

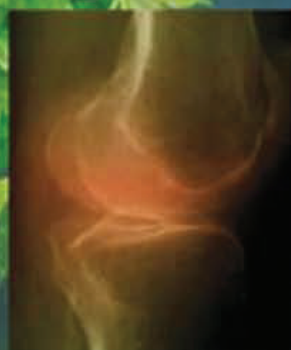
Naturopathic Physical Medicine

THEORY AND PRACTICE FOR MANUAL THERAPISTS AND NATUROPATHS

Co-authored and edited by
LEON CHAITOW

With contributions from
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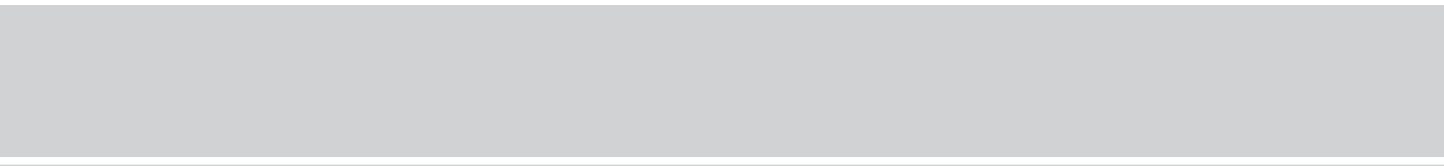
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Foreword by
Joseph Pizzorno, Jr

Naturopathic Physical Medicine



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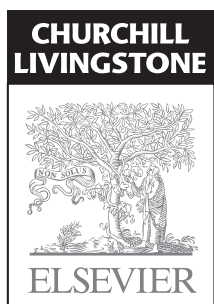
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Dedication

This book is dedicated to the naturopathic teachers and pioneers who inspired all those involved in writing it, as well as to all students, educators and practitioners of naturopathy, and their patients.

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Foreword

Our modern world suffers a tremendous burden of poor health and disease. The incidence of most chronic degenerative diseases has increased in virtually every age group during almost every decade of the past 50 years. Much of this suffering is unnecessary – as research has now shown that a large body of healing wisdom, long the province of naturopathic medicine, has been missing from the health care system.

We have much to be grateful for in conventional medicine – almost miraculous advances in the treatment of acute illness, trauma and life-threatening disease accomplished through dedication, intense research, and a huge investment of financial resources (unfortunately to the exclusion of most other approaches to health care). Key to this advancement has been standardization of diagnosis, of therapy and, unfortunately, of patients. In addition, the advancement of this disease treatment model has apparently necessitated isolation of diagnosis and treatment to distinct entities separate from the whole person. Conventional medicine has developed standardized therapies for standard diagnoses for specific conditions in generic patients that are sometimes curative, often highly effective in symptom relief, but not very effective in promoting health, ignore the interactive complexity of whole-person systems and are utterly incapable of recognizing how truly different each of us is, starting at the cellular level. Worse, this reductionistic isolation of attention and the lack of recognition of each patient's uniqueness is a primary cause of the huge incidence of adverse drug reactions from *appropriately prescribed* medications. As the number of drugs prescribed per person has increased, so has the incidence of adverse drug reactions and health-damaging interactions.

Widespread public dissatisfaction with the cost, side effects and limited health advancement that characterize the dominant medical system has led to the search for a new medicine. Patients are looking for health care professionals who integrate the best of conventional and natural medicine and treat them as

a whole, complex person, not as isolated parts. This search has led to renewed appreciation of naturopathic medicine and the healing wisdom it offers.

The growth and increasing sophistication of naturopathic medicine over the past few decades has been phenomenal. The naturopathic precepts of the causes of ill health and rules for healthful living, which were once dismissed as faddism (and worse), are now becoming mainstream wisdom. Eating a whole foods, organically grown diet; avoiding endogenous and exogenous toxins; physical exercise and balance; stress reduction; healthy social relationships – all once dismissed – are now known as necessary for health.

Over the past century, physical medicine has been foundational to the formation and evolution of naturopathic thought and practice. The huge expansion of research into nutrition, lifestyle and physiology has inspired in modern naturopathic medicine a much greater orientation to metabolic approaches for the promotion of health and treatment of disease. While this approach has much to offer, prescribing supplements and changing a patient's diet do not correct the neurological, muscular and vascular dysfunctions caused by musculoskeletal problems. Problems can range from mechanically impaired joints chronically releasing pro-inflammatory chemical mediators that cause health-damaging effects throughout the body to tissues being so poorly vascularized or their lymphatic drainage sufficiently compromised that no amount of detoxification or supplementation can restore normal function.

When we assert that we treat the whole person – mind, body and spirit – we need to remember that the body includes more than just biochemical reactions. Its physical structures can have as much impact on bodily health as nutrients and toxins. And, happily, they are amenable to intervention.

Physical medicine is perhaps the most whole-person of all our therapies. Thinking back to my days as a student, I remember one of Dr Bastyr's wise admonitions, 'Always touch your patients; let them know you

care.’ The application of physical medicine is in many ways the most intimate of our therapies, where we as physical beings interact personally with our patients with healing intent. In this era of increasing depersonalization and social isolation, this closeness to our patients is a welcome contrast to the 7-minute office call.

In addition to the importance of this textbook in advancing our understanding of physical medicine is its role as another example of the emerging sophistication of academic natural medicine. This excellent textbook was written by experts in all schools of natural medicine from all over the world. Osteopaths, natu-

ropaths, chiropractors, acupuncturists and physical therapists have all contributed their expertise without being limited by the boundaries of their professions and united by their passion for this healing wisdom. Dr Chaitow is to be congratulated for bringing together such an outstanding group of leaders in physical medicine to create such a valuable resource for clinicians.

Joseph Pizzorno Jr ND

Author, Textbook of Natural Medicine

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A Clinician’s Journal

Preface

Naturopathic physical medicine incorporates a wide array of methods, techniques and modalities, many of which are explored in this text, along with the evidence and rationale for their use in health care. As explained in depth in this book, the use of physical medicine in a naturopathic context may focus on the treatment and rehabilitation of musculoskeletal dysfunction, or it may be employed in treatment of both major and minor health problems in order to enhance and encourage self-regulatory functions.

It is important to note that naturopathic practitioners in different states, provinces and countries practice physical medicine as part of their clinical care of patients, in accordance with local laws and licensing regulations which are anything but uniform. For example, in North America and Canada naturopathic education results in qualification as licensed primary care naturopathic physicians through state or provincial boards of medical examiners.

In contrast, in Europe and Australia (as examples), a naturopathic qualification leads to a more limited scope of practice, unless additional qualifications (DO, DC, PT, MD, etc.) are also held. To an extent these differences are reflected in the physical medicine (and other) methods utilized and, in some instances, to the conditions treated.

The continuum of manual methods employed in naturopathic clinical practice may (depending on licensing variations) incorporate both static and motion palpation, as well as a wide variety of soft tissue techniques, joint articulation, mobilization without impulse (joint play), as well as mobilization with impulse. Mobilization with impulse is also referred to as high velocity, low amplitude (HVLA) thrust technique and, because of concerns as to safety, this modality is deserving of some explanation (Hurwitz et al 2005).

Naturopathic manipulation (including HVLA) is directed towards correcting imbalances in structural integrity, commonly manifested as joint fixation/restriction and/or malposition, by means of mechani-

cal/manual stimulation, delivered by physician/practitioner controlled soft-tissue, spinal and extremity mobilization. Evidence is offered in the book of the ways in which such treatment approaches can beneficially influence neurological, circulatory and biomechanical functions, as well as having positive effects on the individual's psychological/emotional status.

In keeping with the naturopathic principle of *first do no harm*, when mobilization with impulse (HVLA) is applied, it is with an appropriate (to the patient's needs and current health status) degree of force, designed to produce just sufficient impulse to overcome articular restriction and/or malposition. It is the application of such an extrinsically applied thrusting impulse that has attracted concern regarding safety and competency.

It is worth emphasizing that, by definition, HVLA impulse, or thrust, involves *high velocity*, not *high force*, delivered over a very small distance. This use of velocity rather than force is an essential skill in HVLA delivery, only employed once an appropriate diagnosis has been made. Once a dysfunctional segment or joint has been identified, specific HVLA techniques *may* be selected to achieve mobilization. The mechanics of such applications include the use of long or short levers, focused tissue tension with joint locking, appropriate line of drive, and physician and patient positioning, all achieved with balance and control (see Chapter 7).

The efficacy of mobilization with impulse (HVLA thrusting) has longstanding and current validation from both the osteopathic and chiropractic professions (see Chapters 7 and 10, in particular). HVLA issues relating to safety are commonly directed to cervical spine manipulation, and these safety concerns, in naturopathic practice, are covered in some detail in Chapter 7. Safety concerns exist in the realm of the knowledge of potential risk, precautions, complications, reactions and contraindications, as much as in the realm of technique application. In naturopathic educational programs that provide instruction in

naturopathic physical medicine and naturopathic manipulation, including HVLA usage, the topics of risk, precautions, complications, reactions and contraindications are studied in depth. These topics are not only covered in specific classes on naturopathic manipulation but are also included in other aspects of the curriculum which deal with pathology and dysfunctional conditions involving the musculoskeletal system and general systemic function, including classes in diagnostic imaging. The naturopathic student, practitioner and practicing physician usually focuses on whole body issues and restoration of health, and so the training in physical medicine, including naturopathic manipulation, is taught within that context. Naturopathic manipulation using HVLA techniques is seldom employed in isolation but as part of a process designed to restore maximal pain-free movement of articulations, restoration of postural balance, systemic functionality and facilitation of the self-regulatory mechanisms of the body.

In a recent study of licensed Canadian naturopathic physicians there was a strong indication that core naturopathic manipulation skills were adequate and thorough (Verhoef et al 2006).

Similarly, a recent American Association of Naturopathic Physicians (AANP) Position Paper reminds us that naturopathic manipulative treatment, as part of naturopathic physical medicine, has historically been an integral part of the practice of naturopathic medicine, and has been included in naturopathic medical education and licensure since the early 1900s. That Position Paper states that naturopathic medical education prepares naturopathic physicians to safely and competently perform and practice naturopathic physical medicine and naturopathic manipulation (Buratovich et al 2006).

It is worth re-emphasizing that HVLA is not a part of the training of naturopathic practitioners in Europe or Australia, and is employed by naturopathic practitioners in those countries only if the ND also holds a qualification as an osteopath, chiropractor or physical therapist, or as an appropriately trained medical practitioner.

Over and above the issue of safe HVLA usage, naturopathic physical medicine employs a wide range of methods, modalities and techniques, including hydrotherapy and electrotherapy, and a plethora of manual, movement, rehabilitation and re-education approaches, all designed and employed to achieve one of three objectives:

- To reduce adaptive demands via, as examples, modifying patterns of use including improved mobility, stability, balance, posture and/or respiratory function

- To improve the body's capacity to cope with adaptive demands via, as examples, enhanced biomechanical, circulatory and/or neurological functions
- To safely modulate the patient's presenting symptoms – without adding to existing adaptive overload.

Naturopathy considers that the body heals itself, unless damage, dysfunction and degeneration are too advanced. Even then, functional improvement, or a delaying of further decline, may be possible. In all these objectives, use of naturopathic physical medicine methods rely for efficacy on intrinsic, endogenous, innate, homeostatic, self-regulatory forces.

All naturopathic therapeutic interventions, including naturopathic physical medicine methods, are therefore focused on encouraging these processes.

Nick Buratovich, Paul Orrock, Leon Chaitow – and all the other co-authors, contributors and internal reviewers responsible for this book.

References

- Buratovich N, Cronin M, Perry A et al 2006 AANP Position Paper on Naturopathic Manipulative Therapy. American Association of Naturopathic Physicians, Washington DC
- Hurwitz E, Morgenstern H, Vassilaki M, Chiang L 2005 Frequency and clinical predictors of adverse reactions to chiropractic care in the UCLA neck pain study. *Spine* 30:1477–1484
- Verhoef M, Boon H, Mutasingwa D 2006 The scope of naturopathic medicine in Canada: an emerging profession. *Social Science and Medicine* 63(2):409–417

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Physical Medicine in a Naturopathic Context

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In order to appreciate the meaning of the term naturopathic physical medicine (NPM), it is first necessary to have an understanding of just what naturopathic medicine is (Lindlahr 1913); see Box 1.1.

The naturopathic profession

Naturopathic medicine is a worldwide profession with concentrations in the USA, Germany, Canada, UK, Australia and India. In these countries, naturopathic medicine functions, or is legally defined, as a primary health care profession whose practice incorporates health promotion and the prevention, diagnosis and treatment of acute and chronic disease. There are marked scope of practice and training differences among various regional and global traditions (Standish et al 2005).

In the USA and Canada naturopathic doctors (NDs) are trained as general practice family physicians. This is intentional and consistent with naturopathic principles of practice. Naturopathic doctors (and practitioners in countries where licensing and scope of practice are not as full as in the USA where a broad medical scope of practice prevails in many states) are trained to assess and treat disease from a whole person perspective, taking into account not only the presenting pathology but also deeper causes and collateral relationships with other systems of the body (Standish et al 2005).

Boon et al (2004) report that:

Naturopathic medicine is a licensed health care profession in twelve US states (Alaska, Arizona, Connecticut, Hawaii, Maine, Montana, New Hampshire, Oregon, Utah, Vermont, Washington, California), Puerto Rico and four Canadian provinces (British Columbia, Manitoba, Ontario and Saskatchewan) (Hough et al 2001, American Association of Naturopathic Physicians 2007). In most states and provinces where naturopathic medicine is not regulated, individuals call themselves naturopaths (whether or not they have been trained at a school for naturopathic medicine) because the term naturopathic medicine is not a restricted term in all jurisdictions. The

number of individuals practicing in unregulated jurisdictions is unknown. All licensed states require standardized training and board examinations to obtain a license.

Naturopathic medicine

Naturopathic medicine encompasses treatment and diagnostic modalities whose use is guided by the principles and theory of naturopathic medicine that are critical to the practice's identity and effectiveness. Clinical application of naturopathic theory influences case management; selection, sequencing and integration of therapies; patient diagnoses; healing practices, and lifestyle and wellness approaches (Standish et al 2005). Both effectiveness and safety can be influenced by theory. Leading ethicists such as Edmund Pellegrino have observed that all health care systems have an inherent theory which influences clinical decision-making, whether explicitly described or not, and a system of thinking is implied by the pattern of clinical decisions in each discipline (Pellegrino 1979).

The vis

Naturopathic medicine is based upon principles that are abstracted from observations of health and healing. Although to some extent these principles are consis-

tent with all branches of the healing arts, the key principle in naturopathic medicine is a major distinguishing element. That first principle is *vis medicatrix naturae* ('the healing power of nature'), which establishes naturopathic medicine as a vitalistic medicine, a modern inheritor of the vitalistic tradition. This fundamental principle identifies naturopathy as being focused on the natural tendency of the body to heal itself. This tendency is intelligent, always acting in the best interest of the body. It can be seen in Hans Selye's work (1946, 1975), expressed there as 'homeostasis' and the 'adaptation response', described as 'a relative constancy in the internal environment, naturally obtained by adaptive responses that promote healthy survival'. (See Chapter 2 for a discussion of Selye's *General Adaptation Syndrome* model that has both permeated much medical thinking over the last half century and which many take as a conceptual scientific validation of traditional naturopathic thinking.)

Between 1986 and 1989 the American naturopathic profession undertook a 3-year national consensus process, after which it adopted the following definition of naturopathic medicine, based on principles of practice, rather than modalities. This definition (Box 1.1) has been widely accepted throughout the international naturopathic community (Snider & Zeff 1989, American Association of Naturopathic Physicians 2006).

Box 1.1 Definition of naturopathic medicine

Naturopathic medicine is a distinct system of primary health care – an art, science, philosophy and practice of diagnosis, treatment and prevention of illness. Naturopathic medicine is distinguished by the principles that underlie and determine its practice. These principles are based upon the objective observation of the nature of health and disease, and are continually re-examined in the light of scientific advances.

Methods used are consistent with these principles and are chosen on the basis of patient individuality.

Naturopathic physicians and practitioners are primary health care providers, whose diverse techniques include modern and traditional, scientific and empirical methods. The following principles are the foundation for the practice of naturopathic medicine.

Principles

I. The healing power of nature (*Vis medicatrix naturae*)

The healing power of nature is the inherent, self-organizing and healing process of living systems that establishes, maintains and restores health. Naturopathic medicine recognizes this healing process to be ordered

and intelligent. It is the naturopathic practitioner's role to support, facilitate and augment this process by identifying and removing obstacles to health and recovery, and by supporting the creation of a healthy internal and external environment.

II. Identify and treat the causes (*Tolle causam*)

Illness does not occur without cause. Causes may originate in many areas. Underlying causes of illness and disease must be identified and removed before complete recovery can occur. Symptoms can be expressions of the body's attempt to defend itself, to adapt and recover, to heal itself, or may be results of the causes of disease. The naturopathic physician/practitioner seeks to treat the causes of disease, rather than to merely eliminate or suppress symptoms.

III. First do no harm (*Primum non nocere*)

Naturopathic physicians and practitioners follow three precepts to avoid harming the patient:

1. Naturopathic physicians/practitioners utilize methods and medicinal substances that minimize the risk of harmful effects and apply the least possible force or intervention necessary to diagnose illness and restore health.

Box 1.1 Definition of naturopathic medicine continued

2. Whenever possible the suppression of symptoms is avoided, as suppression is generally considered to interfere with the healing process.
3. Naturopathic physicians respect and work with the *vis medicatrix naturae* in diagnosis, treatment and counseling, for if this self-regulating process is not respected the patient may be harmed.

IV. Doctor as teacher (*Docere*)

The original meaning of the word 'doctor' is teacher. A principal objective of naturopathic medicine is to educate the patient and emphasize self-responsibility for health. Naturopathic physicians and practitioners also recognize and employ the therapeutic potential of the doctor–patient relationship.

V. Treat the whole person (*Tolle totum*)

Health and disease result from a complex of physical, mental, emotional, genetic, environmental, social and other factors. Since total health also includes spiritual health, naturopathic physicians and practitioners encourage individuals to pursue their personal spiritual development. Naturopathic medicine recognizes the harmonious functioning of all aspects of the individual as being essential to health. The multifactorial nature of health and disease requires a personalized and comprehensive approach to diagnosis and treatment. Naturopathic physicians and practitioners attempt to treat the whole person, taking all of these factors into account.

VI. Prevention (*Preventare*)

Naturopathic colleges and universities emphasize the study of health as well as disease. The prevention of disease and the attainment of optimal health in patients are primary objectives of naturopathic medicine. In practice, these objectives are seen to be best accomplished through education and the promotion

of healthy ways of living. Naturopathic physicians and practitioners assess risk factors, heredity and susceptibility to disease, and make appropriate interventions in partnership with their patients to prevent illness. Naturopathic medicine asserts that one cannot be healthy in an unhealthy environment and is committed to the creation of a world in which humanity may thrive.

Practice**Naturopathic methods**

Naturopathic medicine is defined primarily by its fundamental principles. Methods and modalities are selected and applied, based upon these principles in relationship to the individual needs of each patient. Diagnostic and therapeutic methods are selected from various sources and systems, and will continue to evolve with the progress of knowledge.

Naturopathic practice

Depending on local licensing laws and scopes of practice, naturopathic practice may include the following diagnostic and treatment modalities: utilization of all methods of clinical and laboratory diagnostic testing including diagnostic radiology and other imaging techniques; nutritional medicine, dietetics and therapeutic fasting; medicines of mineral, animal and botanical origin; hygiene and public health measures; naturopathic physical medicine including naturopathic manipulative therapies; the use of water, heat, cold, light, electricity, air, earth, electromagnetic and mechanical devices, ultrasound and therapeutic exercise; homeopathy; acupuncture; psychotherapy and counseling; minor surgery and naturopathic obstetrics (natural childbirth).

Naturopathic practice excludes major surgery and the use of most synthetic drugs (Snider & Zeff 1989, American Association of Naturopathic Physicians).

International perspective

International perspectives on naturopathic practice and principles demonstrate increasing coherence and consistency between North America, Australia and the United Kingdom, as evidenced by a recent publication on naturopathic medicine that included naturopathic physician authors from several countries (Myers et al 2003). In this, naturopathic medicine is described as the eclectic and integrative practice of health care, united by the core underlying principles (and their applied clinical theory) described above.

Central to these principles is the healing power of nature (*vis medicatrix naturae*), a concept that is ascribed

to Hippocrates, and which is as old as the healing arts. The healing power of nature refers to the inherent self-organizing and healing process of living systems that establishes, maintains and restores health (Myers et al 2003).

In the words of Newman Turner (1984): 'Naturopathy is based on the recognition that the body possesses not only a natural ability to resist disease, but inherent mechanisms of recovery and self-regulation.'

Naturopathic medicine bases its clinical theories and reasoning, as evidenced by its therapeutic choices, on assisting the self-regulation processes by means of removing obstacles to recovery and/or enhancing the functionality of systems, organs and tissues.

Allopathic medicine – a comparison

In contrast, the defining features of allopathic medicine have been summarized by a number of naturopathic theorists and clinicians (Pizzorno & Snider 2004, Zeff 1997).

For example, Zeff et al (2006) have advanced four underlying assumptions of standard allopathic medicine, the fundamental basis of which is generally characterized as ‘the diagnosis and treatment of disease’.

In allopathic medicine:

1. diseases are commonly regarded as entities (e.g. measles, smallpox, cancer, diabetes, etc.)
2. diseases are seen as entities that can be identified (‘diagnosis’)
3. treatment is directed against disease entities (the diabetes is treated, rather than the person with the diabetes)
4. appropriate allopathic medical treatment is the evidence-based application of drugs, surgery and other methods.

In distinction, naturopathic medicine can be characterized by a different model from one that ‘diagnoses and treats disease’: the ‘restoration of health’ would be a better characterization of the naturopathic approach.

In 1989 naturopathic physicians and practitioners adopted the following brief statement, characterizing naturopathic medicine: ‘Naturopathic physicians treat disease by restoring health’ (Snider & Zeff 1989).

It should be possible to recognize a distinct difference: mainstream medicine is disease-based; naturopathic medicine is health-based. In naturopathic medicine disease is seen much more as a *process* than as an *entity*.

Rather than seeing the ill patient as suffering from a ‘disease’, the naturopathic practitioner views the ill person as functioning within a process of disturbance and recovery, in which disease and ill-health can be seen to involve an adaptive state – a response to disturbances, changes, adaptations and stresses within the system. In this perspective equal weight is given to biochemical, structural and psychosocial influences interacting with the unique genetic and acquired characteristics of the individual.

Psychoneuroimmunology – towards a broader allopathic model?

The description of core features of allopathic medicine as it is most commonly practiced, as listed above, is by no means the only model operating, as some

branches of mainstream medicine evolve from its current biomedical focus.

There are strands within current medical thinking that mirror naturopathic ideas, offering a hopeful prospect for the future. An example can be observed in the concepts promoted by the study of psychoneuroimmunology (as expounded by Engel 1977) as a major feature of what has come to be called the biopsychosocial model of medicine. The main theme of biopsychosocial medicine is that mechanistic biological explanations, as proposed by biomedicine, are unable to account for many health outcomes, and that the etiology and progress of many conditions demand an understanding of the interaction between biological, psychological and social factors (Borrell-Carrio et al 2004).

Alford (2007) has observed that:

One of Engel’s main criticisms was that the biomedical model encouraged separation of mind and body. In the biomedical model the body is viewed as a machine to be fixed and is separate from emotions. Engel and his colleagues considered that this was leading to the dehumanization of medicine. They considered that patients were being seen as objects to be fixed, and [that] their subjective experiences were of no relevance to assessment and management decisions.

Were structural, biomechanical influences more closely incorporated into this perspective, alongside psychosocial and biochemical/biological factors, the model would start to resemble a naturopathic appreciation of health and disease.

It has been suggested by some that the psychosocial aspect of this new paradigm has tilted it too far, as it attempts to counterbalance the biomedical approach of most mainstream medical practitioners. Waddell (2004), for one, has concluded that this is so, particularly in relation to musculoskeletal conditions such as low back pain where, he maintains, the emphasis has swung excessively towards consideration of psychosocial issues, to the neglect of structural and physical aspects of dysfunction.

Figure 1.1, reproduced from a review of psychoneuroimmunology by Lutgendorf & Costanzo (2003), allows us to appreciate the progress medicine has made via this broader understanding of health and disease, and how this resembles much traditional naturopathic thinking. It is easy to observe the interacting systems, coping with adaptation processes, within this model, as described in detail in Box 1.2. Chapter 2 provides a deeper discussion of adaptation and health.

Examples of ill-health involving clear evidence of a process of adaptation might include the following.

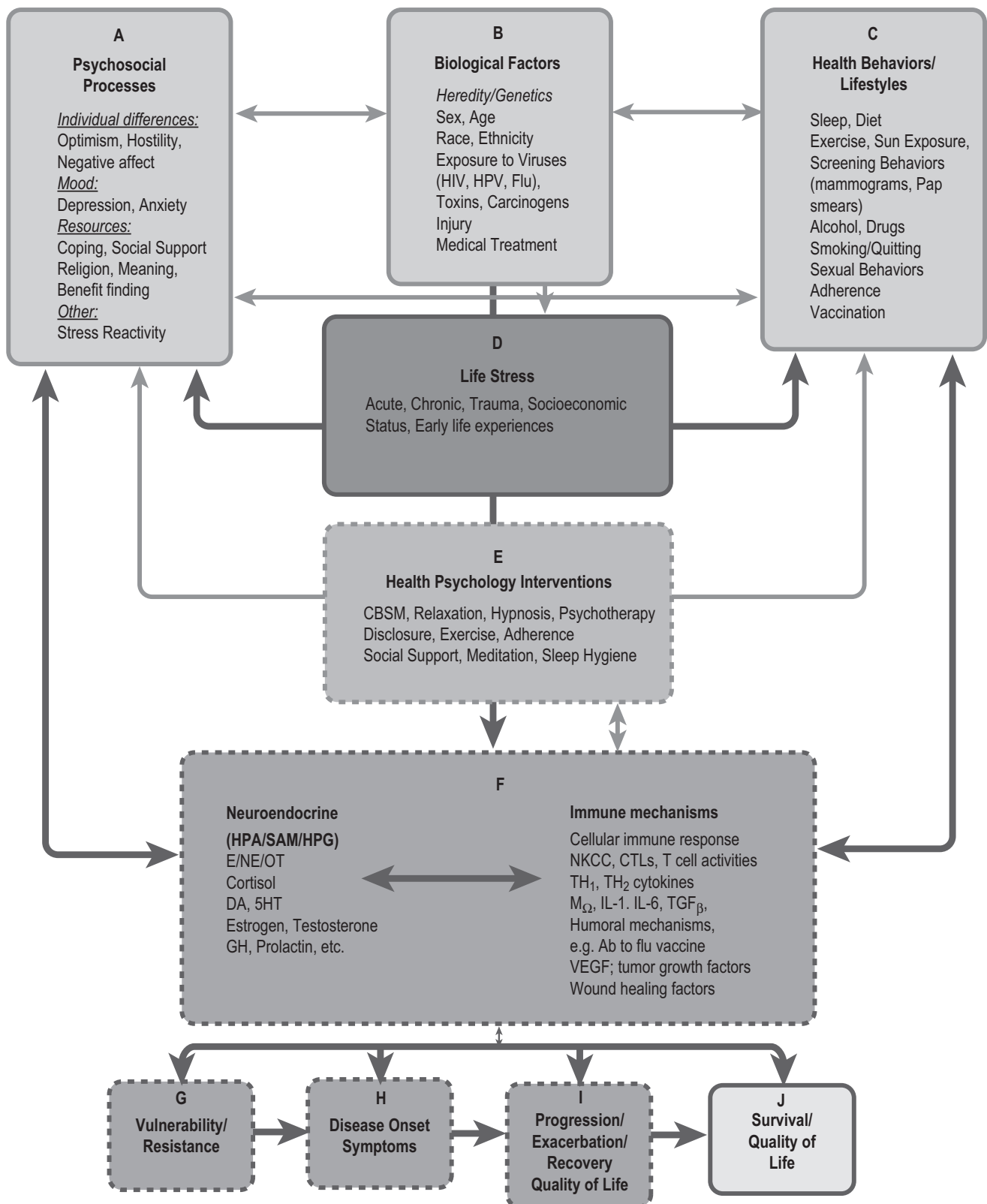


Figure 1.1 The biopsychosocial model of medicine. See Box 1.2 for a full description of the interacting systems within this model. 5HT, serotonin; Ab, antibody; CTLs, cytotoxic lymphocytes; DA, dopamine; E, endocrine; GH, growth hormone; HPA, hypothalamic pituitary adrenocortical axis; HPG, hypophyseal pituitary gonadal axis; HPV, human papilloma virus; IL-1, interleukin 1; IL-6, interleukin 6; M_α, macrophage; NE, neuroendocrine; NKCC: natural killer cell cytotoxicity; OT, oxytocin; SAM, sympathoadrenomedullary axis; TGF_β, transforming growth factor beta; TH, T-helper; VEGF, vascular endothelial growth factor. Reproduced with permission from Lutgendorf & Costanzo (2003)

Box 1.2 Interacting systems within the biopsychosocial model of medicine (Fig. 1.1)

The interaction between psychosocial processes (Box A), biological factors (Box B), and health behaviors (Box C) leads to a vulnerability (or resistance) to illness (Box G), disease onset and symptoms (Box H), progression, exacerbation, recovery, with concomitant quality of life (Box I), and survival with concomitant quality of life (Box J) via processes involving neuroendocrine and immune mechanisms (Box F). Effects of life stress (Box D) are filtered through psychosocial processes (Box A) and health behaviors (Box C) in their resultant effects on downstream mechanisms. Health psychology interventions (Box E) can modulate effects of psychosocial processes and health behaviors on neuroendocrine and immune mechanisms and on resultant health outcomes. There are also pathways between biobehavioral factors and disease outcomes not involving neuroendocrine or immune mechanisms, but other pathways are not included in this figure.

Psychosocial processes (A) encompass psychological and social factors, particularly those that involve interpretation of and response to life stressors. These include personality variables (e.g. optimism, hostility and negative affect), mental health and mood variables (e.g. depression and anxiety), coping, social support, spirituality and sense of meaning. Health behaviors (C) include drug and alcohol use, smoking, sleep, nutrition, exercise, adherence to medical regimens, physical examinations, risk screenings and risky sexual behaviors, among others. Health psychology interventions (E) can

be used to alter psychosocial processes (A: e.g. decrease depression, increase coping) or improve health behaviors (C: e.g. smoking cessation) to provide a more positive influence on neuroendocrine and immune factors and perhaps slow disease progression/exacerbation. Interventions include cognitive-behavioral stress management (CBSM), relaxation, hypnosis, meditation, emotional disclosure, adherence-based interventions, sleep hygiene, exercise, social support groups, psychotherapy, imagery, distraction, behavioral pain management, yoga, massage, biofeedback, drug/alcohol prevention/rehabilitation, psychotherapy and behavioral conditioning. These interventions can be used at all points of the trajectory of the disease or condition. Box F shows selected mechanisms involved in the bidirectional interactions between neuroendocrine and immune axes that mediate the relationships between biobehavioral factors (A–D) and disease outcomes (G–J).

This is by no means an all-inclusive list of mechanisms, but it represents some of the commonly studied factors in this literature. Once vulnerability (G) has been established, continued interaction with positive or negative psychosocial factors (A: e.g. depression/social support), disease factors (B), adaptive/maladaptive health behaviors (C) and stress (D) will contribute to expression (or lack thereof) of disease symptoms (H), disease-free intervals/progression/exacerbation, and quality of life (e.g. functional, physical, emotional, and social well-being) (I), and survival (J).

Example 1

Gastrointestinal irritation and/or inflammation may be caused by dietary imbalances, allergy, stress factors, local bowel flora changes due to use of medication (e.g. antibiotics) (Vanderhoof et al 1999), environmental pollution or other factors, resulting in altered gut ecology (McCourtie & Douglas 1984). This process involves depleted beneficial bacterial function (Valeur et al 2004), reduced protective secretory IgA levels (Crago & Tomasi 1987) and increased gut permeability (Crissinger et al 1990).

This sequence of adaptations to previous or ongoing events results in larger than desirable molecules being absorbed from the gut, potentially triggering allergic reactions (Heyman 2005), as well as overloading liver function, with the possibility of autoimmune implications (Peltonen et al 1994).

A host of symptoms might be anticipated, ranging from fatigue to palpitations, skin disturbances, head-

aches, nausea, joint pain and more (Bengtsson et al 1996).

A virtual domino-effect cascade is observed as symptoms progress from initially acute, through chronic phases, many of which are anxiety-provoking, so adding to the distress of the individual and further aggravating normal gut function (Tache et al 2001).

Restoration of normal gut ecology (Hickman 1998, Perdigon et al 1990, Verhoef et al 1998) and permeability (Alverdy 1990) would be one aspect of the therapeutic plan, rather than focusing on obvious symptoms and secondary effects (allergic symptoms, fatigue, arthritis, etc.).

In addition to normalizing the gut flora and reducing inappropriate permeability, enhancing stress management could be another primary focus (Brosschot 2002).

Naturopathic care has an excellent record in such situations, even where autoimmune conditions such as rheumatoid arthritis coexist with food allergy,

increased gut permeability, increased circulating immune complexes, excessive inflammatory processes and increased oxidative stress (Dunn & Wilkinson 2005).

Example 2

An emotionally stressful period might initiate an altered breathing pattern (Lum 1984), in which diaphragmatic function is reduced and an anxiety-linked upper chest respiratory pattern evolves (Perri & Halford 2004).

Initially this response is a physiologically normal adaptation to an acute/alarm situation ('fight/flight'). However, if prolonged and/or repetitive, the changes engendered may become chronic as the adaptation phase of the general adaptation syndrome (GAS) develops (Selye 1975). See Chapter 2 for more detail of GAS.

Excessive, physiologically undesirable and ultimately unsustainably high levels of CO₂ exhalation occur, resulting in respiratory alkalosis (Foster et al 2001). This, in turn, induces smooth muscle constriction (Litchfield 2003), reducing the diameter of blood vessels (impeding normal circulation) (Neill et al 1981) as well as the intestines, so altering normal peristaltic function (Ford et al 1995).

Respiratory alkalosis also induces the *Bohr* effect in which hemoglobin's attachment to oxygen increases, reducing delivery of O₂ to tissues such as brain and muscles (Fried 1987, Pryor & Prasad 2002), resulting in fatigue and a variety of cognitive and emotional repercussions (Nixon & Andrews 1996).

Neural function is impaired by these changes, and neural sensitization, with heightened pain awareness as one consequence, is common (Charney & Deutch 1996, Sergi et al 1999).

Homeostatic adaptation to these changes involves increased bicarbonate excretion via the kidneys in an effort to return pH to normal (~7.4), so disturbing calcium and magnesium balance (George 1964, Macefield & Burke 1991) and further interfering with already unbalanced neural and muscular function.

The hyperventilating individual's symptoms might therefore include irritable bowel, short-term memory loss, perception of a variety of areas of increased head, neck, shoulder, chest and back pain (commonly associated with overuse of accessory breathing muscles), feelings of sympathetic arousal, anxiety, panic and general fatigue (Abelson et al 2001). Many other symptoms might evolve as this cycle of compensation, adaptation, decompensation and possible illness behavior advances (Vlaeyen & Crombez 1999).

Ultimately, in a state of chronic pain and fatigue, and with minimal likelihood of adequate aerobic activity, the deconditioned individual's ATP production will come to rely on anaerobic glycolysis – resulting in lactic and other acid waste production that further stimulates hyperventilation tendencies – accelerating and exacerbating the processes described above (Nixon & Andrews 1996).

Should such an adaptive process occur in a woman between the ages of 15 and 50 (chances are 7 : 1 that this will be the case rather than the individual being male), where progesterone levels rise following ovulation, the respiratory rate will accelerate, further aggravating all these symptoms during the premenstrual phase (Damas-Mora et al 1980, Ott et al 2006).

All these symptoms will also be exaggerated if this pattern of breathing coincides with periods of hypoglycemia (Timmons & Ley 1994).

This kaleidoscope of interacting influences, synchronicities, compensations and adaptations offers a clear picture of biochemical, biomechanical and psychosocial effects – deriving from an initial adaptation to stress – leading to complex chronic ill-health.

Resolution demands, among other things, breathing rehabilitation (Mehling et al 2005), which has been shown to be best achieved by a combination of relearning diaphragmatic respiration, structural mobilization of the thorax, stress management (DeGuire et al 1996) and a lifestyle that encourages nutritional excellence, adequate exercise and sleep (Gardner 1996).

Example 3

Matthew Wallden ND DO

It is well documented that, when exposed to a sensitizing food such as gluten, there may initially be a non-specific immune response resulting in increased mucus production and swelling of the body's mucous membranes and tissues, such as tonsils and adenoids (Brostoff & Gamlin 1998, Tortora & Grabowski 1993). These two factors (the tissue swelling more than the mucus) result in a decreased patency of the nasal airway. When there is a decreased nasal patency this induces an increased respiratory rate with multiple sequelae (Chaitow 2004), including forward head posture (Hiyama et al 2002, Roithmann et al 2005) and anterior translation of the mandible (Shikata et al 2004).

Anterior translation of the mandible creates shear at the highly innervated temporomandibular joint (TMJ) that interferes with the forward head posture already driven by the food allergy, contributing to an upper crossed syndrome postural imbalance (Janda 1982)

(see description in Chapter 6 and Fig. 6.33 for detail of crossed syndromes).

In forward head posture, the tone of the suboccipital group is reflexively upregulated to keep the eyes on the optic plane (in line with the horizon). The resulting increase in tone in the suboccipital group (rectus capitis posterior minor in particular) invokes the tonic neck reflex, meaning that the tone of the hamstrings automatically becomes upregulated (Fukuda 1984, McPartland et al 1997). If this hypothetical individual then sprints or plays a sport, a hamstring strain is likely to occur due to excessive or inappropriate tone. Any injury resulting in pain – including a hamstring strain – induces a stress response, which increases forward head posture (the fetal or ‘red-light’ posture), reinforcing shear at the TMJ, adverse tone in the suboccipitals, increased tone in the hamstrings and a modified respiratory pattern. Such additional stress on the bodily systems as a whole increases adrenal output (Selye 1956) and automatically increases cardiorespiratory rate that, if sustained, is likely to result in respiratory alkalosis, relative tissue hypoxia and ischemia, and increased formation of trigger points (Chaitow 2004), which – in tandem with forward head posture – involves the upper fibers of trapezius, sternocleidomastoid (SCM), levator scapula and/or the suboccipitals with tracking of the disc within the TMJ. This shear increases afferent drive to the trigeminal nucleus and this afferent bombardment causes increased neural drive to the SCM and upper portion of trapezius, via the trigemino-accessory reflex (Di Lazzaro et al 1996).

Increased tone in these two muscle (SCM and upper trapezius) groups reinforces forward head posture, leading to further loading through this muscle group. Forward head posture creates an incremental load on these neck extensors by a factor of 1 for each inch (2.5 cm) the head migrates forward (Chek & Curl 1994). This means that if the normal load on the neck extensors was, say, 7 lb (~3 kg) (the center of gravity of the head is anterior to the spine, meaning that even in optimal posture there is a load on the neck extensors), then a forward head posture of 2 inches (5 cm) – which is extremely common clinically – would result in a load of 21 lb (~9 kg) through the neck extensors. Since it only takes a contraction of 10% of the maximum voluntary contraction to induce ischemia in a muscle (Chek & Curl 1994), a forward head posture of 2 inches not only triples the load on the neck extensors, but also increases metabolic demand, while concurrently causing ischemic changes in the muscles concerned. As a result, metabolic waste such as lactic acid and pyruvate will accumulate in, and damage, the working muscles (Chaitow 2004). This

process is likely to cause muscle and joint distress as well as contributing to the formation of myofascial trigger points.

This scenario illustrates how simply applying soft tissue techniques or ultrasound to a hamstring strain, or using ischemic pressure or spray and stretch techniques to deactivate a trigger point in the trapezius, may be, at best, a temporary solution, or, at worst, futile, unless underlying dysfunctional patterns and causative factors (including nutritional ones) are also addressed.

Complexity

The three examples outlined above illustrate complexity and synchronous processes that inevitably result in symptoms. Understanding the underlying etiological influences allows the practitioner – naturopathic or other – to advise appropriately and/or intervene therapeutically to enhance the self-regulating processes. Inappropriate interventions may well modify or suppress symptoms, but not necessarily to the advantage of ultimate well-being.

Identifying what is and what is not appropriate in any given situation depends on information gathering and assessment skills, as well as an awareness of the probable natural evolutionary order of events in relation to the particular patient, with idiosyncratic characteristics. Part of that understanding involves what has become known in naturopathic medicine as the ‘hierarchy of healing’ or ‘therapeutic order’ seen within the context of a broader theory, encompassing naturopathic principles and tenets such as the naturopathic model of healing, the determinants of health, and other tenets defining the processes in the disease and healing process. This theory is described by Zeff and others as ‘the process of healing’ and is discussed below. It is important to be aware that this ‘order’ remains a work in progress as the naturopathic profession evolves its understanding of the complex processes involved.

Figures 1.2 and 1.3 offer relatively simplistic pictorial representations of the complex interactions associated with the progression from health towards ill-health and dysfunction (see also Figs 9.1 and 9.2 in Chapter 9).

The healing power of nature and a therapeutic order

These three examples offer pictures of normal health being disturbed by a variety of factors, where a virtual

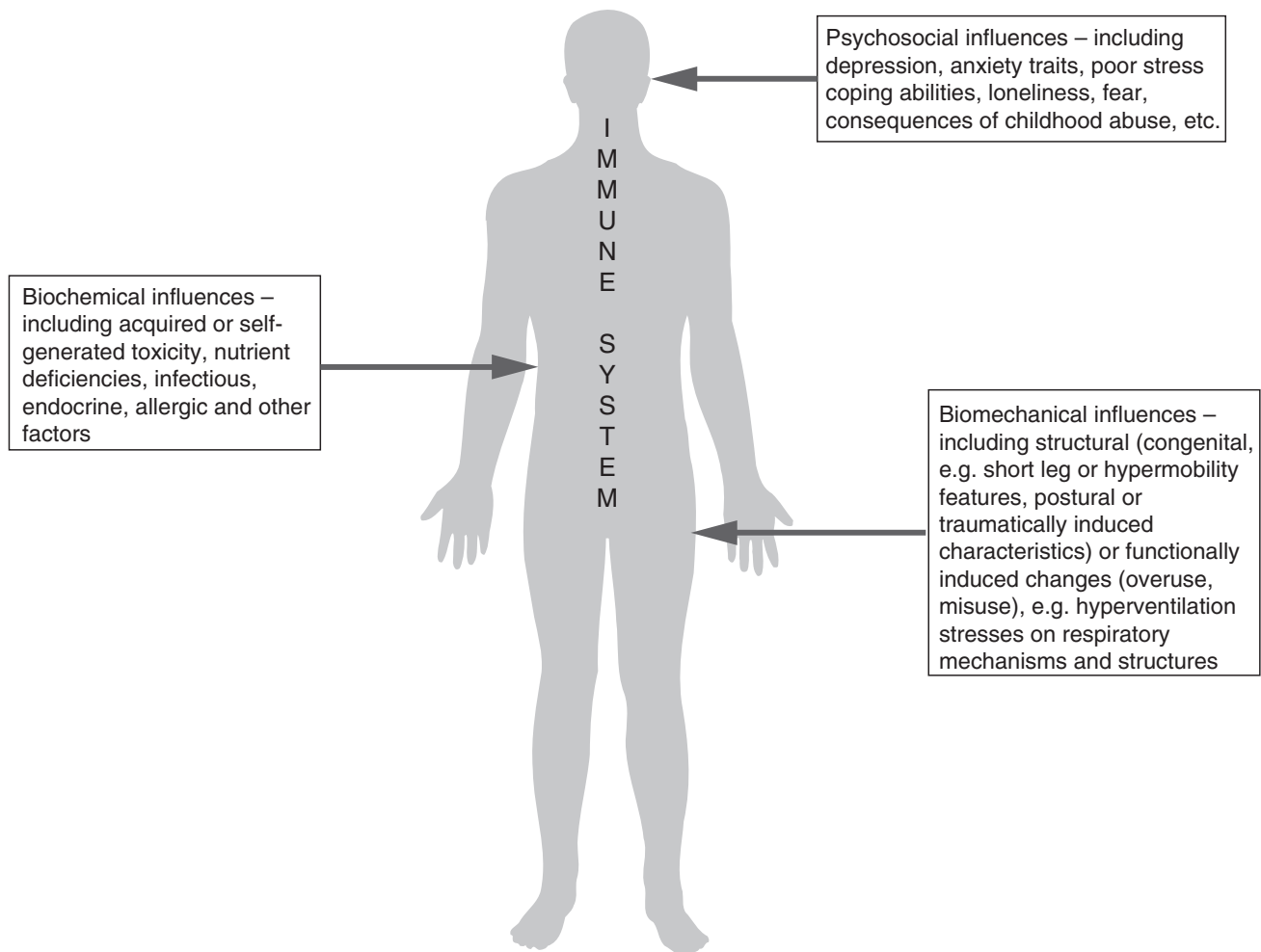


Figure 1.2 The interacting influences of a biochemical, biomechanical and psychosocial nature produce complex changes. For example, a negative emotional state produces specific biochemical changes, modifies immune response and alters muscle tone. A biomechanical function such as breathing, when dysfunction (hyperventilation) modifies blood pH, alters neural function, creates feelings of apprehension and anxiety, and causes smooth muscle constriction, so altering circulatory and digestive efficiency. Nutritional imbalances, or acquired or self-generated toxicity, modify biochemical status, affecting mood, which can modify respiratory function, with all the changes listed above. Reproduced with permission from Chaitow (2003)

chain reaction of symptom-inducing events follows logically, as the human system attempts to maintain functionality in the face of adaptive demands that seem to be overwhelming.

The task of the naturopathic physician/practitioner is to identify and understand these disturbances and to then assist the patient to remove or moderate them (or some of them) and/or to improve the ability to cope with the imposed stressors. In doing so, the cascade of adaptive changes should reduce sufficiently to allow self-regulation to restore health

and optimal function. This process has been referred to as 'the naturopathic model of healing' and is intimately related to functions described within a 'hierarchy of healing' or the 'therapeutic order'. One can dissect health disturbance into a number of identifiable categories, based upon those that determine health, and these can be listed as such (Standish et al 2005, Zeff et al 2006).

In facilitating the process of healing, the naturopathic physician/practitioner seeks to use those therapies that are most efficient and that have the least

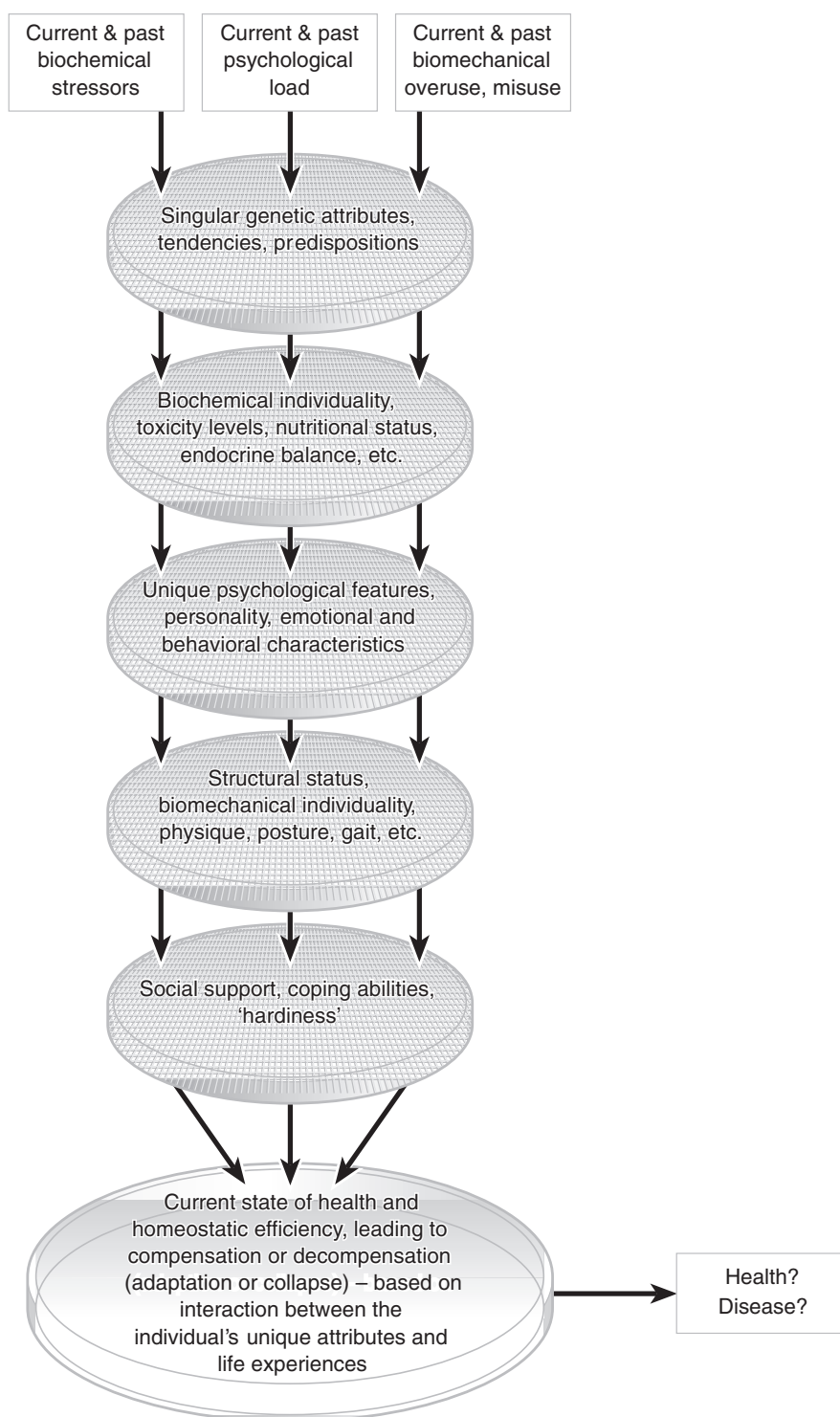


Figure 1.3 Schematic 'life-grid' representing many of the multiple interactions – both acquired and genetic – involved in an individual's progression from health to ill-health. Reproduced with permission from Chaitow (2003)

potential to harm the patient. The concept of ‘harm’ includes the effects of suppression, or exhaustion, of natural healing processes, including inflammation and fever. These precepts, coupled to an understanding of the process of healing, have resulted in an appreciation of a therapeutic hierarchy.

This hierarchy (or therapeutic order) appears to be a natural consequence of how the organism heals itself. This ‘order’ also calls for therapeutic modalities to be applied in a rational sequence, determined by the nature of the healing process, partly determined by, and balanced with, the individual needs of the patient for safe and effective care.

It is important at this juncture to state that the ‘therapeutic order’, as currently expressed (see below), is under constant review and debate by the naturopathic profession, its educators and leading clinicians, and is not by any means fixed in stone. It is to be anticipated, therefore, that aspects of the sequencing, as described below, will modify and change as these ideas are explored in coming years.

Zeff et al (2006) have offered one perspective of a natural order of appropriate therapeutic interventions, embracing the principles outlined above, suggesting that in treating people who are ill it is (or may be) necessary to follow a model of care as laid out in Box 1.3.

Underlying principles of the therapeutic order

The concepts expressed in the naturopathic therapeutic order are derived from Hippocrates’ writings and those of medical scholars, nature doctors and naturopathic physicians concerning the function and activation of the self-healing process. The recognition of a sense of order in the healing processes, and in the selection of therapeutic and restorative practices, has permeated the modern dialogue on naturopathic clinical theory, and has evolved to recognize the dynamic interface and balance between a natural therapeutic order and its accommodation to patient individuality.

The therapeutic order proceeds from least to most force, although all modalities can be found within the various steps and stages, depending on their application. The spiritual aspect of the patient’s health is considered to begin with Step 1 (Pizzorno & Snider 2004).

The philosophy represented in the naturopathic therapeutic order does not determine what modalities are ‘good or bad’, useful or useless. Rather, it provides a clinical framework for all modalities, used in the order consistent with that of the natural self-healing process. It respects the origins of disease, as well as

Box 1.3 The therapeutic order (modified from Zeff et al 2006)

1. Address acute concerns

2. Re-establish the basis for health

Identify and remove causes of disease and obstacles to healing:

- establish a healthy regime
- identify and modify or eliminate adaptive demands (biochemical, biomechanical, psychosocial) and initiate enhancement of adaptive capacity of tissues, systems, and the individual.

3. Stimulate the *vis medicatrix naturae* (healing power of nature)

Many systems and modalities incorporate methods that have the potential to stimulate the inherent self-regulating processes. Examples include botanical, homeopathic and/or nutritional approaches; physical/structural methods including therapeutic exercise, manipulation, massage, etc.; hydrotherapy, psychological–spiritual medicine, Ayurvedic, Tibetan, Traditional Chinese Medicine, acupuncture.

4. Tonify weakened systems

Many systems and modalities have system-specific strategies (botanical, homeopathic and/or nutritional approaches; physical/structural methods including therapeutic exercise, manipulation, massage, etc.; hydrotherapy, psychological–spiritual medicine, Ayurvedic, Tibetan, Traditional Chinese Medicine, acupuncture and others). Examples of objectives are to:

- strengthen the immune system
- decrease toxicity
- normalize inflammatory processes
- optimize metabolic function
- balance regulatory systems
- enhance regeneration
- harmonize with the life force.

5. Prescribe specific natural substances:

Appropriate modalities or interventions.

6. Prescribe specific pharmacological or synthetic substances:

Appropriate modalities or interventions.

7. Use higher force interventions:

Examples are surgery, suppressive drugs, radiation, chemotherapy and other approaches.

Note: The actual therapeutic order may change depending on the individual patient’s needs and unique characteristics.

the applications of care and interventions necessary for health and healing with the least force.

The therapeutic order schematically directs the naturopathic practitioner's therapeutic choices in an efficient order, based on individual patient needs and priorities for safe and effective care, rather than using a 'shotgun' approach. It is this common philosophy and theory that both distinguishes the field of modern naturopathic medicine and enables it to consider and incorporate new therapies (Pizzorno & Snider 2004).

Practical example

To express these theories in practical form, a simple example may be illustrative:

- A fall or strain results in tissue damage.
- The damage (tear, break, sprain) may have been 'caused' by the fall or strain, but the scale of damage will be dependent on many other factors, including age, degree of fitness, relative stability/instability/vulnerability of the area and tissues affected, the individual's nutritional status, the surface onto which the fall occurred – and more.
- In simple cases, addressing the acute strain or break would probably be sufficient – immobilizing and possibly compressing the damaged tissues, use of ice, elevation, etc.
- However, in cases of recurrent strains or breaks, or where such an injury does not heal as rapidly as expected, a naturopath would be expected to look more deeply into all of the determining factors and make a variety of corrections and suggestions (possibly involving nutritional, stability, flexibility, balance, postural, ergonomic, psychosocial and other factors) following the therapeutic order.

The words synchronicity or 'simultaneity' (Jung 1973) can be used to describe this way of viewing patterns and events. Such spatial thinking – which mirrors much naturopathic clinical decision-making – may represent the most effective way of evaluating health problems, avoiding naive cause-effect (and 'cure') considerations. It may be useful to now examine these considerations with specific reference to naturopathic physical medicine (which is explained in greater detail in Chapter 4).

Derivation – naturopathy's antecedents

'The bulk of professional naturopathic clinical theory' in the USA, subsequent to the establishment of natu-

ropathic medicine in the USA, 'was to be found in Benedict Lust's magazines: *Herald of Health* and *The Naturopath*' (Zeff et al 2006). These publications displayed the prodigious writings of Lust, but did not contain a comprehensive and definitive statement of either philosophy or clinical theory. Lust often stated that all natural therapies fell under the purview of naturopathy.

He stated for example:

Naturopathy is the mother, all inclusive, of natural therapy. It is the basic platform of all methods of healing . . . (Lust 1925)

and

Naturopathy is a distinct school of healing, employing the beneficent agency of Nature's forces, of water, air, sunlight, earthpower, electricity, magnetism, exercise, rest, proper diet, various kinds of mechanical treatments, such as massage, osteopathy, and chiropractic, mental and moral science . . . As none of these agents of rejuvenation can cure every disease, the Naturopath rightly employs the combination that is best adapted to each individual case . . . (Lust 1918, Kirchfeld & Boyle 1994)

There were also several other defining texts used by the emerging profession. These included:

- Henry Lindlahr MD's seven volume *Natural Therapeutics*, published in the 1910s and 1920s.
- *Nature Cure* (1913) by Lindlahr is considered a seminal work in naturopathic theory, laying the groundwork for a systematic approach to naturopathic treatment and diagnosis.
- Lindlahr ultimately presented the most coherent naturopathic theory extant, summarized in his *Catechism of Naturopathy* (1913), which presented a five-part therapeutic progression:
 1. 'Return to Nature' – which meant paying attention to the basics of diet, dress, exercise, rest, etc.
 2. Elementary remedies – water, air, light, electricity
 3. Chemical remedies – botanicals, homeopathy, etc.
 4. Mechanical remedies – manipulations, massage, etc.
 5. Mental/spiritual remedies – prayer, positive thinking, doing good works, etc. (Zeff et al 2006).

Early 20th century texts that influenced naturopathic thinking also included Macfadden's five

volume *Encyclopedia of Physical Culture* published in 1918.

Additional literature emerged:

- In the US, Spitler wrote *Basic Naturopathy, a Textbook* (1948), and Wendel, *Standardized Naturopathy* (1951). These books presented the somewhat opposing perspectives of the more science-based, or 'green allopathic', and the purist 'nature cure' camps.
- Kutts-Cheraux's *Naturopathic Materia Medica* (1953) was produced to satisfy a statutory demand by the Arizona legislature, but as one of the few extant guides persists.
- A number of earlier texts have been relied upon, many of which arose from the German hydrotherapy practitioners (Kneipp 1889, 1891, 1894, Rausse 1838, Rikli 1869, Trall 1851) or the Eclectic school of medicine (a refinement and expansion of the earlier 'Thomsonian' system of medicine; Beach 1848, Boyle 1888, Ellingwood 1919, Felter 1922, Thomson 1821) that predated the formal American naturopathic profession (1896).

The history of naturopathic medicine in general and naturopathic physical medicine in particular are described more fully in Chapter 3.

It is out of this background that current concepts and practices have emerged, including identification by the North American naturopathic profession of the principles and therapeutic order, as discussed above.

Naturopathic physical medicine (see Chapter 4)

Naturopathic physical medicine:

- is the practice of physical medicine, in the context of naturopathic medicine
- integrates both scientific knowledge in physical medicine and the principles of naturopathic medicine into a distinct approach to physical medicine practice.

Core components

1. A respect for the traditional and empirical naturopathic approach to knowledge of the physical aspect of the human being in health and disease.
2. Recognition of the value of individualization of therapy and constitutional needs.
3. A concentration on holistic diagnosis and the interaction of all bodily systems.

4. Having the general therapeutic goal of enhancement of self-regulating systems and mechanisms (*vis medicatrix naturae*).

Features of naturopathic physical medicine

A central concept that distinguishes naturopathic physical medicine from other forms of manual medicine is the perception of a vitalistic organism, seen to be adapting to inherited and acquired stressors, ultimately becoming symptomatic as a result of failure to manage this load, and then requiring holistic assessment and diagnosis, followed by sensitive, minimal, physical medicine (and other naturopathic) interventions to stimulate self-regulation (*vis medicatrix naturae*) in order to restore or enhance functionality and well-being.

The variety of eclectic modalities and methods used by NPM to achieve these ends are summarized and discussed in some detail in Chapter 4 (Introduction to NPM), Chapter 5 (Assessment and palpation approaches), Chapter 7 (NPM modalities), Chapter 8 (Constitutional approaches), Chapter 9 (Rehabilitation and re-education), Chapter 10 (Specific conditions), Chapter 11 (Hydrotherapy) and Chapter 12 (Electrotherapy).

Each of the modalities/methods incorporated into NPM has been shown to be effective and safe when utilized appropriately. Even when degenerative processes have progressed beyond a stage where realistic anticipation exists for the restoration of normal function, the authors suggest that clinical experience has demonstrated that NPM has the potential to alleviate pain, modulate dysfunction and encourage functionality.

For example, an individualized protocol combining – as appropriate to the person involved and their current condition – mind-body approaches/stress management (Berman & Singh 1997, Lundgren & Stenstrom 1999, Stevens 2005), nutritional strategies (Egger et al 1983, Gottlieb 1997, Maheu et al 1998), use of botanical substances (Ernst & Chrubasik 2000, Mills et al 1996), manual methods (Bonfort 1999, Bratberg 1999, Garfinkel et al 1994; see Chapters 7 and 8), exercise and education (Fitzcharles et al 2006, Gowans et al 1998; see Chapter 9), acupuncture and/or moxibustion (Berman et al 1999, Ernst & White 1998), hydrotherapy (Evick et al 2002, Faull 2005, Mannerkorpi et al 2000; see Chapter 11) and/or electrotherapy (McMakin 1998, 2004; see Chapter 12) can be significantly beneficial in treatment of patients with conditions as diverse as low back pain, migraine, fibromyalgia and degenerative joint disease.

As will become clear, particularly in Chapters 7, 8, 9 and 10, a wide range of general health problems, often of a severe life-threatening nature, ranging from acute pneumonia in the hospitalized elderly (Noll et al 2000) to pancreatitis (Radjieski et al 1998) and postsurgical recovery problems, can all be shown to benefit from a variety of physical medicine interventions that encourage self-regulatory functions (O-Yurvati et al 2005).

It is worth reflecting on the potential for patient benefit of this wide range of approaches, all of which are selectively employed in naturopathic physical medicine, within a context that treats the person not the disease, and which relies on inherent, endogenous, self-healing potentials for health enhancement.

As mentioned above, treatment approaches for specific conditions are discussed in Chapter 10.

The meaning of symptoms

Within the framework of naturopathic thinking there exists an appreciation that symptoms are frequently evidence of self-regulation in action – to be understood, respected, assisted and possibly modulated if excessive (inflammation is a clear example) – and ideally not to be suppressed (Lindlahr 1913).

Pain, arguably the most common symptom of all, epitomizes the need to understand the sources and mechanisms involved, and the processes associated with its origin and maintenance. Merely suppressing pain without such understanding, and where possible the taking of appropriate action to relieve symptoms and remove causes, is a prescription for chronicity.

Pain may represent:

- a warning (hand touches a flame)
- a caution not to move the area (due to a tear, a break or a process of degeneration)
- part of a protective process
- a signal that repair is underway (inflammation, etc.)
- a remnant of past trauma or dysfunction that has little current relevance (e.g. post-herpes pain)
- evidence of neural sensitization or other forms of neurologically mediated distress or pathology
- reflexogenic activity (viscerosomatic, somaticovisceral, myofascial trigger point, etc.).

Pain and the mind

Pain may also have many other possible (e.g. psychogenic) meanings.

Understanding the processes involved in the production and maintenance of pain (or other symptoms)

is clearly desirable in making clinical choices; however, if naturopathic principles are to be applied these should always go beyond the obvious and should include not only the structural/physical aspects of the problem but also biochemical and psychosocial contextual ramifications and influences.

A comprehensive review (Linton 2000) of over 900 studies involving back and neck pain concluded that psychological factors play a significant role, not only in chronic pain but also in the etiology of acute pain – particularly in the process of transition to chronicity:

Stress, distress or anxiety as well as mood and emotions, cognitive functioning, and pain behaviour all were found to be significant in the analysis of 913 potentially relevant articles.

In an athletic (or any other) injury setting the need to consider both the context and all aspects of the individual and the injury event becomes obvious. Crown et al (1997) have observed:

Both extrinsic and intrinsic factors can increase the risk of injury. Extrinsic factors include training errors, faulty technique, poor environmental conditions, incorrect equipment and surfaces. Intrinsic factors include biomechanical deficiencies including malalignment of limbs, muscular imbalances, degenerative processes, and other anatomical factors.

A fuller list of additional factors might also include nutritional imbalances, past and present pathological processes, adaptive changes to previous injury or repetitive microtrauma, etc.

Specific examples will be offered in later chapters, emphasizing the naturopathic approaches to such common features as restriction and pain, as well as the wider range of conditions that are treated using naturopathic physical medicine approaches.

Beyond biomechanical dysfunction

Naturopathic physical medicine is also employed in the treatment of patients with a wide range of diseases, unrelated to obvious biomechanical problems.

As in other manual medicine settings, NPM commonly focuses on obvious structural, physical, biomechanical pain and dysfunction; however, the modalities and methods used can – as in physiotherapy, osteopathy and chiropractic – also be beneficially used in the treatment of patients presenting with a variety of general health problems.

Massage and general health

Amongst the most widely beneficial manual methods of treatment commonly incorporated into naturopathic care is traditional massage therapy, which has

been shown in numerous research studies to have value in the care of conditions as diverse as pregnancy, prematurity, ADHD, autism, stroke, leukemia and low back pain – offering as it does relief from psychological distress, stress modulation, enhanced sleep, mood and behavior, improved circulation and lymphatic flow, better bowel and breathing function, and raised immunity – among many other benefits (Field 2000, Rich 2002).

The studies listed and/or discussed in Chapters 7 and 8 provide a small selection from those described in *Massage Therapy Research* (2006) by Tiffany Field PhD, of the Touch Research Institute, University of Miami Medical School.

Osteopathic and chiropractic treatment and general health

Modalities deriving from osteopathic medicine have demonstrated the value of osteopathic manipulative therapy (OMT) in a wide range of pathological settings (see discussions in Chapters 7 and 8).

As will become evident in subsequent chapters, particularly Chapters 4 and 7, the soft tissue modalities that are discussed as being appropriate and useful in NPM settings include those employed in the osteopathic studies listed in Chapter 7. These include muscle energy technique (MET), positional release technique (PRT) and myofascial release (MFR), as well as general joint mobilization and high velocity, low amplitude (HVLA) thrust methods, where appropriate. A number of well-conducted studies have also shown the benefit of HVLA thrust in chiropractic practice in the treatment of conditions such as infantile colic and pyloric stenosis (Fallon 1994).

Some of the many studies in which OMT and chiropractic manipulation methods have been employed with benefit in the treatment of patients with serious pathological conditions are discussed in Chapters 7 and 8.

In addition, methods developed in physical therapy, such as mobilization with movement (MWM), McKenzie rehabilitation exercises and supportive ('unloading') taping methods, are all suitable for use in a naturopathic practice (see Chapter 7).

All or any of the methods used in these and numerous other studies would be appropriate in a naturopathic setting, as part of a comprehensive therapeutic approach.

Are all 'natural' modalities necessarily naturopathic?

In general health settings a person may effectively reduce digestive distress by using, say, peppermint or

chamomile infusions, or by taking mastic capsules or probiotics. However, unless the reasons for the digestive distress are also evaluated and addressed, such methods could be described as 'green allopathy', where 'natural' substances are used in a symptom-focused manner.

While it is true that taking these substances would probably carry less risk of side-effects than use of over-the-counter pharmacological medication, such treatment approaches would nevertheless fail to meet basic naturopathic requirements. The concept of *tolle causum* (identify and treat the cause, as discussed earlier in this chapter) requires further evaluation if a naturopathic approach is to be true to its principles. Examination from a naturopathic physical medicine perspective may reveal facilitated mid-thoracic spinal segments (see Box 2.2 for discussion of segmental facilitation) contributing significantly to digestive distress, or poor posture might be contributing to crowding of the abdominal organs (see notes under the subheading 'Postural adaptation influences on visceral and somatic function' on page 42 for discussion of the influence of posture on visceral function).

Additionally or alternatively, emotional distress might be a key feature in the etiology of digestive distress, or an unbalanced dietary pattern may be implicated. Whichever of these (or other) factors is identified as being part of the etiology, the use of peppermint or chamomile infusions to ease the symptoms would not be dealing with cause.

Objectives and methods

Naturopathic physical medicine can be defined by its comprehensive objectives, as well as by the context in which it employs safe and effective modalities. Such approaches demand focus on the processes involved, and the context and etiology of the presenting symptoms.

Essential requirements need to be considered and, if possible, met in naturopathic patient management:

- Causes need to be comprehensively addressed. It is worth emphasizing at this point that the causes of disease and dysfunction, as perceived by naturopathic medicine, might include a variety of constitutional features such as toxicity, organ dysfunction, endocrine imbalance, lowered general vitality, nutritional deficiencies and more. The broad scope of 'causes' will be more fully outlined in relation to specific conditions in Chapter 10.
- An inclusive assessment should be made of, and selective attention given to, those components of dysfunction that best meet the patient's current needs.

- A preventive educational and/or rehabilitative element needs to be incorporated as a standard aspect of naturopathic physical medicine.

Note: There is no suggestion implied that other health care disciplines do not also seek causes; however, the principles of naturopathic medicine demand a primary attention to context and the processes involved in symptom manifestation (e.g. lowered vitality, organ dysfunction, nutritional imbalance, toxicity), as well as the more obvious etiological features of any given condition.

Non-naturopathic manual methods

Examples of manual medicine approaches that offer short-term gain, without consideration of the context out of which the symptoms have emerged, can be described for almost all modalities. This is the case when they are applied in isolation, outside of a comprehensive contextual evaluation of the patient's broader symptoms and needs.

Massage therapy for example (or forms of hydrotherapy or aromatherapy) might well represent safe, effective, non-specific interventions that reduce feelings of anxiety, enhance sleep and reduce sympathetic arousal – encouraging self-regulation. However, these methods will not be being employed naturopathically unless the causes of the individual's health problems are also addressed, and preventive methods considered and discussed. Simple examples might include cases of anxiety, treated by means of massage and/or aromatherapy, without recourse to attention to the underlying causes of the anxiety state (Cooke & Ernst 2000, Field et al 1996).

This suggests that much that is currently done in massage therapy, chiropractic, osteopathic and physical therapy settings may fail to meet the basic naturopathic requirements of dealing with the whole person and the causes of their problems. If naturopaths mimic symptom-oriented approaches in dealing with musculoskeletal dysfunction they are not living up to the core principles on which their profession is based. Box 1.4 compares and contrasts the major health professions using physical medicine.

What methods and modalities form naturopathic physical medicine?

Most of the treatment and rehabilitation methods and techniques employed in physiotherapy (physical therapy), osteopathy and chiropractic, as well as massage and the wide range of other soft tissue and movement methods and modalities (including hydro-

therapy and electrotherapy), are commonly used in naturopathic practice, although few of the methods used in NPM actually originated in naturopathic settings. An exception is neuromuscular technique (NMT) which is described and illustrated in Chapters 5, 7 and 8.

A method or modality is seen to be 'naturopathic', less by its *form* than by its *intent*, mode of operation and the *context* in which it is applied, i.e. the general state of health of the patient and the nature of the pathology or dysfunction, as well as the state of the tissues requiring attention – are they inflamed, hypertonic, in spasm, edematous, etc.?

This points to the fact that the same modality may be used either allopathically or naturopathically – depending largely on the context in which it is employed, the intent behind its use and the condition of the person to whom (as well as the tissues to which) it is being applied.

A structural example will suffice at this stage (see Chapters 4, 7, 8 and 9 for more detailed analysis of this topic):

- High velocity, low amplitude (HVLA) thrust is a major tool in chiropractic and osteopathic medicine, as well as increasingly in physical (physio) therapy (see Box 1.5 for a detailed statement as to what constitutes manipulative therapy as viewed from a naturopathic perspective).
- In the context of an intra-articular restriction that has failed to respond to gentler soft tissue and movement therapy approaches, and in the absence of contraindications to its use, an HVLA thrust may be an effective means of restoring functionality to a joint. This would be seen as offering a naturopathic solution to a problem if used as part of a comprehensive approach to the needs of the tissues and the person.
- The same thrust, utilized without recourse to prior soft tissue treatment (which may well make the thrust redundant), used in a setting contraindicated for a forceful thrust (possibly due to age or state of the tissues) or as an end in itself (i.e. mobilize ('adjust') the joint and nothing else), or where careful analysis of risk/benefit factors has not been considered or the patient was fearful of the procedure, would not be considered naturopathic.
- The use of an HVLA thrust to successfully mobilize a restricted joint, where no attempt was made to identify and remedy etiological features, would equally not fully match naturopathic requirements.

Box 1.4 Comparison and contrast between the major health professions using physical medicine*Paul Orrock ND DO*

- **Biomedicine**
- **Chiropractic medicine**
- **Naturopathic medicine**
- **Osteopathic medicine**
- **Physiotherapy/physical therapy**
- **Traditional Chinese Medicine**
- **Ayurvedic medicine**

Preamble

What is 'medicine'? Medicine is:

- *the science of diagnosing, treating, or preventing disease and other damage to the body or mind* (www.thefreedictionary.com/medicine)
- *the art and science of the diagnosis, treatment, and prevention of disease and the maintenance of good health* (Mosby's Medical Dictionary 1998).

Practicing a system of medicine (as opposed to a therapy, modality or technique) requires an established diagnostic and therapeutic methodology, and core training in that identifiable style of medicine.

Therapies and techniques are open for all practitioners to use unless:

- limited by law in a jurisdiction (e.g. Australian States limit spinal manipulation to registered medical practitioners, osteopaths, chiropractors and physiotherapists)
- there is no evidence of having trained in the safe and appropriate use of the therapy/technique (Jonas & Levin 1999).

Biomedicine

Features of the biomedical profession:

- Specific therapy is employed that is antagonistic to a specific condition/disease.
- Clinical practice attempts to be evidence based in a biomedical science foundation.

The use of many physical medicine techniques by a practitioner of biomedicine may be limited by the uncertain answers to the questions:

- What is the condition? *and*
- What is the evidence base for certain therapies (e.g. spinal manipulation) for that condition?

Chiropractic medicine

Traditional features of this profession are as follows (Redwood 1997):

- The diagnosis of subluxation – at a specific spinal segment
- Diagnosed by plain radiographs and palpation

- The neurological model of compression and dysfunction
- The goal of treatment is to balance neural function by correcting subluxation.

There are modern developments in chiropractic that are more complex, subtle, 'reprogramming' approaches (e.g. bio-energetic synchronization technique, BEST).

Naturopathic medicine

- Identifies individual maladaptive response, failing adaptation (i.e. suboptimal system/organ function; reduced self-regulatory potential)
- Leading to acute and chronic illnesses, toxicity.

Therapeutic approach is to support self-regulation via nutrition, botanical substances, homeopathy, lifestyle and holistic physical therapies.

Osteopathic medicine

- Diagnoses somatic dysfunction – circulatory/neural/lymph effects.

Manual treatment/strategies to encourage normal function = decrease somatic dysfunction. Treatment of immune and organ dysfunction.

Physiotherapy/physical therapy

- Physiotherapy is concerned with human function and movement, maximizing potential.

Uses science-based physical approaches to promote, maintain and restore well-being, and to speed healing, rehabilitation and prevent recurrence.

Traditional Chinese Medicine and Ayurvedic medicine

- Identify constitutional types with imbalanced energy as a feature of ill-health.

Therapeutic interventions aim to balance flow and distribution of energy by natural methods.

Case example

A 42-year-old male presented with mid-thoracic pain and stiffness following increased manual labor. Most of the seven practitioners from the listed professions utilized spinal manipulation of the T6/7 segment. What was their rationale for this use, and what else might they do?

- *Biomedicine*: Anti-inflammatory and/or analgesic medication for pain relief, and/or referral to physiotherapist or (increasingly) a chiropractor or osteopath.
- *Chiropractic medicine*: The straight/traditional approach would treat a radiologically defined subluxation – manipulated for all related T6/7 functions to be healthy and to prevent disease. Modern chiropractic approaches

Continued

Box 1.4 Comparison and contrast between the major health professions using physical medicine continued

would include rehabilitation and postural soft tissue-based therapies (Liebenson 2006).

- *Naturopathic medicine*: Manipulation to relieve regional muscle spasm and immobility that is seen to be negatively influencing physical vitality and adaptive energy. All appropriate areas would be treated using massage, manipulation, physical methods including hydrotherapy and/or electrotherapy – with attention to ergonomics, posture and use patterns. Attention would be offered to lifestyle and occupational activities that might be stressing the area, including respiratory function. Considerations would be given to possible nutritional influences.
- *Osteopathic medicine* (Ward 1996): Focus would be on segmental/articulation and soft tissue-based dysfunction, with altered range of motion and tender tissue changes, treated with multiple manual and exercise methods to influence function at a circulatory, neural (visceral and somatic – viscerosomatic facilitation concepts) and lymphatic level, aimed to enhance function = optimal health.

- *Physiotherapy/physical therapy* (The Physiotherapy Site Network): Soft tissue and joint diagnosis and general identified stiffness, treated with application of evidence-based manual exercise (e.g. Maitland (Maitland et al 2001), Mulligan (1999) and/or McKenzie (1981) methods) and electrotherapies (e.g. ultrasound), in order to change local findings and pain. Exercise prescription to stabilize and mobilize.
- *Traditional Chinese Medicine and Ayurvedic medicine* (incorporating yoga therapy): Diagnosis of constitutional and energy imbalances, with treatment to balance these, some local manual massage and manipulation and/or acupuncture to remove obstacles to flow of energy; balanced flow = health and prevention of disease.

All or any of the professions listed might incorporate or refer aspects of Pilates methodology, yoga, Alexander technique and other movement-based modalities, techniques and systems.

Avoiding adaptive overload

Almost all modalities and techniques used in NPM (ranging from massage to specific soft tissue methods, exercise, movement, hydrotherapy or electrotherapy) can be shown, in particular situations, contexts and patients, to be undesirable, to be imposing undue adaptive demands or to carry unnecessary risks of 'doing harm' – the avoidance of which is one of the defining features of naturopathic medicine.

Needless to say, almost all other disciplines also express a desire to avoid harm; however, the definition as to what constitutes harm is likely to differ from that of naturopathy, where 'harm' is seen to embrace failure to comprehensively deal with underlying causative features including nutrition, lifestyle and emotion. Treating symptoms, and possibly relieving or removing these short term, without due attention to etiology, is tantamount to doing harm.

Reference back to basic principles, as outlined earlier in this chapter, can usually determine just how naturopathic, or non-naturopathic, a treatment approach is.

Is the therapeutic method being used likely to achieve any of the following key objectives?:

1. To reduce adaptive load (e.g. deactivation of a pain-producing, active trigger point, together with attention as to its cause).

2. To enhance functionality (better posture, enhanced breathing function, greater mobility, etc.).
3. To ease symptoms without adding to the patient's adaptive burden (how sensitive and vulnerable, and how far along the road to decompensation, is this individual?).
4. To be working with self-repair, self-regeneration, self-healing processes (see items 1, 2 and 3 above).
5. To be taking account of the whole person, the context, and not just the symptoms (see item 6 below).
6. To be cognisant of where the individual is in the spectrum of adaptation – judging as best possible the current degree of exhaustion and susceptibility (see notes on the Zink & Lawson assessments on page 138), with a rule-of-thumb guideline that the more complicated the condition, the more vulnerable the individual, the less that should be done therapeutically at any given time.
7. To deal with causes where possible – for example, symptomatic headache relief by means of gentle release of suboccipital muscles, and/or trigger point deactivation, and/or mobilization of upper cervical restrictions, would be followed by addressing

Box 1.5 Position Paper of AANP (Buratovich et al 2006)

Nick Buratovich ND, Michael Cronin ND,
MA Perry ND et al

Extracts from a Position Paper on Naturopathic Manipulative Therapy, by the American Association of Naturopathic Physicians (AANP), have been listed below.

These extracts demonstrate how the naturopathic profession in North America perceives physical medicine, in the context of its broader scope of practice.

The Position statement notes that:

- 'Naturopathic physical medicine', including 'naturopathic manipulative treatment' (NMT), has historically been an integral part of the practice of naturopathic medicine and has been included in naturopathic medical education and licensure since the first naturopathic college (1902).
- Naturopathic physicians use appropriate diagnostic and imaging methods with physical medicine modalities and procedures as part of an integrated approach to the diagnosis and treatment of the full spectrum of health disorders, and the optimization of structure and function in healthy individuals, including but not limited to the musculoskeletal/postural, nervous, circulatory, respiratory, metabolic, psychosocial and bioenergetic systems.
- Naturopathic physical medicine is the therapeutic use by naturopathic physicians of the physical agents of air, water, heat, cold, sound, light and the physical modalities/procedures including but not limited to hydrotherapy, electrotherapy, diathermy, ultrasound,

ultraviolet, infrared and low level laser light, therapeutic exercise, naturopathic manipulative treatment and the use of needling and injection therapies, including dry needling, regenerative injection therapy (prolotherapy), mesotherapy, neural therapy and myofascial trigger point therapy.

- Naturopathic manipulative treatment (NMT) is treatment by manual and other mechanical means of all body tissues and structures, including bones, fascia, muscles, tendons, ligaments, joint capsules, bursa, tendon sheaths, visceral organs located in the spine, cranium, thoraco-abdominal cavity and extremities by naturopathic physicians. These manual and mechanical techniques involve the use of oscillation, thrust and sustained tension including but not limited to high and low velocity techniques, high and low amplitude techniques, traction, mobilization through physiological and extra-physiological ranges of motion, including passive intrinsic mobility of all body joints, and repositioning of displaced body tissues and organs.
- Naturopathic medical education includes naturopathic physical medicine and manipulative treatment in courses devoted specifically to NPM and NMT and integrated with other courses and clinical experience and prepares NDs to competently perform NPM and NMT, to recognize the limits of their skills, understand the risks, contraindications and limitations of the modality and to refer patients to specialists when appropriate.

postural and use patterns (aspects of the adaptive demands) that may have produced or contributed to these changes. In addition, possible nutritional, toxicity, lifestyle (e.g. inadequate sleep or exercise) and psychological influences would be considered.

8. To do no harm.

These objectives represent the major principles on which naturopathic physical medicine is based.

The processes of adaptation, maladaptation, compensation and decompensation are described and discussed in Chapter 2, with the intention of providing insights into naturopathic thinking in terms of the contextual evolution of dysfunction and disease, and to therefore reflect on clinical reasoning and choice of therapeutic options that should naturally follow.

References

- Abelson J, Weg JG, Nesse RM, Curtis GC 2001 Persistent respiratory irregularity in patients with panic disorder. *Biological Psychiatry* 49(7):588–595
- Alford L 2007 Findings of interest from immunology and psychoneuroimmunology. *Manual Therapy* 12(2):176–180
- Alverdy J 1990 Effects of glutamine-supplemented diets on immunology of the gut. *Journal of Parenteral Nutrition* 14(4):1095–1135
- American Association of Naturopathic Physicians 2006. www.naturopathic.org
- American Association of Naturopathic Physicians 2007. www.naturopathic.org
- Beach W 1848 A treatise on anatomy, physiology and health. Baker & Scribner, New York

- Bengtsson U, Hanson LA, Ahlstedt S 1996 Survey of gastrointestinal reaction to foods in adults in relation to atopy, presence of mucus in the stools, swelling of joints and arthralgia in patients with gastrointestinal reactions in foods. *Clinical and Experimental Allergy* 26(12):1387–1394
- Berman BM, Singh BB 1997 Chronic low back pain: an outcome analysis of a mind–body intervention. *Complementary Therapies in Medicine* 5:29–35
- Berman BM, Singh BB, Lao L et al 1999 A randomized trial of acupuncture as an adjunctive therapy in osteoarthritis of the knee. *Rheumatology* 38:346–354
- Bonfort G 1999 Spinal manipulation, current state of research and its indications. *Neurological Clinics of North America* 17(1):91–111
- Boon HC, Cherkin D, Erro J 2004 Practice patterns of naturopathic physicians: results from a random survey of licensed practitioners in two US States. *BMC Complementary and Alternative Medicine* 4:14
- Borrell-Carrio F, Suchman A, Epstein R 2004 The biopsychosocial model 25 years later: principles, practice, and scientific inquiry. *Annals of Family Medicine* 2(6):576–582
- Boyle W 1988 *The herb doctors*. Buckeye Naturopathic Press, East Palestine, Ohio
- Brattberg G 1999 Connective tissue massage in the treatment of fibromyalgia. *European Journal of Pain* 3:235–245
- Brosschot J 2002 Cognitive–emotional sensitization and somatic health complaints. *Scandinavian Journal of Psychology* 43:113–121
- Brostoff J, Gamlin L 1998 *The complete guide to food allergy and intolerance*. Bloomsbury, London
- Buratovich N, Cronin M, Perry A et al 2006 AANP Position Paper on Naturopathic Manipulative Therapy. American Association of Naturopathic Physicians, Washington DC
- Chaitow L 2003 *Fibromyalgia syndrome: a practitioner's guide to treatment*. Churchill Livingstone, Edinburgh
- Chaitow L 2004 Breathing pattern disorders, motor control and low back pain. *Journal of Osteopathic Medicine* 7(1):33–40
- Charney D, Deutch A 1996 Functional neuroanatomy of anxiety and fear. *Critical Reviews in Neurobiology* 10(3–4):419–446
- Chek P, Curl DD 1994 Posture and craniofacial pain. In: Curl DD (ed) *Chiropractic approach to head pain*. Williams & Wilkins, Baltimore, p 121–162
- Cooke B, Ernst E 2000 Aromatherapy for anxiety: a systematic review. *British Journal of General Practice* 50:493–496
- Crago S, Tomasi T 1987 *Mucosal antibodies, food allergy and intolerance*. Baillière Tindall/WB Saunders, London, p 167–189
- Crissinger K, Kvietys P, Granger D 1990 Pathophysiology of gastrointestinal permeability. *Journal of Internal Medicine* 228:145–154
- Crown L, Hizon J, Rodney W 1997 *Musculoskeletal injuries in sports: the team physician's handbook*. Mosby, St Louis, p 361–370
- Damas-Mora J, Davies L, Taylor W, Jenner FA 1980 Menstrual respiratory changes and symptoms. *British Journal of Psychiatry* 136:492–497
- DeGuire S, Gevirtz R, Hawkinson D, Dixon K 1996 Breathing retraining: a three-year follow-up study of treatment for hyperventilation syndrome and associated functional cardiac symptoms. *Biofeedback and Self-Regulation* 21(2):191–198
- Di Lazzaro V, Restuccia D, Nardone R et al 1996 Preliminary clinical observations on a new trigeminal reflex: the trigemino-cervical reflex. *Neurology* 46(2):479–485
- Dunn J, Wilkinson J 2005 Naturopathic management of rheumatoid arthritis. *Modern Rheumatology* 15(2):87–90
- Egger J, Carter CM, Wilson J, Turner MW, Soothill JF 1983 Is migraine food allergy? A double-blind controlled trial of oligoantigenic diet treatment. *Lancet* 2:865–869
- Ellingwood F 1919 *Materia medica, therapeutics, and pharmacognosy*. Ellingwood's Therapist, Evanston, IL
- Engel G 1977 The need for a new medical model: a challenge for biomedicine. *Science* 196:129–136
- Ernst E, Chrubasik S 2000 Phyto-anti-inflammatories: a systematic review of randomized, placebo-controlled, double-blind trials. *Rheumatic Diseases Clinics of North America* 26(1):13–27
- Ernst E, White AR 1998 Acupuncture for back pain, metaanalysis. *Archives of Internal Medicine* 158:2235–2241
- Evcik D, Kizilay B, Gokcen E 2002 The effects of balneotherapy on fibromyalgia patients. *Rheumatology International* 22(2):56–59
- Fallon J 1994 Assessing the efficacy of chiropractic care in pediatric cases of pyloric stenosis. *International Chiropractic Association: Proceedings of National Conference of Chiropractic and Pediatrics*, Arlington VA, p 72

- Faull K 2005 Comparison of the effectiveness of Watsu and Aix massage for those with fibromyalgia syndrome: a pilot study. *Journal of Bodywork and Movement Therapies* 9(3):202–210
- Felter H 1922 *The eclectic materia medica, pharmacology, and therapeutics*. John K Scudder, Cincinnati
- Field T 2000 *Touch therapy*. Churchill Livingstone, Edinburgh
- Field T 2006 *Massage therapy research*. Churchill Livingstone, Edinburgh
- Field T, Grizzle N, Scafidi F, Schanberg S 1996 Massage and relaxation therapies' effects on depressed adolescent mothers. *Adolescence* 31:903–911
- Fitzcharles M-A, Almahrezi A, Shir Y 2006 New insights into pain mechanisms. Practical advice on pain management – pain: understanding the challenges for the rheumatologist. *Arthritis & Rheumatism Research News Alerts*. Posted 01/05/2006 www.interscience.wiley.com/journal/arthritis
- Ford MJ, Camilleri MJ, Hanson RB 1995 Hyperventilation, central autonomic control, and colonic tone in humans. *Gut* 37:499–504
- Foster G, Vaziri N, Sassoon C 2001 Respiratory alkalosis. *Respiratory Care* 46(4):384–391
- Fried R 1987 *Hyperventilation syndrome*. Johns Hopkins University Press, Baltimore
- Fukuda T 1984 *Statokinetic reflexes in equilibrium and movement*. University of Tokyo Press, Tokyo, p 5
- Gardner WN 1996 The pathophysiology of hyperventilation disorders. *Chest* 109:516–534
- Garfinkel MS, Schumacher HR, Husain A, Levy M, Reshetar RA 1994 Evaluation of a yoga based regimen for treatment of osteoarthritis of the hands. *Journal of Rheumatology* 21:2341–2343
- George S 1964 Changes in serum calcium, serum phosphate and red cell phosphate during hyperventilation. *New England Journal of Medicine* 270:726–728
- Gottlieb MS 1997 Conservative management of spinal osteoarthritis with glucosamine and chiropractic treatment. *Journal of Manipulative and Physiological Therapeutics* 20:400–414
- Gowans SE, deHueck A, Voss S, Richardson M 1998 A randomized, controlled trial of exercise for fibromyalgia syndrome. *Arthritis Care and Research* 11:196–209
- Heyman M 2005 Gut barrier dysfunction in food allergy. *European Journal of Gastroenterology and Hepatology* 17(12):1279–1285
- Hickman MA 1998 Interventional nutrition for gastrointestinal disease. *Clinical Techniques in Small Animal Practice* 13(4):211–216
- Hiyama S, Ono T, Ishiwata Y, Kuroda T 2002 Effects of mandibular position and body posture on nasal patency in normal awake subjects. *Angle Orthodontist* 72(6):547–553
- Hough HJ, Dower C, O'Neil E 2001 *Profile of a profession: naturopathic practice*. Center for the Health Professions, San Francisco. University of California, San Francisco
- Janda V 1982 Introduction to functional pathology of the motor system. *Proceedings of the VII Commonwealth and International Conference on Sport. Physiotherapy in Sport* 3:39
- Jonas WB, Levin JS (eds) 1999 *Essentials of complementary and alternative medicine*. Lippincott, Williams and Wilkins, Philadelphia
- Jung C-G 1973 *Synchronicity: an acausal connecting principle*. Princeton University Press, Princeton, NJ
- Kirchfeld F, Boyle W 1994 *The nature doctors: pioneers in naturopathic medicine*. *Medicina Biologica*, Milan, p 194
- Kneipp S 1889 *Thus shalt thou live*. Kosel, Kempten, Bavaria
- Kneipp S 1891 *My water-cure*. Translation and preface by A deF. Thorsons, Wellingborough (1979 reprint of the 1891 edition)
- Kneipp S 1894 *My will*. Kosel, Kempten, Bavaria
- Kutts-Cheraux A (ed) 1953 *Naturae medicina and naturopathic dispensatory*. American Naturopathic Physicians and Surgeons Association, Washington DC
- Liebenson C 2006 *Rehabilitation of the spine*, 2nd edn. Williams & Wilkins, Baltimore
- Lindlahr H 1913 *Nature cure: philosophy and practice based on the unity of disease and cure*. The Nature Cure Series, Vol. 1. Nature Cure Publishing, Chicago
- Linton S 2000 Review of psychological risk factors in back and neck pain. *Spine* 25:1148–1156
- Litchfield PA 2003 Brief overview of the chemistry of respiration and the breathing heart wave. *California Biofeedback* 19:1
- Lum L 1984 Hyperventilation and anxiety states [editorial]. *Journal of the Royal Society of Medicine* January: 1–4
- Lundgren S, Stenstrom CH 1999 Muscle relaxation training and quality of life in rheumatoid arthritis. A randomized controlled clinical trial. *Scandinavian Journal of Rheumatology* 28:47–53
- Lust B 1918 *Universal naturopathic encyclopedia, directory and buyers' guide: year book of drugless therapy for 1918–1919*. Benedict Lust, Butler, NJ
- Lust B 1925 *The naturopath*. *Naturopathic News* 30:368

- Lutgendorf S, Costanzo E 2003 Psychoneuroimmunology and health psychology: an integrative model. *Brain, Behavior and Immunity* 17:225–232
- Macefield G, Burke D 1991 Paraesthesiae and tetany induced by voluntary hyperventilation. *Brain* 114:527–540
- Maheu E, Mazieres B, Valat J P et al 1998 Symptomatic efficacy of avocado/soybean unsaponifiables in the treatment of osteoarthritis of the knee and hip. *Arthritis and Rheumatism* 41:81–91
- Maitland GP, Hengeveld E, Banks K, English K 2001 Maitland's vertebral manipulation, 6th edn. Butterworth-Heinemann, Oxford
- Mannerkorpi K, Nyberg B, Ahlmen M, Ekdahl C 2000 Pool exercise combined with an education program for patients with FMS. A prospective, randomized study. *Journal of Rheumatology* 10:2473–2481
- McCourtie J, Douglas L 1984 Relationship between cell surface composition, adherence, and virulence of *Candida albicans*. *Infection and Immunity* 45:6–12
- McKenzie R 1981 The lumbar spine: mechanical diagnosis and therapy. Spinal Publications, Waikanae, New Zealand
- McMakin C 1998 Microcurrent treatment of myofascial pain in the head, neck and face. *Topics in Clinical Chiropractic* 5(1):29–35
- McMakin C 2004 Microcurrent therapy: a novel treatment method for chronic low back myofascial pain. *Journal of Bodywork and Movement Therapies* 8:143–153
- McPartland J, Brodeur R, Hallgren R 1997 Chronic neck pain, standing balance and suboccipital muscle atrophy – a pilot study. *Journal of Manipulative and Physiological Therapeutics* 20(1):24–29
- Mehling WE, Hamel KA, Acree M et al 2005 Randomized, controlled trial of breath therapy for patients with chronic low-back pain. *Alternative Therapies in Health and Medicine* 11(4):44–52. See: www.breathexperience.com
- Mills SM, Jacoby RK, Chacksfield M et al 1996 Effect of a proprietary herbal medicine on the relief of chronic arthritic pain: a double-blind study. *British Journal of Rheumatology* 35:874–878
- Mosby's medical, nursing and allied health dictionary, 5th edn, 1998. Mosby, St Louis
- Mulligan BR 1999 Manual therapy: nags, snags, MWMs, etc., 4th edn. Plane View Services, Wellington, New Zealand
- Myers SP, Hunter A, Snider P, Zeff JL 2003 Naturopathic medicine. In: Robson T (ed) *An introduction to complementary medicine*. Allen & Unwin, Sydney
- Neill W, Pantley GA, Nakornchai V 1981 Respiratory alkalemia during exercise reduces angina threshold. *Chest* 80(2):149–153
- Newman Turner R 1984 Naturopathic medicine. Thorsons, Wellingborough
- Nixon P, Andrews J 1996 A study of anaerobic threshold in chronic fatigue syndrome (CFS). *Biological Psychology* 43(3):264
- Noll D, Shores J, Gamber R et al 2000 Benefits of osteopathic manipulative treatment for hospitalized elderly patients with pneumonia. *Journal of the American Osteopathic Association* 100(12):776–782
- Ott H et al 2006 Symptoms of premenstrual syndrome may be caused by hyperventilation. *Fertility and Sterility* 86(4):1001e17–19.
- O-Yurvati AH, Carnes MS, Clearfield MB et al 2005 Hemodynamic effects of osteopathic manipulative treatment immediately after coronary artery bypass graft surgery. *Journal of the American Osteopathic Association* 105(10):475–481
- Pellegrino E 1979 Medicine, science, art: an old controversy revisited. *Man and Medicine* 4(1):43–52
- Peltonen R, Kjeldsen-Kragh J, Haugen M et al 1994 Changes of faecal flora in rheumatoid arthritis during fasting and one-year vegetarian diet. *British Journal of Rheumatology* 33:638–643
- Perdigon G, Alvarez S, Nader M et al 1990 The oral administration of lactic acid bacteria increases the mucosal intestinal immunity in response to enteropathogens. *Journal of Food Protection* 53:404–410
- Perri M, Halford E 2004 Pain and faulty breathing. *Journal of Bodywork and Movement Therapies* 8(4):237–312
- Pizzorno JE, Snider P 2004 Naturopathic medicine. In: Micozzi MS (ed) *Fundamentals of complementary and alternative medicine*. Churchill Livingstone, Philadelphia, p 159–192
- Pryor J, Prasad S 2002 *Physiotherapy for respiratory and cardiac problems*, 3rd edn. Churchill Livingstone, Edinburgh, p 81
- Radjeski J, Lumley M, Cantieri M 1998 Effect of osteopathic manipulative treatment on length of stay for pancreatitis: a randomized pilot study. *Journal of the American Osteopathic Association* 98(5):264–272
- Rausse JH 1838 *Der Geist der Graffenberger Wasserkur*. Schieferdecker, Zeitz
- Redwood D (ed) 1997 *Contemporary chiropractic*. Churchill Livingstone, Edinburgh

- Rich G 2002 *Massage therapy: the evidence for practice*. Mosby, St Louis
- Rikli A 1869 *Die Thermoelectricität und das tagliche thermoelectrische Licht und Luftbad in Verbindung mit naturfemasser Diät als zukünftige Heilmethode*. Braumueller, Vienna
- Roithmann R, Demeneghi P, Faggiano R, Cury A 2005 Effects of posture change on nasal patency. *Revista Brasileira de Otorrinolaringologia* (English ed.) 71(4):478
- Selye H 1946 The general adaptation syndrome and the diseases of adaptation. *Journal of Clinical Endocrinology* 6:117–231
- Selye H 1956 *The stress of life*. McGraw-Hill, New York
- Selye H 1975 Confusion and controversy in the stress field. *Stress* 1(2):37–44
- Sergi M, Rizzi M, Braghiroli A et al 1999 Periodic breathing during sleep in patients affected by fibromyalgia syndrome. *European Respiratory Journal* 14(1):203–208
- Shikata N, Ueda HM, Kato M et al 2004 Association between nasal respiratory obstruction and vertical mandibular position. *Journal of Oral Rehabilitation* 10:957–962
- Snider P, Zeff JL 1989 Definition of naturopathic medicine. American Association of Naturopathic Physicians (AANP) Position Paper. Select Committee on the Definition of Naturopathic Medicine. AANP House of Delegates, Rippling River, Oregon. Online. Available: www.naturopathic.org
- Spitler H 1948 (ed) *Basic naturopathy, a textbook*. American Naturopathic Association
- Standish L, Calabrese C, Snider P et al 2005 The future and foundations of naturopathic medical science. The naturopathic medical research agenda. Bastyr University Press, Kenmore, Washington
- Stevens A 2005 *The two million-year-old self*. Texas A&M University Press, College Station, TX, p 118
- Tache Y, Martinez V, Million M, Wang L 2001 Stress and the gastrointestinal tract III. Stress-related alterations of gut motor function: role of brain corticotropin-releasing factor receptors *American Journal of Physiology. Gastrointestinal and Liver Physiology* 280(2):G173–G177
- The Physiotherapy Site Network: www.thephysiotherapysite.co.uk/physio/physiotherapy.html
- Thomson S 1821 *A brief sketch of the causes and treatment of disease*. EG House, Boston
- Timmons B, Ley R (eds) 1994 *Behavioural and psychological approaches to breathing disorders*. Plenum Press, New York, p 118–119
- Tortora G, Grabowski S 1993 *Principles of anatomy and physiology*, 7th edn. HarperCollins, New York, p 69
- Trall RT 1851 *Hydropathic encyclopedia: a system of hydropathy and hygiene*. Fowler & Wells, New York
- Valeur N, Engel P, Carbajal N, Connolly E, Ladefoged K 2004 Colonization and immunomodulation by *Lactobacillus reuteri* ATCC 55730 in the human gastrointestinal tract. *Applied Environmental Microbiology* 70(2):1176–1181
- Vanderhoof JA, Whitney DB, Antonson D et al 1999 *Lactobacillus GG* in the prevention of antibiotic-associated diarrhea in children. *Journal of Pediatrics* 135:564–568
- Verhoef MJ, Scott CM, Hilsden RJ 1998 A multimethod research study on the use of complementary therapies among patients with inflammatory bowel disease. *Alternative Therapies in Health and Medicine* 4:68–71
- Vlaeyen J, Crombez G 1999 Fear of movement, (re)injury, avoidance and pain disability in chronic low back pain patients. *Manual Therapy* 4:187–195
- Waddell G 2004 *The back pain revolution*, 2nd edn. Churchill Livingstone, Edinburgh, p 457–459
- Ward R (ed) 1996 *Foundations for osteopathic medicine*. Williams & Wilkins, Baltimore
- Wendel P 1951 *Standardized naturopathy* (published by the author)
- Zeff JL 1997 The process of healing: a unifying theory of naturopathic medicine. *Journal of Naturopathic Medicine* 7(1):122–125 (submitted to the Journal in 1993; presented as Hierarchy of Therapeutics)
- Zeff J, Snider P, Myers S 2006 A hierarchy of healing: the therapeutic order. The unifying theory of naturopathic medicine. In: Pizzorno J, Murray M (eds) *Textbook of natural medicine*, 3rd edn. Churchill Livingstone, Edinburgh

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Adaptation and the Evolution of Disease and Dysfunction

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Adaptation processes

One significant way of understanding the processes involved in the evolution of disease and dysfunction requires an appreciation of Selye's general adaptation syndrome (GAS) (Selye 1946, 1952). Selye described stages in which an initial defensive/protective ('fight/flight') alarm phase occurs in response to a stressor (Rosch 1999) (see Fig. 2.1 and also Box 2.1), followed, if the stressor (or multiple stressors) continues to be operative, by a phase of adaptation ('resistance') which, when exhausted, results in collapse, frank illness and death.

Selye defined the basic, inborn, endogenous, self-regulating process as *homeostasis* (Fig. 2.2A), which eventually failed when overloaded, at which time a stage of *heterostasis* was reached, where 'something' – treatment in this context – is required to restore health and the self-regulating (adaptive) potential.

Heterostasis (Fig. 2.2B) calls for appropriate treatment to reduce adaptive load or to enhance adaptive capacity in order to avoid adaptation exhaustion, i.e. to avoid the

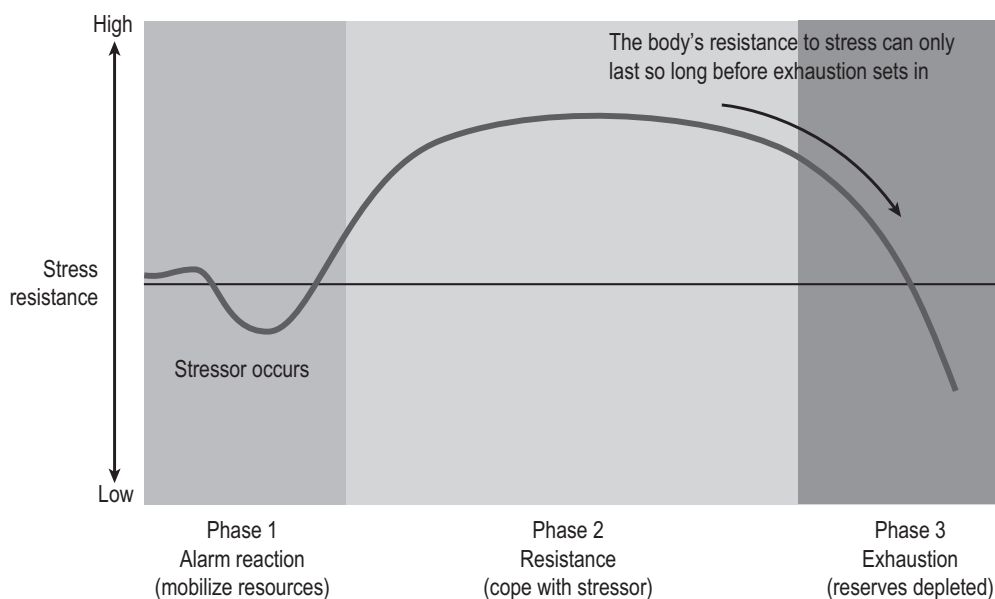


Figure 2.1 Selye's general adaptation syndrome

Box 2.1 Understanding Selye's use of the word 'stress'

The material in this box derives from the writings of Selye's close colleague Paul Rosch MD (2003). Rosch attempts to explain the choice by Selye of the word 'stress' that he used to describe the background to adaptation.

Rosch points out that although Selye was fluent in many languages, including English, his choice of the word 'stress' to describe the non-specific response syndrome he discovered was probably an error of judgment. He had used the word 'stress' in his initial letter to the Editor of *Nature* in 1936, who suggested that it be deleted since this word implied nervous strain, recommending that he use the term 'alarm reaction' instead.

Selye was unaware that the word 'stress' had been used for centuries in physics to explain elasticity, the property of a material that allows it to resume its original size and shape after being compressed or stretched by an external force. As expressed in Hooke's Law, the magnitude of an external force, or *stress*, produces a

proportional amount of deformation, or *strain*. Selye apparently expressed the view that had his knowledge of English been better he would have gone down in history as the father of the 'strain' concept.

Finding an acceptable definition of stress was a problem that exercised Selye for the rest of his life. He noted to Rosch that 24 centuries previously Hippocrates had written that disease was not only *pathos* (suffering), but also *ponos* (toil), as the body fought to restore normalcy.

Ultimately, because many people viewed stress as an unpleasant threat, Selye created a new word, 'stressor', in order to distinguish between stimulus and response. Even Selye had difficulties when he tried to extrapolate his laboratory research to humans. In helping to prepare the *First Annual Report on Stress* in 1951, Rosch included the comments of one critic, who, using verbatim citations from Selye's own writings concluded: 'Stress, in addition to being itself, was also the cause of itself, and the result of itself.'

point at which the 'stretched elastic' of the individual's adaptive potential snaps.

An evolution of these models has included recognition of an altered version of homeostasis – *allostasis* – that produces exaggerated, or insufficient, responses to stressors (Fig. 2.2C) (McEwan 1994, Sapolsky 1990, 1994).

Stress defined

Stress is defined by Selye in his writings (1976) as the non-specific response of the body to any demand, whether it is caused by, or results in, pleasant or unpleasant conditions.

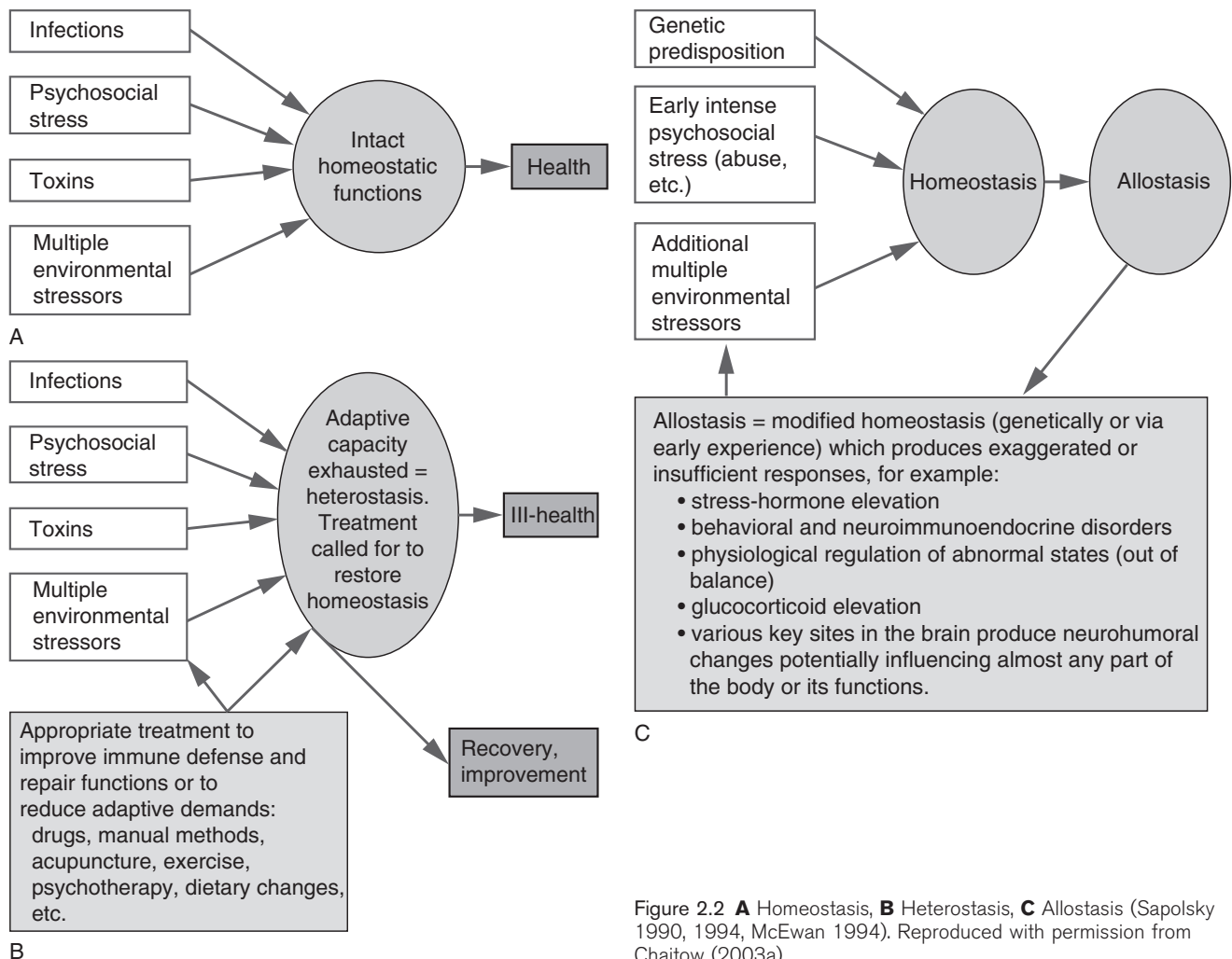


Figure 2.2 **A** Homeostasis, **B** Heterostasis, **C** Allostasis (Sapolsky 1990, 1994, McEwan 1994). Reproduced with permission from Chaitow (2003a)

Many of Selye's findings and concepts fit intimately with naturopathic thought, as outlined in Chapter 1 (Selye 1976):

The fact that the state of stress, even if due to the same agent, can cause different effects in different individuals, has been traced to 'conditioning factors' that can selectively enhance or inhibit one or the other stress effect. This conditioning may be endogenous (genetic predisposition, age or sex) or exogenous (treatment with certain hormones, drugs or dietary factors). Under the influence of such conditioning factors, a normally well-tolerated degree of stress can even become pathogenic, selectively affecting those parts of the body that are particularly sensitized both by those conditioning factors and by the specific effects of the eliciting agent, just as physical tensions of equal strength in different chains will break the particular link that is the weakest, as a result of internal or external factors.

In this model, a spectrum of adaptive changes – many of which produce symptoms, some benign and others serious or sinister – is seen to emerge from a background of the interaction of variable (in degree, variety and chronicity) idiosyncratic adaptive demands, superimposed on the individual's unique acquired and inherited biochemical, biomechanical and psychosocial characteristics, qualities and attributes – sometimes called polymorphism (Williams 1956).

Stress explained

A close colleague of Selye, Istvan Berczi, provides insights into Selye's thinking regarding disease causation, from the perspective of the general adaptation syndrome (Berczi 2005):

The prediction by Dr. Selye of the pluricausal nature of most diseases is really the recognition that living

organisms have evolved multiple mechanisms to defend themselves against harmful agents. For this reason, in most cases, it is necessary to interfere with these defense mechanisms at more than one point to cause disease. The redundancy of immune effector mechanisms (Berczi & Nagy 1994, Clark & Kamen 1987) or the recent recognition that it is necessary to deregulate more than one gene to cause cancer (Berczi & Nagy 1991) certainly supports this view. In his last years he turned his attention to the protective power of certain hormones against various toxins and other noxious stimuli and created the term 'catatoxic steroids' for those hormones that have protective effect (Selye 1969, 1971). That hormones are important in immunological and other forms of resistance, is the subject of current scientific inquiry (Berczi 1986, 1994).

The schematic representation in Figure 2.3 suggests many of the events and pathways related to the way stress influences the body. In the mid-1940s when this was first presented, and in 1955, when explaining the progress his research had achieved and how much more was unknown, Selye noted:

Non-specific damage, again through unknown pathways, also acts upon the hypophysis and causes it to increase corticotrophic hormone production at the expense of a decreased gonadotropic, lactogenic and growth hormones. The resulting corticotrophic hormone excess causes enlargement of the adrenal cortex with signs of increased corticoid hormone production. These corticoids in turn cause changes in the carbohydrate (sugar active corticoids) and electrolyte metabolism (salt-active corticoids) as well as atrophy of the thymus and the other lymphatic organs. It is probable that the cardiovascular, renal, blood pressure and arthritic changes are secondary to the disturbances in electrolyte metabolism since their production and prevention are largely dependent upon the salt intake . . . We do not know as yet, whether the hypertension is secondary to the nephrosclerosis or whether it is a direct result of the disturbance in electrolyte metabolism caused by the corticoids. Similarly, it is not quite clear, as yet, whether corticoids destroy the circulating lymphocytes directly, or whether they influence the lymphocyte count merely by diminishing lymphocyte formation in the lymphatic organs. Probably both these mechanisms are operative.

In 2005, Berczi brought Selye's original observations closer to present times by observing:

Today we know that a variety of insults, including trauma and infection, stimulate the release of chemotaxic, proinflammatory cytokines, and a whole

host of other mediators from a variety of cells in the damaged area that include mast cells, endothelial cells, platelets. The released mediators attract blood borne leucocytes, such as neutrophilic granulocytes, monocytes/macrophages, lymphocytes, eosinophils and basophils that release additional mediators, and thus contribute to the inflammatory response. In some cases certain cytokines, such as interleukin-1 (IL-1), tumor necrosis factor- α (TNF- α) and interleukin-6 (IL-6), become detectable in the blood and function as acute phase hormones. They act on the brain causing fever and other functional modifications (IL-1, TNF- α), release certain pituitary hormones and inhibit others, promote general catabolism (mediated primarily by TNF- α , also known as cachectin), stimulate the production of new serum proteins known as acute phase reactants in the liver (the joint action of IL-6, glucocorticoids and catecholamines), and also elevate the production of leucocytes in the bone marrow, the mechanism of which is not fully elucidated (Berczi & Nagy 1994). Thus, with the recent discovery of cytokines and our increasing recognition of their functions, we have begun to fill in the gaps in Dr. Selye's adaptation syndrome outlined nearly half a century ago.

Huether (1996) has further outlined the ways in which Selye's original work has evolved.

Selye's observation regarding GAS and LAS

Reviewing the topic of the so-called 'pluricausal causes' of disease, Selye et al (1968) noted:

The characteristic response of the body to systemic stress is the General Adaptation Syndrome (GAS), characterized by manifold morphologic and functional changes throughout the organism, whereas topical stress elicits a Local Adaptation Syndrome (LAS) whose principal repercussions are confined to the immediate vicinity of the eliciting injury. The term 'stress' implies only non-specificity of causation; it does not presume to distinguish between manifestations of damage and of defense. Also, depending upon the simultaneous application of certain 'conditioning agents', both systemic stress and local stress can produce vastly different and highly specific reactions. The pluricausal causes of disease are due to complex pathogenic constellations . . .

A patient in traumatic shock furnishes a characteristic example of the GAS and, in particular in its earliest stage, the 'shock phase' of the general alarm reaction.

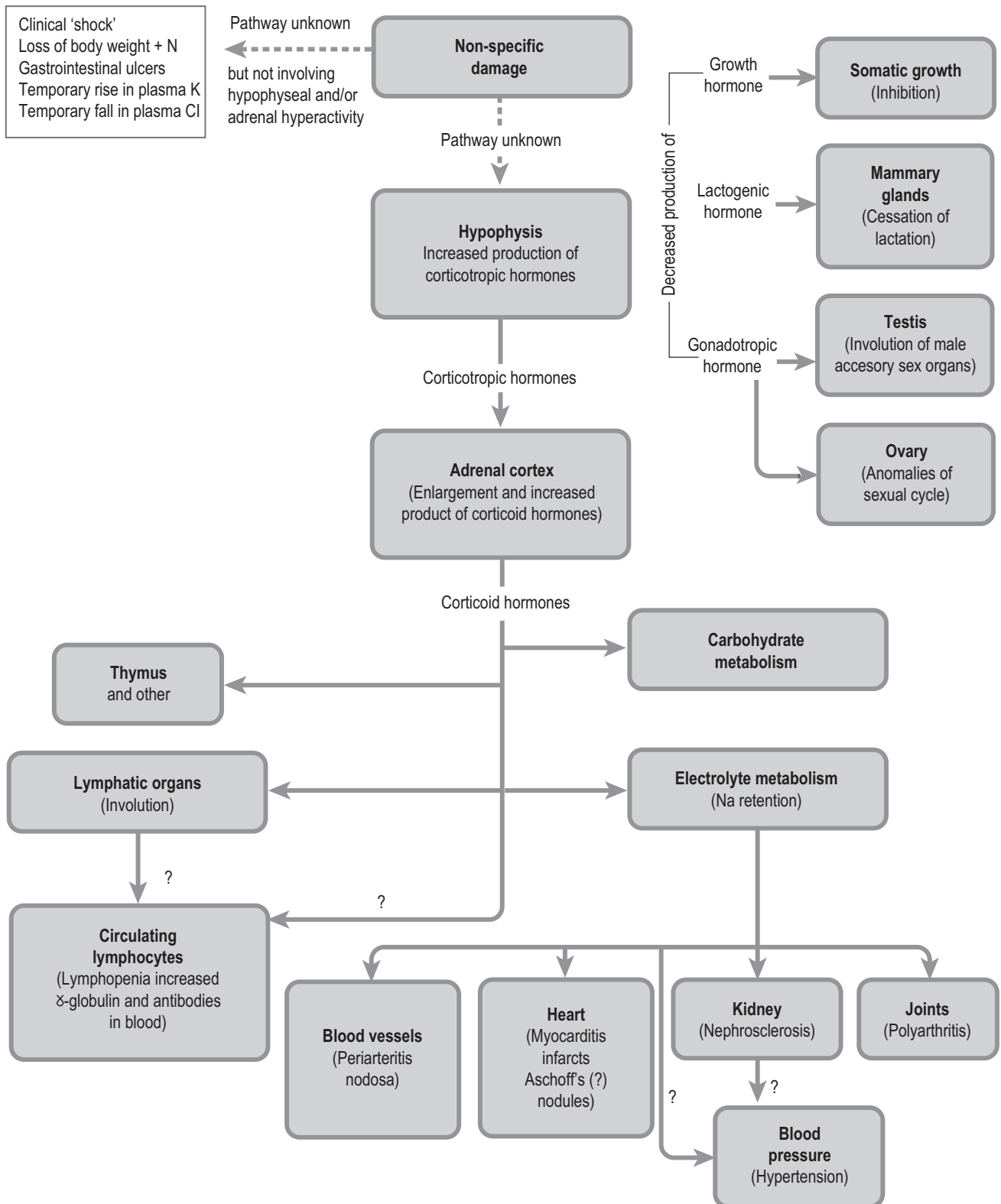


Figure 2.3 Functional interrelations during general adaptation syndrome. Schematized drawing indicating that non-specific damage causes clinical shock, loss of body weight and nitrogen, gastrointestinal ulcers, temporary rise in plasma potassium with fall in plasma Cl, through unknown pathways (nervous stimulus?, deficiency?, toxic metabolites?) but manifestly not through the stimulation of the hypophyseoadrenal mechanism. This is proven by the fact that the above manifestations are not prevented either by hypophysectomy or by adrenalectomy; they even tend to be more severe in the absence of either or both of these glands (Selye 1946)

An abscess, formed around a splinter of wood, represents a typical instance of the LAS, and, in particular, of its 'stage of resistance' during which the defensive, inflammatory phenomena predominate. On the surface, these two conditions [traumatic shock and the abscess] reveal no obvious similarities; however, more careful studies show them to be closely related.

The GAS and the LAS are thought to be interrelated because:

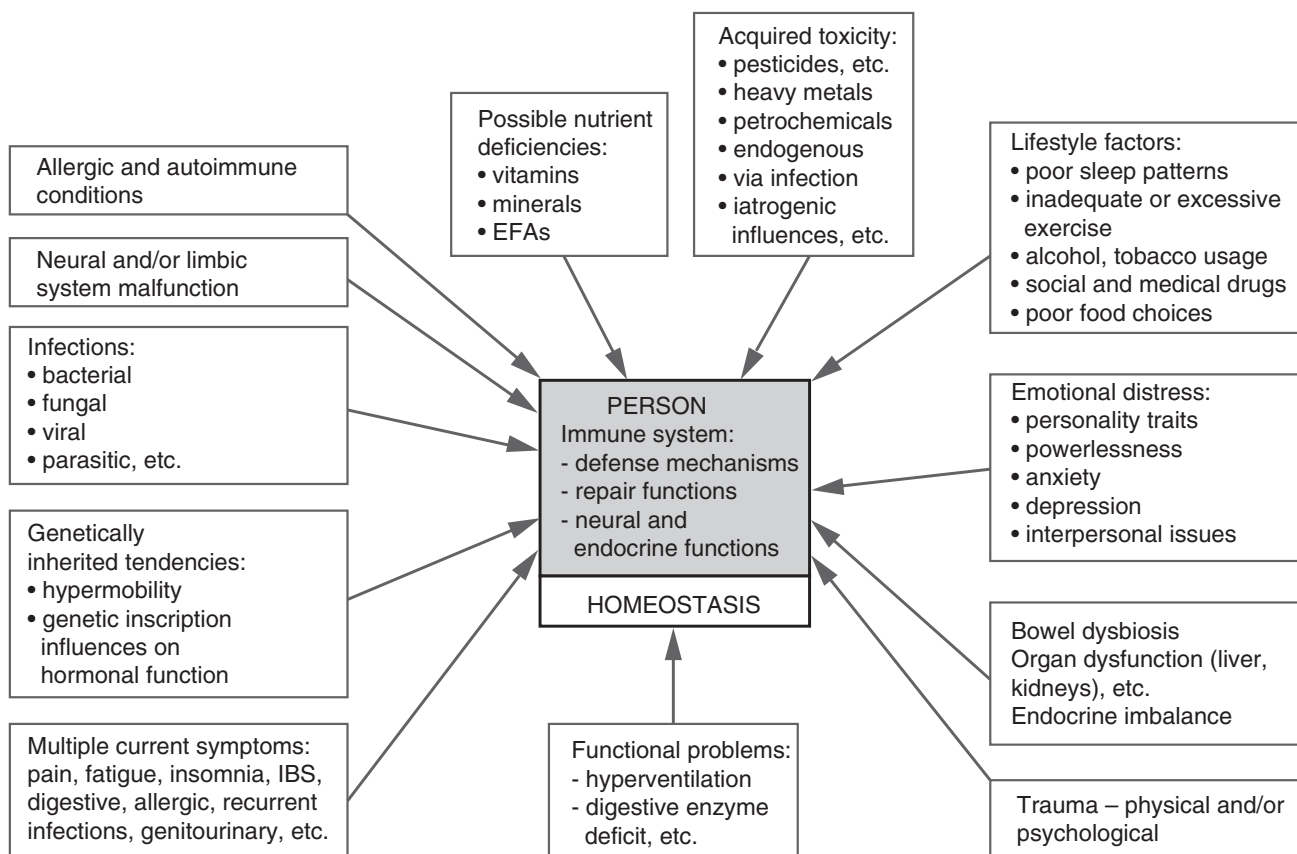
- (1) Both are nonspecific reactions comprising damage and defense.
- (2) Both are triphasic [stages of alarm, resistance, exhaustion] with typical signs of 'cross-resistance' during the 'stage of resistance'.
- (3) Both are singularly sensitive to the so-called 'adaptive hormones' (ACTH, corticoids, STH [growth hormone]).

- (4) If the two reactions develop simultaneously, they greatly influence one another: systemic stress markedly alters reactivity to local stress and vice versa (Selye 1953).

Selye's observations speak to the recognition of multicausal ('pluricausal'), contextual sequences of events that underlie ill-health, and of self-regulating, protective endogenous substances and functions (Fig. 2.4). These concepts are at the very heart of naturopathic thinking and practice.

Differing responses to adaptation

Illness and dysfunction can be seen in this model to represent either a partial or total failure of adaptation, or adaptation in progress.



When homeostatic adaptive capacity is exhausted treatment calls for:

1. Restoration of immune competence, enhancement of defense capabilities, support of repair functions
2. Reduction of as many of the multiple interacting stressors impacting the individual as possible
3. Attention to symptoms (ideally without creating new problems).

Figure 2.4 Multiple stressors in fibromyalgia. EFAs, essential fatty acids; IBS, irritable bowel syndrome. Reproduced with permission from Chaitow (2003a)

Although many such adaptive changes manifest as symptoms, these [symptoms] may at times be no more than evidence of processes of repair (e.g. inflammation following trauma) or attempts at restoration of the status quo.

Within this framework it becomes clear that responses to apparently similar stressors (adaptive load) will produce different responses in severity and degree, dependent on the unique characteristics of the individual or of the tissues affected.

Rosch (1999) reports that:

Selye observed that patients suffering from different diseases often exhibited identical signs and symptoms. They just 'looked sick'. This observation may have been the first step in his recognition of 'stress'. He later discovered and described the General Adaptation Syndrome, a response of the body to demands placed upon it. The Syndrome details how stress induces hormonal autonomic responses and, over time, these hormonal changes can lead to ulcers, high blood pressure, arteriosclerosis, arthritis, kidney disease, and allergic reactions.

It is also evident that similar symptoms might emerge from a background of very different stressors, interacting with the idiosyncratically distinctive biomechanical, biochemical and psychosocial features of the individual.

This highlights and underscores a basic requirement in naturopathic medicine – the need to consider the individual features, attributes and qualities of each person and condition, when considering therapeutic interventions.

Local adaptation syndrome – an example and a naturopathic solution

The discussion above of the general adaptation syndrome (GAS) can easily be refined to a more local, regional focus – a local adaptation syndrome (LAS).

A painful, restricted, shoulder problem might be seen to be responding (adapting) variously to postural imbalances, possible spinal restrictions and overuse, in which symptoms have evolved over time, as adaptation to the imposed demands has gradually exhausted the elastic and dynamic self-repair potential of the tissues involved.

For example, the anterior glenohumeral capsule is structurally stronger than the posterior joint capsule, though functionally it is exposed to greater cumulative trauma, particularly in those who use their arms in an overhead position – for example, racket sports players, baseball pitchers (Wilk et al 1993), volleyball players, painters and decorators, window cleaners. Hence, the anterior joint capsule will undergo creep,

become unstable and inflamed and commonly, in time, would become restricted in flexion.

This can be seen in terms of the local adaptation syndrome as follows.

- An acute (alarm) phase would follow initial stress (excessive throwing action perhaps).
- During this phase, repair activity would be carried out, almost certainly involving some inflammation and discomfort.
- Compensatory recruitment patterns would operate to minimize stress on the anterior capsule region.
- A combination of repetitive microtrauma due to continued throwing activity, overlaid on a modified recruitment pattern, possibly overlaid on long-term postural stressors (forward head position, inhibited lower fixators of the scapula, excessive activity of some of the rotator cuff muscles, etc.), together with possible nutritional imbalances, leads to a situation where *the damage rate exceeds the repair rate*.
- Pain and greater restriction of movement become the dominant symptoms leading to underuse of the arm and psychological distress, as well as further compensation/adaptation demands on other tissues and structures.
- Thus wear and tear eventually produce a stage of virtual decompensation – the final phase of Selye's local adaptation syndrome.
- The potential for further functional adaptation in that shoulder to the imposed demands would have been exhausted, and other dysfunctional adaptations, involving overuse of the unaffected shoulder and more widespread postural changes, become increasingly likely.
- Solutions to such symptom-producing situations do not lie in local treatment of the painful and restricted area (anterior capsular strain), where little more than symptomatic – short-term – relief would be possible.
- For the manual therapist to attempt to locally mobilize the glenohumeral joint into greater ease in flexion, without understanding the biomechanical rationale for the original local stress to the anterior glenohumeral capsule, would most probably prove both futile and detrimental.
- A naturopathic physical medicine approach would ideally give attention to the larger picture, including whole body postural considerations, potential thoracic spinal

restrictions and improved use patterns, as well as normalization, if possible, of the shortened, and the inhibited, muscles and other soft tissues including deactivation of trigger points and mobilization of the shoulder joint.

- In this broader clinical approach, consideration would also be given to nutritional features as well as to rehabilitation, including aspects of pain behavior and altered patterns of use resulting from the condition.
- Therapeutically it is important to incorporate appropriately focused use patterns into a rehabilitation process, building on the re-education and retraining potential of imposed demand, and so minimizing the likelihood of further symptom-producing adaptational changes.

Thoughts on specific adaptation from a professional baseball trainer

Based on specific adaptation to imposed demands (SAID), athletes adapt to the imposed demands of their particular sport, the physical requirements of the activities demanded within the sport and specific exercise regimes. Failure to adapt leads to proneness to injury or inadequate performance (Kraemer & Gomez 2001). For example, generalized patterns of adaptation are recognized in the overhead throwing athlete. Various experts (Crockett et al 2002, Osbahr et al 2002, Reagan et al 2002) have described a variety of adaptation possibilities in the throwing shoulder, and the ability to adapt adequately seems to be what allows the athlete to compete at the top levels of the chosen sport (Fig. 2.5).

As such adaptations to sporting activities occur, the athlete's general habits also become important. Greenfield et al (1995) demonstrated that posture degradation, such as forward head position, can affect the shoulder of the throwing athlete, making assessment of postural adaptations important in order to maintain optimal function of the athlete. (For deeper consideration of adaptation issues in relation to trauma and rehabilitation, see Chapter 9.)

Crenshaw (2006), a senior athletic trainer for a major league baseball team, insightfully notes:

Not only are athletes challenged physically, they must adapt to many other stressors as well. Mental, social, environmental, nutritional stressors combined with aging, competition requirements, travel, and sleep pattern disruption, all add to the athlete's adaptation burden. General health depends on more than the absence of disease. It is critical to keep stressors to a minimum and/or to use mechanisms such as recovery and relaxation techniques to improve stress-coping potentials.

'Slow' adaptation examples from Juhl, Janda and Grieve

How do structural features adapt?

There are few more common structural imbalances than leg-length inequality. Juhl et al (2004) report that:

Asymmetry within the pelvic structure can lead to a cascade of postural compensations throughout the axial spine, predisposing persons to recurrent somatic dysfunction and decreased functionality. Numerous

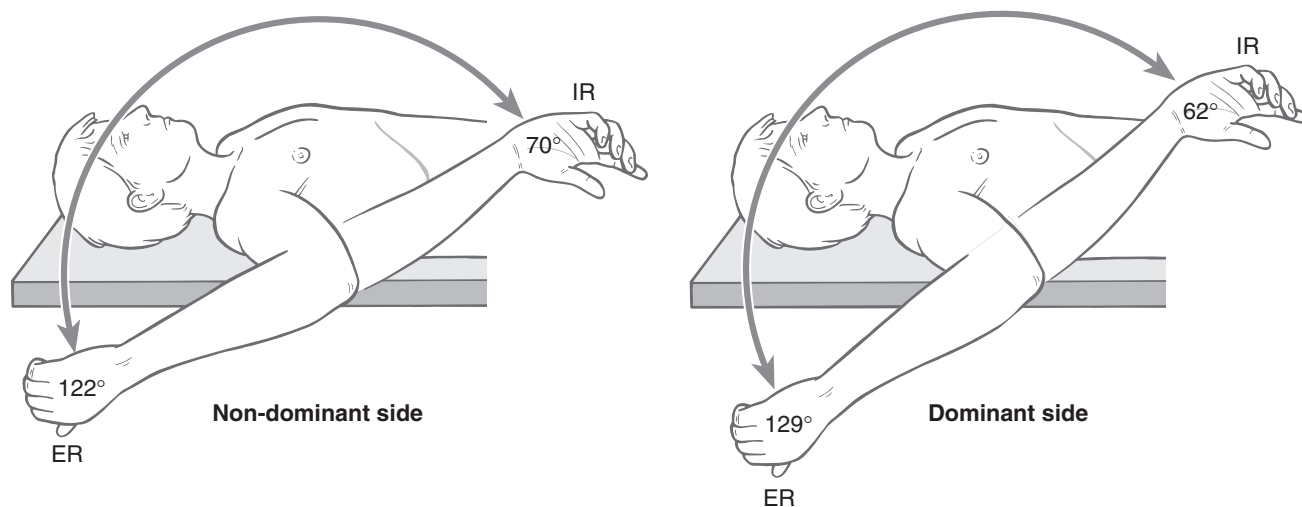


Figure 2.5 The total motion concept discussed by Wilk (2004) shows the adaptation of the throwing shoulder in the professional baseball pitcher. ER, external rotation; IR, internal rotation. Reproduced with permission from Chaitow (2006)

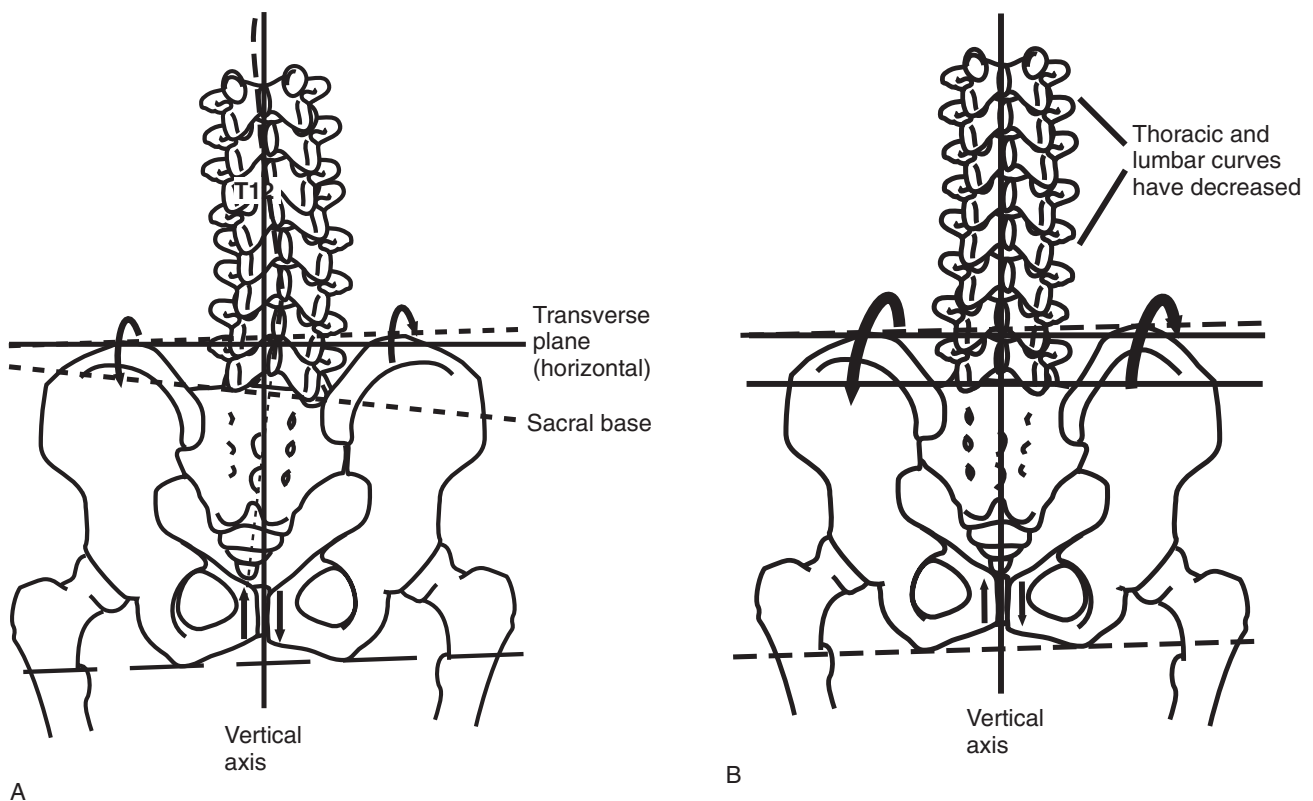


Figure 2.6 Sacral adjustment to functional leg-length difference caused by malalignment. **A** Uncompensated: the sacral base and iliac crest are oblique, and there is an accentuated compensatory scoliosis. **B** Compensated: although the obliquity of iliac crests persists, the sacral base is now level and the degree of scoliosis decreased. Reproduced with permission from Schamberger (2002)

authors have found a correlation between leg length inequality and low back pain (LBP).

(See Fig. 2.6.)

How common is anatomic leg-length discrepancy?

Using data on leg-length inequality, obtained by accurate and reliable x-ray methods, Knutson (2005) found the prevalence of anatomic leg-length inequality to be 90%, the mean magnitude being 5.2 mm (SD 4.1). The evidence suggested that, for most people, anatomic leg-length inequality does not appear to be clinically significant until the magnitude reaches ~20 mm (~ $\frac{3}{4}$ "'). This finding supports the supposition that the degree of 'load' (leg-length inequality in this example) along temporal features and multiple other factors determines whether and when adaptation ultimately fails, allowing dysfunctional symptoms to emerge.

Most schools of manual therapy hold to the concept of considering the body as a whole, and yet in reality attention to local features still seems to be the dominant clinical approach. Janda (1988) offers examples

as to why this is extremely clinically short sighted. He describes the adaptive changes resulting from the presence of a significant degree of leg shortness, as follows.

- A short leg inevitably requires an altered pelvic position.
- This unlevels the sacral base and leads to scoliosis.
- As the spine adapts, a sequence of compensations is likely to lead to joint dysfunction at the cervicocranial junction.
- This inevitably results in compensatory activity of the small cervico-occipital muscles and a modified head position.
- Further compensation occurs concerning most of the neck musculature, some of which will involve increased muscle tone and possibly muscle spasm.
- A sequence follows of compensation and adaptation responses in many muscles, ligaments and joints of the region, followed by the development of a variety of possible syndromes and symptoms involving the head,

neck, temporomandibular joint, shoulder and/or the arm.

Janda's point is that after all the adaptation that has taken place, treatment of the most obvious cervical restrictions, where the person might be aware of pain and restriction, would offer only limited benefit. Whether the short leg is anatomic or functional (i.e. where there is a primary sacroiliac dysfunction that alters the position on the innominate and therefore creates an apparent change in leg length), the changes described by Janda will occur. The difference is that with a functional change, correction of the sacroiliac joint problem should correct the chain reaction of adaptational modifications, whereas with a true anatomic short leg, choices would be far more limited – for example, a heel and sole lift, or possibly surgery.

Janda also points to the existence of oculopelvic and pelviocular reflexes, which indicate that any change in pelvic orientation alters the position of the eyes and vice versa, and to the fact that eye position modifies muscle tone – visual synkinesis (Komendatov 1945) – particularly involving the suboccipital muscles (look up and extensors tone, look down and flexors prepare for activity, etc.). The implication of modified eye position, due to altered pelvic position, therefore becomes yet another factor to be considered when unraveling chain reactions of interacting adaptive elements.

'These examples,' Janda says, 'serve to emphasize that one should not limit consideration to local clinical symptomatology . . . but [that we] should always maintain a general view'. This approach is profoundly naturopathic.

Grieve (1986) echoes this viewpoint. He has explained how a patient presenting with pain, loss of functional movement or altered patterns of strength, power or endurance, will probably either have suffered a major trauma, which has overwhelmed the physiological limits of relatively healthy tissues, or will be displaying 'gradual decompensation demonstrating slow exhaustion of the tissue's adaptive potential, with or without trauma'.

As this process of decompensation progresses, postural adaptation, influenced by time factors and possibly by further trauma, leads to exhaustion of the body's adaptive potential and results in dysfunction and symptoms.

Grieve reminds us of Hooke's Law, which states that within the elastic limits of any substance, the ratio of the stress applied to the strain produced is constant (Bennet 1952). In simple terms, this means that tissue capable of deformation will absorb or adapt to forces applied to it within its elastic limits, beyond which it will break down or fail to compensate (leading to decompensation).

Grieve rightly reminds us that while attention to specific tissues incriminated in producing symptoms often gives excellent short-term results, 'Unless treatment is also focused towards restoring function in asymptomatic tissues responsible for the original postural adaptation and subsequent decompensation, the symptoms will recur'. This description of attention to causes is a clear naturopathic position.

Adaptation to breathing imbalance

Just as poor posture, or the presence of a structural imbalance such as a short leg, can result in widespread dysfunction, a breathing pattern disorder (BPD) – the extreme of which is hyperventilation – can produce an astonishing array of adaptive changes creating biomechanical, biochemical and psychological compensations as summarized in Figure 2.7. Solutions may involve a variety of rehabilitation and structural approaches, as discussed in Chapters 7, 8 and 10 (Chaitow et al 2002).

It is possible to see in the sequence illustrated in Figure 2.7 (and discussed more fully in later chapters) that symptoms as diverse as neck and head pain, chronic fatigue, anxiety and panic attacks, cardiovascular distress, gastrointestinal dysfunction, lowered pain threshold, spinal instability and hypertension (and this is not a comprehensive listing) might be directly caused, or more commonly aggravated and maintained, by breathing pattern disorders such as hyperventilation (Timmons & Ley 1994).

The complex sequences of biochemical, psychological and structural adaptations and compensatory changes involved in this example highlight the absolute requirement for attention to cause. Part of that attention also needs to focus on the causes of breathing pattern disorders, which are themselves, after all, symptoms.

Neurophysiological responses to trauma (Patterson & Wurster 1997)

There is a neurophysiological dimension to trauma adaptation, including what can be termed peripheral and central (adaptive) changes.

An initial response to injury usually involves local changes in the affected tissues, possibly including swelling, inflammation and pain (Bevan 1999, Johansson 1993).

Pain receptors (nociceptors) will be stimulated and transmit their distress to the dorsal horn of the spinal cord, and, if the intensity of this stimulation from the periphery is great enough, pain will be registered in the brain. Additionally, stimulation of motor neurons at the ventral horn will ensure an increase in muscular tone (He et al 1988) and sympathetic responses will

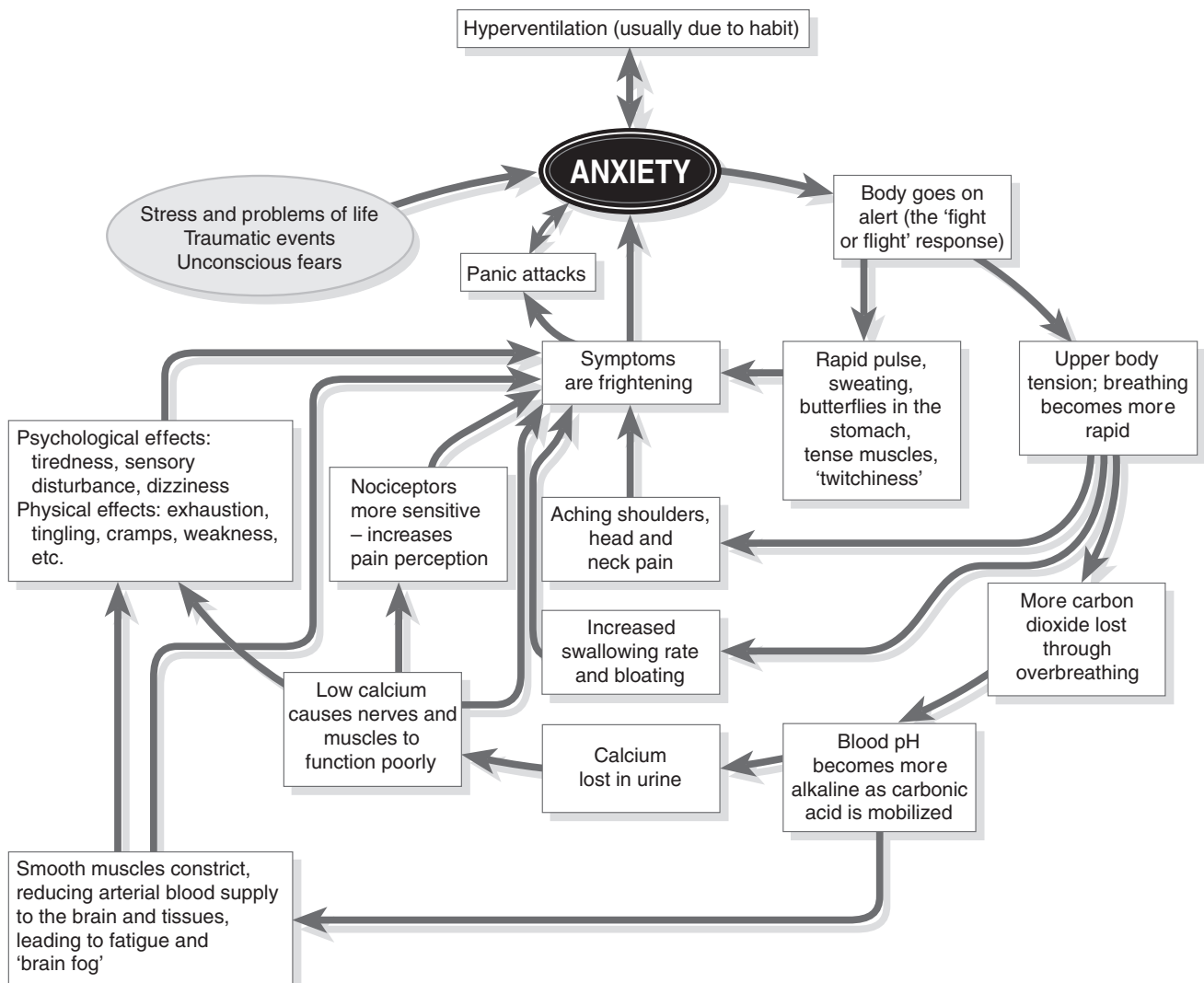


Figure 2.7 The hyperventilation–anxiety connection. Reproduced with permission from Chaitow (2003a)

cause increased circulatory perfusion of the muscles (Sato & Schmidt 1973).

While all these adaptive responses have protective value, if they are prolonged or repetitive a 'neurological footprint of abnormal patterning' (Brookes & Pusey 2006) may remain, with pain circuits inappropriately maintaining their post-injury activity.

The nervous system will effectively have become sensitized, and therefore more vulnerable to being far more easily triggered into a similar series of responses by relatively mild stimuli. This process of the *facilitation* of neural responses has been widely studied in osteopathic medicine (Korr 1976) and is discussed in greater detail in Box 2.2 along with consideration of localized areas of facilitation (sensitization) and myofascial trigger points (Box 2.3). Areas that have become adaptively sensitized are more vulnerable to the influence of subsequent stressors, and

increased vulnerability – as part of an adaptive process – has important implications in many chronic health situations such as, for example, fibromyalgia (see Chapter 10).

Naturopathic physical medicine approaches would focus on reducing adaptive demands while attempting simultaneously to enhance integration of neurological and physiological function, modulating the sensitized tissues.

Korr and axonal transportation of trophic substances

Korr – the premier osteopathic researcher of the second half of the 20th century – summarizes another vital implication of soft tissue dysfunction – interference with axonal transport mechanisms evolving out

Box 2.2 Facilitation and sensitization

Spinal (segmental) facilitation

Adaptational changes to neural structures are a central feature of understanding the effects of viscerosomatic reflex effects.

In osteopathic terminology, when these changes occur spinally, the term 'segmental facilitation' is used (Korr 1976).

A similar local phenomenon occurs throughout the myofascial tissues of the body, where the term 'myofascial trigger points' is used to describe the resulting dysfunction (see below).

Beal (1985) has described the segmental phenomenon as resulting from afferent stimuli arising from dysfunction of a visceral nature. An adaptational progression is readily noted in this sequence.

- The reflex is initiated by afferent impulses arising from visceral receptors, transmitted to the dorsal horn of the spinal cord, where they synapse with interconnecting neurons.
- The stimuli are then conveyed to sympathetic and motor efferents, resulting in changes in the somatic tissues, such as skeletal muscle, skin and blood vessels.
- Abnormal stimulation of the visceral efferent neurons may result in hyperesthesia of the skin and associated vasomotor, pilomotor and sudomotor changes.
- Similar stimuli of the ventral horn cells may result in reflex rigidity of the somatic (usually paraspinal) musculature.
- Pain may result from such changes.
- The degree of stimulus required, in any given case, to produce such changes will differ, because factors such as prior facilitation (sensitization) of the particular segment, as well as the response of higher centers, will vary from person to person (Fig. 2.8).

In many cases the viscerosomatic reflex activity may be noted before any symptoms of visceral change are evident and this phenomenon is therefore of potential diagnostic and prognostic value (Korr 1976).

The first signs of viscerosomatic reflexive influences are vasomotor (increased skin temperature) and sudomotor (increased moisture of the skin) reactions, skin textural changes (e.g. thickening), increased subcutaneous fluid and increased contraction of muscle. The value of light skin palpation in identifying areas of facilitation cannot be too strongly emphasized (Lewit 1999) (see Chapter 6). These signs usually disappear if the visceral cause improves.

When such changes become chronic, however, trophic alterations/adaptations are noted, with increased thickening of the skin and subcutaneous tissue, and localized muscular contraction. Deep musculature may

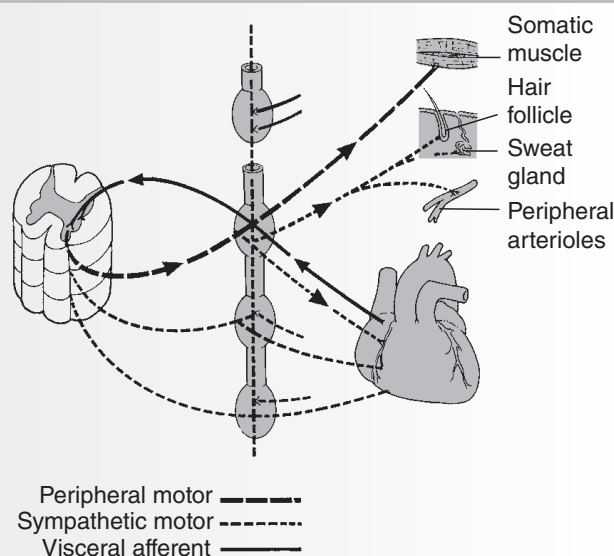


Figure 2.8 Schematic representation of viscerosomatic reflex. Reproduced with permission from Chaitow & DeLany (2000)

become hard, tense and hypersensitive. This may result in deep splinting contractions, involving two or more segments of the spine, with associated restriction of spinal motion. In the thoracic spine the costotransverse articulations may be significantly involved in such changes.

Beal (1983) notes that, when the voluminous research into segmental associations with organ dysfunction is compounded, three distinct groups of visceral involvement are found in respect of particular sites:

- T1–T5: heart and lungs
- T5–T10: esophagus, stomach, small intestine, liver, gall bladder, spleen, pancreas and adrenal cortex
- T10–L2: large bowel, appendix, kidney, ureter, adrenal medulla, testes, ovaries, urinary bladder, prostate gland and uterus.

Kelso (1971) reports that in one 5-year study involving more than 5000 hospitalized patients, it was found that most visceral disease appeared to influence more than one spinal region, and that the number of spinal segments involved seemed to be related to the duration of the disease. This study showed that there was an increase in the number of palpatory findings in the cervical region, relating to patients with sinusitis, tonsillitis, diseases of the esophagus and liver complaints, whereas soft tissue changes were noted in patients with gastritis, duodenal ulceration, pyelonephritis, chronic appendicitis and cholecystitis, in the region of T5–T12.

Research (Bendtsen et al 1996) suggests that there exists:

Box 2.2 Facilitation and sensitization continued

... a pathophysiological model for tension-type headache [resulting from] central sensitization [facilitation] at the level of the spinal dorsal horn/trigeminal nucleus due to prolonged nociceptive inputs from pericranial myofascial tissues. The increased nociceptive input to supraspinal structures may in turn result in supraspinal sensitization. The central neuroplastic changes may affect the regulation of peripheral mechanisms and thereby lead to, for example, increased pericranial muscle activity, or sensitization may be maintained even after the initial eliciting factors have been normalized, resulting in conversion of episodic into chronic tension-type headache.

This research demonstrates the need to understand how, over time, a reversible problem may become entrenched and chronic.

Areas of facilitation appear to be irritated by stressors of all types which create adaptive demands on any aspect of the individual – physical, chemical or psychological – even if there is no direct or obvious impact on the area of facilitation.

- From a naturopathic perspective this fits directly into the contextual model of understanding ill-health and dysfunction.
- It also offers explanations for the influence of a wide array of stressors (climatic, emotional, postural, nutritional, etc.) on the health of individuals who are somewhere on the road towards decompensation/adaptation exhaustion, exacerbating symptoms, despite apparently not directly impacting the involved tissues, systems or structures.

of a background of compensatory and adaptation-induced changes (Korr 1981):

Any factor that causes derangement of transport mechanisms in the axon, or that chronically alters the quality or quantity of the axonally transported substances, could cause trophic influences to become detrimental. This alteration in turn would produce aberrations of structure, function and metabolism, thereby contributing to dysfunction and disease. Almost certainly to be included among these harmful factors are the deformation of nerves and roots, such as compression, stretching, angulation and torsion that are known to occur all too commonly in humans, and that are likely to disturb the interaxonal transport mechanisms, intraneural microcirculation and the blood-nerve barrier. Neural structures are especially vulnerable in their passage over highly mobile joints, through bony canals, intervertebral foramina, fascial layers and tonically contracted muscles.

Many of such biomechanically induced deformations are, of course, capable of amelioration and correction by means of appropriate manipulative and soft tissue treatment (Korr 1967, 1970).

Simons et al and the trigger point phenomenon

Simons et al (1999) have detailed somatovisceral responses arising from abdominal musculature, influencing internal visceral organs and functions (see Box 2.2 and Fig. 2.12).

This is not meant to suggest that local adaptation-induced changes (such as trigger points) are necessar-

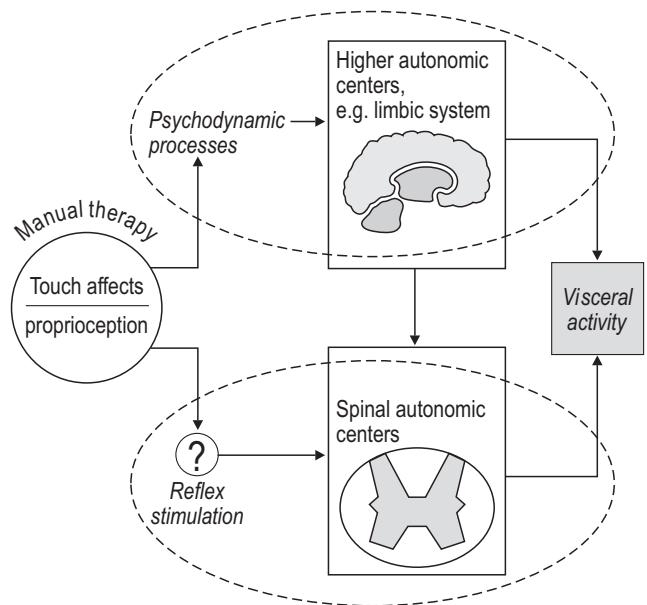


Figure 2.9 The effect of manual therapy on visceral activity is unlikely to occur via reflex stimulation of spinal autonomic centers. Most manual influences are related to the psychodynamics of touch and its effect on the limbic system. Reproduced with permission from Lederman (2005)

ily the *cause* of such dysfunctions and diseases (see list below), but that there exists a strong possibility, in any given case, that the condition/disease may be being aggravated and/or maintained by reflexogenic activity associated with myofascial trigger points, and that attempts to treat such conditions without a primary

Box 2.3 More on local facilitation – myofascial trigger points

Wall & Melzack (1990), in their exhaustive investigation of pain, are clear that all chronic pain has myofascial trigger point activity as at least a part of its etiology, and that in many instances trigger points are the major contributors to the pain (Figs 2.10–2.12).

- Trigger points are localized, palpable areas of deep tenderness and increased resistance, and digital pressure on such a trigger will often produce twitching and fasciculation.

- Trigger points are located either close to the motor endpoint of a muscle or near the attachments.
- Pressure maintained on such a point will produce referred pain in a predictable area.
- If there are a number of active trigger points, the reference areas may overlap.
- What is distinctive about trigger points (myofascial trigger points) is that, when active, they are not only painful but also refer sensations or symptoms to a precise target area; this target area is more or less

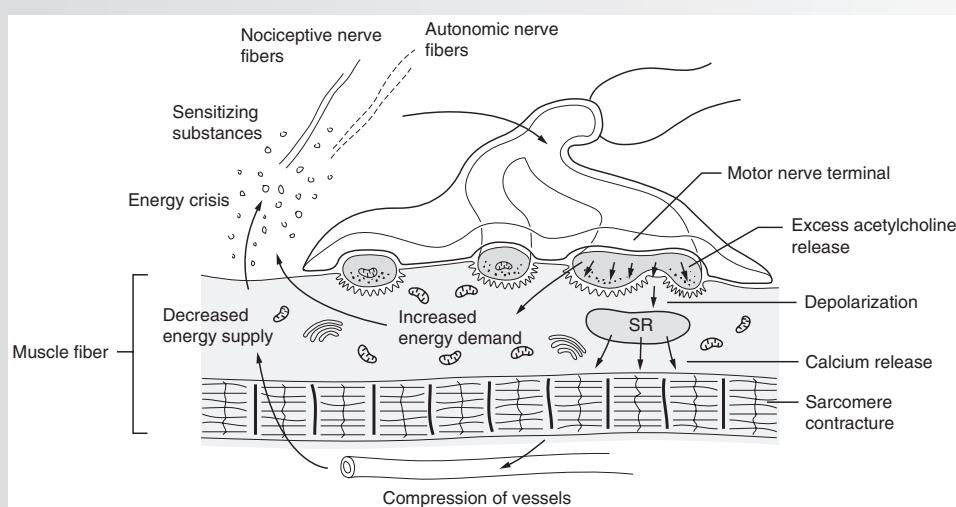


Figure 2.10 Integrated trigger point hypothesis (after Simons et al 1999). Reproduced with permission from Chaitow (2003a)

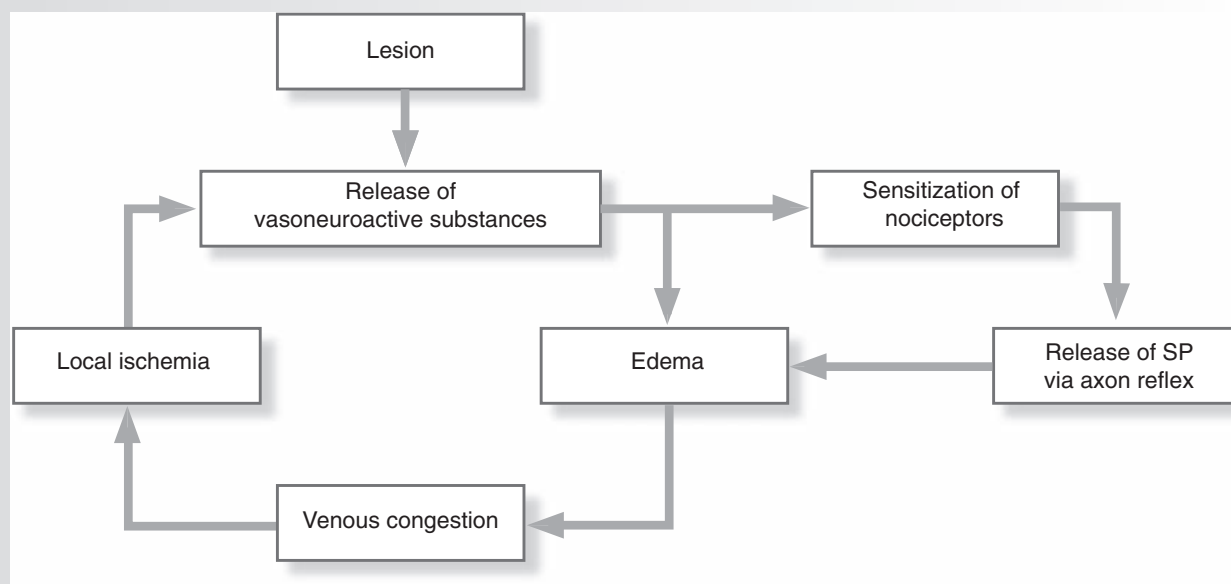


Figure 2.11 Schematic diagram showing hypothesized mechanism for sustained tenderness in trigger points. SP, substance P. Reproduced with permission from Chaitow (2003b)

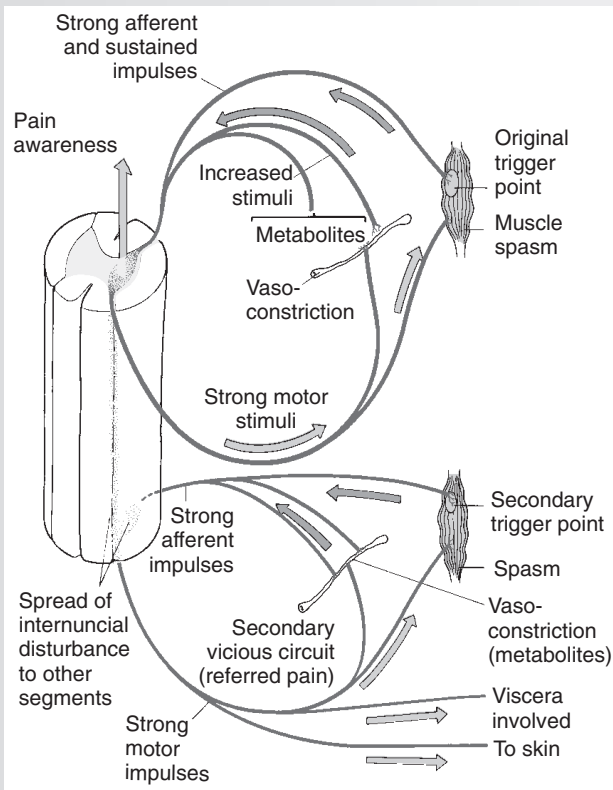
Box 2.3 More on local facilitation – myofascial trigger points continued

Figure 2.12 Schematic representation of the secondary spread of neurologically induced influences deriving from acute or chronic soft tissue dysfunction and involving trigger point activity and/or spasm. Reproduced with permission from Chaitow (2003b)

reproducible in other individuals, when trigger points are located in similar positions (Fig. 2.13). No other soft tissue dysfunction has this particular attribute.

- Before an active trigger point exists there needs to be a period of evolution that involves the development of soft tissue changes that are palpable and probably sensitive or painful, but that, until sufficient localized stress has been involved, will not refer symptoms onwards.
- In other words, many localized muscular areas of sensitivity or pain, which do not refer pain or other symptoms, may be considered to be embryonic or evolutionary trigger points.
- A trigger point is a localized, palpable area of soft tissue that is painful on pressure, and that refers symptoms, usually including pain, to a predictable target area some distance from itself.
- It is an area of local facilitation that has developed following a very similar etiological pathway to that occurring in segmental (spinal) facilitated areas (possibly involving overuse, reflexogenic influences, ischemia or trauma).

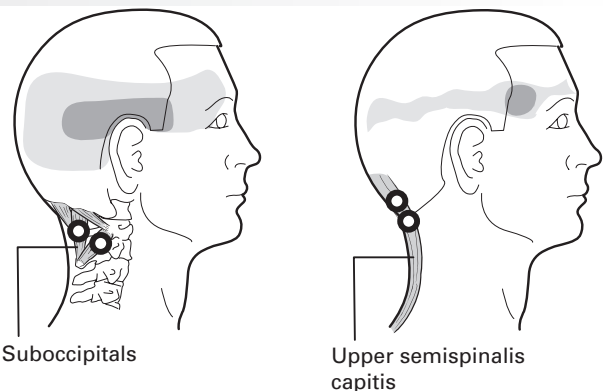


Figure 2.13 The referral patterns of the suboccipital muscles and the upper semispinalis capitis are similar. Reproduced with permission from Chaitow & DeLany (2000)

Much research and clinical work has been done in recent years in this field by Simons et al (1999) who maintain that if a pain is severe enough to cause a patient to seek professional advice (in the absence of organic disease), referred pain is likely to be a factor and therefore a trigger point is probably involved. To be defined as 'active' (ideal for treatment) rather than 'latent', a trigger point should refer symptoms or sensations that are familiar to the patient as part of their symptom picture.

A single trigger may refer pain to several reference sites and can give rise to embryonic, or satellite, triggers in those target areas.

While pain is the commonest symptom arising from the activity of trigger points, other symptoms may be noted (Travell & Simons 1983, 1992), including:

- lymphatic stasis and reduced mobility of joints
- vasoconstriction (blanching)
- coldness
- sweating
- pilomotor response
- ptosis
- hypersecretion.

Analysis of substances surrounding trigger points

The degree of pathophysiological change associated with trigger points is now clear following National Institutes of Health sponsored research into the local tissue state surrounding the trigger point. The biochemistry has been evaluated in a prospective, controlled trial, using a remarkable microanalytical technique (Shah et al 2003). This showed that a novel microdialysis needle can successfully sample the biochemical milieu of myofascial trigger points (MTrP).

Continued

Box 2.3 More on local facilitation – myofascial trigger points continued

Pressure algometry was performed to determine pain pressure threshold (PPT) in individuals with active trigger points, latent trigger points and no trigger points. Samples were obtained continuously from normal tissue (controls) as well as from tissues where latent and active trigger points had been identified, using the microdialysis needle.

This technique recovered extremely small quantities (<0.5 µL) of very small substances (molecular weight <100 kD) directly from soft tissue. There were significant differences in the levels of pH, substance P, calcitonin gene-related peptide, bradykinin, norepinephrine, tumor necrosis factor and interleukin-1 in those subjects with an active MTrP (symptoms, MTrP present) compared with subjects with a latent MTrP (no symptoms, MTrP present) and normal subjects (no symptoms, no MTrP).

Trigger points can be deactivated manually or by chilling, injection (procaine etc.), acupuncture or dry needling. However, removal of the stressor features (postural, overuse, misuse, etc.) is the most effective means of removing trigger point activity.

Assessment and treatment approaches are discussed in later chapters, with manual protocols described in Chapter 7.

Naturopathic considerations

From a naturopathic perspective, trigger points can most commonly be seen to represent focal areas of dysfunctional adaptation. For this reason it is obvious that the context out of which trigger points emerge requires evaluation and, if possible, correcting – better posture, breathing, nutrition (deficiencies of iron, vitamin

B complex and/or vitamin C, as well as hypothyroidism, have been reported as predisposing factors by Travell & Simons (1992), the main researchers into this phenomenon), sleep, stress and lifestyle modification, etc., as well as enhanced muscle tone and flexibility.

At times it may be noted that trigger points represent a functional adaptation, a means whereby increased stability may be being maintained in an economical manner. Examples can be seen in an unstable joint or an individual who is hypermobile.

- *Protection of an unstable sacroiliac joint:* Trigger points in the hamstrings would increase tone in the muscle, producing tension via the sacrotuberous ligament that would stabilize the sacroiliac joint. Removal/deactivation of the MTrP, or stretching of the tight hamstring, would probably destabilize the joint (Chaitow & DeLany 2003, Hong & Simons 1998).
- *Hypermobility:* Individuals who are hypermobile tend to have a higher incidence of musculoskeletal pain (Goldenberg 1991) and to have soft tissues that contain a high level of active myofascial trigger points. The question arises as to whether there is increased functionality as a result, involving greater stability.

In such settings trigger points may be seen as alarm signals and to be creating stabilizing influences, and so should not be deactivated unless the stability they offer is replaced by other means. Instead, the reason for their presence should be addressed – for example by means of improved core stability involving enhanced balance, tone, flexibility and stability, or other means of support such as a sacroiliac support or prolotherapy.

focus on the reflexogenic activities of trigger points are likely to be less than optimally successful:

- projectile vomiting
- anorexia
- nausea
- intestinal colic
- diarrhea
- urinary bladder and sphincter spasm
- dysmenorrhea
- pain symptoms mimicking those of appendicitis and cholelithiasis
- symptoms of burning, fullness, bloating, swelling or gas
- heartburn and other symptoms of hiatal hernia
- urinary frequency (interstitial cystitis – see below)
- groin pain
- chronic diarrhea

- pain when coughing
- belching
- chest pain that is not cardiac in origin
- abdominal cramping
- colic in infants as well as adults.

Baldry's perspective

Baldry (1999) details a huge amount of research that validates the link (a somatovisceral reflex) that Simons et al have made between trigger points and symptoms as diverse as anorexia, flatulence, nausea, vomiting, diarrhea, colic, dysmenorrhea and dysuria.

Pain of a deep aching nature, or sometimes of a sharp or burning type, is reported as being associated with this range of symptoms, which mimic organ disease or dysfunction (Hoyt 1953, Ranger 1971, Travell & Simons 1991).

Baldry emphasizes the importance of the abdominal region as a source of considerable pain and distress

involving pelvic, abdominal and gynecological symptoms. He states:

Pain in the abdomen and pelvis most likely to be helped by acupuncture is that which occurs as a result of activation of trigger points in the muscles, fascia, tendons and ligaments of the anterior and lateral abdominal wall, the lower back, the floor of the pelvis and the upper anterior part of the thigh. Such pain, however, is all too often erroneously assumed to be due to some intra-abdominal lesion, and as a consequence of being inappropriately treated is often allowed to persist for much longer than is necessary.

What activates these triggers?

Similar factors that produce 'stress' and adaptation load anywhere else in the musculoskeletal system: postural faults, trauma, environmental stressors such as cold and damp, surgery (another form of trauma), nutritional imbalances and psychogenic factors. Differential diagnosis is obviously important in a region housing so many vital organs, as is attention to the overall pattern of symptom presentation and the etiological context.

If the word *acupuncture* is replaced by the term *appropriate manual methods*, it is possible to appreciate that a large amount of abdominal and pelvic distress – much of it mimicking pathology – is remediable manually (see below).

Example: Interstitial cystitis and chronic pelvic pain

- Between September 1995 and November 2000, 45 women and 7 men, including 10 with interstitial cystitis and 42 with the urgency-frequency syndrome, were treated once or twice weekly for 8–12 weeks, using manual therapy applied to the pelvic floor, aimed at decreasing pelvic floor hypertonus and deactivating trigger points (Weiss 2001).
- Of the 42 patients with the urgency-frequency syndrome, 35 (83%) had moderate to marked improvement or complete resolution, while 7 of the 10 with interstitial cystitis had moderate to marked improvement.
- In 10 cases the subjective results (symptom score sheet) were confirmed by measuring resting pelvic floor tension by electromyography before and after the treatment course.

Conclusion

Whether structural influences on function, on a cellular or whole body level, are being considered, the

examples outlined above offer evidence that in many instances biomechanical, structural, factors are of primary importance in restoration of a situation in which self-regulation can operate efficiently.

Specifically relevant is the evidence that in situations where cells are unable to process and metabolize nutrients, due to being in a distorted state, there seems little advantage in attempting to assist function by nutritional manipulation.

This does not negate nutritional intervention, but it strongly questions the automatic primacy of such an intervention.

Identifying vulnerability

Defeo & Hicks (1993) note that:

Osteopathic physicians Zink and Lawson have observed clinically that a significant percentage of the population assumes a consistently predictable postural adaptation, arising from nonspecific mechanical forces such as gravity, gross and micro-trauma, and other physiological stressors. These forces appear to have their greatest impact on the articular facets in the transitional areas of the vertebral column.

It is clearly important for the naturopathic practitioner to have an awareness, as best this can be ascertained, as to the patient's current level of vitality and vulnerability – both of which can be considered as reflections of the degree to which the person (or the local tissues) have adapted. The principle this reflects, in naturopathic terms, would be the desire to avoid interfering with self-regulation ('vis') by further overloading adaptation mechanisms.

Zink & Lawson (1979) described methods for testing tissue preference in these transitional areas where fascial and other tensions and restrictions can most easily be noted, i.e. the occipitoatlantal (OA), cervicothoracic (CT), thoracolumbar (TL) and lumbosacral (LS) levels of the spine. These sites are tested for rotation and side-flexion preference.

Zink & Lawson's research showed that most people display (assessing the occipitoatlantal pattern first) alternating patterns of rotatory preference, with about 80% of people showing a common pattern of left-right-left-right (L-R-L-R) compensation, termed the 'common compensatory pattern' (CCP).

In a hospital-based study involving over 1000 patients they also observed that the approximately 20% of people whose compensatory pattern did not alternate in the CCP manner had poor health histories, low levels of 'wellness' and poor stress-coping abilities.

Methods for evaluation of the CCP and the accompanying imbalances are given in Chapter 6. See also Chapter 9 (Rehabilitation) which contains ways of addressing problems associated with such imbalances and asymmetries.

The Zink–Lawson sequence is described more fully, and illustrated, in Chapter 6.

Postural adaptation influences on visceral and somatic function

The first comprehensive discussion of how biomechanical alignment influences visceral function was described by the orthopedic surgeon Joel E. Goldthwaite in his book *Essentials of Body Mechanics* (1934). The concepts first described by Goldthwaite and subsequently developed by others (see below) are extremely relevant to naturopathic practice. They demonstrate the normal progression as tissues adapt to postural imbalance, with the added influences of aging and gravity adding to the picture.

The main factors which determine the maintenance of the abdominal viscera in position are the diaphragm and the abdominal muscles, both of which are relaxed and cease to support in faulty posture. The disturbances of circulation resulting from a low diaphragm and ptosis may give rise to chronic passive congestion in one or all of the organs of the abdomen and pelvis, since the local as well as general venous drainage may be impeded by the failure of the diaphragmatic pump to do its full work in the drooped body. Furthermore, the drag of these congested organs on their nerve supply, as well as the pressure on the sympathetic ganglia and plexuses, probably causes many irregularities in their function, varying from partial paralysis to overstimulation. All these organs receive fibers from both the vagus and sympathetic systems, either one of which may be disturbed. It is probable that one or all of these factors are active at various times in both the stocky and the slender anatomic types, and are responsible for many functional digestive disturbances. These disturbances, if continued long enough, may lead to diseases later in life. Faulty body mechanics in early life, then, becomes a vital factor in the production of the vicious cycle of chronic diseases and presents a chief point of attack in its prevention . . . In this upright position, as one becomes older, the tendency is for the abdomen to relax and sag more and more, allowing a ptotic condition of the abdominal and pelvic organs unless the supporting lower abdominal muscles are taught to contract properly. As the abdomen relaxes, there is a great tendency towards a drooped chest, with narrow rib

angle, forward shoulders, prominent shoulder blades, a forward position of the head, and probably pronated feet. When the human machine is out of balance, physiological function cannot be perfect; muscles and ligaments are in an abnormal state of tension and strain. A well-poised body means a machine working perfectly, with the least amount of muscular effort, and therefore better health and strength for daily life.

Schamberger's malalignment model

Some 70 years later Chamberger's malalignment model (2002) has offered important messages for naturopathic consideration, as he follows Goldthwaite and takes the discussion of postural imbalance beyond the biomechanical towards body-wide adaptational influences. He describes some of the inevitable changes that are associated with common asymmetries, as follows.

*Malalignment of the pelvis, spine and extremities remains one of the frontiers of medicine . . . the associated biomechanical changes – especially the shift in weight-bearing and asymmetries of muscle tension, strength, joint ranges of motion – affect soft tissues, joints **and organ systems throughout the body** and therefore have implications for general practice and most medical sub-speciality areas. [Emphasis added]*

Schamberger offers examples of visceral problems emerging from malalignment of the pelvis, resulting in pelvic floor dysfunction:

Typical visceral problems that have been attributed to pelvic floor dysfunction include:

- Incontinence of bowel and bladder attributed to a lax floor
- Constipation and incomplete voiding with excessive tension
- Dysmenorrhoea, dyspareunia, impotence and sexual dysfunction
- Recurrent cystitis and urinary tract infection.

He continues:

Distortion of the vagina and uterus may account for problems of dyspareunia and dysmenorrhoea, which can sometimes disappear just as miraculously with realignment (Barral & Mercier 1989, Costello 1998, Herman 1988).

Naturopathic physical medicine should be able to offer biomechanical solutions, or at least help and support, for such problems, and these issues will be discussed in greater detail in Chapter 10.

Beyond dysfunction towards pathology

Over time, adaptational changes, as listed by Goldthwaite and Schamberger, may progress from the production of dysfunction (e.g. low back pain) to the development of actual pathological changes. Staying with the same anatomic short leg example discussed earlier, Gofton & Trueman (1971) found a strong association between leg length and unilateral osteoarthritis on the side of the anatomically long leg.

They noted that all subjects with this type of OA 'had led healthy active lives prior to the onset of hip pain', and few subjects were aware of any difference in leg length. They also point out that this form of OA has its onset around the age of 53, but acknowledge that many people with precisely this anatomic asymmetry failed to develop an arthritic hip, *suggesting that factors other than the leg-length disparity are also important.*

This underscores the importance of the context in which this mechanical adaptation was being processed by the tissues under stress – with some joints becoming arthritic and others not.

What were the other variables? Nutritional? Genetic? Gender? Weight? Occupation? Other . . . ?

A naturopathic perspective should involve evaluation of the obvious anatomic and biomechanical, as well as identifiable contextual (e.g. environmental, psychological, nutritional, etc.) etiological features. These issues will be covered more fully in Chapters 4, 9 and 10.

A question

The onset of arthritic changes in the hip as a (partial) result of adaptation to a leg-length discrepancy leads logically to the question: Might surgery such as hip replacement ever be a naturopathic option? Clearly the answer here would depend upon the degree of pathology and its impact on the individual's life and lifestyle.

Naturopathic options might include ergonomic and postural advice, altered footwear (incorporation of cushioned insoles to reduce jarring); physical therapy and home stretching advice to enhance muscular function in the pelvic and lower limb regions; nutritional interventions to assist in weight control, reduced pro-inflammatory arachidonic acid-rich food intake (i.e. low animal fat and high fish oil content); enhanced intake of anti-inflammatory nutrients and potential cartilage-enhancing substances (glucosamine, chondroitin); pain-relieving strategies including hydrotherapy and acupuncture; pain-relieving botanical products; pain management methods including cognitive-behavioral and relaxation methods, etc.

However, if despite such efforts – in cases where pain has become constant, pathology extensive, function (walking etc.) extremely limited, and the potential for recovery without surgery extremely doubtful or impossible – the conclusion that hip replacement surgery may be the least worst option would be obvious. At that point this would be the best way of restoring function and reducing adaptive demands on the rest of the body. Therefore at times surgery could be considered to be a naturopathic choice.

Adaptation following trauma

Patterns of adaptation-induced dysfunction that emerge from habitual use patterns (poor posture, upper chest breathing, etc.) or from an anatomic anomaly (short leg, small hemi-pelvis, etc.) appear to differ from those that result from injury.

Lederman (1997) points out that following actual traumatically induced structural damage, tissue repair may lead to compensating patterns of use, with reduction in muscle force and possible wasting, often observed in backache patients. If uncorrected, such altered patterns of use inevitably lead to the development of habitual motor patterns and eventually to structural modifications.

The possible adaptational sequelae to trauma may include the following:

- Modified proprioceptive function due to alteration in mechanoreceptor behavior.
- If joint damage has occurred there may be inhibition of joint afferents influencing local muscle function, possibly involving the build-up of metabolic by-products (Lederman 1997).
- Altered motor patterns result from higher center responses to injury. These psychomotor changes may involve a sense of insecurity and the development of protective behavior patterns, resulting in actual structural modification such as muscle wasting.
- There may be non-painful reflexogenic responses to pain and also to injury (Hurley 1991).

Naturopathic physical medicine treatment of the patterns of imbalance that result from trauma, or from habitually stressful patterns of use, needs to address the causes of residual pain, as well as aiming to improve these patterns of voluntary use, with a focus on rehabilitation towards normal proprioceptive function.

Active, dynamic rehabilitation processes that re-educate the individual and which enhance neurolo-

gical organization may usefully be assisted by passive manual methods, including basic massage and soft tissue approaches (see Chapter 9 for rehabilitation options in a naturopathic setting). Such methods fit with naturopathic concepts of assisting self-regulation, reducing adaptive demands and enhancing functionality.

A naturopathic approach

Wallden (2000) has explained how a biomechanical adaptation sequence calls for a comprehensive (i.e. naturopathic) therapeutic intervention:

Across the life-span of an organism, or of a tissue, the rate of repair slowly declines, whilst the rate of cumulative micro-trauma to the organism/tissue increases. The point at which the rate of trauma exceeds the rate of repair is the point at which the organism/tissue fails. If repair mechanisms are optimal, the organism or tissue should realize its genetic potential. If repair mechanisms are impaired or overloaded, potential is not realized, and adaptation will fail.

(See Fig. 9.1.)

Quite simply, in order to reduce microtrauma, there is a requirement for better patterns of use. However, for tissue repair to occur in an optimal manner, there is also a requirement for an optimal anabolic environment – which may be influenced by nutrition, breathing patterns, sleep patterns, hydration levels and modification of other potential stressors to the system or the organism (when unbalanced).

A naturopathic therapeutic formula that focuses on lightening the adaptive load, as well as on enhancing functionality (the ability to handle ‘the load’), may be initiated by drawing on all or any of the requirements for health – whether these involve biomechanical, biochemical or psychosocial factors.

Can adaptation be used to restore optimal function?

The processes of adaptation have been used with great refinement in athletic and sport training.

Methods and principles devised in those settings can help guide therapeutic and rehabilitation choices in naturopathic practice, since they involve employment of sound physiological principles that do not conflict with basic naturopathic concepts.

The acronym SAID describes how a process of *specific adaptation to imposed demand* occurs. This is a familiar ‘training’ approach that employs structured adaptation principles that can offer athletic (and therapeutic) benefits (Norris 1995).

Take, for example, rehabilitation of the injured ankle, where therapeutic goals that are in tune with naturopathic principles might include encouragement of decreased swelling, pain and initial inflammatory response, without suppressing the essential healing process, using a combination of protection, rest, ice, compression and elevation (acronym = PRICE) (Andrews et al 1998).

In addition there would need to be protection of the joint, so that secondary inflammatory responses did not develop as a result of overly aggressive rehabilitation (Mattacola & Dwyer 2002).

In such cases – following the healing of damaged tissues – strategies need to be introduced to restore range of motion, muscular strength, power and endurance (as well as proprioceptive efficiency) to pre-injury levels, so that full, asymptomatic functional activities can be performed.

In this recovery and rehabilitation process the application of specific functional exercises is important to ‘stress’ the healing tissue, with SAID principles being helpful in the design of functional progression (Kegerreis 1983). Such stress will lead to the formation of collagen cross-bridges along the lines of stress, resulting in the development of ‘functional scar tissue’. Injured tissues that are fully immobilized without functional stress applied to the healing tissue will form dysfunctional scar tissue that may go on to cause further symptoms (Croft 1995).

It is ironic that SAID principles can work to rehabilitate and add functionality just as effectively as they can to create dysfunction, depending on the appropriateness or otherwise of the imposed demands.

The use of SAID methods are directly in tune with naturopathic thinking when used therapeutically, representing as they do a means for reducing the adaptive load at the same time as enhancing functionality, while respecting and working with self-repair mechanisms.

Maladaptation

Adaptation is not necessarily beneficial and can substantially reduce efficiency. Take for example the processes involved in what is known as stimulus–fatigue–recovery–adaptation (SFRA).

Verkhoshansky (1986, 1988) noted that several weeks of a unidirectional concentrated load of strength, or strength–endurance training in track and field athletes, commonly resulted in a diminished speed–strength (power) capability. Put simply this means that adaptation to one demand (strength) caused reduced efficiency in another function (speed).

It has been found that a return to more comprehensive (less specialized) training reversed this trend – which is not surprising since removal of an unbalanced training approach would reduce an excessive degree of adaptive load.

Interestingly, the changes that occur during such unbalanced training are not just a matter of learned responses, but seem to involve endocrine imbalances (as Selye predicted) as observed when young weight lifters introduced just such a modified training (Fry et al 2000).

Stone et al (1991) noted that adaptation – or maladaptation – is the summation of all stressors that an athlete may encounter (a contextual rather than a linear perspective), with recovery–adaptation being viewed as involving a long-term interplay between various stressors.

‘We are all athletes, but not all of us are in training!’ (Vaughan 1998)

Substitute the word ‘patient’ for ‘athlete’, and we can easily see how specialized knowledge in relation to sport and adaptation can translate into an understanding of use patterns completely divorced from athletics.

- How does the individual sit, stand, bend, breathe?
- What are the positions adopted for frequently performed tasks?
- What work or leisure postures are regular features of the individual’s life?
- What aspects of the individual’s close environment (chair, bed, desk, shoes, car seat, etc.) add contextual stressors to the picture?
- What are the individual’s age, gender, health history and record of adaptation to past trauma, occupational and leisure activities?
- What nutritional, endocrine, neurological and/or psychosocial factors may be influencing this situation?

These are the potential stressors that could impose adaptive demands on each of us, overlaid on our unique inherited and acquired characteristics, the summation of our past and ongoing adaptations.

The questions that need to be asked in a naturopathic setting are to what extent any of these factors have contributed to the patient’s presenting symptoms, and/or may be acting to aggravate or maintain dysfunction?

Safe adaptation

In both training and rehabilitation settings, common sense and clinical experience suggest that injury is less likely (i.e. recovery and prevention are both optimal) when:

- muscle and joint structures are coordinated, balanced, flexible and stable and are free of mechanical dysfunction
- appropriate movement(s) are used for exercise
- there is an opportunity for complete recovery between training/exercise periods
- overtraining is avoided
- light (and in home-based settings – pleasurable) training periods are scheduled
- increases of intensity or volume of exercise are progressive, and only modest increases of intensity are introduced between adaptations
- dietary and sleep factors are balanced.

In contrast, injury is more likely to occur if biomechanical structures have not adapted well to previously imposed demands or if features of the list above are not operating.

Bakker et al (2003) remark that musculoskeletal tissues not only weaken from overuse or disuse but also that the actual shape of the vertebrae and the intervertebral discs, as well as the ligaments, adapts and adjusts to the type of load imposed. This is clearly an example of a specific adaptation to imposed demand (Conroy & Earle 2000).

The quality of this physiological musculoskeletal adaptation – that alters function as well as structure – is largely determined by the magnitude of the load, the use, or misuse, to which the spine is put.

Choice of therapeutic approaches

In naturopathic thinking the ideal selection of therapeutic methods and modalities, in any given case, can be seen to require a need for choices that match that individual’s current levels of decompensation/maladaptation, vitality and vulnerability.

Treatment approaches should have as objectives a necessity to either reduce adaptive load or enhance functionality (or both), so allowing self-regulation to operate more effectively. The only other therapeutic choice would be to focus attention mainly on symptomatic relief, with little or no immediate attention as to cause. Indeed, symptom-oriented treatment may at times be the only choice initially available; however, in a naturopathic setting, objectives that incorporate the possibility of assisting self-regulation (‘lighten the

load/enhance functionality') would usually be the primary choices.

Treatment as a potential further stressor

As previously noted, Selye defined stress as anything to which the organism is obliged to respond, to adapt to, good or bad, meaning that stress and stressors are not by definition 'negative' or necessarily undesirable.

Selye (1978) further observed that:

The stress of failure, humiliation, or infection is detrimental; but that of exhilarating, creative, successful work is beneficial. The stress reaction, like energy consumption, may have good or bad effects.

Since all therapeutic interventions, by their very nature, impose *adaptive demands*, these can be seen, in the absolute sense, to be *stressors*.

In naturopathic terms this imposes an obligation on the practitioner to select methods and modalities that achieve the maximum benefit accompanied by the least cost, in terms of demands for further adaptation, on the part of an already distressed system.

Whether an individual receives treatment involving insertion of a needle, a manipulative maneuver, an exercise regime, a change of diet, a hydrotherapy procedure, or anything else, the method involved demands physiological responses – further adaptation.

It is not difficult to imagine how a susceptible, poorly compensated individual, with multiple symptoms and a background of adaptive overload, could be quite unable to adapt to particular therapeutic demands, leading to exacerbation of symptoms – or worse.

Mennell (1964) points out what should be obvious – that imposing adaptive demands needs to consider not only the local tissues but also those at a distance that may be affected. He gives the example of the use of an orthotic device, or a heel lift, that can produce side-effects such as back pain if the structures required to adapt to the altered leg length are incapable of compensating to absorb the imposed changes. In such a case, new symptoms become likely – for example if the lumbar spine of the individual happens to be rigid or arthritic.

Chapter 9 provides exercise-based examples.

Genetic influences

Fibromyalgia syndrome (FMS) and adaptation as an example

FMS involves chronic body-wide pain, fatigue, disturbed sleep and usually a variety of other symptoms, including irritable bowel syndrome (Clauw 1995).

Some studies show clear indications of familial tendencies/genetic components in the development of FMS in a subset of people affected (Buskila & Neumann 1997, Pellegrino et al 1989).

- Mitral valve prolapse has been reported in 75% of patients with FMS, a far higher rate than that noted in the general population (Schneider & Brady 2001).
- When HLA typing was carried out involving four multicase families (in which at least two members of the same family had FMS), statistically significant genetic linkage was established (Yunus et al 1999).

Researchers at the University of Miami (Klimas 1995) have evolved a model that attempts to explain the evolution and perpetuation of fibromyalgia (FMS) and chronic fatigue syndromes (CFS). This suggests that there is an initial predisposition followed by an 'etiological event' (i.e. major adaptation demand) which might involve a single trauma, a reactivation of dormant viral activity or a one-off infection (Fig. 2.14).

One or other such event seems to lead to a major ongoing immunological response which is perpetuated either by further activation of infectious agents – viral as a rule, it is suggested (Keller & Klimas 1994) – or by a dysfunctional hypothalamic–pituitary–adrenal axis related to stress influence (Lowe & Honeyman-Lowe 2003). This hypothesized explanation has strong echoes of Selye's multiple stressor-influence model.

Klimas (1995) further suggests that:

Treatment is basically symptomatic. Our concept is to treat anything we can. If someone has sleep disturbance we treat it. If we can take 20% of the miseries away by giving someone restorative sleep and we can eliminate 20% of the symptoms by treating their allergy overlay, then they are 40% better and that's significant.

These thoughts support the suggestions, expressed earlier, that one aspect of comprehensive care should be 'to lessen the [adaptive] load' and this is probably what any naturopathic practitioner would also do (although the methods employed might differ considerably from those that Klimas might suggest).

A genetic predisposition to FMS – for some patients at least – seems to be a probability, based on the evidence available, and were there nothing to be done about such a predisposition, the approach suggested by Klimas would seem reasonable.

But is there really nothing that can be done to influence genetic predispositions? In other words, is gene expression 'hard-wired'?

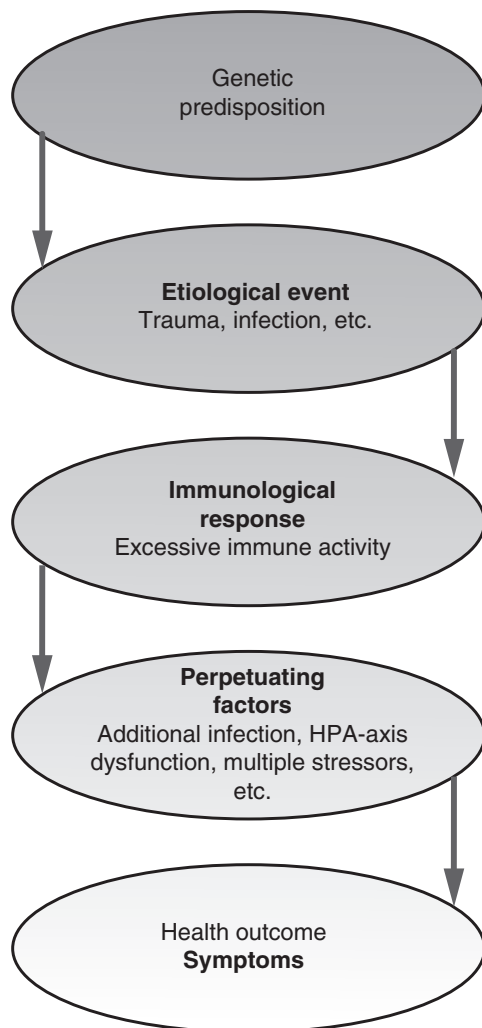


Figure 2.14 Genetic predisposition hypothesis for fibromyalgia. HPA, hypothalamic pituitary adrenocortical [axis]. Reproduced with permission from Chaitow (2003a)

Evidence exists that gene expression can indeed (at least sometimes) be modified or influenced, not only by tinkering with the genes themselves as researchers are currently attempting to do but also by encouraging them to express themselves more normally.

There are at least two approaches that might do so – one a great deal less obvious than the other – involving nutritional (biochemical) and structural considerations.

Environmental risk factors interacting with genetic predisposition leading to disease

Masi (2000) has presented an integrative physiopathogenetic perspective of hormonal and immunological risk factors leading to such diseases as rheumatoid arthritis and fibromyalgia. This model, which reso-

nates strongly with the concepts of adaptation and decompensation discussed above, outlines a multi-layer preclinical phase in which, during a long interval of symptomatically silent disease incubation, multiple genetic, somatic, behavioral and environmental risk factors (stressors) perturb the normal homeostasis of the core systems (i.e. the neuroendocrine, immunological and microvascular compartments).

When physiological homeostasis is sufficiently disturbed by such stressors (i.e. when adaptation fails), inflammatory and clinical manifestations appear or progress. Conversely, regulatory mechanisms controlling the homeostasis of perturbed core systems may also become normalized to a point that favors clinical improvements. Such amelioration of disease activity may occur in persons with less strong genetic loading predisposing towards particular disease processes, and with fewer accumulated non-genomic risk factors, something that naturopathic care would aim to encourage (Masi & Chang 1999).

Biochemical and structural factors that modify gene expression

Gene expression (also known as protein expression) is the process by which a gene's information is converted into the structures and functions of a cell. This is a multistep process which involves a sequence of transcription, post-transcriptional modification (involving messenger RNA) and translation, followed by folding, post-translational modification and targeting.

The amount of protein that a cell expresses depends on the tissue, the developmental stage of the organism, and the metabolic or physiological state of the cell (Araujo et al 2006).

Regulation of gene expression is the cellular control of the amount and timing of appearance of the functional product of a gene. Any step of gene expression may be modulated, from the DNA–RNA transcription step to post-translational modification of a protein. Gene regulation gives the cell control over structure and function, and is the basis for cellular differentiation, morphogenesis and the versatility and adaptability of any organism.

Genes may be regarded as nodes in a network, with inputs being proteins such as transcription factors, and outputs being the level of gene expression. The node itself performs a function, and the operation of this function has been interpreted as performing a kind of information processing within the cell that determines cellular behavior.

Hard wired?

Bland has discussed the biochemical possibility for such modification as follows (Bland 1999, Martin 2001):

Functional genomics derived out of the human genome project, in which it was thought that by dissecting the code of life in our 23 pairs of chromosomes people would be able to understand how they were going to die. They would see locked in their genes heart disease, cancer, diabetes, arthritis, whatever it might be, and they would tell from these genetic imperfections what day, and what disease, they would finally fall prey to . . . the discovery of the code of life through the dissection of the encyclopedia of our chromosomes has not told us how we're going to die, but told us how we're going to live. Mendelian determinism . . . said that locked into our genes, when the sperm met the egg, were these strengths and weaknesses that we call the recessive and dominant characteristics of inheritance that we could not get out from under. That basically if we had the genes for cancer we would die of cancer. If we had the genes for heart disease we would die of heart disease. It turns out that the human genome project has discovered that the genes that we thought were hard-wired to produce these diseases, are not hard-wired at all. Within our genes are multiple messages, and the message that is expressed at any moment – that's in our phenotype – is a consequence of the environmental messages including diet, lifestyle, environment, that wash over our genes to give rise to different expression paths of the genes . . . some may be healthy, some may be unhealthy, depending upon the experiences that are washing over our genes . . . what we're really seeing is that the major determinants for the expression of genetic patterns, over decades of living, are the decisions that we make, either consciously or subconsciously, every day. How we exercise, how we work, what our stress patterns are.

Research by Ames et al (2002) has now shown that these concepts are indeed accurate, and that gene expression can often be dramatically modified by nutritional strategies. Ames and colleagues have listed more than 50 genetic diseases, successfully treated with high doses of vitamins and other nutrients, most of them rare inborn metabolic diseases due to defective enzymes.

Modifying gene expression biomechanically

But there exists another – possibly surprising to some – factor that can modify gene expression: the state of structural adaptation of the cells themselves.

These structural adaptations can be seen to influence, and indeed determine, the way cells express themselves genetically. Put at its simplest, structural modification to cell shape, warping or distortion of the cytoskeleton, and the environment in which the

cell is located have been shown unequivocally to modify its ability to process nutrients normally, or to express itself genetically (Ingber 2003). This has profound implications for physical medicine in general, and for naturopathic physical medicine in particular.

There is growing interest in mechanical forces as biological regulators. Ingber (2003) reports:

Clinicians have come to recognize the importance of mechanical forces for the development and function of the heart and lung, the growth of skin and muscle, the maintenance of cartilage and bone, and the etiology of many debilitating diseases, including hypertension, osteoporosis, asthma and heart failure. Exploration of basic physiological mechanisms, such as sound sensation, motion recognition and gravity detection, has also demanded explanation in mechanical terms. At the same time, the introduction of new techniques for manipulating and probing individual molecules and cells has revealed the importance of the physical nature of the biochemical world. Enzymes such as RNA polymerase generate as much force as molecular motors (Mehta et al 1999); cells exert tractional forces on micro-particles greater than those that can be applied by optical tweezers (Schmidt et al 1993); and behaviours required for developmental control, including growth, differentiation, polarity, motility, contractility and programmed cell death, are all influenced by physical distortion of cells through their extracellular matrix (ECM) adhesions.

It is reasonable to ask how a physical force applied to the extracellular matrix, creating cell distortion, can change chemical activities inside the cell and control tissue development. The answer, says Ingber, lies in molecular biophysics and to a large extent in the tensegrity format on which cellular architecture is based (Chen & Ingber 1999, Ingber 1991, 1997, 1999).

It seems that when a distending force is applied to cell surface adhesion receptors, the mechanical load is transferred to linked cytoskeletal elements that form the tensegrity framework of the cell. These may either distort or break (Wang & Stamenovic 2000).

If the cytoskeletal filaments and associated regulatory molecules distort, without breaking, then some or all of the molecules that make up these structures effectively change shape, and when the *shape* of a molecule is altered, its *biophysical properties* change. The resulting changes affect intracellular biochemistry by altering thermodynamic parameters locally in living cells (Ingber & Jamieson 1985).

Ingber (2000) explains further:

In contrast to existing paradigms that look for explanations in terms of specific soluble and insoluble factors and linear signaling pathways, the functional

state of the cell appears to 'self-organize' as a result of the architecture and dynamics of its underlying regulatory network.

In this context, tensegrity-based changes in cytoskeletal structure may influence cell phenotype, switching on the basis of their ability simultaneously to alter the biochemical activities of multiple cytoskeleton-associated signaling components throughout the cell. Because it provides a structural basis for the formation of functionally integrated molecular hierarchies, tensegrity might also have played a central role in the origin of cellular life.

It may be of interest to note that Ingber's research into bone density loss in astronauts (on behalf of NASA) demonstrated that the collapse of the cytoskeleton's tensegrity struts in zero gravity warped the cells and was the primary reason for the cells' inability to process calcium and other nutrients normally, leading to the loss of bone density (Ingber 1999). Here we see a picture of complex structural adaptations and modification determining the efficiency of metabolic function and gene expression, at the cellular level.

As mentioned above, the implications for physical medicine in general, and naturopathic physical medicine in particular, are colossal, although as yet difficult to fully comprehend.

What seems clear is that given a structurally modified context (tissues that are, for example, fibrotic, contracted, distorted, hypertonic or even in spasm), the best nutrition in the world would have difficulty being utilized adequately.

The osteopathic dictum 'structure governs function' would seem to be validated by Ingber's research – and this clearly places structural normalization at the forefront of naturopathic therapeutic requirements.

The corollary to this is, of course, that – as described earlier – functional factors such as overuse and misuse, imposed on tissues, will modify structure (shortening, fibrosis, etc.), making the structure–function equation a two-way process.

Structure and function: the adaptation cycle

Leaving aside the obvious link between structure and function on the musculoskeletal (muscle, joint, back pain, etc.) level, it is reasonable to ask what evidence is there for systemic, constitutional, whole-body influences of structural (biomechanical) changes that emerge from a background of adaptation and compensation.

What impact on general health – including gene expression as suggested by Ingber's (1993) studies –

derives from the processes of structural compensation and adaptation that occur in response to aging, environmental influences, overuse, misuse, abuse and disuse and the resulting acquired deviations from the structural norm?

Different areas of recent research offer glimpses of the reality of the scale of structure/function influences on cellular metabolism, gene expression and internal signaling mechanisms. Box 2.4 provides a glimpse of the larger picture of how climate helped to determine the very shape of the human body via a process of adaptation, achieved through evolution.

Langevin's research

Ingber's research – outlined above – suggests that, in the short term, normalizing distorted, crowded, bunched and generally abnormally structured tissues (e.g. through exercise, stretching, massage and manipulation) should enhance metabolic function, health and gene expression (Ingber 2003).

Langevin et al (2002), at the University of Vermont, have added greatly to our understanding of biomechanical force, as exerted on connective tissue by acupuncture, building on Ingber's findings:

We have demonstrated that acupuncture needle rotation results in a measurable deformation of connective tissue. Pulling of collagen and/or elastic fibers and deformation of extracellular matrix during needle manipulation may have powerful and long-lasting effects on local cells, including synthesis and release of extracellular matrix components and modification of interstitial connective tissue composition (Langevin et al 2001). Such changes in matrix composition in turn potentially can modulate the effect of future mechanical signal transduction in connective tissue cells (Brand 1997).

By providing evidence of subcutaneous connective tissue involvement in needle grasp, Langevin et al's research suggests that the mechanism of action of acupuncture also involves extraneural tissues and paves the way for further investigation.

The results of this research highlight the potentially important role of interstitial connective tissue in neuromodulation:

Subcutaneous connective tissue forms a continuous tissue plane throughout the body. This tissue plane is itself continuous with dermis, with interstitial planes separating muscles, bones, and tendons and with intramuscular connective tissue. These connective tissue planes also constitute the 'milieu' surrounding a wide variety of sensory mechanoreceptors and nociceptors (Willis & Coggeshall 1991). Techniques such as acupuncture may act not simply via neural

Box 2.4 How have human body characteristics been affected by adaptation to historical climatic influences?

In 1991, Ruff described how the colder the climate, the wider the body structure appeared to be. He explained that:

The very broad pelvis of small early hominids has previously been interpreted in obstetrical and biomechanical terms. However, neither of these considerations can explain the subsequent decrease in maximum pelvic breadth relative to stature in larger more recent hominids. [This] increase in relative linearity of the body, with an increase in body size, is consistent with basic thermoregulatory principles. Specifically, to maintain a constant surface area/body mass ratio, absolute body breadth should remain constant despite differences in body height. Variation among modern humans supports the prediction: populations living in the tropics vary greatly in stature, but show little variation in body breadth. In contrast, populations living in colder climates have absolutely wider bodies, and thus lower surface area/body mass, regardless of stature.

Ruff also suggested that thermoregulatory constraints on absolute body breadth, together with obstetric and biomechanical factors, have probably contributed to the evolution of the rotational birth process and secondary altriciality [relative underdevelopment of the human newborn infant compared to other primates], associated with increased body and brain size in *Homo erectus*.

Additionally, Stock (2004) has demonstrated that the relative strength of distal limb bones, such as the tibia, shows a stronger correlation with habitual activity patterns than does the relative strength of proximal limb bones, such as the femur, which shows a stronger correlation with climate.

More recently, Ruff et al (2006) pointed out that another way to explain these same features is that the structure of proximal limb bones is influenced by body shape, which itself is in large part determined by adaptation to climatic demands (Ruff 1994). In contrast, it seems that the structure of distal limb bones is probably more influenced by adaptation to activity, rather than climate (or general body type).

stimulation, but also by producing changes in the connective tissue milieu surrounding sensory afferent nerve fibers. These connective tissue changes may be long lasting, which may explain claims that acupuncture can have prolonged effects.

Langevin's more recent research (Langevin et al 2005) has profound implications for manual methods:

Cytoskeleton-dependent changes in cell shape are well-established factors regulating a wide range of cellular functions including signal transduction, gene expression and matrix adhesion. Although the importance of mechanical forces on cell shape and function is well established in cultured cells, very little is known about these effects in whole tissues or in vivo. In this study we have used ex vivo and in vivo models to investigate the effect of tissue stretch on mouse subcutaneous tissue fibroblast morphology.

Tissue stretch ex vivo (average 25% tissue elongation from 10 minutes to 2 hours) caused a significant time-dependent increase in fibroblast cell body perimeter and cross-sectional area (ANOVA $p < 0.01$) . . . Tissue stretch in vivo for 30 minutes had effects that paralleled those ex vivo.

The dynamic, cytoskeleton-dependent responses of fibroblasts to changes in tissue length have important implications for our understanding of normal movement and posture, as well as therapies using mechanical stimulation of connective tissue including physical therapy, massage and acupuncture. [Emphasis added]

Summary

To summarize the research of Ingber, and that of Langevin, insofar as their findings impact this particular discussion:

- Cell behavior – including metabolic functions, handling of nutrients, gene expression and even cell death – is 'shape dependent', powerfully influenced by structural changes (resulting from the adaptational effects of the influence of gravity, environment, aging, etc.).
- Amongst its many other functions, connective tissue acts as an important signaling mechanism with body-wide influences, the efficiency of which is also 'shape dependent', being positively affected by methods such as acupuncture needling and manual methods.

Stating the obvious

At first glance the naturopathic concepts as outlined in this chapter – of attention to cause, doing no harm, encouraging self-regulation, etc. – would seem to state the obvious, to represent no more than common sense, and to possibly be indistinguishable from the primary beliefs and practices of many other health care systems.

However, on closer examination, differences should become apparent, most notably the incorporation into clinical reasoning of all of these features, overlaid onto a perspective that observes whatever symptoms are evident to be part of ongoing (often adaptational) processes, rather than seeing them as stand-alone entities.

In truth, much that is now done in responsible and evidence-based osteopathic, chiropractic, physical therapy, massage and other 'bodywork and movement therapy' settings conforms to many of these naturopathic principles – but as will become clear in discussions in later chapters, by no means always.

Mainstream ('allopathic') medical approaches to pain, for example, would often seem to have a far less searching focus on enhancing homeostatic mechanisms – with symptom relief to the fore. Analgesic and anti-inflammatory medication – while useful in extreme conditions – hardly deals with cause or encourages self-regulation.

In the next chapter an historical overview of naturopathic physical medicine is presented to allow the context out of which modern naturopathic physical medicine has emerged to be better understood.

References

- Ames B, Elson-Schwab I, Silver E 2002 High-dose vitamin therapy stimulates variant enzymes with decreased coenzyme binding affinity (increased K_m): relevance to genetic disease and polymorphisms. *American Journal of Clinical Nutrition* 75(4):616–658
- Andrews J, Harrelson G, Wilk K 1998 *Physical rehabilitation of the injured athlete*, 2nd edn. WB Saunders, Philadelphia
- Araujo A, Ribeiro MFM, Enzweiler A et al 2006 Myocardial antioxidant enzyme activities and concentration and glutathione metabolism in experimental hyperthyroidism. *Molecular and Cellular Endocrinology* 249(1–2):133–139
- Bakker E, Koning H, Verhagen A 2003 Interobserver reliability of the 24-hour schedule in patients with low back pain: a questionnaire measuring the daily use and loading of the spine. *Journal of Manipulative and Physiological Therapeutics* 26(4):226–232
- Baldry P 1999 *Acupuncture, trigger points and musculoskeletal pain*, 3rd edn. Churchill Livingstone, London
- Barral J-P, Mercier P 1989 *Visceral manipulation*. Eastland Press, Seattle
- Beal M 1983 Palpatory testing of somatic dysfunction in patients with cardiovascular disease. *Journal of the American Osteopathic Association* 82(11): 73–82
- Beal M 1985 Viscerosomatic reflexes review. *Journal of the American Osteopathic Association* 85:786–800
- Bendtsen L, Jensen R, Olesen J 1996 Qualitatively altered nociception in chronic myofascial pain. *Pain* 65:259–264
- Bennet C 1952 *Physics*. Barnes & Noble, New York
- Berczi I 1986 Immunoregulation by pituitary hormones. In: Berczi I (ed) *Pituitary function and immunity*. CRC Press, Boca Raton, FL
- Berczi I 1994 The role of the growth and lactogenic hormone family in immune function. *Neuroimmunomodulation* 1:201–216
- Berczi I 2005 Stress and disease: the contributions of Hans Selye to neuroimmune biology. Department of Immunology, Faculty of Medicine, University of Manitoba, Winnipeg
- Berczi I, Nagy E 1991 Effects of hypophysectomy on immune function. In: Ader R, Felten DL, Cohen N (eds) *Psychoneuroimmunology II*. Academic Press, San Diego
- Berczi I, Nagy E 1994 Neurohormonal control of cytokines during injury. In: Rothwell NJ, Berkenbosch F (eds) *Brain control of responses to trauma*. Cambridge University Press, Cambridge
- Bevan S 1999 Nociceptive peripheral neurones: cellular properties. In: Wall P, Melzack R (eds) *Textbook of pain*, 4th edn. Harcourt, Edinburgh, p 85–103
- Bland J 1999 *Genetic nutritioneering*. Keats Publishing, Los Angeles, p 116–118
- Brand R 1997 What do tissues and cells know of mechanics? *Annals of Medicine* 29:267–269
- Brookes J, Pusey A 2006 Application of positional techniques in the treatment of animals. In: Chaitow L (ed) *Positional release techniques*, 3rd edn. Churchill Livingstone, Edinburgh
- Buskila D, Neumann L 1997 Fibromyalgia syndrome and nonarticular tenderness in relatives of patients with FMS. *Journal of Rheumatology* 24:941–944
- Chaitow L 2003a *Fibromyalgia syndrome: a practitioner's guide to treatment*. Churchill Livingstone, Edinburgh
- Chaitow L 2003b *Modern neuromuscular techniques*, 2nd edn. Churchill Livingstone, Edinburgh
- Chaitow L 2006 *Muscle energy techniques*, 3rd edn. Churchill Livingstone, Edinburgh

- Chaitow L, DeLany J 2000 Clinical application of neuromuscular techniques: the upper body. Churchill Livingstone, Edinburgh
- Chaitow L, DeLany J 2003 Neuromuscular techniques in orthopaedics. *Techniques in Orthopaedics* 18(1):74–86
- Chaitow L, Bradley D, Gilbert C 2002 Multidisciplinary approaches to breathing pattern disorders. Churchill Livingstone, Edinburgh
- Chen C, Ingber D 1999 Tensegrity and mechanoregulation: from skeleton to cytoskeleton. *Osteoarthritis and Cartilage* 7:81–94
- Clark SC, Kamen K 1987 The human hematopoietic colony-stimulating factors. *Science* 236:1229
- Clauw D 1995 Fibromyalgia: more than just a musculoskeletal disease. *American Family Physician* 52(3):843–851
- Conroy B, Earle R 2000 Bone, muscle and connective tissue adaptations to physical activity. In: Baechle TR, Earle R (eds)/National Strength & Conditioning Association. *Essentials of strength training and conditioning*, 2nd edn. Human Kinetics, Champaign, IL, p 57–72
- Costello K 1998 Myofascial syndromes. In: Steege J, Metzger D, Levy B (eds) *Chronic pelvic pain: an integrated approach*. WB Saunders, Philadelphia, p 251–266
- Crenshaw K 2006 Use of MET in athletic training. In: Chaitow L (ed) *Muscle energy techniques*, 3rd edn. Churchill Livingstone, Edinburgh
- Crockett HC, Gross LB, Wilk KE et al 2002 Osseous adaptation and range of motion at the gleno-humeral joint in professional baseball pitchers. *American Journal of Sports Medicine* 30(1):20–26
- Croft A 1995 Management of soft tissue injuries. In: Foreman SM, Croft AC (eds) *Whiplash injuries: cervical acceleration/deceleration syndrome*, 2nd edn. Lippincott Williams & Wilkins, Baltimore
- Defeo G, Hicks L 1993 A description of the common compensatory pattern in relationship to the osteopathic postural examination. *Dynamic Chiropractic* 24:11
- Fry A, Kraemer W, Stone M 2000 Relationships between serum testosterone, cortisol and weightlifting performance. *Journal of Strength and Conditioning Research* 14:338–343
- Gofton J, Trueman G 1971 Studies in osteoarthritis of the hip: Part II. Osteoarthritis of the hip and leg-length disparity. *CMA Journal* 104:791–799
- Goldenberg D 1991 Fibromyalgia, chronic fatigue syndrome, and myofascial pain syndrome. *Current Opinion in Rheumatology* 3:247–258
- Goldthwaite J 1934 *Essentials of body mechanics*. Lippincott, Philadelphia
- Greenfield B, Catlin PA, Coats PW et al 1995 Posture in patients with shoulder overuse injuries and healthy individuals. *Journal of Orthopedic Sports Physical Therapy* 21(5):287–295
- Grieve G 1986 *Modern manual therapy*. Churchill Livingstone, London
- He X, Proske U, Schaible H, Schmidt R 1988 Acute inflammation of the knee joint in the cat alters flexor motor neurones to leg movement. *Journal of Neurophysiology* 59:326–340
- Herman H 1988 Urogenital dysfunction. In: Wilder E (ed) *Obstetric and gynaecological physical therapy*. Churchill Livingstone, New York, p 83–111
- Hong C, Simons D 1998 Pathophysiologic and electrophysiologic mechanisms of myofascial trigger points. *Archives of Physical and Medical Rehabilitation* 79:863–872
- Hoyt H 1953 Segmental nerve lesions as a cause of trigonitis syndrome. *Stanford Medical Bulletin* 11:61–64
- Huether G 1996 The central adaptation syndrome: psychosocial stress as a trigger for adaptive modifications of brain structure and brain function. *Progress in Neurobiology* 48:569–612
- Hurley M 1991 Isokinetic and isometric muscle strength and inhibition after elbow arthroplasty. *Journal of Orthopedic Rheumatology* 4:83–95
- Ingber D 1991 Integrins as mechanochemical transducers. *Current Opinion in Cell Biology* 3:841–848
- Ingber D 1993 The riddle of morphogenesis: a question of solution chemistry or molecular cell engineering? *Cell* 75:1249–1252
- Ingber D 1997 Tensegrity: the architectural basis of cellular mechanotransduction. *Annual Review of Physiology* 59:575–599
- Ingber D 1999 How cells (might) sense microgravity. *FASEB Journal* S1:3–15
- Ingber D 2000 Cancer as a disease of epithelial–mesenchymal interactions and extracellular matrix regulation. *Differentiation* 70:547–560
- Ingber D 2003 Tensegrity II. How structural networks influence cellular information processing networks. *Journal of Cell Science* 116:1397–1408
- Ingber D, Jamieson J 1985 Cells as tensegrity structures: architectural regulation of histo-differentiation by physical forces transduced over basement membrane. In: Andersson LC, Gahmberg CG, Ekblom P (eds) *Gene expression during normal and malignant differentiation*. Academic Press, Orlando, FL, p 13–32

- Janda V 1988 Muscles and cervicogenic pain syndromes. In: Grant R (ed) *Physical therapy in the cervical and thoracic spine*. Churchill Livingstone, New York
- Johansson H 1993 Influence on gamma-muscle spindle system from muscle afferents stimulated by KCl and lactic acid. *Neuroscience Research* 16(1):49–57
- Juhl J, Ippolito Cremin T, Russell G 2004 Prevalence of frontal plane pelvic postural asymmetry – Part 1. *Journal of the American Osteopathic Association* 104(10):411–421
- Kegerreis S 1983 The construction and implementation of functional progression as a component of athletic rehabilitation. *Journal of Orthopaedic and Sports Physical Therapy* 5:14–19
- Keller R, Klimas N 1994 Association between HLA class II antigens and CFS. *Clinical Infectious Diseases* 18(Suppl):S154–S156
- Kelso A 1971 A double-blind clinical study of osteopathic findings in hospital patients. *Journal of the American Osteopathic Association* 70:570–592
- Klimas N 1995 Report to CFS patient conference. Charlotte, North Carolina, September 23. In: *Fibromyalgia Network Newsletter*, January, p 12
- Knutson G 2005 Anatomic and functional leg-length inequality: a review and recommendation for clinical decision-making. Part I, anatomic leg-length inequality: prevalence, magnitude, effects and clinical significance. *Chiropractic and Osteopathy* 13:11
- Komendatov G 1945 Proprioceptivnije reflexi glaza i glavy u krolikov. *Fiziologiceskij Zurnal* 31:62
- Korr IM 1967 Axonal delivery of neuroplasmic components to muscle cells. *Science* 155:342–345
- Korr IM 1970 The physiological basis of osteopathic medicine. Postgraduate Institute of Osteopathic Medicine and Surgery, New York
- Korr IM 1976 Spinal cord as organiser of disease process. *Academy of Applied Osteopathy Yearbook*, Newark, OH
- Korr IM 1981 Axonal transport and neurotrophic functions. In: Korr IM (ed) *Spinal cord as organiser of disease process*, part 4. *Academy of Applied Osteopathy Yearbook*, Newark, OH, p 451–458
- Kraemer WJ, Gomez AL 2001 Establishing a solid fitness base. In: Foran B (ed) *High performance sports conditioning*. Human Kinetics, Champaign, IL, p 3–17
- Langevin H, Churchill D, Cipolla M 2001 Mechanical signaling through connective tissue: a mechanism for the therapeutic effect of acupuncture. *FASEB Journal* 15:2275–2282
- Langevin H, Churchill D, Wu J et al 2002 Evidence of connective tissue involvement in acupuncture. *FASEB Journal* 16:872–874. Online. Available: www.fasebj.org/cgi/content/full/16/8/872
- Langevin H, Bouffard N, Badger G et al 2005 Dynamic fibroblast cytoskeletal response to subcutaneous tissue stretch ex vivo and in vivo. *American Journal of Physiology. Cell Physiology* 288:C747–756
- Lederman E 1997 *Fundamentals of manual therapy*. Churchill Livingstone, Edinburgh
- Lederman E 2005 *Science and practice of manual therapy*. Churchill Livingstone, Oxford
- Lewit K 1999 *Manipulation in rehabilitation of the motor system*, 3rd edn. Butterworths, London
- Lowe JC, Honeyman-Lowe G 2003 The metabolic rehabilitation of fibromyalgia patients. In: Chaitow L (ed) *Fibromyalgia syndrome: a practitioner's guide to treatment*, 2nd edn. Churchill Livingstone, Edinburgh
- Martin S 2001 Interview with Jeff Bland: lessons from the genome. *CAM* November 2001
- Masi A 2000 Hormonal and immunologic risk factors for the development of rheumatoid arthritis: an integrative physiopathogenetic perspective. *Rheumatic Disease Clinics of North America* 26:775–804
- Masi A, Chang H 1999 Cigarette smoking and other acquired risk factors for rheumatoid arthritis. In: Kaufman LD, Varga J (eds) *Rheumatic diseases and the environment*. Chapman & Hall, New York, p 111
- Mattacola C, Dwyer M 2002 Rehabilitation of the ankle after acute sprain or chronic instability. *Journal of Athletic Training* 37(4):413
- McEwan N 1994 The plasticity of the hippocampus is the reason for its vulnerability. *Seminars in Neuroscience* 6:197–204
- Mehta A, Rief M, Spudich J 1999 Single-molecule biomechanics with optical methods. *Science* 283:1689–1695
- Mennell J 1964 *Joint pain*. Churchill, Boston, MA
- Norris C 1995 An exercise programme to enhance lumbar stabilisation. *Physiotherapy* 81(3):138–146
- Osbahr DC, Cannon DL, Speer KP 2002 Retroversion of the humerus in the throwing shoulder of college baseball pitchers. *American Journal of Sports Medicine* 30:347–353
- Patterson M, Wurster R 1997 *Neurophysiologic system*. In: Ward R (ed) *Foundations for osteopathic medicine*. Williams & Wilkins, Baltimore, p 137–151
- Pellegrino M, Waylonis G, Sommer A 1989 Familial occurrence of primary fibromyalgia. *Archives of Physical Medicine and Rehabilitation* 70(1):61–63

- Ranger I 1971 Abdominal wall pain due to nerve entrapment. *Practitioner* 206:791–792
- Reagan KM, Meister K, Horodyski MB et al 2002 Humeral retroversion and its relationship to glenohumeral rotation in the shoulder of college baseball players. *American Journal of Sports Medicine* 30(3):354–360
- Rosch P 1999 Reminiscences of Hans Selye, and the birth of 'stress'. *International Journal of Emergency Mental Health* 1(1):59–66
- Rosch P 2003 How it all began. International Congress on Stress. The American Institute of Stress. Online. Available: www.stress.org/cong.htm.
- Ruff C 1991 Climate and body shape in hominid evolution. *Journal of Human Evolution* 21:81–105
- Ruff CB 1994 Morphological adaptation to climate in modern and fossil hominids. *Yearbook of Physical Anthropology* 37:65–107
- Ruff CB, Holt B, Sladek V et al 2006 Body size, body proportions, and mobility in the Tyrolean 'Iceman'. *Journal of Human Evolution* 51:91–101
- Sapolsky R 1990 Hippocampal damage associated with prolonged glucocorticoid exposure in primates. *Journal of Neuroscience* 10:2897–2902
- Sapolsky R 1994 Individual differences and the stress response. *Seminars in Neuroscience* 6:261–269
- Sato A, Schmidt R 1973 Somatosympathetic reflexes. *Physiological Reviews* 53:916–947
- Schamberger W 2002 The malalignment syndrome. Churchill Livingstone, Edinburgh, p 238–239
- Schmidt C, Horwitz A, Lauffenburger D 1993 Integrin-cytoskeletal interactions in migrating fibroblasts are dynamic, asymmetric, and regulated. *Journal of Cell Biology* 123:977–991
- Schneider MJ, Brady D 2001 Fibromyalgia syndrome: a new paradigm for differential diagnosis and treatment. *Journal of Manipulative and Physiological Therapeutics* 24(8):529–539
- Selye H 1946 The general adaptation syndrome and the diseases of adaptation. *Journal of Clinical Endocrinology* 6:117–230
- Selye H 1952 The story of the adaptation syndrome. Acta, Montreal, Canada
- Selye H 1953 The part of inflammation in the local adaptation syndrome. In: *The mechanism of inflammation*. Acta, Montreal, Canada, p 53
- Selye H 1955 The stress concept in 1955. *Journal of Chronic Diseases* 2(5):583–592
- Selye H 1969 Catatoxic steroids. *Canadian Medical Association Journal* 1:51
- Selye H 1971 Hormones and resistance. *Journal of Pharmaceutical Sciences* 60:1
- Selye H 1976 Stress in health and disease. Butterworths, Reading, MA
- Selye H 1978 The stress of life, revised edn. McGraw Hill, New York
- Selye H, Somogyi A, Vegh P 1968 Inflammation, topical stress and the concept of pluricausal diseases. *Biochemical Pharmacology Supplement*:107–122
- Shah J, Phillips T, Danoff J, Gerber L 2003 A novel microanalytical technique for assaying soft tissue demonstrates significant quantitative biochemical differences in three clinically distinct groups: normal, latent, and active. *Archives of Physical Medicine* 84:9
- Simons D, Travell J, Simons L 1999 Myofascial pain and dysfunction: the trigger point manual, vol 1: upper half of body, 2nd edn. Williams & Wilkins, Baltimore
- Stock JT 2004 Differential constraints on the pattern of skeletal robusticity in human limbs relative to climatic and behavioral influences on morphology. *American Journal of Physical Anthropology* 38(Suppl):188–189
- Stone M, Keith R, Kearney J 1991 Overtraining: a review of the signs and symptoms and possible causes of overtraining. *Journal of Applied Sports Science Research* 5(1):35–50
- Timmons B, Ley R (eds) 1994 Behavioral and psychological approaches to breathing disorders. Plenum Press, New York
- Travell J, Simons D 1983 Low back pain (pt 2). *Postgraduate Medicine* 73(2):81–92
- Travell J, Simons D 1991 Myofascial pain and dysfunction: the trigger point manual, vol 2: lower half of body. Williams & Wilkins, Baltimore
- Travell J, Simons D 1992 Myofascial pain and dysfunction: the trigger point manual, vol 2: the lower extremities. Williams & Wilkins, Baltimore
- Vaughan B 1998 Presentation: *Journal of Bodywork and Movement Therapies* 1st North American Conference, Berkeley, CA
- Verkhoshansky YV 1986 Fundamentals of special strength-training in sport. *Fizkultura i Spovt* 1977. Livonia MI: Sportivny Press, Moscow
- Verkhoshansky YV 1988 Programming and organization of training. *Fizkultura i Spovt* 1985. Livonia Sportivny Press, Moscow
- Wall P, Melzack R 1990 The textbook of pain, 2nd edn. Churchill Livingstone, Edinburgh

Wallden M 2000 Lumbopelvic associations with hamstring strain in professional footballers. MSc Thesis, British College of Osteopathic Medicine, London

Wang N, Stamenovic D 2000 Contribution of intermediate filaments to cell stiffness, stiffening, and growth. *American Journal of Physiology. Cell Physiology* 279:C188–C194

Weiss J 2001 Pelvic floor myofascial trigger points: manual therapy for interstitial cystitis and the urgency–frequency syndrome. *Journal of Urology* 166:2226–2231

Wilk KE 2004 Rehabilitation guidelines for the thrower with internal impingement. Presentation, American Sports Medicine Institute Injuries in Baseball Course, 23 January 2004

Wilk K, Andrews J, Arrigo C et al 1993 The strength characteristics of internal and external rotator muscles in professional baseball pitchers. *American Journal of Sports Medicine* 21:61–66

Williams R 1956 *Biochemical individuality*. University of Texas Press, Austin, TX

Willis W, Coggeshall R 1991 *Sensory mechanisms of the spinal cord*. Plenum Press, New York

Yunus M, Khan M, Rawlings KK 1999 Genetic linkage analysis of multicase families with fibromyalgia syndrome. *Journal of Rheumatology* 26:408–412

Zink G, Lawson W 1979 An osteopathic structural examination and functional interpretation of the soma. *Osteopathic Annals* 7(12):433–440