

ACPR — the Auto-Contractile Pain Reflex

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Intrinsic Bodily Reactions to Painful Emotions: Key to the Puzzle of Somatization

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ABSTRACT

An extensive group of loosely related functional somatic disorders, disorders without direct organic cause and where the emotions are observed or suspected to have major impact, remain difficult to understand

because the process by which the emotions could do this has not been clear. These disorders are known by many names; among them are psychosomatic, psychogenic, hysterical, and functional somatic symptoms. They may be either continuous or episodic. They may involve more than one bodily organ, but not necessarily. They may involve hidden childhood abuse or other unsuspected or unremembered trauma. Most often, several emotions are implicated but their nature may not be initially apparent.

Somatization may result when the Somatic Affect, or bodily feeling state, of the emotion(s) involved with a psychotrauma share a common bodily location with a functioning organ. This paper describes the *Auto-Contractile Pain Reflex* (ACPR), a reflexive reaction to painful somatic affect, which appears central to the formation and pathophysiology of many of these disorders. The probable effects of this reflexive response on several bodily mechanisms are discussed, as well as a general treatment approach.

BACKGROUND

The assumption that the emotions play a formative role in physical health is widespread. “*When you get your emotional act together, your body will get well*” is a popular conviction, and not only among laypersons – the principle threads through the alternative/complementary health movement and a significant portion of mainstream medicine as well. One of the earliest to identify the role of emotions in physical health was Socrates who advised physicians to, “*Heal the soul first*”. In those days the passions (emotions) were understood to be felt experiences in an ethereal (pneuma)* soul body that was suffused† (krasis di’ holōn) throughout the physical body.¹ Instead of being a bipolar separation of Mind-Body, human beings were thought to be a Body-Soul continuum, each part with some influence over the other. Since the emotions suffused the physical organs it logically followed that if the emotion was upsetting – fear, anger, shame, for example – the physical organ(s) the emotion(s) suffused would necessarily be upset. But the concept of a direct link between the emotions and the physical organs was lost when medical thinking (after Darwin and William James) ceded the Soul to religion, where any medical considerations have been largely ignored.

* The original meaning of *pneuma* is ‘breath’, but that did not mean the breath of air. It is equivalent to the Hindu *prana* and Chinese *ch’i* or *qi*.

† Similar to the way in which electromagnetic fields from radio, television, high voltage lines, and electrical appliances suffuse our bodies.

But how to “*get your emotional act together*” remains a question; the emotions are not so submissive as to be easily dislodged – and they do not tread lightly.[‡] The functional somatic disorders, disorders in which behavior, personal relationships, and other psychosocial factors are suspected of interfering with the functioning of the body’s organs, cross many fields of medicine. These factors may be hidden childhood abuse or other trauma. Their course may be relatively constant or episodic. The number continues to increase – among the most recently identified are severe paroxysmal hypertension² and non-epileptic attack disorder.³ (See Table.) They are pandemic; as much as one third of the population suffers from one or another functional somatic disorder⁴. Functional gastrointestinal disorders alone trouble up to 20% of the adults in the industrialized world.⁵ Other studies indicate as many as 75% of physical symptoms presented to primary care physicians cannot be explained by organic cause alone, often indicating potentially treatable psychiatric (emotional) disorders.⁶ And these do not include the hundreds of not so minor ways the emotions plague the body on an everyday basis.

Once known as ‘nervous affections’⁷ or ‘nervous indigestion’⁸ the current welter of identifying terms: psychosomatic, conversion disorder, somatoform, psychogenic, hysteria, neurosis, etc., imply a separation between mind and body⁹ presuming that the body has gone awry as a result of one or another hidden mental or neurological factor. The most common term, *psychosomatic*, has come to suggest a hidden conflict between conscious and subconscious desires – a contention silently objected to by the suffering patient all the while the perplexed physician is silently contemplating it. The reluctance to identify these as real physical disorders is reflected in the title words – as well as the approach – of two recent comprehensive texts on the subject, *Symptoms in the Mind*¹⁰ and *Treatment of Functional Somatic Symptoms*.¹¹

Examples of Functional Somatic Disorders

- Anorexia**
- Bulimia**
- Functional Heartburn**
- Functional Constipation and Diarrhea**
- Functional Sexual Disorder**
- Irritable Bowel Syndrome**
- Low Back Pain Syndrome**
- Non-Epileptic Attack Disorder**
- Premenstrual Tension Syndrome**
- Psychogenic Migraine**
- Severe Paroxysmal Hypertension**
- Unspecified Dyspepsia**

These examples are drawn from the 1988 Rome *Criteria of Functional Gastrointestinal Disorders*, the World Health Organization’s *International Classification of Disease (ICD-10)*, *DSM-IV*, and other clinical observations. It is by no means complete; it includes only those disorders in which the impact of emotions on the body is so great as to be impossible not to recognize. These are disorders where specific associations are shown between individual emotions and specific dysfunctions, such as the association between feelings of inadequacy and irritable bowel syndrome, and between anxiety and digestive dysfunction. Some would include asthma, chronic fatigue syndrome, lupus, and psoriasis and other disorders in which the patient’s emotional state is suspected of contributing to the onset and course of illness.

Few fields of medicine have demanded as much thought and effort to penetrate their obscurity as the functional somatic disorders. Unfortunately, while volumes have been written describing abstract relationships between one’s external and internal life, exact-

[‡] “The emotions ... are the most powerful of all human agencies, and have been well described as giants fighting for the bodies and souls of mankind.” From *The Anatomy of Emotion* by Edward Lazell, 1929

ly how external life transforms or somatizes into internal bodily dysfunction has been left glaringly unclear. The simple explanation of the ancient Greeks that troubling emotions upset the organs because they suffused them, has been replaced by lengthy explanations that fail to describe in any objective detail how psychological responses to psychosocial factors could disrupt normal, healthy organs in the many ways they so obviously do.

OBJECTIVES

The hypothesis described in this paper is that the functional somatic disorders mainly arise, not from psychological or neurological factors as has been supposed, but from an intrinsic bodily reaction to the painful emotions involved with these disorders. Since this reaction is not mediated by the cerebral cortex it cannot be reversed by conscious intention. The paper details biological mechanisms that disrupt normal functioning of healthy organs as a result of this reaction and describes a general treatment approach that is consistent with the hypothesis.

DISCUSSION

Current concepts of emotion

The currently dominant school of medical/psychological thought places the emotions in an emotional/visceral brain that sends signals to many areas of the body resulting in overt physical symptoms. This concept generally follows Cannon's principle that "*thalamic neurones ... discharge in a particular combination ... to innervate muscles and viscera ... with thrills, excitements or depressions ... as the neurones enter the afferent pathways (to the cortex)*".¹²

The opposing school, relying largely on the reports of thousands of professionals that emotions are released from the body during and as a result of their bodywork, and on subjective experience, places emotion in the physical body.

However – whether the emotions originate in the brain, in the physical body, or even in a soul body as thought by the ancient Greeks – the hallmark of every emotion is its body-felt sensory experience – identified here as the emotion's Somatic Affect.[§]

Characteristics of Somatic Affect

1. Each emotion has its own specific somatic affect, or feeling-state. It is self-evident to almost all that love, joy, grief, anger, fear, shame, and inadequacy are all felt differently from each other. **

[§] *Somatic Affect* is defined as the core body-felt experience of an emotion, exclusive of any physical reaction, mental thought, or behavioral response that the somatic affect may provoke.

At least one authority maintains that emotions cannot be perceived by an inner sense,¹³ but the fact that a few cannot internally sense emotion does not mean that it is not possible for others to do so. Whether the inability to internally sense emotions results from a genetic deficit as in color-blindness, from a psychological factor, or from deep somatic repression is an individual question.

2. All somatic affects are centrally located deep within one of three regions of the torso. We experience the feeling states of love, joy and grief within the chest, feeling states of anger, excitement and fear within the upper abdomen, and feeling states of confidence, shame and inadequacy within the lower abdomen.

There is near universal agreement as to these anatomical loci; a heart shape, as one example, indicates love to most people in nearly all cultures and religions.

3. The somatic affects of anger, embarrassment, fear, grief, inadequacy and shame are experienced in the same region of the torso that contains the bodily organs with those emotions which are psychologically linked in the functional somatic disorders.

In Western psychological profiles, anger and fear are largely associated with functional eating disorders, shame and inadequacy with functional colon problems, grief with functional chest pain, and fear with functional respiratory disorders. In a similar fashion, Chinese medicine identifies the Seven Emotions of anger, joy, worry, anxiety, grief, fear, and fright as being associated with specific organs and specific organ dysfunction.¹⁴

4. The somatic affects of anger, embarrassment, fear, grief, inadequacy, and shame are all experienced as being somatically painful.

Even though not usually identified in the literature as being painful,⁺⁺ it is self evident that these emotions and their variants are painful. Many have reported having had emotional pain more excruciating than any physical pain they had ever known. Except for intensity, the anguish of physical pain in the heart is little different than the anguish of intense grief. The most extreme result of grief is cardiac arrest,¹⁵ Isocrates' heart stopped from grief when he learned of the loss of the battle at Chersonesus.¹⁶ Fear can also cause cardiac arrest as can joy that is so intense as to become painful.¹⁷

5. All pain, whether physical or emotional, initiates a strong contractile reflex, which has been identified and termed the Auto-Contractile Pain Reflex (ACPR).¹⁸ This ability of the emotions to provoke visceral contractions has only recently been identified,¹⁹ but it is certainly not a new thought.²⁰ Once initiated, the reaction is maintained as long as the precipitating impetus continues.²¹

⁺⁺ For purposes of brevity only a few primary emotions are listed here. The fact that all are usually preceded by the words "*I feel ...*" rather than "*I think ...*" indicates that they are truly emotional feeling states and not just mental thoughts or concepts.

^{††} Over fifty current texts on emotion, functional somatic disorders and pain were consulted in preparation of this article; only one indexed the term 'painful emotions' or identified emotions as being intrinsically painful.

An example of physical response to pain occurs when muscle tissue surrounding a broken bone contracts. The phenomenon is medically identified as the 'splinting reflex' because it immobilizes the broken ends of the bone. Usually described as innate bodily wisdom because it prevents the sharp ends from further damaging the surrounding tissue, the reflex is not always wise; for example it immobilizes a dislocated shoulder and prevents it from regaining its normal position.

One common experience of ACPR occurs when a sudden painful gas bubble causes the gut to contract, an event most have experienced at one time or another. The body reacts equally to pain of physical or psychogenic origin.^{22,23} There is no essential difference between the gut spontaneously contracting around a painful bubble of gas or around the painful gut-felt emotions of embarrassment and/or shame.

6. Because painful somatic affect is experienced deep within the torso, the visceral contractions encircle and constrict the physical organs that reside within the affected bodily region.^{††}

This is often felt as the cramping of the upper gut while waiting to deliver a speech, report to the boss, or ask someone out on a date. An extreme example of intense abdominal emotional pain is the battlefield terror that clamps the lower abdomen with enough force to cause involuntary urination and defecation.

7. These contractions inexorably impinge upon the tissue of the bodily organs they enclose and the constriction that results will impede normal functioning of the affected organ. Constant or recurring painful emotional stimuli reinitiate the contraction, resulting in a long-term functional somatic disorder. The idea that contraction causes organs to malfunction is not new. In the 2nd century A. D., Soranus of Ephesus, a leading gynecologist of the Greek Methodist medical tradition, identified constriction as the cause of dysfunctioning organs²⁴ and treated them with a range of procedures designed to relax and dilate them.²⁵

Even the simple constricting pain of anxiety interferes with digestion; the constricting emotions of deep shame, overwhelming grief and breathtaking fear upset normal functioning more profoundly.

8. Painful somatic affect does not readily abate because the contraction initiated by emotional pain traps the pain that caused it. These spontaneous 'gut reactions' are difficult, if not impossible, to offset by conscious intention because they are not filtered, or mediated, through the cerebral cortex.²⁶

The contraction initiated by the painful emotion traps the emotion as it surrounds the pain, just as touching a live electric wire with the palm provokes a reflex that contracts the palm and causes it to clench the wire.

A crying child illustrates how difficult, if not impossible, it is to overcome this contractile reflex through conscious intent. Each inhalation the child takes expands the

†† In 1595 Thomas Wright wrote in *Passions of the Minde*, "Two sorts of Passions affect all men, some dilate, and some compress and restringe the heart..."

pain of sadness, this in turn re-contracts the chest, causing the child to shudder and gasp through the episode.

The well-known reaction of the single celled amoeba proteus, which has no muscles, demonstrates the effects of ACPR; when touched by a needle probe the amoeba contracts and enfolds the needle. The amoeba is unable to eject the intruding needle; it is only by the slow migration of ligands from the contracted area to the opposite side of the cell that the amoeba is able to eventually move away from the intrusion.

9. Since the organs in the gut and the gut itself are poorly enervated, the physical contractions are not felt as strongly as they might be if occurring elsewhere in the body. This scarcity of nerves does not, however, prevent the perception of emotional pain, as emotional pain appears to be experienced without nociception.

The gut is so poorly enervated that, “we are unaware of the contractions and relaxations of the stomach and intestines during digestion, of the rubbing of the stomach against the diaphragm, of the squeezing motions of the spleen, of the processes of the liver...”.²⁷

Pain and the perception of pain are only partially understood.²⁸ Until recently it was assumed that pain was entirely a nociceptive process (activation of nerve filament endings in the skin and/or viscera by noxious elements) however it is now known that some pain can be experienced without nociceptor input.²⁹

10. Since ACPR is independent of conscious awareness, memory of the events associated with the painful emotions may be lost to consciousness without lessening the adverse visceral effects of ACPR.

Early-life trauma may be associated with somatic symptoms years later.³⁰ Patients with chronic intractable abdominal pain (CIAP) often report prior physical or sexual abuse.³¹ Functional somatic disorders are often indicators of hidden childhood sexual, emotional or physical abuse³² or other hidden trauma.^{33,34,35}

Impact of visceral contraction on local body tissue

Contraction of major abdominal muscle groups may account for a large portion of bodily organ dysfunction but smooth muscle tissue is probably involved as well. Smooth muscle tissue regulates many organ functions,^{36,37} and smooth muscle cells contract under pressure³⁸ as well as initiating and maintaining contraction in their regulatory processes.

First and foremost, the organ’s ability to function is entirely dependent upon a common factor – the continual supply of nutrients and removal of waste products. Both actions are accomplished in capillary beds of the vascular system that are woven through each organ. All necessary hormones, amino acids, lipids, glucose, and other nutrients are perfused through the walls of the capillaries into the organ tissue while carbon dioxide and waste metabolites are drawn off.³⁹ Insufficient perfusion causes many disease states⁴⁰ and functional disturbances will occur when perfusion falls below the basal metabolic demands of the organ.⁴¹

Flow through every capillary is regulated by a precapillary sphincter which consists of a single smooth muscle cell spiraled around the capillary's entrance.^{42,43} These precapillary sphincters can not be controlled through the cerebral cortex because they are not enervated. They respond only to the demands of the local tissue they serve. Partially contracted when at rest, the sphincters open fully when relaxed by histamine and other waste metabolites thrown off by nearby tissue cells during normal cellular activity. Since capillary diameter is slightly less than an average red blood cell, which squeeze through by distorting the capillary, even a slight additional constriction will affect capillary flow and perfusion. (See figure)

Contraction, either because of emotional pain directly affecting the precapillary sphincters, or indirectly because of the major visceral reflex, will reduce perfusion to the organs situated within the region of painful somatic affect. The impairment of capillary perfusion over the long term will thus be a primary factor in the pathophysiology of the functional somatic disorders.

In addition to controlling capillary perfusion, smooth muscle tissue is found in the walls of all hollow internal structures including the organs, the digestive tract where it regulates phasic relationships, and the blood vessels. The baroreceptors on the aortic arch and carotid arteries that control blood volume and pressure are dependent on the intrinsic mechanisms of smooth muscle tissue. These functions are usually not mediated by the cerebral cortex, or controlled by the central or autonomic nervous systems. While the CNS does mediate peristaltic action, local phasic action of the gut is largely controlled by the gut's smooth muscle tissue. It is unlikely that any organ system even partially dependent upon smooth muscle tissue to regulate its actions would function normally when impacted by the pressures induced by emotional pain.

Clinical observations that support the hypothesis.

Two pilot studies have demonstrated the relationship between local emotional pain, ACPR, and the functional somatic disorders. These studies were organized following numerous reports of relief of functional somatic disorders following SHEN Physio-Emotional Release Therapy sessions during which deeply held emotional trauma was released. SHEN® techniques focus the bioflux, or qi, from the practitioner's hands at the anatomical loci of painful somatic affect to eliminate deeply held emotional trauma and pain.⁴⁴

The first study, on premenstrual tension syndrome, showed "significant long term symptom relief and behavioral change with 11 out of 13 subjects" after the hidden feelings of shame and inadequacy were released during SHEN procedures applied at the region of the uterus and ovaries.⁴⁵ The eleven reported greatly lessened symptoms during the six-month follow-up period. Several who reported being "nearly out of control" when pre-menstrual, reported marked reduction of symptoms following treatment, achieving states of calmness they had not believed impossible. All subjects had received either two or three treatments at the height of symptoms. (The two who showed no

change were controls whose symptoms had not meet criteria for premenstrual tension syndrome.)

During the second study, on long-term migraine syndrome, “24 out of 35 migraines were aborted in mid-attack during treatment.” Here the SHEN focussed relaxation procedures were applied to the region of the baroreceptors on the aortic arch and carotid arteries. All subjects accessed and released deep grief; many reported the surfacing of previously hidden memory of childhood events that were directly linked to the onset of the migraines. All reported greatly lessened frequency of attacks. Several long-term migraine sufferers reported no further episodes for periods well outside their normal expectations.⁴⁶ (One, who had endured migraines of three to four days duration at least every two weeks, reported no migraines at all for over two years following treatment, after which contact was lost.)

Subsequently, several hundred cases of functional somatic disorders of all sorts with similar outcomes have been documented by hundreds of SHEN practitioners in the United States, Canada, England, Ireland, Norway and Scotland. In all cases, painful emotions were released during treatment.

Additional support comes from Chinese biofeedback technicians who use biofeedback techniques during which temperature in the gut is reduced in order to reduce anger.⁴⁷

TREATMENT APPROACH

Many patients are resistant to psychotherapy for disorders they perceive to be physical,⁴⁸ and ordinary massage or biofeedback relaxation techniques are not suitable because they cannot address the deep smooth muscle tissue tensions involved. Techniques that relax the deep local tensions resulting from painful somatic affect appear to be the most promising treatment approach, one easily combined with psychotherapy for added benefit when the patient is not resistant.

CONCLUSION

There is substantial evidence that the body, feeling what is inside itself, responds directly to the presence of painful emotions by contracting around the interrelated painful somatic affect. This involuntary, reflexive contraction appears to be the initiating step in the pathophysiology of the functional somatic disorders by provoking deleterious responses in the surrounding tissue. Release and completion of the painful emotions associated with the psychotrauma that preceded the functional somatic disorder appears to complete the disorder. By extension, the model offers a rationale for how grief at the heart-thymus region might depress T-cell production and how the fluctuating day-to-day experience of emotion stresses and affects bodily functions in other ways we have come to expect as normal.

Obviously, further clinical study will be needed for both the hypothesis and the best treatment approach to be securely established. The wealth of subjective observations of so many people, the anecdotal records of thousands of bodywork practitioners, and the real possibility of more effective treatment for the functional somatic disorders urge that this be undertaken. The benefits to those who suffer from these disorders and to the cost of health care would be enormous.

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- ¹ Annas J. *Hellenistic Philosophy of Mind*. Berkely, Calif: UC California Press; 1992:37-70.
- ² Mann, S. Severe Paroxysmal Hypertension (Pseudopheochromocytoma), *Archives of Internal Medicine*; 1999,159:670-4.
- ³ Reilly G, et al, The association of sexual and physical abuse with somatization: characteristics of patients presenting with irritable bowel syndrome and non-epileptic attack disorder, *Psychological Medicine*; 1999, 29:399-406.
- ⁴ Uexküll T. Ed. *Psychosomatic Medicine*, München, Germany: Urban & Schwarzenberg; 1997:804.
- ⁵ Farthing J, Gomborone J. Abdominal symptoms and the mind. In Watkins A. ed. *Mind-Body Medicine: A clinician's guide to psychoneuroimmunology*. Edinburgh, UK: Churchill Livingstone; 1997:130-1.
- ⁶ Kroenke K. et al, Physical Symptoms in Primary Care, In *Archives of Family Medicine*; 1994,3:774-779.
- ⁷ Friedenwald J, Morrison T. Morrison S. *Clinics on Secondary Gastro-Intestinal Disorders, Reciprocal relationships*. Baltimore, Maryland: William Wood; 1938:viii, 164-202.
- ⁸ Alvarez W. *Nervous indigestion. 2 impression corrected*. New York, New York: Paul B. Hoeber; 1931:3.
- ⁹ Sharpe M. Wessely S. Non-specific ill health: a mind body approach to functional somatic symptoms. In Watkins A, ed. *Mind-Body Medicine: A clinician's guide to psychoneuroimmunology*, Edinburgh, UK: Churchill Livingstone; 1997:169-73.
- ¹⁰ Sims A. Fundamental concepts of descriptive psychopathology. In *Symptoms in the Mind: An introduction to Descriptive Psychopathology*. 2 Ed. London: Saunders; 1995:1-23.
- ¹¹ Sharpe M. Mayou R. Bass C. Concept, Theories and Terminology. In Mayou, R, Bass, C, Sharpe, M, eds. *Treatment of Functional Somatic Symptoms*. New York, New York: Oxford University Press; 1995:3-16.
- ¹² Cannon, W. The James-Lange Theory of Emotion: a critical examination and an alternative theory. *American Journal of Psychology*; 1927, Vol 39, 120.
- ¹³ Kenny A. *The Metaphysics of Mind*. Oxford, Eng: Oxford University Press; 1989:53-55.
- ¹⁴ Kaptchuk T. *The Web that has no Weaver*. New York, NY: Congdon and Weed; 1983:129-31.
- ¹⁵ Marieb E. *Human Anatomy & Physiology*. 4 Ed. Menlo Park, Calif: Addison Wesley Longman; 1998: 429.
- ¹⁶ Fréré C. *The Pathology of Emotions: Physiological and Clinical Studies*. London: University Press; 1899:214-5.
- ¹⁷ Gould G, Pyle W. *Anomalies and Curiosities of Medicine*. Philadelphia, Penn.: W. B. Saunders; 1896:524-5.
- ¹⁸ Pavek R, Daily T. Disruption of the auto-contractile pain response. *Journal of Occupational Therapy Practice*. 1990, Vol 1, No. 3. 53-61.
- ¹⁹ Pavek R. Emotion and the Contractility Factor. Presented at the Founding Conference of the Chinese Society for Behavioral Medicine and Biofeedback; January 16, 1988; Tainjin, People's Republic of China.
- ²⁰ Tuke D. *Illustrations of the Influence of the Mind upon the Body*. Philadelphia, Penn: Henry C. Lea; 1873:227.
- ²¹ Silverthorn D. *Human Physiology, an Integrated Approach*. Upper Saddle River, New Jersey: Prentice Hall; 1998: 366.

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- ²² Wall P, Melzack R, eds. *Textbook of Pain*. 3 ed. Edinburgh, UK: Churchill Livingstone; 1994:904.
- ²³ Huether S, McCance K. *Understanding Pathophysiology*. St. Louis, Mo: Mosby;1996:320.
- ²⁴ Soranus; Temkin O, trans-ed. Soranus' Gynecology. Baltimore, Maryland: Johns Hopkins Press; 1956.
- ²⁵ Rubenstein G. *The Riddle of the Methodist Method: Understanding a Roman Medical Sect. Dissertation for degree of Doctor of Philosophy*. King's College, Cambridge, England; 1985:122-69. Thesis.
- ²⁶ Farthing J, Gomborone J. *Abdominal symptoms and the mind*. In Watkins A, ed. *Mind-Body Medicine: A clinician's guide to psychoneuroimmunology*. Edinburgh, UK: Churchill Livingstone; 1997:129.
- ²⁷ Cannon, W. The James-Lange Theory of Emotion: a critical examination and an alternative theory. *American Journal of Psychology*; 1927, Vol 39, 111.
- ²⁸ Hansen M. Pathophysiology: *Foundations of Disease and Clinical Intervention*. Philadelphia, Penn: W. B. Saunders; 1998:657.
- ²⁹ Copstead L. *Perspectives on Pathophysiology*. Philadelphia, Penn: Saunders; 1995:930.
- ³⁰ Mayou R, Smith K, Post traumatic symptoms following medical illness and treatment, *Journal of Psychosomatic Research* 1997, 43:121.
- ³¹ Yamada T, ed. *Handbook of Gastroenterology*. Philadelphia, Penn: Lippencott–Raven; 1988.
- ³² Mann, S. Severe paroxysmal hypertension(Pseudopheochromocytoma), *Archives of Internal Medicine*; 1999,159:670-4.
- ³³ Reilly G, et al, The association of sexual and physical abuse with somatization: characteristics of patients presenting with irritable bowel syndrome and non-epileptic attack disorder, *Psychological Medicine*; 1999, 29:399-406.
- ³⁴ Biofield Therapeutics Section. In Berman B, Larson D, et al, *Alternative Medicine: Expanding medical horizons, A Report to the National Institutes of Health on Alternative Medical Systems and Practices in the United States*. Washington, D.C. Government Printing Office; 1994:143.
- ³⁵ Pavek R. Assumptive models in research of biofield therapeutics. Presented at the Conference Examining Research Assumptions in Alternative Medical Systems; July 12, 1994; Bethesda, Maryland.
- ³⁶ Wilson K, Waugh A. *Anatomy and Physiology in Health and Wellness*. 8 ed. Edinburgh, UK: Churchill Livingstone; 1996:29-30.
- ³⁷ Porth C, ed. *Pathophysiology: Concepts of Altered Health States*. 5 ed. Philadelphia, Penn: Lippincott;1998:28-9.
- ³⁸ Hansen M. Pathophysiology: *Foundations of Disease and Clinical Intervention*. Philadelphia, Penn: W. B. Saunders; 1998:99-101.
- ³⁹ Sherwood S. Human Physiology, From cells to systems. Belmont, Calif: Wadsworth; 1998:325.
- ⁴⁰ Hardaway R. *Capillary Perfusion in Health and Disease*. Mount Kisco, New York: Futura Publishing; 1981:iii, 27-8.
- ⁴¹ Woolf N. *Cell, Tissue and Disease: The Basis of Pathology*. 2 ed. London: W. B. Saunders; 1986:325.
- ⁴² Hansen M. Pathophysiology: *Foundations of Disease and Clinical Intervention*. Philadelphia, Penn: W. B. Saunders; 1998:338.
- ⁴³ Porth C, ed. *Pathophysiology: Concepts of Altered Health States*. 5 ed. Philadelphia, Penna: Lippincott; 1998:328-9.
- ⁴⁴ Pavek R, Clinical uses of SHEN: theory, methodology and application. *Holistic Health*. 1999, No. 60: 24-27.
- ⁴⁵ Biofield Therapeutics Section. In Berman B, Larson D, et al, *Alternative Medicine: Expanding medical horizons, A Report to the National Institutes of Health on Alternative Medical Systems and Practices in the United States*. Washington, D.C. Government Printing Office; 1994:143.
- ⁴⁶ Pavek R. Assumptive models in research of biofield therapeutics. Presented at the Conference Examining research Assumptions in Alternative Medical Systems; July 12, 1994; Bethesda, Maryland.

⁴⁷ Personal comments made to the author at the Founding Conference of the Chinese Conference for Psychosomatic Medicine and Biofeedback, Tainjin, P. R. C. 1988.

⁴⁸ Mann S, Severe Paroxysmal Hypertension, *Psychosomatics*; 1996, 37:449.