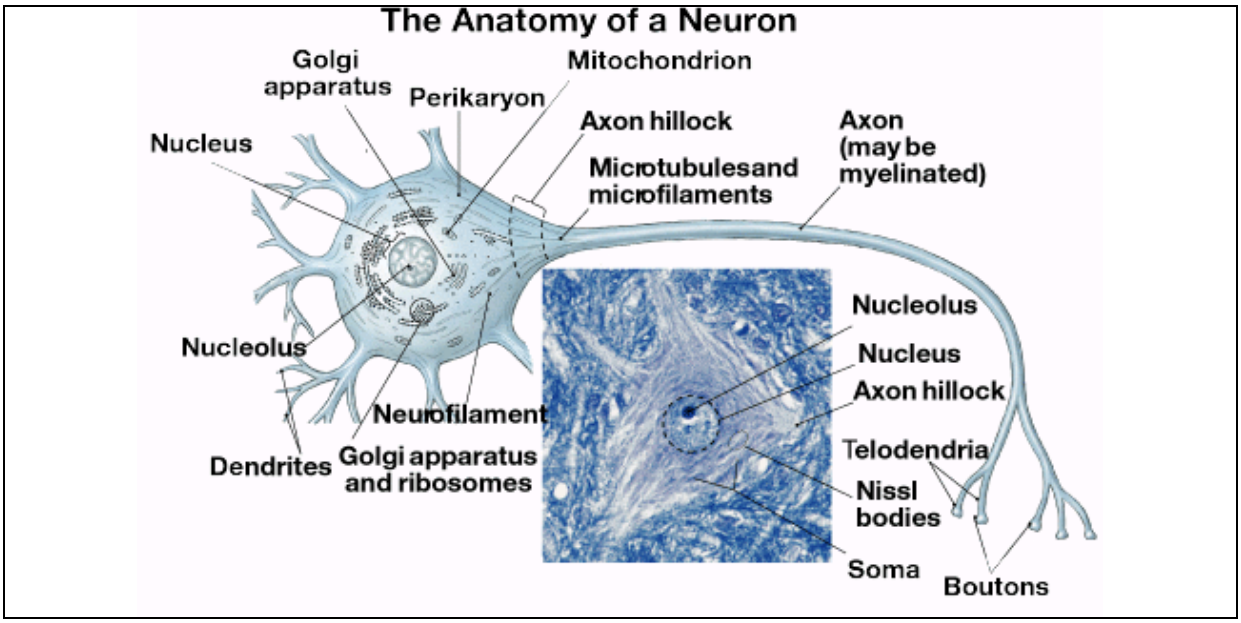


Image Source : Prentice Hall, www.prenticehall.com

In a normally functioning healthy brain, the dendrites of a given axon connect with the dendrites of many other axons, therefore, fostering full communication of information.

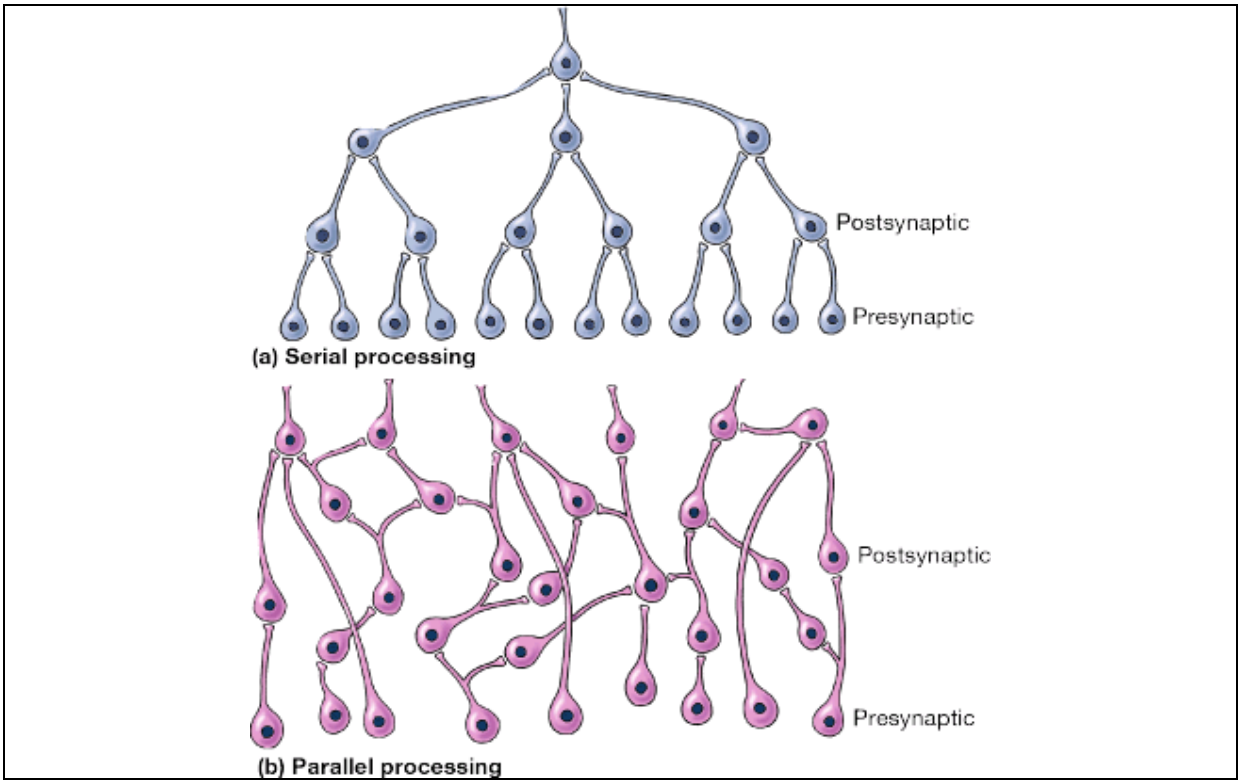


Image Source : Prentice Hall, www.prenticehall.com

Often, development of neural pathways may be delayed, resulting in deficits of function of hearing (CAPD), comprehension and / or sensory motor development. These delays may be global (pervasive developmental disorders) or can result in specific learning difficulties.

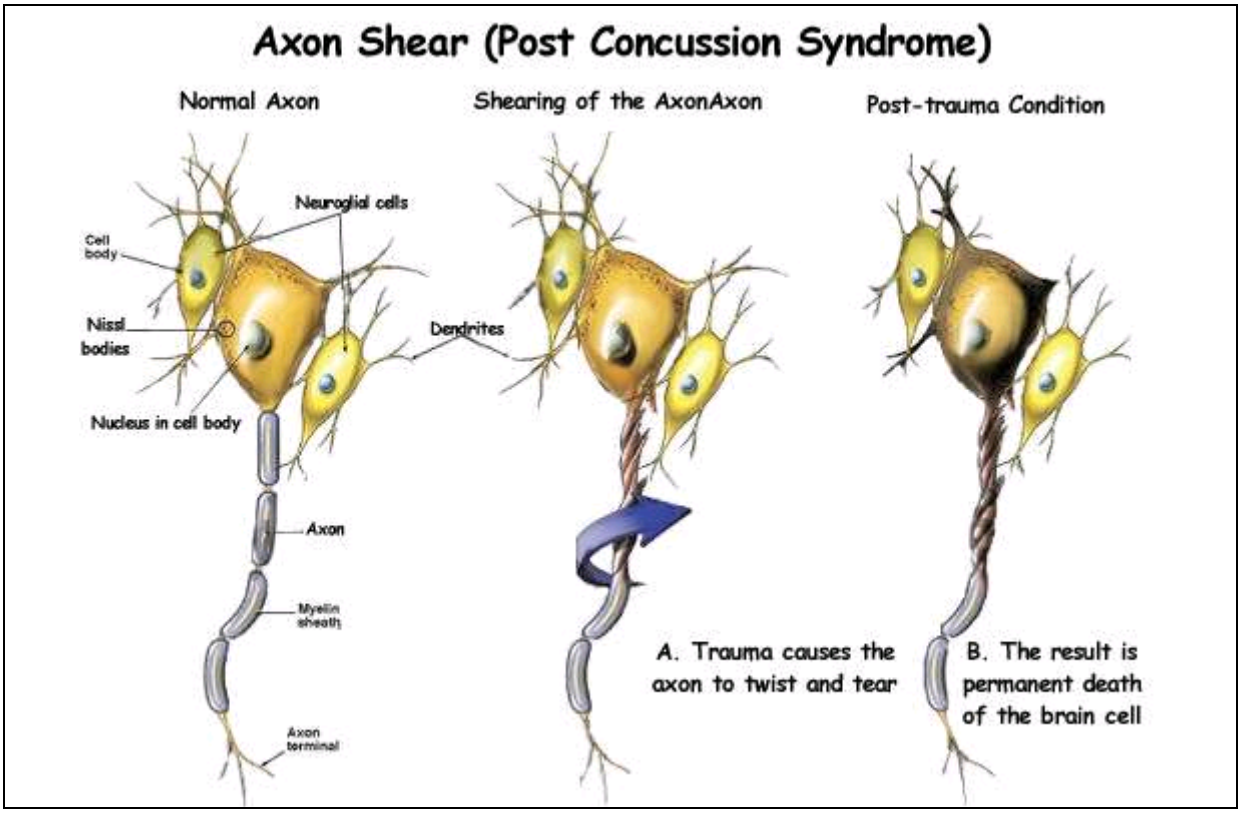
As ageing occurs, the brain loses some of its neural circuitry due to shrinkage and a reduction in the number of dendrites. The ability of neurones to communicate thus decreases as these connections are reabsorbed by the cell body with age or non-use.

Common symptoms (which can start as early as 40) include forgetting the names of people, and then names of things and facts, short-term memory deficits, difficulty following instructions and memorising material.

However, we can slow down or even reverse this process, by providing multi-sensorial stimulation to our brains.

Stimulation can take the form of neurofeedback, biofeedback, psychological counselling, healthy eating, exercise, Brain Wave Entrainment (BWE) and a plethora of non-drug approaches that focus on prevention rather than correction.

When traumatic brain injury (TBI) occurs, connections between neural circuitry are also disrupted which leads to aberrant brain wave activity. This can occur through diffuse axonal shearing, or more directly as damage to specific brain areas.



Whilst the site of injury is unlikely to repair itself, (without stimulus the neurone is likely to undergo involution and eventually die), other neural pathways can be stimulated to be evoked by the brain, compensating for and perhaps in time performing the functions of those damaged. This inherent plasticity of the brain is what makes AVE and biofeedback so effective for many people.

With the use of an AVE unit a person can activate a pre-programmed AVE session at the simple press of a button to entrain the brain at a frequency that would be most useful for their particular needs or concerns.

APPLICATIONS OF AVE

Some of the uses and benefits of BWE with an AVE unit, as indicated by the research literature, are as follows:

EXERCISES THE BRAIN

- Enriched environment
- Increase in dentritic length
- Increase in brain mass
- Increase in blood supply

Nerve cells are designed to receive stimulation resulting in growth and change. This growth and change is fundamental throughout life.

REDUCE STRESS AND PRODUCE DEEP RELAXATION

- Decrease in stress related neurochemicals
- Reduce muscle tension
- Lower blood pressure
- Reduce heart rate

BOOST IQ

- LD average increase over 20 points and as high as 30.
- ADD/ADHD - 12-20 increase

AUTISM

- Increase alertness
- Reduce tantrums and aggressiveness
- Reduce hyperactivity
- Improved speech articulation and vocabulary
- Normalisation of sleep patterns

ACCELERATED LEARNING

- Learn more - learn faster - more adept at learning difficult and complex material due to increased dendritic outgrowth - more neural connections make learning easier.

INCREASE MEMORY

- Improve both long and short term memory.

PRODUCE PEAK PERFORMANCE

- Produce high efficiency, effortless "flow" states.

SUBSTANCE ABUSE PROBLEMS

- Produce unprecedented recovery rates.

OVERCOME DEPRESSION AND ANXIETY

- Greatly reduce or eliminate chronic depression and anxiety.

ALLEVIATE PAIN

- Eliminate or greatly reduce both chronic and transient pain.

BOOST IMMUNE FUNCTION

- Increase the power of the immune system to overcome existing diseases and boost its resistance to infection.

FURTHER READING SUGGESTIONS

- Sleeping Disorders
- Depression
- Anxiety
- Pain Management
- Post Concussive Syndrome / Head Injury
- Attention Deficit Disorder (ADD) & Attention Deficit Hyperactivity Disorder (ADHD)
- The Relationship Between Vital Energy And The Human Brain And Nervous System
- Samonas Sound Therapy
- Auditory Processing Disorder (APD) (Previously known as Central Auditory Processing Disorder)
- The relationship between spelling, writing, reading and comprehension
- Sensory-Motor Integration and Learning and Remediation of reading, spelling, and comprehension

- Pervasive Developmental Disorder (PDD)
- Learning Disabilities
- Neurofeedback - EEG Biofeedback - a Drug-Free Strategy for ADHD, Learning Disorders and Other Conditions
- Biofeedback
- Counselling

LINKS

PLEASE NOTE :
Learning Discoveries offers the links below as a convenience to our clients and the users of this website. However, we do not control third party websites and we are not responsible for the websites content.

- **DSM-IV**

  To view the DSM-IV criteria and revisions online please go to BraveNetÒ Clinical Capsules on the above link.

  http://www.behavenet.com/capsules/index.htm

  DSM-IV is a coded reference manual published by the American Psychiatric Association to provide clear descriptions of diagnostic categories in order to enable clinicians and investigators to diagnose, communicate about, study, and treat people with various mental disorders.

- **Mind Alive Inc**

  http://www.mindalive.com/2_1_3.htm

  Mind Alive Inc., an electronics manufacturing and design company incorporated in the province of Alberta in 1981, designs and manufactures a series of Audio-Visual Entrainment (AVE) devices. T

- **Photosonix**

  http://www.photosonix.com/

For more information or to make an appointment please contact us on (02) 9637 9998 during business hours.

REFERENCES

1. Hutchison, M., 19 , "Megabrain"

2. Seiver, D., 1997-2000, "The Rediscovery of Audiovisual Entrainment Technology"., Comptronic Devices Limited, Edmonton, Alberta, Canada.

3. Tortora & Grabovski, 2000,

OTHER PAPERS AND STUDIES OF AVE

1. Hypnosis in Anesthesiology, M.S. Sadove, M.D., Chicago, Illinois Medical Journal, July 1963, Pages 39 to 42.

2. Flicker Potentials and the Alpha Rhythm in Man, James Toman, Journal of Neurophysiology, 1941, Vol. 4, Pages 51 to 61.

3. Colour Illusions and Aberrations During Stimulation by Flickering Light, W. Grey Walter, Nature, Vol. 177, Page 710.

4. Responses to Clicks from the Human Brain: Some Depth Electrographic Observations, Gian Emilio Chatrian, M.D., Magnus C. Petersen, M.D., and Jorge A. Lazarte, M.D. - Rochester State Hospital (1959).

5. Visual Evoked Responses Elicited by Rapid Stimulation, Jo Ann S. Kinney, Christine L. McKay, A.J. Mensch, and S.M. Luria, Naval Submarine Medical Research Laboratory, Naval Submarine Medical Centre, Naval Submarine Base New London, Groton, Connecticut (1972).

6. The Prognosis of Photosensitivity, P.M. Jeavons, A. Bishop, and G.F.A. Harding, Clinical Neurophysiology Unit, Department of Vision Sciences, Aston University, Birmingham, England (1986).

7. A Comparison of Depths of Relaxation Produced by Various Techniques and Neurotransmitters Produced by Brainwave Entrainment, Shealy and Forest Institute of Professional Psychology, Comprehensive Health Care, C. Norman Shealy, M.D., Ph.D., Roger K. Cady, M.D., Richard H. Cox, M.D., Ph.D., Saul Liss, William Clossen, Ph.D., Diane Culver Veehoff, R.N., Ph.D.

8. Influence of Colour on the Photo Convulsive Response, T. Takahasi and Y. Tsukahara, Department of Neuropsychiatry and Department of Physiology, Tohoku University School of Medicine, Sendai, Japan (1976).

9. EEG Alpha Training, Hypnotic Susceptibility and Baseline Techniques, Bruce Crosson, Rodger Meinz, Eric Laur, Don Williams, and Ted Andreychuk, Texas Technological University (1977)

10. Altered States of Consciousness and Hypnosis: A Discussion, Erika Fromm, The University of Chicago (1977).

11. Hazard of Video Games in Patients with Light-Sensitive Epilepsy, Neil R. Dahiquist, MD; James F. Mellinger, MD; Donald W. Klass, MD (1983).

12. Megabrain Report - Recent Studies in Sound and Light, Julian Isaacs, Ph.D.

13. The Clinical Guide to Light/Sound Instrumentation & Therapy, Thomas H. Budzynski, Ph.D.

14. White and Red Lights in Photic Stimulation, David Siever, C.E.T.

15. Isochronic Tones and Brainwave Entrainment, David Siever, C.E.T.

16. An Electronic Aid for Hypnotic Induction: A Preliminary Report, William S. Kroger, M.D., and Sidney A. Schnieder, P.E.

17. Muscle and Fitness - Mind Over Matter = Muscle (article), Michael Hutchison (1993).

18. Fast Entry To Meditative States With Light and Sound Units, CMC, England

19. Auditory Beats in the Brain, Gerald Oster, Scientific American.

DENTAL RESEARCH

1. The Effect of Repetitive Audio/Visual Stimulation on Skeletomotor and Vasomotor Activity in the Low Hypnotizable TMJ Subject, Dr. Norman Thomas B.D.S., B.Sc., Ph.D. & David Siever, C.E.T. Hypnosis, 1988.

2. The Effect of the RelaxodontTM Brain Wave Synchronizer on Endodontic Anxiety: Evaluation by Galvanic Skin Resistance, Pulse Rate, Physical Reactions, and Questionnaire Responses, Donald R. Morse, D.D. S., M.A. (Biol), M.S. (Psychol), PhD (Nutr), and Edmond Chow; D.M.D. (1993).

3. A Technique for Rapidly Inducing Hypnosis, Bernard S. Margolis, D.D.S., CAL, June, 1966, Pages 21 to 24.

4. Tension Occurring in Muscles of Mastication During Jaw Opening - Research using Brainwave Entrainment Devices, David Siever, C.E.T., Unpublished.

5. The Application of Audio Stimulation and Electromyographic Biofeedback to Bruxism and Myofascial Pain-Dysfunction Syndrome, Ardeer Mains, Rudolf Miracles, and Hugo Adrian, Santiago, Chile, Department of Physiology and Biophysics, Faculty of Medicine, University of Chile (1981).

HEADACHE RESEARCH

1. The Treatment of Migraine with Variable Frequency Photo-Stimulation, D.J. Anderson, B.Sc., M.B., B.S. (1989).

2. Slow Wave Photic Stimulation in the Treatment of Headache - A Preliminary Report, Glen D. Solomon, M.D.

3. PMS, EEG Biofeedback, and Photic Stimulation , Presented at the 1995 SSNR Annual Conference, David Noton, Ph.D.

PAIN RESEARCH

1. Living with Chronic Pain - A Holistic Treatment Program for Wellness, Frederic J. Boersma, Ph.D., University of Alberta (1990)

2. The Use of Repetitive Audio/Visual Entrainment in the Management of Chronic Pain, Frederic Boersma, Ph.D. and Constance Gagnon. M.Ed. (1992) Medical Hypnoanalysis Journal.

RELAXATION RESEARCH

1. Mindworld Study #2 - Pilot Study - Effects of S/E Mediated Stress Management with the Metro Dade Police Department, Stress Reduction Study, Dr. Juan Abascal and Laurel Brucato (1989-1991) Miami Dade Community College. The Effects of Light and Sound Stimulation when used for Relaxation - Juan R. Abascal, Ph.D., and Larel L. Brucato, Ph.D. Miami - Dade Community College

2. Stress Reduction for Audio/Visual Integrated Stimulation and Self Therapy - Comptronic Devices Limited