REVIEW ARTICLE

The Neurochemistry of Counterconditioning: Acupressure Desensitization in Psychotherapy

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Abstract

A growing body of literature indicates that imaginal exposure, paired with acupressure, reduces midbrain hyperarousal and counterconditions anxiety and traumatic memories. Recent research indicates that manual stimulation of acupuncture points produces opioids, serotonin, and gamma-aminobutyric acid (GABA), and regulates cortisol. These neurochemical changes reduce pain, slow the heart rate, decrease anxiety, shut off the fight/flight/freeze response, regulate the autonomic nervous system, and create a sense of calm. This relaxation response reciprocally inhibits anxiety and creates a rapid desensitization to traumatic stimuli. This paper explores the neurochemistry of the types of acupressure counterconditioning used in energy psychology and provides explanations for the mechanisms of actions of these therapies, based upon currently accepted paradigms of brain function, behavioral psychology, and biochemistry.

Keywords: Counterconditioning, acupressure, amygdala, exposure therapies, anxiety, desensitization.

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Clients with anxiety disorders, phobias, and traumatic memories, constitute a significant treatment population for mental health practitioners (Barlow, 2004). What these treatment categories have in common is the maladaptive hyperarousal of the midbrain's FFF response (Perry, 1999; Barlow, 2004). The midbrain acts in a quick, reflex-like manner to stimuli (van der Kolk, 2002), and is conditioned based upon associative learning (Rothschild, 2000).

To recondition these stimuli, psychiatrist Joseph Wolpe developed a type of exposure therapy in which the anxiety reflex is elicited by having the client imagine an anxiety-producing stimulus, and then replacing it with a relaxation response (Corey, 1977; Wolpe & Wolpe, 1981). He demonstrated that the response of anxiety can be "reciprocally inhibited" by deep muscle relaxation. The process of transforming the response to a stimulus from anxiety to calm is called "counterconditioning" or "desensitization." Feinstein (2008a, 2009) has summarized a growing body of research studies which demonstrate that energy psychology (EP) techniques, which combine exposure to a stress component with self-applied acupoint stimulation, effectively countercondition anxiety.

Evidence from acupuncture research indicates that manual stimulation of acupuncture points (acupoints) produces endogenous opioids, increases production of neurotransmitters such as serotonin and gamma-aminobutyric acid (GABA) and regulates cortisol, the main stress hormone (Napadow et al., 2007; Akimoto et al., 2003; Lee, Yin, Lee, Tsai & Sim, 1982; Ulett, 1992). These biochemical changes effect midbrain structures to reduce pain, slow the heart rate, decrease anxiety, induce calm and shut off the fight/flight/freeze (FFF) response (Dhond, Kettner, & Napadow, 2007; Fang et al., 2008; Hui et al., 2000; Korber et al., 2002). For psychotherapy clients re-experiencing fearful memories, panic or anxiety states, or heightened affect, the calming effects of acupoint stimulation are a valuable supplement to other therapeutic approaches.

This paper explores acupressure-assisted EP psychotherapy and provides explanations for its mechanisms of action based upon the currently accepted paradigms of brain function, behavioral

psychology, and biochemistry. The purpose of this paper is to familiarize mental health practitioners with the theory and practice of acupressure desensitization therapies. It will discuss in more depth the physiological mechanisms of the FFF response; midbrain structure and function; conditioning and counter conditioning; traumatic memories as conditioned stimuli which elicit the FFF response; current acupressure desensitization therapies; procedures common to acupressure counterconditioning therapies; and acupuncture research defining the neurobiological molecules which produce a relaxation response. This paper will also summarize the evidence base for the efficacy of acupressure desensitization EP techniques and discuss their integration into current psychotherapies.

Acupoint Stimulation, Changes in the Brain, and Anxiety Reduction

Ulett's (1992) review of scientific acupuncture studies on pain reduction indicates that acupoint stimulation produces: internal opioids (endorphins, enkephalins and dynorphins) which reduce pain; serotonin, a mood regulator; and decreases of up to 50% in cortisol, which signals the homeostatic mechanisms in the midbrain to reduce the FFF response. Internal opioids, such as endorphins, both reduce pain and slow down the heart rate. A fast heart rate often is an indication of anxiety and fear for the person experiencing this proprioceptive stimulus. Ulett cites acupuncture studies which found a doubling of pain-reducing endorphin levels in the cerebrospinal fluid within 30 minutes of acupuncture stimulation.

Many neuroimaging studies of acupuncture indicate that midbrain structures, particularly the amygdala, are influenced by acupoint stimulation (Dhond et al., 2007; Fang et al., 2008; Hui et al., 2000; Napadow et al., 2007; Napadow et al., 2009). Rudin (2005) indicates that an increase in serotonin stimulates the basolateral amygdala to produce GABA, an anxiety-reducing neurotransmitter that blocks the production of glutamate and delinks the biochemical pathway that produces and maintains the fear response. Regulatory genes, such as EGR-1 and c-fos, are triggered by stressful experiences (Sabban & Kvetnansky, 2001; Davis, Bozon, & Laroche, 2003). Church (2009b) summarizes epigenetic studies demonstrating that relaxation downregulates the expression of the genes involved in the FFF response, and increases the reuptake of stress hormones such as cortisol.

Several fMRI neuroimaging studies have noted that acupuncture results in significant decreases in the activity of the limbic system, amygdala, brain stem and midbrain structures involved in the FFF response (Dhond et al., 2007; Fang et al., 2008; Hui et al., 2000; Napadow et al., 2007; Napadow et al., 2009). The activation of the amygdala is associated with a heightened FFF response, while the hippocampus, which is responsible for contextual associations, reduces it (LeDoux, 2002; Phelps & LeDoux, 2005; Perry, 1999). Both studies by Napadow et al. (2007; 2009) showed significant differences occurring in fMRI images resulting from true versus sham acupuncture points, indicating that acupoint stimulation has greater efficacy than other forms of somatic stimulation.

Acupoint stimulation is an effective treatment for fear because it terminates the sympathetic nervous system's (SNS) alarm or FFF response, and replaces it with the parasympathetic nervous system's (PNS) relaxation response (Korber et al., 2002; Napadow et al., 2007; Rudin, 2005). The SNS alarm response is terminated through a biochemical feedback mechanism in the midbrain that produces calming neurotransmitters such as opioid neuropeptides, serotonin, and GABA, and regulates cortisol. These biochemical changes are active ingredients in the counterconditioning process.

Perry (1999) notes that the human midbrain lies between the brainstem and neocortex and is structured to sense, process, store, perceive and mobilize responses to threat. It provides, along with the brainstem, regulatory functions affecting the whole body (e.g. activation or relaxation). He notes that sensory input is matched against stored patterns of threat, so that incoming sensory information associated with threat sets off a sympathetic nervous system alarm response.

The limbic (emotional) brain is part of the midbrain structure, and plays a key role in the alarm response (Rothschild, 2000). Within the midbrain, the amygdala is involved in the integration of multiple sensory modalities and is where associational learning of the alarm response occurs (Phelps & LeDoux, 2005; Perry, 1999). Human brain mapping of the effects of acupoint stimulation, and neurobiological research, indicates that the process of counterconditioning occurs in the human midbrain, particularly in the amygdala (Hui et al. 2000; Napadow et al., 2009; Rudin, 2005).

Besides the insertion of acupuncture needles, acupoint stimulation can also be accomplished by vacuum suction, tapping, ultrasound, and acupressure (Jones, 2002; Cherkin et al., 2009; Ulett, 1992; Andrade & Feinstein, 2004). Cherkin et al. (2009), using randomized controls, showed that somatic stimulation (acupressure) produced the same results as acupoint needling. These studies indicate that tapping or rubbing provides effective stimulation of the acupoints. This gives credence to the hypothesis that the findings of acupuncture research apply equally to acupressure.

The theory and practice of counterconditioning is a generally accepted paradigm in Behavior Therapy, with applications for psychotherapy (Corey, 1997). Joseph Wolpe successfully demonstrated the counterconditioning of anxiety-producing stimuli by using progressive muscle relaxation. Several other therapies also appear to effect counterconditioning. They include exposure therapy, cognitive behavior therapy, and Eye Movement Desensitization and Reprocessing, or EMDR (Bradley, Greene, Russ, Dutra, & Western, 2005; Institute of Medicine, 2006/2007).

Energy psychology builds on the foundation of research and clinical experience found in exposure therapies and cognitive restructuring, but adds in the stimulus of acupoint stimulation. Energy psychology interventions are observed in a number of studies to reduce affect, counterconditioning emotionally traumatic memories very rapidly (Church, 2009; Johnson, Shala, Sejdijaj, Odell, & Kadengjika, 2001; Church & Brooks, in press; Wells, Polglase, Andrews, & Carrington, 2003).

As a result of acupressure desensitization through EP, the stress-producing thought becomes newly associated with a state of relaxation, resulting in the rapid counterconditioning of stress-producing stimuli, such as thoughts, memories, and external triggers. Studies measuring brain EEG patterns of subjects before and after EP treatments find a reduction in the EEG frequencies associated with anxiety (Lambrou, Pratt, & Chevalier, 2003; Swingle, Pulos & Swingle, 2004; Diepold & Goldstein, 2008).

The counterconditioning appears to take place in the amygdala (Hui et al., 2000; Rothschild, 2000; Rudin, 2005; Napadow et al., 2007; Ulett, 1992). It is possible that any effective therapy for conditioned states of maladaptive hyperarousal (disabling anxiety) needs to induce a relaxation response to "reciprocally inhibit" and countercondition the response of anxiety.

The relaxation state counterconditions the connection between the stimulus and anxiety (Wolpe & Wolpe, 1981), increases blood flow to the neocortex (Amen, 2002; Root et al., 2009) and opens up new neural pathways for processing information and changing behavior (LeDoux, 2002; Foa, Keane, & Friedman, 2000; Hartung & Galvin, 2002; van der Kolk, 2002). Energy psychology is therefore believed to enhance the effects of cognitive and exposure protocols through its use of the stimulation of acupoints.

Biophysiology of the Autonomic Nervous System's Fight / Flight / Freeze Response

The control mechanisms of the autonomic (automatic) nervous system (ANS) include the thalamus, amygdala, hippocampus, and hypothalamus, which are housed in the midbrain (Perry, 1999; Rothschild, 2000). The ANS is closely linked to the limbic system, which shares many of the same midbrain structures, and which governs emotional responsiveness (van der Kolk, 2002). The midbrain is also directly linked to the hindbrain, which governs heart rate and respiration, and to the prefrontal cortex, which can inhibit the activation of midbrain responses (Rudin, 2005).

Within the autonomic nervous system are the sympathetic nervous system (SNS), which prepares the body for vigorous physical activity, and the parasympathetic nervous system (PNS), which generates the relaxation response. The purpose of the SNS alarm response is to increase the ability of the body to perform vigorous muscular activity in the event of an emergency.

This alarm response prepares the body for vigorous physical activity by increasing respiration, pulse rate, cardiac output, arterial blood pressure, blood flow to the large muscles (and away from the skin's surface), blood sugar, cellular metabolic rates, muscle strength, blood coagulants and the anti-inflammatory response. The FFF response results in limited and highly focused mental activity. Current SPECT (single positron emission computerized tomography) scan research (Amen, 2002) indicates that there is more blood flow in the limbic system and basal ganglia of the midbrain than in the prefrontal cortex and other parts of the neocortex (the "analytical brain") during states of anxiety.

The SNS alarm response is a survival response that fires off in fractions of a second, and often pre-

cedes awareness of the stimulus by the frontal lobes of the brain (Perry, 1999; van der Kolk, 2002). This alarm response can be triggered by physical stress, tissue damage that causes pain, prior conditioning, and/or by strong emotional reactions (Swack, 2001). Pain stimuli travel up the brainstem and register in the thalamus. Other internal (interoceptive) and external (exteroceptive) stimuli also are registered in the thalamic region of the brain.

The amygdala, sometimes called the "smoke detector of the brain" (van der Kolk, 2002), rapidly assesses information from the thalamus and, on the basis of prior learning by association (Perry, 1999; Rothschild, 2000; Rudin, 2005), triggers the FFF alarm response via the hypothalamus. The hypothalamus sets off the FFF response through separate nerve and neuropeptide pathways to the adrenal glands. The hypothalamus directly ennervates the adrenal medulla, producing epinepherine (adrenaline) and norepinephrine. The adrenal cortex is signaled to produce the stress hormone, cortisol, an anti-inflammatory, through neuropeptide action in the hypothalamic-pituitary-adrenal (HPA) axis. Coritsol also signals the liver to release glycogen (blood sugar), so the body can increase its energy. The hippocampus, which houses memory relating to the context of the perceived threat, can be overridden by a sudden strong amygdala activation (van der Kolk, 2002). The left prefrontal cortex, which inhibits the expression of the FFF response, is activated more slowly than the FFF response, and can be preempted by amygdala activation (Perry, 1999; Rothschild, 2000; van der Kolk, 2002).

The entire purpose of the FFF response is immediate activation of physical responsiveness geared towards survival. Part of the parasympathetic nervous system (PNS) and the brain's gray matter (Rudin, 2005) may be involved in the freeze response, which can have survival value in certain situations (Rothschild, 2000). After the individual has taken him/herself out of danger, termination of the FFF response is the most adaptive response. Other systems which have been shut down by the SNS alarm response, such as digestive processes, can resume and the organism can utilize its energy for other activities.

The Midbrain, the Amygdala and Associative Learning

The amygdala evaluates danger associated with incoming stimuli funneling through the thalamus. The amygdala operates in a rapid but incomplete fashion and, although it involves thousands of neurons, it is reflex-like in its operation. When at great physical risk, speed and strength are primary (as is skill, but skills have to be learned and practiced over time to become solidified into behavior patterns). Certain stimuli, such as pain, extreme physical stress, or intense emotional reaction register in the amygdala, and set off the FFF response. The amygdala learns to associate patterns of stimuli which have been paired with danger to set off the FFF response.

The ability to engage in associative learning is one of the hallmarks of the human brain. It appears that a kind of reflex-like Pavlovian (classical) conditioning occurs in the midbrain's amygdala (Rothschild, 2000; van der Kolk, 2002). Rudin (2005) cites animal studies indicating that associative learning is accomplished in the basolateral nucleii of the amygdala. When a configuration of stimuli associated with danger is perceived by the amygdala, the result is a firing of the FFF response. The stimuli are associated with prior learning. For instance, if an individual was attacked from behind, she or he may well develop an SNS alarm response any subsequent time he or she is approached from behind. An individual with this association will demonstrate an exaggerated startle response, physiological hyperarousal, and other FFF responses, dependent upon prior learnings (e.g. prior traumas, other environmental stimuli, martial arts training).

It has been demonstrated that thinking about a stressful event and/ or stimulus cues in the environment can bring on distressingly high levels of SNS activation (Perry, 1999; van Der Kolk, 2002; Wolpe & Wolpe, 1981). Intrusive thinking that elicits the FFF response is one of the indicators of traumatic stress disorder and posttraumatic stress disorder or PTSD (van der Kolk, 2002). Panic attacks may also be triggered by stimuli, perceived by the amygdala, that have been unconsciously associated with prior trauma, or imagined/ anticipated traumas.

Classical Conditioning

Pavlovian, or "classical" conditioning, builds on the foundation of a connection between an unconditioned stimulus (UCS) which, without prior learning, leads to an unconditioned response (UCR). For example, a very loud noise (UCS) leads to a startle and orientation response (UCR).

Subsequently, a neutral stimulus is paired with the unconditioned stimulus (e.g. the visual presentation of a speeding red pickup truck) and after one or more pairings, the once neutral stimulus is able to elicit a startle and orientation response in the absence of the UCR (loud noise).

The once neutral stimulus, now called the conditioned stimulus (CS), has the ability to elicit a startle and orientation response similar to the loud noise alone. The startle and orientation response elicited by the CS alone is referred to as the conditioned response (CR). A scenario drawn from clinical experience follows: A relaxed driver of a car is making a left turn and is hit by another car (UCS). As the accident happens, the driver's sympathetic nervous system's "alarm" response fires off a rush of adrenaline and cortisol, giving the driver an experience of the FFF response (UCR).

After recovery from the accident, whenever the driver begins to make a left turn (CS), the driver feels a rush of adrenaline and its physiological effects (CR). Even thinking about making a left turn results in feelings of anxiety. Making a left turn while driving has become a conditioned stimulus for activation of the FFF response.

The Counterconditioning of Anxiety

Counterconditioning is the replacement of one conditioned response by another conditioned response to the same conditioned stimulus (Corey, 1971, p.127). In the counterconditioning of anxiety, a stimulus which has been associated with anxiety is reassociated with a response of relaxation. The response of relaxation is physiologically incompatible with anxiety, therefore the relaxation response "reciprocally inhibits" the response of anxiety. In this way, a particular stimulus once associated with anxiety can be counterconditioned. The counterconditioning of anxiety is also referred to as "desensitization," as the subject becomes less and less sensitive to the stimulus that triggered the anxiety (Wolpe & Wolpe, 1981, p. 50).

Wolpe used deep muscle relaxation to produce a state of relaxation. The state of relaxation was then paired with target stimuli which elicited anxiety. The relaxation response reciprocally inhibited the anxiety, and a new association was learned to the once-anxiety-producing stimuli. In Wolpe's therapeutic system of counterconditioning, clients construct a desensitization hierarchy by enumerating several stimuli having varying levels of anxiety associated with a desensitization target. The anxiety levels are calibrated using the client's subjective units of discomfort (SUD) on a scale of 0 (no anxiety) to 100 (maximum anxiety). Stimuli associated with low levels of anxiety are counterconditioned first, thereby providing a "systematic desensitization" of anxiety-producing stimuli. This gradual approach ensured that the patient did not get overwhelmed with anxiety and retraumatized. Stimuli associated with progressively higher levels of anxiety were then counterconditioned, resulting in the therapeutic desensitization of a particular target. The result was that the anxiety-producing stimuli no longer elicited anxiety. This process resulted in greater behavioral flexibility, better problem solving (with more blood flow to the cognitive centers of the brain), and enhanced performance for the client.

Therapies That Utilize Acupressure Desensitization and Shared Procedures of Treatment

There are some 30 different EP methods (Feinstein, 2003). Among the most widely practiced are Thought Field Therapy or TFT (Callahan, 2000), Emotional Freedom Techniques or EFT (Craig, 2008), Touch and Breathe (Diepold, 2000), and Tapas Acupressure Technique or TAT (Fleming, 1996). There are many hybrids, variations, and combinations of these and other therapies. These therapies use cognitive and exposure elements, as well as acupressure stimulation. They first evoke an anxiety-producing stimulus (exposure), and then apply the therapeutic technique to bring about a relaxation state, counterconditioning client anxiety. During the process, these therapies also introduce a reframing statement (cognitive restructuring), helping the client develop a new cognitive framework. Clients self-rate their level of distress on the SUD scale after each application of the procedure.

Energy psychology interventions typically begin with a statement of self-acceptance while stimulating one or more acupoints, which is believed to ameliorate the client's resistance to treatment. For example, the client will say: "Even though I have this problem, I accept myself and choose to overcome this problem." The subject's distress level generally decreases by two or more SUD points per round of acupoint stimulation (Craig, 2008; Gallo, 1999; Feinstein, 2003; Grudermeyer & Gruedermeyer, 2000). This procedure

is then repeated a number of times focusing on the same stimuli and/or different distressing aspects of the traumatizing material (Craig, 2008). Utilizing this approach, the SUD level is brought to 0 or stabilizes at a low level, providing the client with a sense of calm, behavioral flexibility, and increased cognitive problem-solving capacity. The result of the therapy is that the client can think of the once-distressing stimulus without feeling a sense of discomfort. Additionally, the mental representation of the distressing thought (e.g. the remembered visual recollection of an emotional trauma, body sensations, and internal dialogue) often changes. The results hold over time, indicating that reassociation or counterconditioning of the distressing material has occurred (Church & Brooks, in press; Church, 2009a; Wells, Polglase, Andrews, & Carrington, 2003; Baker & Siegel, 2005). A review of EP research to date notes that in all EP studies that include a follow-up, participant gains have been maintained over time (Feinstein, 2008a).

Studies Support the Efficacy of Acupressure Desensitization

The efficacy of acupressure-assisted EP therapies in promoting counterconditioning, along with all the positive biological changes that accompany it, is attested by several groups of studies, many of them summarized by Feinstein (2008a). This evidence base is in several forms, from case studies and anecdotal collections, to uncontrolled outcome studies, to randomized controlled trials using stringent experimental designs. Anecdotal, case report, and preliminary data studies show a reduction in FFF triggering in subjects (Arenson, 2001; Craig, 2008; Gallo, 1999; Hover-Kramer, 2002; Callahan, 2000; Carbonell & Figley, 1999).

Prelminary Studies

A small research study using evaluative measures, and follow-ups, was done by Carbonell and Figley (1999). They evaluated the effectiveness of the acupressure method, Thought Field Therapy (TFT) and a number of other methods deemed successful by experienced psychotherapists for treating Post Traumatic Stress Disorder symptoms. Other therapies included Eye Movement Desensitization and Reprocessing (EMDR), Visual/ Kinesthetic Dissociation (V/KD) and Traumatic Incident Reduction (TIR).

Subjects were drawn from an ad in the newspaper, and were given an array of psychological tests and physiological measures. Thirty nine subjects were allotted up to four sessions of one of the therapies. The average treatment time by treatment mode was 63 minutes for TFT; 113 minutes for V/KD; 172 minutes for EMDR and 254 minutes for TIR. All subjects started with a SUD level of between 8 and 9. Four to six months later, the subjects in the study, by treatment group, reported a SUD of 3.60 for TFT; 3.30 for V/KD; 2.64 for EMDR and 5.67 for TIR. This study attested to lasting therapeutic effects of TFT along with the effectiveness of the other modalities. Of all the modalities utilized, TFT had the shortest average time of treatment. One limitation of the study was that varying methods of client selection were used, therefore limiting strict comparisons among methods.

Reports of victims of the 9/11 World Trade Center disaster showed relief from persistent troubling memories after EP (Nicosia, 2008; Greene, 2002). Several dozen cases are presented by Feinstein, Eden, and Craig (2005), reporting success with a wide range of physical and psychological ailments. EP has been used in disaster areas throughout the world, where case reports are sometimes the only evidence available because of the difficulty of gathering empirical data (Feinstein, 2008b). EP was used to successfully treat traumatic memories experienced by the survivors of the genocide in Kosovo (Johnson et al., 2001).

Within-subjects Studies

Uncontrolled studies using time-series, repeated measures designs to measure pre-post changes in psychological symptoms have shown a high degree of statistical significance (Feinstein, 2008a). Rowe (2005) demonstrated that an 18-hour EFT training group, involving 102 participants, reduced both the intensity and breadth of psychological distress. Rowe took a baseline measurement a month before the training, and found that participant distress levels were the same as pretest.

Posttest, participant symptom levels had improved to a statistically significant degree, and in two follow-ups, they were found to have maintained their gains. Church & Brooks (in press) performed a similar study with 216 healthcare

workers who received a one-day EFT workshop in which they self-applied EFT for two hours. The participants were workshop attendees at five different conferences. One workshop was taught by Gary Craig, founder of EFT, and the other four by Church. No statistically significant difference was found when EFT was taught by its founder, and when it was taught by another presenter. This study also tracked EFT use after the conferences, and found that those who used EFT the most improved more than those that used EFT little or not at all. Depression, anxiety, and seven other symptom areas all declined to a highly statistically significant degree, as did the breadth and depth of psychological distress.

A study by Church, Geronilla, & Dinter (2009), using a repeated measurement within-subjects design, demonstrated the effectiveness of six sessions of EFT in the reduction of PTSD and other psychological symptoms experienced by seven combat veterans. A significant effect in a study with only seven participants indicates a very large effect size, i.e. the intervention initiated large changes in participant symptoms. In another study, Church (2009a), found a reduction in PTSD and co-occurring conditions among 11 military veterans and their family members as a result of a one week EFT intensive, which contained 10 to 15 sessions of EFT. The average participant PTSD symptom score dropped from well over clinical levels at pretest, to subclinical levels at posttest. Three follow-ups, the last at one year, indicated that participants had maintained their subclinical levels of PTSD symptoms over time. EP was also shown to produce statistically significant improvements in PTSD symptoms in genocide orphans in Rwanda in two pilot studies (Sakai, 2007; Stone, Leyden, & Fellows, 2009).

A number of EEG neuroimaging studies also support the effects of acupressure in calming areas of the midbrain associated with the FFF response. Andrade & Feinstein (2004) studied a group of patients who were diagnosed with Generalized Anxiety Disorder (GAD). Digitized EEG scans were done at the start of TFT acupressure treatment and after four, eight, and 12 sessions. GAD symptoms and SUD ratings reduced over the course of treatment. The brain mapping showed a progressive movement towards EEG normalization as treatment progressed. A single case study on the effects of TFT in normalizing brain waves has been reported by Diepold and Goldstein (2008). They used qEEG frequencies before treatment, after treatment and at 18 months.

The results demonstrated that as reported SUD ratings decreased from the use of acupressure, so did the brainwave frequencies associated with anxiety. Lambrou, Pratt, & Chevalier (2003) found that one 30-minute TFT session was effective in reducing symptoms of claustrophobia for the 4 subjects treated, as well as pre/ post normalization of EEG brain function. A study by Swingle, Pulos, & Swingle (2004) with 9 traumatized auto accident victims, also showed EEG brain normalization. A study, examining heart rate variability values, found that during the course of EP treatment, the HRV of the client entrained with that of the therapist (Bair, 2009).

Randomized Controlled Trials

Randomized controlled trials (RCTs) have also demonstrated the efficacy of EP interventions for many psychological and physical conditions. One of the earliest applications of EP, in the 1970s, was for the treatment of phobias (Callahan, 2000). In one of the first RCTs of EP, Wells et. al. (2003) utilized acupressure-based Emotional Freedom Techniques (EFT) in the treatment of small animal or insect phobias (mouse, rat, spider, cockroach) under laboratory conditions. Subjects screened had to: have a "specific phobia" as designated by the DSM-IV criteria, be over 18 years old, have had this phobia for over three years, and not be receiving current treatment for this phobia. This study used a control group and a double blind rating procedure. Randomly assigned participants were treated individually for 30 minutes with either EFT (n = 18) or a comparison condition known to reduce anxiety, Diaphragmatic Breathing (DB) (n = 17).

The structure of both treatments were kept as similar as possible, with both groups visualizing the feared object while applying the treatment in individual sessions run by a trained research psychologist. The dependent variables included: the Behavioral Approach Test (BAT), three subjective ratings of fearfulness (two using SUD scales) and pulse rate. EFT produced significantly greater improvement than did DB in the ability to approach the feared objects ($p < .02$). EFT also appeared more effective when comparing the three self-report measures.

Reductions in SUD levels using imagination of the feared object were: 3.8 units for EFT and 1.1 units for DB ($p < .005$). Reductions in SUD level when actually approaching the feared object were: 3.7 units for EFT and 1.8 units for DB ($p < .02$). There was no significant difference between EFT and DB on pulse rate. The greater improvement for EFT was maintained, and possibly enhanced at six to nine months follow-up on the behavioral measures. These findings suggest that a single 30-minute treatment session using EFT to reduce specific phobias can produce valid behavioral and subjective effects which last for at least six to nine months after the treatment.

Baker & Siegel (2005) replicated the effectiveness of EFT for treating phobias of small animal and insects using randomized controls. They compared a 45-minute session of EFT ($n = 11$) with a 45-minute supportive Rogerian counseling ($n = 10$) and a no treatment group ($n = 10$). EFT showed statistically significant results compared to the control groups on pre/post measures of: SUD ratings following treatment ($p < .001$), SUD during the Behavioral Approach Test ($p < .002$), and two fear of animal questionnaires ($p < .02$, $p < .001$) and the BAT ($p < .03$).

A follow up averaging 1.4 years later showed that the treatment effectiveness was maintained, albeit in a reduced amount. This attested to the effectiveness of EFT over Rogerian counseling and supported the Wells et al. findings.

Salas, Brooks, & Rowe (2009) have partially replicated the Wells et al. study, where 22 subjects served as their own controls. Half of the subjects received Diaphragmatic Breathing (DB) first and EFT second. The other half received EFT first and DB second. The three criterion ratings were the Beck Anxiety Inventory, a modified Behavioral Approach Test (BAT), and SUD ratings prior to treatment and after the first and the second treatment. EFT produced significant reductions of anxiety on all three measures, whether it was used as the first or the second treatment. DB did not have this effect. Irgens, Uldal, & Hoffart (2007), using a wait list control, demonstrated the effectiveness of TFT for anxiety disorders. A study by Schoninger (2004) showed the effectiveness of a one hour Thought Field Therapy (TFT) session ($n = 24$) compared with a wait list ($n = 24$) in the treatment of public speaking anxiety.

Following the successful within-subjects pilot studies of veterans with clinical levels of PTSD, a randomized controlled trial was undertaken (Church, Hawk, Brooks, Toukolehto, Wren, Dinter, & Stein, 2009). Preliminary reports of this study show participants dropping from high clinical to subclinical levels of PTSD symptoms after EFT, with gains maintained on 3 and 6 month follow-ups, and highly statistically significant results. Other symptoms such as phobias, hostility, paranoia, depression and anxiety also decreased.

A study by Elder et al. (2007) demonstrated that Tapas Acupressure Technique (TAT) was significantly more effective at maintaining weight loss than a weight maintenance strategy group or a qi gong group at the end of ten one hour sessions and at a 12 week follow-up.

Brattberg (2008) administered EFT to a population of fibromyalgia sufferers randomized into a wait list or treatment group. She found a significant improvement in the primary fibromyalgia symptoms of pain, fatigue, and muscular soreness. The intervention in this case was administered over the internet in the form of an online study course.

Church, Piña, Reategui, & Brooks (2009) administered a single session of EFT to a PTSD-positive sample of abused adolescents living in a group home. On one-month followup, the scores of all participants had reduced to normal levels, while those of a no-treatment group had stayed the same. As is typical in EP studies, the effect size was so large ($p < .001$) that the results were highly statistically significant though the sample was small ($n = 16$).

A study of elite athletes used a very brief EFT treatment (Church, 2009c). Members of a championship university basketball team were tested on their performance at free throws, and the height of their vertical jumps. After 15 minutes of EFT, the difference between the treatment group and a placebo control group was 38% on free throws ($p < .03$), though no significant improvement was found in jump height.

Andrade & Feinstein (2004) published clinical research on the treatment of anxiety disorders done in South America. This five-year pilot study, of 5,000 patients diagnosed with a variety of anxiety disorders, used randomized, controlled, and blind rated data. Patients were randomly assigned to an experimental group using Thought Field Therapy (TFT), a form of acupoint therapy, or a control group using Cognitive Behavior Therapy (CBT) with medication (benzodiazepines).

Ratings were taken at one, three, six and 12 months by independent clinicians, who were blind to whether the patients had been in the treatment or control group. Raters only knew the initial diagnosis, symptoms, and severity of patient anxiety problems. Patients were rated using categories of: no improvement, some improvement, and complete remission. At the close of therapy, 90% of the acupoint desensitization group showed at least "some improvement" compared with 63% of the control group. In the "complete remission" category, the acupoint desensitization group had a 76% success rate (i.e. of being symptom free), compared to a 51% success rate for the CBT/ medication group. At one-year follow-up, the gains observed with the acupoint tapping treatments were less prone to relapse or partial relapse than those with CBT/ medication, as indicated by the independent raters' assessments. The mean number of treatment sessions for the acupoint treatment was three sessions, while the mean number of treatment sessions for the CBT/ medication group was 15.

Another substudy by Andrade & Feinstein (2004), indicated a change in neurotransmitter profiles, with the acupoint treatment resulting in lower levels of norepinephrine (a stress related neurotransmitter) and higher levels of serotonin (a calm inducing neurotransmitter) than the CBT/ medication group.

A third substudy of 78 subjects compared the efficacy of acupoint tapping with acupoint needling. The results indicated that tapping reduced anxiety symptoms in 78.5% of the subjects, while inserting acupuncture needles into the same points reduced anxiety in 50% of the subjects, a finding consistent with other published reports that acupressure is at least as effective as needling.

Two randomized controlled trials of EP for test anxiety in students have demonstrated statistical significance. Benor, Ledger, Toussaint, Hett, & Zaccaro (2009) compared two EP treatments with cognitive behavior therapy. All three treatments were found to reduce test anxiety, but the two EP treatments required two sessions, while the CBT treatment required five. In the second study, Sezgin & Ozcan (2009) examined the test scores and anxiety levels of students applying for a university entrance exam. They randomized groups into EFT and diaphragmatic breathing (DB). The EFT group was found to have reduced anxiety, and lower test scores, though there was not a statistically significant change for entrance exam scores between the two groups.

The evidence presented above demonstrates that acupressure treatments reduce the stress response by changing brain function, nervous system arousal, gene expression, hormone levels, neurotransmitter levels, and associated brain functioning. The research indicates that acupressure calms down the FFF response and replaces it with a relaxation response. As demonstrated by Wolpe (1981), we know that the relaxation response is a key element in the counterconditioning of anxiety, phobias and traumatic memories. Given this current understanding, it is desirable to use the quickest, least invasive and most economical techniques for counterconditioning in psychotherapy. Therefore, having clients activate the fear response through active imagination and then tap and/or rub their own acupoints appears to be one of the treatments of choice.

Advantages of Using Acupoint Desensitization

There are many advantages to using acupoint desensitization techniques. Acupressure can be framed as a technique for stress management and self-comforting. This makes it easy for clinicians to explain this novel treatment to clients, and to incorporate it into various types of psychotherapy. The acupressure procedures take only a short time to learn and are easy to apply. The techniques can be used to desensitize traumatic material rapidly, thereby minimizing the risk of retraumatization (Mollon, 2007).

Preliminary studies have shown that acupressure desensitization is an effective tool for combat veterans and survivors of auto accidents who suffer from PTSD (Church, 2009a; Church et al., 2009; Irgens et al., 2007; Swingle et al., 2004). Given the numbers of returning combat veterans, this easily learned technique can reduce much pain and suffering. The techniques can be used outside the office by the client as homework, or as a self-help tool. Effective acupoint desensitization ensures that the client's alarm response is no longer spontaneously triggered by associated memories or conditioned stimuli. The client no longer feels compelled to avoid stimuli associated with the traumatic event or memory. The reduction of compulsive avoidance may have beneficial effects upon maladaptive behavior patterns such

as addictive cravings and other compulsive behaviors. Church & Brooks (in press) found an 83% reduction (pre/ post test, $p < .001$) in cravings (for cigarettes, alcohol, drugs, etc.) among a group of healthcare workers, after 20 minutes of applying EFT. Acupoint desensitization allows the client to calmly rethink aspects of traumatic events and put this information into a more reasonable and/ or broader frame of reference. As Perry (1999) and Van der Kolk (2002) point out, the ability to analyze data effectively is enhanced by the reduction of the FFF response. The client feels a greater sense of calm, competency and self-esteem.

Beyond Counterconditioning, Implications for Psychotherapy and Health

Acupoint desensitization is the first step in the psychobiological healing process of counterconditioning FFF reactions. This frees the client from reflexively reacting in a panicked manner to stimuli. Next, the reduction of the SNS alarm response increases access to prefrontal lobe and neocortex thinking (Amen, 2002; Perry, 1999; Rudin, 2005; van der Kolk et al., 1996). Experiencing a relative sense of calm, the client can create new cognitive frames of reference which restructure the memory (e.g. "I'm a resilient person who got through a difficult challenge"). This process can be facilitated by a simple question such as: "Now that you feel differently, how do you think about the traumatic event/s differently?" This process can also be facilitated with EMDR (Shapiro, 2002), cognitive behavioral therapy (Meichenbaum, 1994), hypnotherapy (Rossi, 2002) psychoanalytic therapy (Mollon, 2008), or other therapies.

Thirdly, the therapist can help the client install and strengthen an adaptive behavioral repertoire and cognitive framework, regarding how to handle challenging situations in the future. This can be facilitated by a simple question such as: "How would you like to see yourself handling a potential trigger situation in the future?" A host of other therapies that are part of the therapist's tool box can facilitate this process. In short, the client is able to transform the disabling traumatic event, think more clearly about the event, think more positively about him- or herself, and develop strategies and skills that help him or her deal more effectively with life. I call this process "acupressure assisted psychotherapy."

The reduction of chronic SNS hyperarousal has powerful implications for physical health as well (Atanackovicab, Krögerc, Serked, & Deterb, 2004; Brattberg, 2008; Ebrect, Hextall, Kirtley, Taylor, Dyson, & Weinman, 2004; Kendall-Tackett, 2009; van der Pompe, Duivenvoorden, Antoni, Visser, & Heijnen, 1997). Kendall-Tackett (2009) notes that traumatic stress increases chronic inflammation and deregulates the sympathetic nervous system. A large epidemiological study by Felitti et al. (1998) found that childhood emotional trauma correlates with many adult diseases, including cancer, heart disease, hypertension, diabetes, and depression.

Acupressure-assisted psychotherapy can help conditions like diabetes, where the FFF response increases blood sugar levels, as well as speeding the healing of wounds (Ebrect et al., 2004), and reducing the symptoms of fibromyalgia that are brought on and exacerbated by chronic stress (Brattberg, 2008). It is established that chronic physiological stress reduces immune function (Atanackovicab et al., 2004; van der Kolk, 1996; van der Pompe et al., 1997). Reduction of unnecessary heightened states of stress through acupressure desensitization can regulate the sympathetic parasympathetic balance and enhance the body's own ability to heal. The management of pain and is another application of acupressure desensitization. Church & Brooks (in press) found that 20 minutes of EFT resulted in a 68% reduction in pain (pre- posttest, $p < .001$), among a group of healthcare workers. Several studies show that acupoint stimulation reduces pain (Fang et al., 2008; Napadow et al., 2007; Ulett, 1992). EP provides a natural, self-applied, side-effect-free alternative for those patients otherwise confined to medication for chronic pain. Elder et al. (2007) demonstrated the effectiveness of TAT acupressure on helping subjects maintain weight loss. These are just a few of the ways that acupoint desensitization can improve physical health.

Practitioners working with traumatized clients need to consider that acupressure assisted psychotherapy does not work 100% of the time, nor does any other technique. Andrade and Feinstein (2004) noted that 90% of people with anxiety disorders were helped by TFT acupressure desensitization, yet subjects asked to review traumatic incidents can get retraumatized (van der Kolk, 1996). Mollon (2007) indicates that this danger is typically minimized with EP. Yet, care must be

taken to provide a safety net for clients: teaching them other calming and grounding skills such as diaphragmatic breathing, sensory comforting (e.g. wrapping themselves in a blanket), present-centered awareness, and visualizing a safe place. My own clinical experience indicates that it is useful to incorporate diaphragmatic breathing with EP. It is also important not to address major historical traumas at a time that clients are dealing with current traumas that are overwhelming them. Wolpe and others recommended starting therapy by counterconditioning triggers with lower SUD levels, then gradually working up to more major complex traumas, and this approach is also recommended with EP. Other practical interventions such as medication consultations, and planning for social support outside the therapy office, are important.

Summary

The acupressure desensitization therapies of energy psychology utilize acupressure to produce a biochemical relaxation response which counterconditions anxiety-producing stimuli and traumatic memories. Anxiety-producing stimuli that were previously associated with the sympathetic nervous system's FFF response are reassociated with the parasympathetic nervous system's relaxation response.

Acupoint stimulation can be accomplished through tapping, rubbing, and/or holding the points. Acupuncture research demonstrates that stimulation of acupoints results in the regulation of cortisol, opioid peptides and serotonin. The stimulation of the opiod peptides result in Central Nervous System analgesia, which deactivates the FFF response and reduces cardiac output. Serotonin production results in the release of GABA by the basolateral amygdala which produces a sense of relaxation.

The net result is the activation of a parasympathetic nervous system relaxation response, which reciprocally inhibits anxiety and results in counterconditioning the particular stimuli which generated the FFF response. The traumatizing thought, or environmental trigger (in vivo stimulus), after counterconditioning, becomes associated with feelings of relative calm. Once calm, the client has greater access to higher levels of cortical thinking. With access to higher levels of thinking, the client can re-evaluate traumatic associations, problem-solve current issues, and experience a sense of competency. Additionally, reduction of chronic hyperarousal improves physical health. The tools of acupressure desensitization are easily learned, and provide an effective self-help tool that empowers the client. EP tools can be safely used outside of medical or therapy settings.

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