

Neuro-Emotional Technique: 35 Years Of Mind-Body Health Care: A Commentary

Authors

Peter Babilis^a DC, Ph.D.
Private Practice, Double Bay, NSW
pbabilis@universalhealth.com.au

Anthony L. Rosner^c Ph.D.
Western States University
8000 NE Tillamook Street, PORTLAND, OR 97213
alrosnertt@gmail.com

ORCID: 0000-0002-3587-3712

Funding statement: No funding was received in the preparation of this paper.

Competing conflicts of interest: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments: (None)

NEURO-EMOTIONAL TECHNIQUE: 35 YEARS OF MIND-BODY HEALTH CARE: A COMMENTARY

Abstract:

In its 35-year history, Neuro Emotional Technique (NET) has resonated with the principles of (i) the biopsychosocial model developed by Engels; (ii) Waddell's application of that model to lower back pain; (iii) numerous observations that the interrelationships of biological, physiological, and psychological factors are all drivers of pain; (iv) manual muscle testing as the centerpiece of Applied Kinesiology introduced by Goodheart; (v) Pert's theory that the expression of emotions united the immune, endocrine, and neurological systems as a hallmark of psychoneuroimmunology; mediated via the Psycho Immune Neuro Endocrine (PINE) Network and finally (vi) the appearance of these concepts and several health disciplines into the application of NET as currently applied by trained practitioners. The overlying objective of the mind-body approach undertaken by NET was to normalize a physiological imbalance caused by an emotional trauma that could not be resolved because of a neurological or meridian deficit. This concept has been updated to specifically indicate that recollection of the past stress-related event has been deemed sufficient to recreate the same type of chemical conditions in the body, which could then be addressed by a combination of manual muscle testing and offering graded interrogations to encourage the patient to access those emotions.

A review of case study, cohort, and randomized clinical trial research included two larger studies. One was the striking demonstration by Monti of parallel changes of fMRI images of the parahippocampus with the reduction of cancer patient distress after NET applications, thereby revealing a possible neurological signature of NET. The second was the report by Bablis and coworkers that, compared to a placebo treatment, an NET regimen produced clinical and statistical significance with declines of Inflammatory and Immune blood markers also declines of virtually all physiological pain and disability markers by gains in quality-of-life indicators at baseline, 1, 3, and 6 months in patients with chronic back pain. Thereby depicting a possible PINE Network signature of NET. These beneficial effects in all outcome measures were sustained, as additional interventions at 3 and 6 months produced no further improvement while at the same time there was no deterioration of these measures during that period. The authors suggested that these results were consistent with the principle of resilience.

Key words: "Neuro-Emotional Technique (NET)", "Biopsychosocial (BPS) Model", "Psychoimmune-neuroendocrine (PINE) network", "Interleukins", "Stress".

Origins of Mind-Body Approaches:

The concepts of Neuro Emotional Technique can be attributed to the duality of mind and body, traced to the Caduceus, the Western symbol of health and healing whose origins were in ancient Greece. The outer snake in the symbol was deemed to represent human biology; the inner aspect indicated consciousness, mental and spiritual life.¹ Eventually this was reflected as the dual serpents representing medicine. It was Hans Seyle, however, whose research in 1956 spanned the domains of pathology, physiology, and psychology demonstrated that when the body underwent psychological stress, it responded with a suite of predictable biological and physiological alterations.² Somatic changes thus affected included swelling of the adrenal cortex, atrophy of the thymus, and gastric and duodenal ulcers.² More significantly, Selye differentiated beneficial responses of the body to stress over the short term from those that occurred over the long term, the latter leading to the exhaustion of coping mechanisms and premature and continuing biological damage.³ Turning to experimental rats, Ader and Cohen demonstrated that rats that were conditioned with an immunosuppressive agent administered with a drinking solution flavored with saccharin became conditioned, such that the stress produced by saccharin alone subsequently produced immunosuppression.⁴ This was to eventually be reflected as the element of conditioning as a modulator of the stress response.

Psychiatric and medical pathologies have converged most prominently in pain disorders.⁵ Further elaboration of the interrelatedness of the body's systems in reaction to stress appeared with the biopsychosocial (BPS) model developed by Engel,⁶ viewing illness as a stressor that entailed the complex interaction of biological, psychological, and social variables.^{5, 7} Pain was regarded as an experience, resulting not only from input caused by peripheral stimulation, but also by inhibitory and facilitating messages descending from the brain i.e., the brain was shown to play a key role in the generation of subjective pain responses.⁷ Indeed, it was found in a workers compensation setting that predictors of outcome of chronic pain were based more on psychosocial variables than physical ones.⁸ ⁹ Overall, the rapid growth of literature on the multi-dimensional aspects of pain required approaches that considered different contributors to pain sensation and the experience of suffering.¹⁰ A multiplicity of research studies showed from multiple perspectives that stress was a leading candidate producing multiple manifestations of physiological distress (Table 1).

TABLE 1: PHYSIOLOGICAL AND PSYCHOLOGICAL DISORDERS PRODUCED BY STRESS

Author	Effect
Melczak, 1999 ¹¹	Affects pain level and degree of suffering in chronic pain patients, especially those with neuromusculoskeletal conditions
Leeuw, 2007 ¹² Sloan, 2008 ¹³	Depressive type comorbidities are associated with chronic pain.
Hemingway, 1999 ¹⁴	Cardiovascular disorders are associated with stress, such as hypertension, atherosclerosis, and cardiovascular disease.
Spilloer, 2007 ¹⁵ Friedman, 2008 ¹⁶	Irritable Bowel Syndrome. Depression, anxiety, and social isolation are related to chronic heart failure outpatient mortality.
Sapolsky, 2000 ¹⁷	Metabolic disorders are associated with stress, such as insulin resistance, metabolic X syndrome, and obesity.
McEwan, 1998 ¹⁸ McEwan, 2000 ¹⁹	Immune disorders are associated with stress, such as chronic inflammatory processes and autoimmune diseases.

Accordingly, Waddell, when discussing lower back pain, indicated that pain could not be comprehensively assessed without a full understanding of the individual's symptoms and therefore the subsequent messages conveyed to the brain from tissue damage experienced.²⁰ Specifically, Waddell concluded that the coexistence of chronic stress and chronic pain indicated that stress reduction needed to be included in the treatment of chronic non-specific low back pain.²¹ Concerning the BPS model of pain, Pollard, Hardy and Curtin extracted 112 articles from the scientific literature in their final search and concluded that the interrelationship of biological, physiological, and psychological factors as drivers of pain made it incumbent that mind-body approaches to understand the full impact of pain should not be lost upon chiropractors.²²

Beginnings of the mind-body approach to managing stress for chiropractors had actually been observed in 1995 when spinal manipulation was performed on two hypercholesterolemic patients while the subject contemplated an associated stress event. The result was a reduction of serum cholesterol levels.²³ Compartmentalization of specific and non-specific effects, often considered the separation of body and mind, was held to be a false dichotomy in chiropractic and other therapeutic approaches by Newell and coworkers, who advanced the concept of Contextually Aided Recovery (CARE).²⁴

Applied Kinesiology:

Not only was a connection of emotional stresses to spinal manipulation emerging, but also a link to manual muscle testing was established in Applied Kinesiology (AK), introduced by George Goodheart in 1964.²⁵ Its premise was that the response of the neuromuscular system to chemical, physical, and emotional stimuli served as an indicator

of the functional status of the patient's physiology. A weak (inhibited) muscle test in which the target muscle gave way to the examiner's pressure indicated a functional maladaptive physiological response to the stimulus. A later preliminary trial with 13 phobic subjects revealed an inhibited muscle test when a perceived threat stimulus was presented.²⁶ A subsequent pilot randomized, controlled, double-blind clinical trial involving 18 phobic community college students revealed that spinal manipulation significantly reduced the intensity of emotional arousal that had been documented by muscle testing.²⁷ Good Interexaminer reliability of muscle tests upon the deltoid and psoas muscle was established between two practitioners of differing skill levels with kappa values of 0.62 and 0.67, respectively.²⁸

Cognitive Behavioral Therapy:

It became clear that an interdisciplinary approach to treating back pain needed further exploration. One such approach was exemplified by cognitive behavioral therapy (CBT), which sought the attenuation of a given manifestation of (pain) behavior by environmental reinforcement.²⁹ It assumed that emotions are associated with distorted cognitions or thought patterns that could arise from chronic pain. Knowledge of the context of pain could restructure the cognition of that pain in terms of perception and propagation. In particular, CBT regarded conditioned reactions to be largely self-activated on the basis of learned expectations and introduced systematic patient training of coping skills to help in times of distress.²⁹

Expression of Emotions through Neural Pathways:

A major conceptual shift was provided by Pert and coworkers who, in 1985, described how brain function is modulated by numerous chemicals in addition to classical neurotransmitters, many of these informational substances described as neuropeptides had originally been studied in other contexts as hormones. Exceeding 50, most if not all were shown to alter behavior and mood states. Particular focus was placed upon neuropeptide receptors found on mobile cells of the immune system that were mediated by distinct receptors that were indistinguishable from those found in the brain, glands, and immune system. They formed a network of communication between brain and body, probably representing the biochemical substrate of emotion.³⁰

Pert further expressed the theory that the expression of emotions united the immune, endocrine, and neurological systems. Repression, on the other hand, blocked network pathways and impeded the flow of the "unifying chemicals that run both our biology and our behavior".³¹

This message indicated that one needed to consider healthcare interventions offering the possibility of unblocking these pathways so that the pain experiences which resisted previous treatments might yet be extinguished. The key to this unblocking was to allow repressed emotions to be physiologically expressed. What was apparent was the linking of a psychosocial approach to emotions, deemphasizing physical interventions alone in favor of the inclusion of contextual emotional factors.

Assembly into Neuro Emotional Technique:

Building upon these principles and incorporating several health disciplines, Neuro Emotional Technique (NET) was introduced by Scott Walker³² as a multimodal intervention based upon eight core principles:

1. **Physiologically Based Emotions**: The work of Dr Candice Pert indicates that emotions do not only reside in the brain but in combination with neuropeptides, hormones and even DNA can permeate the entire body.³³
2. **Pavlovian Responses**: Humans can hold conditioned emotional responses to situations in the same way that Pavlov's work demonstrated how conditioned responses arise in animals.³⁴
3. **Traditional Chinese Medicine (TCM), the emotions and meridian system**: Drawing on acupuncture and the Law of Five Elements (Fire, Wood, Water, Metal, Earth) it has been clinically established that there is a correlation between emotions and the meridian system as has been expressed in acupuncture theory for 2000 years.³⁵ Current concepts hold that tightness in the fascial system might represent acupoints and meridians in the human body.³⁶
4. **Concept of Repetition Compulsion**: Relating to Sigmund Freud's work, the concept that people who have been emotionally traumatised may unconsciously seek to revisit or recreate the same or a similar trauma in future situations in their life.³⁷
5. **The Role of Memory**: Refers to the concept that remembering or reflecting on a prior memory of a trauma or stressful event can produce physiological reactions in the body.³⁸
6. **Evaluating Semantic Responses**: The notion that bodily reactions can occur in response to words, language and other symbols in relation to their meaning to an individual whether visually in seeing the item auditorially, hearing it be named or described and even mentally creating a representation of it.³⁹
7. **Manual Muscle Testing**: It has been shown that muscle testing can serve to access the physiology of the body as part of ascertaining whether there is an emotional charge or

stress responses. The previously described muscle's capability of resisting or giving way to an outside force indicated the status of the nervous system.²⁵ Specifically, Walker proposed that the muscle test responds to cognitive and emotional stimuli.⁴⁰ In addition to the good interexaminer reliability of the deltoid and psoas muscle tests described previously,²⁸ Caruso and Leisman demonstrated significant improvement of the interexaminer reliability of the muscle test applied to the sternal portion of the pectoralis major with increasing years of experience of the examiners.⁴¹ A narrative review of over 100 studies related to the manual muscle test and applied kinesiology used as part of chiropractic technique disclosed evidence for good reliability and validity in the use of the manual muscle test for patients with neuromusculoskeletal dysfunction. The observational cohort studies demonstrated good external and internal validity, together with 12 randomized controlled trials indicating that manual muscle results were not dependent upon examiner bias.⁴² Finally, three diplomates in applied kinesiology who performed manual muscle tests of the middle deltoid of 30 volunteers with or without neck pain revealed no significant statistical differences among the examiners in their muscle classifications or in the forces applied during testing. In addition, clear distinctions between weak and strong muscle classifications both in the absence or presence of therapy localization were shown by both electrogoniometry and vibromyography.⁴³

8. **Like Cures Like**: Under the *Law of Similars*, reliving the same memory by simulating the experience in a clinical setting can serve to reactivate the psycho-neuro-immunology and endocrinology of the initial traumatic or stressful event.⁴⁴

The overlying objective of the mind-body approach undertaken by NET was to normalize a physiological imbalance caused by an emotional trauma that could not be resolved because of a neurological or meridian deficit. *Recollection* of the past stress-related event was sufficient to recreate the same type of chemical conditions in the body.⁴⁵ Essentially, the neurochemical change that occurs in stress was proposed to have a lasting effect upon patients, having the potential to hinder the patient's ability to resolve current health issues. Stress created the potential for a widespread reaction to pain that extended beyond the location of the pain.⁴⁶

Recognised as informational molecules, neurotransmitters, neuropeptides and cytokines were introduced due to their ability to carry complex messages to specific receptors throughout the body. Nerve signaling was shown to occur with these molecules binding specifically to receptors on the postsynaptic membrane of a neuron, muscle cell, or gland with the binding triggering an influx that governs the activity of the target cell. Like hormones, neurotransmitters have been considered chemical messengers but are unique in that they are released from the presynaptic nerve terminal in the brain, moving across the synaptic cleft. Hormones, on the other hand, are produced by glands, are released into the bloodstream, and act on distant target cells. The differences between neuropeptides and neurotransmitters are shown in Table 2.⁴⁷

TABLE 2: DIFFERENCE BETWEEN NEUROPEPTIDES AND NEUROTRANSMITTERS⁴⁷

Neuropeptides	Neurotransmitters
Short chains of amino acids which serve as neurotransmitters	Endogenous chemicals that enable neurotransmission
Have high molecular weight	Have low molecular weight
Are slow-acting	Are fast-acting
Produce a slow response	Produce an acute response
Produce a prolonged action	Trigger a short-term response
Act on a number of receptor proteins	Most act only a specific receptor
Change metabolic machinery	Most do not change metabolic machinery
Alter the expression of specific genes	Most do not alter gene expression
Synthesized in rough endoplasmic reticulum and Golgi apparatus	Synthesized in the cytosol of presynaptic neuron terminals
Synthesized in low concentrations	Synthesized in high concentrations
Found all over the neuron	Only found in axon terminals of presynaptic neurons
Synthesized in large dense-core vesicles (LDCVs)	Stored in small secretory vesicles (SSVs)
Axonal streaming occurs in few cm/day	Released within few milliseconds upon the arrival of an action potential
Released to the synaptic cleft along with another neurotransmitter	Released individually depending on the action potential
Have a different site of action than their origin	Released in direct apposition to their target cells
Vesicles are autolysed without reusing; once released, they do not undergo reuptake	Destroyed by enzymes in the synaptic cleft or are reuptaken by presynaptic terminal or neuroglia by active transport
1000 times more potent than neurotransmitters	Less potent when compared to neuropeptides
Oxytocin vasopressin, TSH, LH, GH, insulin, and glucagon are examples	Acetylcholine, dopamine, serotonin, and histamine are examples

All these elements played role in the concept of psychoneuroimmunology (PNI) as a school of thought maintaining that, when an individual recalls a memory of a past event in which a stress response occurred, similar chemical conditions are recreated in the body--even though the stressor may no longer be present.⁴⁵ NET posited that this neurochemical change had a lasting or recurrent effect on patients, while PNI addressed the interaction between psychological processes and the nervous and immune systems of the body through a range of assessments.⁴⁸ That may be applied to the assessment of the psychosocial components of the biopsychosocial model.⁵

Areas of the body responsible for emotional modulation contain significant concentrations of neuropeptide and cytokine receptors termed nodal points.⁴⁹ What brought this entire discussion of chemical messengers and the connection between the brain, spinal cord, and immune systems into the context of low back pain and the purview of chiropractors is that significant concentrations of the nodal points of these informational molecules were reported in these particular locations.³¹ One such nodal point is the dorsal horn of the spinal cord, the location where sensory information enters the central nervous system. This “hot spot” has been described as an anatomical location which processes an abundance of emotional information and thus adds an important dimension to chiropractic intervention.⁴⁹

Following the introduction of the psycho-immune-neuroendocrine (PINE) network model, it was postulated and asserted that stress (increased allostatic load) acted as a key driver of one or multiple mental health and medical conditions, like, coronary heart disease, vascular cognitive impairment, musculoskeletal complaints as well as mental disorders such as major depressive disorder.⁵⁰ In essence, the possible range of stressors has broadened beyond being psychosocial in nature to also include psychoneuroimmunological and psychoneuroendocrine factors that cause or contribute to dysfunction in the PINE network. In the evidenced based research discussed below it would appear that NET has a direct and positive impact on the PINE network.

Beyond chemical events, NET became established as an integrative treatment approach for traumatic stress, combining emotional, cognitive, and motor processing on a standardized format designed to guide patients in overcoming their physiological connection to traumatic events and memories, including but not limited to Type O disorders of non-mechanical origin (more recently known as non-MSK or non-muculoskeletal disorders) with a somatoform overlay that replicates symptoms of common musculoskeletal disorders.⁵¹

Early Research:

An early indication that NET’s capacity to unblock Pert’s blocked flow of the “vital, feel good, unifying chemicals” came from Peter Bablis’ case studies of two patients who were beset with hypothyroidism. Here the treating practitioner attempted to locate the thyroid dysfunction by means of muscle testing. In specific terms, testing the teres minor muscle in the upper extremity provided a weak response until becoming strong when the practitioner contacted a reciprocally specific TCM meridian access point. This cycle was repeated by assessing an emotion associated with thyroid dysfunction (muddled thinking, feelings of loss and vulnerability, instability, paranoia, and anxiety). This was done by offering graded steps to encourage the patient to access those emotions which, when contemplated, pointed toward the dysfunctional meridian.⁴⁶ In support of this rationale was the proposal that emotional experiences in the presence of physical and neurological

trauma could cause a meridian imbalance presenting as a physical condition that does not resolve.⁵² The concept found to be most significant and uppermost in the patient's mind was identified by the previously strong teres muscle test turning weak. Treatment then consisted of having the patient hold the meridian access point and holding the prefrontal area of the cranium while the practitioner provided a somatic stimulus to the spinal segment (in this instance an instrumental adjustment posterior to anterior applied along the facet plane of C1, C4, and C7) associated with the meridian. Retesting the meridian entry point demonstrated that the muscle tested strong after challenge. In both patients completing the NET intervention, energy levels returned to normal with TSH levels approaching normal values.⁵³ Further support came from the successful NET treatments of two additional hypothyroid patients five years later.⁵⁴ Yet additional symptom resolution following NET applications was evident in 3 cases of anovulation infertility,⁵⁵ one case of separation anxiety disorder,⁵⁶ 7 cases of spider phobia,⁵⁷ and 7 cases in which elite rowers demonstrated improved performance.⁵⁸

More Robust Research:

More robust experimental evidence began to accumulate in 2008 when Bablis sequentially allocated 60 participants with chronic cervical pain into groups receiving either an active or sham NET protocol. Measurements of visual analog scale and pressure algometer recordings of four trigger point locations displayed significant improvement compared to the control group. Specifically, the improvements on the Visual Analog Scale registered 7.1-7.6 across the four trigger points (suboccipital region, levator scapulae region, sternocleidomastoid region, and temporomandibular region) in the NET- treated cohort, while changes of 0-0.1 were found in the control group.⁵⁹ Elsewhere, Jensen demonstrated using a sit-and-reach (SR) test that, in 45 participants in a randomized, controlled trial, NET subjects compared to an active control group (stretching instruction) and a passive control cohort (no instruction or intervention) showed statistically superior flexibility after 40 minutes of experimentation. The mean changes in the SR scores were +3.1 cm in the NET group, +1.2 cm in the active control group and +1.0 cm in the passive control participants.⁶⁰

Following the protocol of a randomized controlled trial that had been published previously,⁶¹ Karpouzis and her colleagues performed a randomized control trial of 41 children aged 5-12 diagnosed with attention deficit hyperactivity disease (ADHD). Participants were divided into groups receiving NET, a placebo, or no treatment. An intention to treat analysis indicated that NET therapy produced significant results in all primary and secondary results; specifically, in the Conners ADHD Index; Conners Global Index; and the Inattentive, Hyperactive/Impulsive, and overall scales of the Diagnostic and Statistical Manual of Mental Disorders. Essentially, the emotional component of NET

therapy delivered clinically meaningful and significant improvements to children with ADHD.⁶²

One of the most far-reaching demonstrations that emotions, NET, and neural pathways were intimately connected emerged from a team of researchers at Thomas Jefferson University in Philadelphia, under the direction of Daniel Monti. Focusing on 23 cancer patients who had cancer-related experiences that produced traumatic stress, the investigators took functional MRI images on all patients while listening to the accounts of their distressing cancer memory before and after receiving NET or a sham treatment.

After four or five brief sessions, only those patients who received NET reported less distress with an overall improvement of their emotional state. At the same time, the fMRI brain images showed connectivity changes between the cerebellum and limbic structures as well as the brain stem approaching normal patterns. Specifically, the parahippocampus which had been activated previous to the NET treatments was no longer activated following the NET sessions (Figure 1).

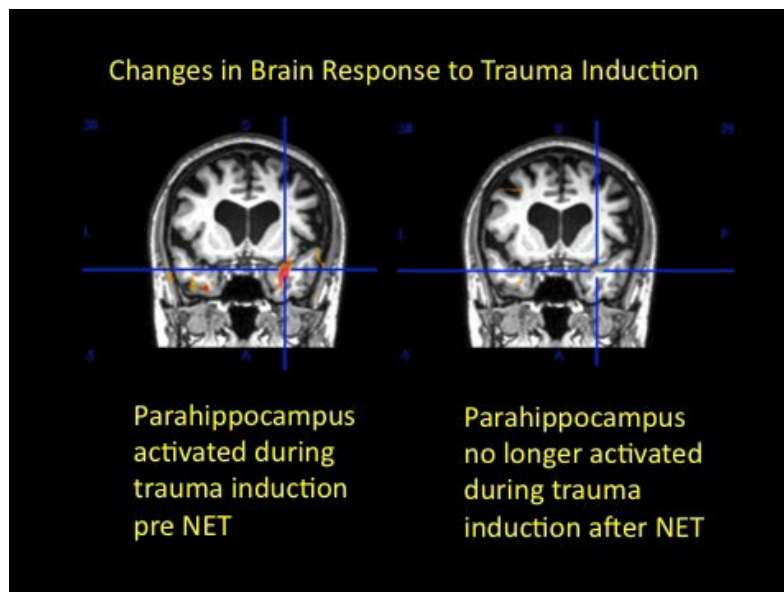


FIGURE 1: fMRI images of the parahippocampus before and after NET treatment. 63

Essentially, this observation established an important neurological signature of the effect of an NET intervention and linked emotion to the regulation of the autonomic nervous system.⁶³ This was the first time that an intervention could be shown to change the neurophysiology of cancer patients with elevated levels of associated stress. It was also

the first time that an intervention could be shown to change interconnectivity within the brain as it relates to the cerebellum.⁶⁴

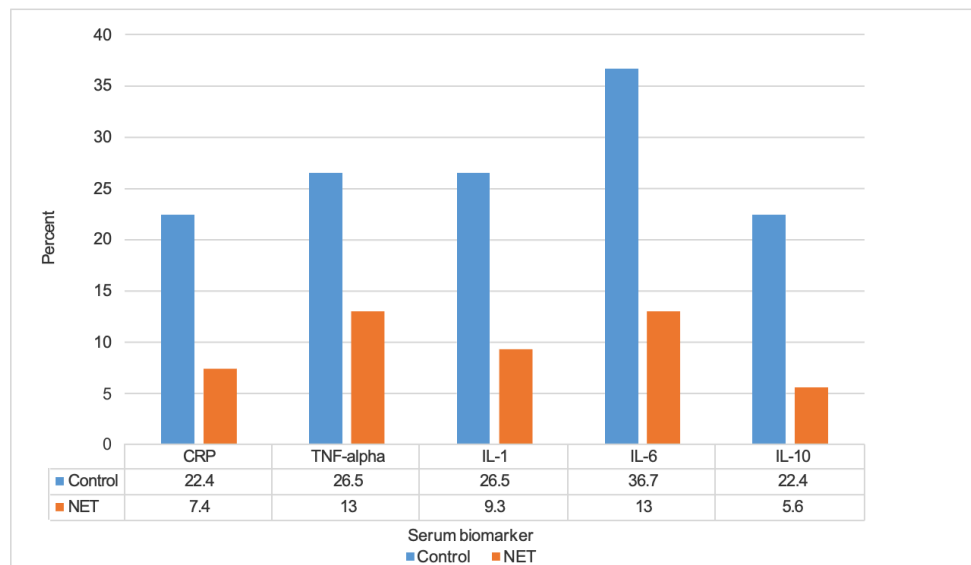
Later Research:

Continuing with his earlier research, Bablis and coworkers recently reported that an NET protocol produced an improvement of chronic low back pain compared to a placebo procedure in a randomized controlled trial across 19 scales representing both subjective and objective health outcome measures. Included were pain (Quadruple VAS scale representing current, maximum, minimum, and average pain on a 10-point scale,⁶⁵ disability (Oswestry Disability Index⁶⁶), the psychoneuroimmunology markers of blood serum levels of C-reactive protein, tumor necrosis factor- α , interleukin -1 (IL-1), IL-6, and IL-10, and ten dimensions of a quality of life and function scale (Short Form Health Survey Scale⁶⁷). All were assessed at baseline and at 1, 3 and 6 months following the intervention of NET or control treatments given twice weekly for 4 weeks in a population of 112 patients.

The NET intervention consisted of multiple steps related to various body entry points, including checking that the patient was congruent with being pain-free. The intervention process included finding an unresolved event and an associated meridian access point (MAP) on the participant's body. Each MAP was considered to be a specific skin point associated with certain emotions.⁶⁸ Participants were then asked to contemplate the unresolved event and the associated emotion while kinesthetic stimulation of specific spinal segments was applied.

Compared to the placebo, the NET regimen produced clinical and statistical significance ($P < 0.0001$) with declines of virtually all physiological, pain and disability markers, accompanied by gains in quality-of-life indicators at baseline, 1, 3, and 6 months. Reductions of the percentages of patients whose biomarkers lay outside the normative range were achieved at 1, 3, and 6 months by NET, by not achieved in the control interventions.

Especially noteworthy was the significant reduction of all five blood inflammatory markers specifically caused by NET treatment (Figure 2). Since these markers have been associated with a variety of chronic inflammatory conditions (such as rheumatoid arthritis,⁶⁹ infection, tuberculosis, pneumonia,⁷⁰ inflammatory bowel disease,⁷¹ major depression,⁷² and generalized pain⁷³), one can speculate that the possible beneficial effects of the NET intervention were indeed widespread and not limited to musculoskeletal complaints.



N=112 patients

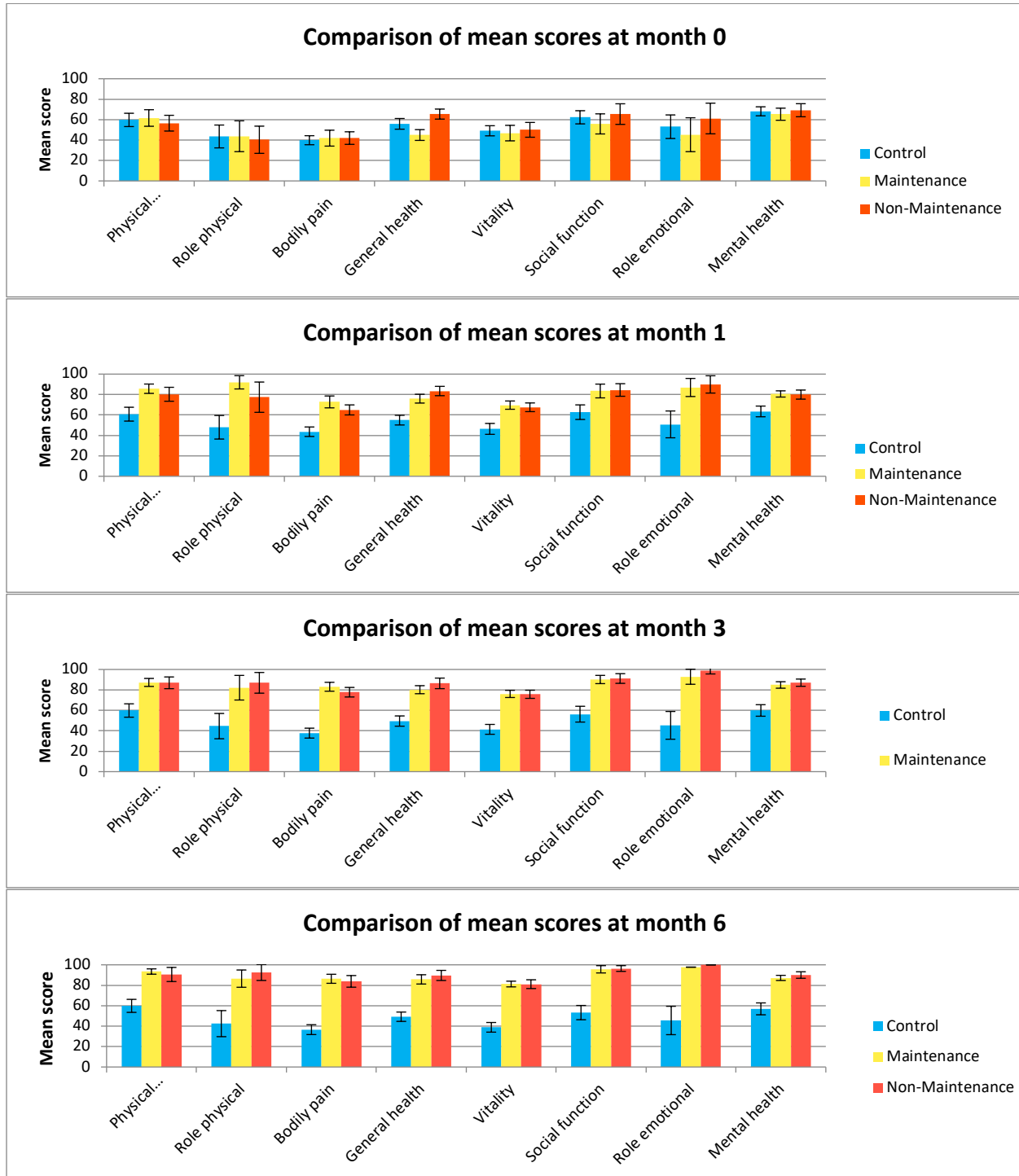
FIGURE 2: Blood serum levels of inflammatory markers outside of normal ranges. NET = neuro emotional technique; CRP = C-reactive protein; TNF- α = tumor necrosis factor α ; IL = interleukin.⁷⁴

The reduction of this broad spectrum of both subjective and objective outcome measures by the NET intervention in a lockstep fashion provided further support to the notion that mind and body are intimately connected, and that emotions can trigger measurable physiological changes as elegantly described by Pert.³¹

The improvements were observed in the first month after 8 treatments^{74,75} and were sufficiently promising to warrant an extension of Bablis' original clinical trial of chronic low back pain patients subjected to NET treatment or a placebo. That extension involved changing the treatment for the original clinical trial into two additional groups: an ongoing therapy group (the maintenance cohort) and a no-further-therapy group (non-maintenance).²⁵ This approach was to offer a comparison to several previous investigations that showed that repeated chiropractic supportive (maintenance) regimens²⁶⁻²⁹ were indicated to sustain the pain and disability improvements primarily experienced after an initial block of spinal manipulations.

In this subsequent randomized clinical trial, Bablis was able to demonstrate that continuing interventions by a technique described as NET beyond one month conferred no additional benefit to patients with chronic low-back pain as determined by a total of 19 outcome measures encompassing disability, pain, physiological, and quality of life outcomes. The stability of the 10 SF-36 scales after maximal improvement at 1 month of NET intervention out to 6 additional months is shown in Figure 3. The breadth of these

benchmarks showing stable outcomes from the conclusion of treatments at 1 month to 6 months spoke to the efficiency of the NET intervention, as additional interventions at 3 and 6 months produced no further improvement while at the same time there was no deterioration of these measures during that period.⁷⁵



N=112 patients

FIGURE 3: SF-36 Health mean scores. The changes in SF-36 Health mean scores across months 1 to 6 were significant ($P<.001$) for the maintenance and non-maintenance groups compared to control. However, differences between the maintenance and non-maintenance groups were not ($P>.05$). Symbols and error bars demonstrate means +standard error of the mean of the data analyzed. SF-36 = Short Form Health Survey; SEM = Standard Error of the Mean.

These results stood in marked contrast to numerous maintenance care trials which exhibited a need to impose additional treatments for up to nine months in order to sustain improvements produced by chiropractic spinal manipulation.²⁶⁻²⁹ In terms of the Oswestry Disability Index (ODI), patients receiving an additional treatment every three weeks for the 9 months following an initial month of 12 treatments displayed marked improvement, suggesting that the initial block of interventions was insufficient to maintain a level of improvement.³⁰ In a similar trial of chronic low back pain patients, only those receiving spinal manipulation every 2 weeks for a 9 month period following an initial block of 12 treatments during the first month produced statistically and clinically significant improvements in pain (VAS), ODI, spine flexion, lateral bending, and global assessment scales,²⁸ buttressing the previous findings.²⁶ Elsewhere, in a pragmatic, investigator-and-assessor-blinded randomized controlled trial, patients with recurrent or persistent non-specific low-back pain scheduled for maintenance chiropractic care rather than calling for interventions when pain recurred (control group) demonstrated 12.8 fewer days in total with bothersome low back pain over a 12-month study period compared to the control group.³⁰ Longer pain-free periods approaching 10 weeks were also attributed to the maintenance care group of patients.³¹ These findings likewise suggested that additional treatments were required to attain improved medical improvement.

Discussion:

To date, the two major signatures that have proven to be among the most robust evidence in select conditions in support of NET research are the previously discussed fMRI neuroimaging studies of Monti at the Thomas Jefferson University Hospital^{63, 76, 77} and the blood inflammatory marker and quality of life outcomes demonstrated by Bablis and coworkers.^{74, 75}

These two streams of research have served as bookends with The Neurological (Brain – Supraspinal) Signature on one end and the PINE Network Signature at the other end. Most notably PNI has described the interaction between psychological processes and both the nervous and immune systems of the body through a variety of assessments,⁴⁸ and NET, which indicates that these neurochemical changes have a lasting or recurrent effect upon patients.^{74, 75} The application of these findings would appear to have satisfied all the psychosocial components of the biopsychosocial model.⁵

Because NET appears to have broader-reaching implications in managing health, future research efforts have been directed toward its possible (i) anti-ageing effects demonstrated by telomere length measurements, (ii) management of type 2 diabetes, (iii) reduction of infertility, and (iv) management of traumatic brain injury observed at the Thomas Jefferson University. Longer term surveillances of NET effects are also needed.

Conclusions:

NET appears able to link emotional, physical, chemical, neurological, endocrine and immune factors in its application as a therapy to the individual patient. Its access to emotions testifies to it being able to treat the individual patient as opposed to a formulaic, one-size-fits-all approach. Specifically, it appears that NET has begun to show an effect on all aspects of the PINE Network targeting biopsychosocial contributors to the pain experience. This is unique to patients with spinal and other musculoskeletal conditions. In this manner, NET has demonstrated that it should be considered as an effective adjunctive procedure, not only in the management of multiple conditions, but perhaps in the promotion of optimal health.

REFERENCES:

1. Dacher ES. A brief history of mind-body medicine. *Int J Transpersonal Stud.* 2014;33:13.
2. Selye H. A syndrome produced by diverse nocuous agents. 1936. *J Neuropsychiatry Clin Neurosci.* 1998;10:230-1.
3. Selye H. *The Stress of Life.* Columbus, OH: McGraw-Hill; 1978.
4. Ader R, Cohen N. Behaviorally conditioned immunosuppression. *Psychosom Med.* 1975;37:333-40.
5. Gatchel RJ. Comorbidity of chronic pain and mental health disorders: the biopsychosocial perspective. *Am Psychol.* 2004;59:795-805.
6. Engel GL. The need for a new medical model: a challenge for biomedicine. *Science.* 1977;196:129-36.
7. Turk DC, Monarch ES. *Psychological Approaches to Pain Management: A practitioner's Handbook.* 2nd edition. New York, NY: Guilford Press; 2002. p. 481-94.
8. Van Wijk RM, Geurts JW, Lousberg R, Wynne HJ, Hammink E, Knape JT, et al. Psychological predictors of substantial pain reduction after minimally invasive radiofrequency and injection treatments for chronic low back pain. *Pain Med.* 2008;9:212-21.
9. Collie A, Sheehan L, Lane TJ, Iles R. Psychological distress in workers' compensation claimants: Prevalence, predictors and mental health service use. *J Occup Rehabil.* 2020;30:194-202.
10. Scascighini L, Sprott H. Chronic nonmalignant pain: a challenge for patients and clinicians. *Nature clinical practice Rheumatol.* 2008;4:74-81.
11. Melczak R.. Pain and stress: A new perspective. In: Gatchel RC, Turk DC, editors. *Psychosocial Factor in Pain: Critical Perspectives.* New York, NY: Guilford Press; 1999. p. 89-106.
12. Leeuw M, Goossens ME, Linton SJ, Crombez G, Boersma K, Vlaeyen JW. The fear-avoidance model of musculoskeletal pain: current state of scientific evidence. *J Behav Med.* 2007;30:77-94.
13. Sloan TJ, Gupta R, Zhang W, Walsh DA. Beliefs about the causes and consequences of pain in patients with chronic inflammatory or noninflammatory low back pain and in pain-free individuals. *Spine (Phila Pa 1976).* 2008;33:966-72.
14. Hemingway H, Marmot M. Psychosocial factors in the aetiology and prognosis of coronary heart disease: systematic review of prospective cohort studies. *BMJ.* 1999;318:1460-7.
15. Spiller R, Aziz Q, Creed F, Emmanuel A, Houghton L, Hungin P, et al. Guidelines on the irritable bowel syndrome: mechanisms and practical management. *Gut.* 2007;56:1770-98.

16. Friedmann E. Sudden Cardiac Death in Heart Failure Trial Investigators. Relationship of depression, anxiety, and social isolation to chronic heart failure outpatient mortality. *Am Heart J.* 2006;152:940. e1-e8.
17. Sapolsky RM, Romero LM, Munck AU. How do glucocorticoids influence stress responses? Integrating permissive, suppressive, stimulatory, and preparative actions. *Endocr Rev.* 2000;21:55-89.
18. McEwen BS. Stress, adaptation, and disease: Allostasis and allostatic load. *Ann N Y Acad Sci.* 1998;840:33-44.
19. McEwen BS. The neurobiology of stress: from serendipity to clinical relevance. *Brain Res.* 2000;886:172-89.
20. Waddell G. Clinical assessment of lumbar impairment. *Clin Orthop Relat Res.* 1987:110-20.
21. Waddell G, Feder G, McIntosh A, Lewis M, Hutchinson A.. *Low Back Pain Evidence Review, 1st Edition.* London, United Kingdom: Royal College of General Practitioners; 1996.
22. Pollard H, Hardy KE, Curtin D. Biopsychosocial model of pain and its relevance to chiropractors. *Chiro J Aust.* 2006;6:82-91.
23. Peterson KB. Two cases of spinal manipulation performed while the patient contemplated an associated stress event: The effect of the manipulation/contemplation on serum cholesterol levels in hypercholesterolemic subjects. *Chiropr Technique.* 1995;7:55-9.
24. Newell D, Lothe LR, Raven TJL. Contextually Aided Recovery (CARE): A scientific theory for innate healing. *Chiropr Man Therap.* 2017;25:6.
25. Goodheart G. *Applied Kinesiology Research Manuals.* Detroit, MI: Private; 1964-1995.
26. Peterson KB. A preliminary inquiry into manual muscle testing response in phobic and control subjects exposed to threatening stimuli. *J Manipulative Physiol Ther.* 1996;19:310-6.
27. Peterson KB. The effects of spinal manipulation on the intensity of emotional arousal in phobic subjects exposed to a threat stimulus: a randomized, controlled, double-blind clinical trial. *J Manipulative Physiol Ther.* 1997;20:602-6.
28. Pollard H, Lakay B, Tucker F, Watson B, Bablis P. Interexaminer reliability of the deltoid and psoas muscle test. *J Manipulative Physiol Ther.* 2005;28:52-6.
29. Thieme K, Turk DC. Cognitive-behavioral and operant-behavioral therapy for people with fibromyalgia. *Reumatismo.* 2012;64:275-85.
30. Pert CB, Ruff MR, Weber RJ, Herkenham M. Neuropeptides and their receptors: A psychosomatic network. *J Immunol.* 1985;135:820s-6s.
31. Pert CB. *The Molecules of Emotion : Why We Feel the Way We Feel.* New York, NY: Scribner; 1997.

32. Walker S. Neuro Emotional Technique seminar. NET. Encinitas, CA; 1994.
33. Pert CB. The wisdom of the receptors: Neuropeptides, the emotions, and bodymind. *Adv Mind Body Med* 2002; 18:30–35.
34. Aguado L. Neuroscience of Pavlovian conditioning: A brief review. *Span J Psychol* 2003;6:155–167.
35. Chase CR. The geometry of emotions: Using chakra acupuncture and 5-Phase Theory to describe personality archetypes for clinical use. *Med Acupunct*. 2018;30:167-78.
36. Bai Y, Wang J, Wu JP, Dai JX, Sha O, Tai Wai Yew D, et al. Review of evidence suggesting that the fascia network could be the anatomical basis for acupoints and meridians in the human body. *Evid Based Complement Alternat Med*. 2011;260510.
37. Casoni D. “Never twice without thrice”: An outline for the understanding of traumatic neurosis. *Int J Psychoanal* 2002;83:137–159.
38. van Giezen AE, Arensman E, Spinhoven P, Wolters G. Consistency of memory for emotionally arousing events: A review of prospective and experimental studies. *Clin Psychol Rev* 2005;25:935–953.
39. Korzybski A. *Science and Sanity: An Introduction to Non-Aristotelean Systems and General Semantics*. San Francisco: International Society for General Semantics, 1994.
40. Walker S. Ivan Pavlov, his dog and chiropractic. *Digest Chiropr Econ*. 1992;34:36-46.
41. Caruso W, Leisman G. A force/displacement analysis of muscle testing. *Percept Mot Skills*. 2000;91:683-92.
42. Cuthbert SC, Goodheart GJ, Jr. On the reliability and validity of manual muscle testing: A literature review. *Chiropr Osteopat*. 2007;15:4.
43. Rosner AL, Leisman G, Gilchrist J, Charles E, Keschner MG, Minond M. Reliability and validity of therapy localization as determined from multiple examiners and instrumentation. *Funct Neurol, Rehabil Ergonom*. 2015;5:365.
44. Karen D'Huyvetter, Andreas Cohrssen, *Homeopathy, Primary Care: Clinics in Office Practice*, 2002, Volume 29, Issue 2, Pages 407-418
45. Hanada T, Yoshimura A. Regulation of cytokine signaling and inflammation. *Cytokine Growth Factor Rev*. 2002;13:413-21.
46. Walker S. Neuro emotional technique seminar manual. Encinitas, CA; 2006.
47. Panawala L: Difference between Neuropeptides and Neurotransmitters. *The Biology Blog: I PEDIAA*; 2017.
48. Irwin M, Vedhara K. *Human Psychoneuroimmunology*. Oxford, UK: Oxford University Press; 2005.

49. Pert C. The wisdom of the receptors: Neuropeptides, the emotions, and bodymind. *Adv Mind Body Med.* 2002;18:30-5.
50. Stapelberg, Nicolas J.C., Branjerdorn Grace, Adhikary Sam, Johnson Susannah, Ashton Kevin and Headrick John: "Environmental Stressors and the PINE Network: Can Physical Environmental Stressors Drive Long-Term Physical and Mental Health Risks?" *Int Journal Environ Res Public Health* 2022 Oct; 19(20): 2022.
51. Pollard H. Reflections on the "type O" disorder. *J Manipulative Physiol Ther.* 2005;28:547.
52. Walker S. NET seminar folder. Encinitas, CA: NET, Inc.;1996.
53. Bablis P, Pollard H. Hypothyroidism: A new model for conservative management in two cases. *Chiropr J Austral.* 2004;34:11.
54. Bablis P, Pollard H. A mind-body treatment for hypothyroid dysfunction: A report of two cases. *Complement Ther Clin Pract.* 2009;15:67-71.
55. Bablis P, Pollard H, Monti DA. Resolution of anovulation infertility using neuro emotional technique: A report of 3 cases. *J Chiropr Med.* 2006;5:13-21.
56. Karpouzis F, Pollard H, Bonello R. Separation anxiety disorder in a 13-year-old boy managed by the Neuro Emotional Technique as a biopsychosocial intervention. *J Chiropr Med.* 2008;7:101-6.
57. Jensen AM, Ramasamy A. Treating spider phobia using Neuro Emotional Technique: Findings from a pilot study. *J Altern Complement Med.* 2009;15:1363-74.
58. Jensen AM. The use of Neuro Emotional Technique with competitive rowers: A case series. *J Chiropr Med.* 2011;10:111-7.
59. Bablis P, Pollard H, Bonello R. Neuro Emotional Technique for the treatment of trigger point sensitivity in chronic neck pain sufferers: A controlled clinical trial. *Chiropr Osteop,* 2008; 16:4.
60. Jensen AM, Ramasamy A, Hall MW. Improving general flexibility with a mind-body approach: A randomized, controlled trial using neuro emotional Technique(R). *J Strength Cond Res.* 2012;26:2103-12.
61. Karpouzis F, Pollard H, Bonello R. A randomised controlled trial of the Neuro Emotional Technique (NET) for childhood Attention Deficit Hyperactivity Disorder (ADHD): A protocol. *Trials.* 2009;10:6.
62. Karpouzis F, Bonello R, Pollard H. Final data of the effects of the Neuro Emotional Technique (NET) for pediatric Attention-Deficit/Hyperactivity Disorder (AD/HD): A randomized trial. 11th Biennial Congress. Rio International Hotel, Rio de Janeiro, Brazil: World Federation of Chiropractic; 2011. p. 44.
63. Monti DA, Tobia A, Stoner M, Wintering N, Matthews M, He XS, et al. Neuro emotional technique effects on brain physiology in cancer patients with traumatic stress symptoms: preliminary findings. *J Cancer Surviv.* 2017;11:438-46.

64. Monti D What has the new science revealed? : One Foundation; 2011.
65. Von Korff M, Deyo RA, Cherkin D, Barlow W. Back pain in primary care. Outcomes at 1 year. *Spine (Phila Pa 1976)*. 1993;18:855-62.
66. Davidson M, Keating JL, Eyres S. A low back-specific version of the SF-36 Physical Functioning scale. *Spine (Phila Pa 1976)*. 2004;29:586-94.
67. Garratt A, Schmidt L, Mackintosh A, Fitzpatrick R. Quality of life measurement: Bibliographic study of patient assessed health outcome measures. *BMJ*. 2002;324:1417.
68. Jagirdar PC. The theory of five elements in acupuncture. *Amer J Chinese Med*. 1989;17:135- 8.
69. Burska A, Boissinot M, Ponchel F. Cytokines as biomarkers in rheumatoid arthritis. *Mediators Inflamm*. 2014;2014:545493.
70. Monastero RN, Pentyala S. Cytokines as biomarkers and their respective clinical cutoff levels. *Int J Inflamm*. 2017; 4309485.
71. Moldoveanu AC, Diculescu M, Braticevici CF. Cytokines in inflammatory bowel disease. *Rom J Intern Med*. 2015;53:118-27.
72. Audet MC, Anisman H. Interplay between pro-inflammatory cytokines and growth factors in depressive illnesses. *Front Cell Neurosci*. 2013;7:68.
73. Zhang J-M, An J. Cytokines, inflammation and pain. *Int Anesthesiol Clin*. 2007;45:27-37.
74. Bablis P, Pollard H, Rosner AL. Stress reduction via neuro-emotional technique to achieve the simultaneous resolution of chronic low back pain with multiple inflammatory and biobehavioural indicators: A randomized, double-blinded, placebo-controlled trial. *J Integr Med*. 2022;20:135-44.
75. Bablis P, Pollard H, Rosner AL. Resiliency and endurance of Neuro Emotional Technique effects on chronic low back pain found in a randomized controlled trial with implications for cost savings. *Evidence-Based Compl Altern Med*. Submitted for publication, 2023.
76. Monti DA, Stoner ME, Zivin G, Schlesinger M. Short term correlates of the Neuro Emotional Technique for cancer-related traumatic stress symptoms: a pilot case series. *J Cancer Surviv*. 2007;1:161-6.
77. Monti DA, Tobia A, Stoner M, Wintering N, Matthews M, Conklin CJ, et al. Changes in cerebellar functional connectivity and autonomic regulation in cancer patients treated with the Neuro Emotional Technique for traumatic stress symptoms. *J Cancer Surviv*. 2018;12:145-53.