Postural Relief of Common, Chronic Pain

A broadening of the model of causality of common, chronic pain from 1) direct effects from trauma, disease and disorder and 2) indirect effects from somatic dysfunction, to include 3) contextual effects from sub-optimal posture.

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I. Introduction

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Research of neither direct causality in terms of trauma, disease or disorder nor of indirect causality from somatic dysfunction has yielded a reliable and enduringly effective treatment of the neuromusculoskeletal system for common, chronic pain of multiple regions for which there is no apparent cause. At the 2nd Interdisciplinary Congress on Low Back and Pelvic Pain, 1995, it was reported by this investigator that a strong, enduring, and pancorporeal reduction of chronic
pain follows treatment aimed to geometrically correct two bases of postural support by

1) leveling of the sacral base by the precise use of a heel lift, and

2) optimization of the amplitude of the arches of both feet by precise configuration of foot orthotics, to render the ankles straight and vertical, applied in combination with manual manipulation and therapeutic postures (practiced at home) aimed to reduce the restriction of tissues reflective of their prior posture. 1 It is not apparent why optimization of the symmetry of these two bases of support from normal extents of postural asymmetry towards geometrically ideal posture is followed by alleviation of the greater portion of common, chronic pain. The subsequent research has been of the philosophy of science to account for this strong and unexplained effect.

The dyadic concept of cause-and-effect most commonly applied in modern science is less broad than is the triadic concept of causality proffered by Aristotle, the father of many life sciences. Aristotle states that a scientific inquiry into something properly identifies three fundamental aspects:

1. cause;

2. process of transformation (‘coming to be’); and the

3. final effect.

Contemporary science does not formally admit Aristotle’s second portion of causality, a ‘process of transformation’. Nor has science resolved common, chronic pain without apparent cause. It is possible that the inapparance of cause of common, chronic pain is a reflection of our operating under too narrow a concept of causality.

By a recovery and application of Aristotle’s original concept of causality, with a detailing of his description of the process of transformation that is intermediate to cause and effect, a comprehensive model of normal posture and common pain is

constructed. Common, chronic pain is understood as an experience of our inaction towards ideal posture, a condition for optimal and ongoing processes of transformation, or homeostasis. These homeostatic processes are inextricably linked to the gravitational context in which they occur, and are operationally linked to the conditions of certain structures of the body on which posture directly depends.

Herein, a third and fundamental cause of chronic pain, after the direct effects of trauma, disease, and disorder, and the 2) indirect effects of somatic dysfunction that encumbers homeostasis, is described as 3) the contextual effects of the normal disarray of the boundary conditions of posture within which both direct causality and structure/function proceed (Fig. 1).

![Diagram of 3 Fundamental Causalities for Chronic Pain](image)

Figure 1. Posited: three fundamental causes of chronic pain: 1) direct causality from trauma, disease, and disorder; 2) indirect effects of somatic dysfunction; and 3) contextual effects from sub-optimal conditions of postural boundaries.

Given the inexhaustability of gravitation, in contrast to the plasticity and exhaustability of the body, even subtle, normal disarray of the posture can have strong and pancorporeal effects, commonly experienced as multiregional pain and somatic dysfunction, and can lead to degenerative joint and other diseases.

The array of posture depends most directly on the conditions of three structures on which the overall postural symmetry depends, and thereby these structures constitute postural boundaries within which direct causality and somatic dysfunction perform in the context of gravitation. Three fundamental boundaries of posture have been identified (Fig. 2).
Figure 2. Three geometric boundaries of posture: 1) lowermost: feet; 2) central: sacrum; and 3) superincumbent: skull, in which resides the postural control system.

Where these boundary conditions are other than ideal, the postural control system located within the brain stem of the skull correspondingly regulates the overall symmetry of the body in order to maintain postural equilibrium, with a tax on homeostasis. An eventual effect of sub-optimal posture is the generation of tissue restriction to varying extents throughout the periphery that forms a fourth and auxiliary boundary of the periphery of posture (Fig. 3).

Figure 3. An abstract figure of posture where the conditions of the three primary boundaries on which posture depends are ideal (Panel A), and where the conditions of these boundaries are sub-optimal (Panel B). Where the conditions of these
boundaries are sub-optimal, a fourth, peripheral, and auxiliary boundary of posture results.

In accord with Aristotle’s triadic causality, a method for optimization of posture and the consequent alleviation of the greater portion of common, chronic pain without apparent cause, described herein, is understood.

By a recovery and application of Aristotle’s original concept of causality, with a detailing of his description of the process of transformation that is intermediate to cause and effect and ongoing within the context of gravity, a comprehensive model of normal posture and common pain is constructed. Common, chronic pain is understood as an experience of our inaction towards ideal posture, a condition for optimal processes of transformation. In accord with Aristotle’s triadic causality, a method for optimization of posture and the consequent alleviation of the greater portion of common, chronic pain without apparent cause, described herein, is understood.

I. A. The problem of posture and pain. Back pain is second only to the common cold as a reason Americans visit their doctors. Patients who seek care for back pain commonly subscribe to one, either or all of three competing strategies: allopathic, chiropractic or osteopathic. Let’s consider a recent and important study by Anderson, et al, who compared the outcomes of 1) standard (allopathic) care and 2) osteopathic care in the treatment of an acute episode of sub-acute pain of the low back. In the Anderson study, the allopathic care consisted primarily of limited rest, medication, and physical therapy. The osteopathic treatment primarily used manual manipulation performed by the physician to reduce somatic dysfunction. The outcomes were approximately equivalent in the 1) duration of the course of treatment and in 2) patient satisfaction. The outcomes were distinctive in that the patients treated with manual manipulation 1) used less medication and physical therapy than did those under allopathic treatment, and 2) required greater time in direct contact with the physician than did the allopathic course of treatment (Fig. 4).

Comparison Of Allopathic and Osteopathic Treatment of An Acute Episode of Sub-acute Pain of the Low Back

<table>
<thead>
<tr>
<th>Characteristics</th>
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<th>Osteopathic</th>
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<tr>
<td>Duration of Course</td>
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<td>Patient Satisfaction:</td>
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<td>Use of Medication:</td>
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<td>Use of Physical Therapy</td>
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Figure 4. A comparison of the outcomes of allopathic versus osteopathic treatment of sub-acute pain of the low back.

This study demonstrates an approximate parity of potency of these two quite distinct therapeutic strategies for treatment of an acute episode of low back pain.

It is possible that this similarity of outcome from these two quite different treatment strategies is due to both treatments not having addressed the initial conditions of postural stress that is known to be the source of the greater portion of somatic dysfunction (Type I). The strong, inexhaustible and potentially deranging stress of posture encumbers the bodies’ inherent capacity to maintain itself, with resultant somatic dysfunction. This routine stress is in contrast to the very occasional, limited stress of a traumatic event that also can causally result in derangement and dysfunction (Type II).

Neither the allopathic nor the osteopathic professions have a reliable and strongly effective treatment for the sub-acute and chronic recurrence of pain. This fact permits the possibility that both the allopathic and osteopathic models are fundamentally lacking in a dimension of diagnosis and treatment that is necessary to adequately treat the derangement we commonly experience as pain that is chronically recurrent. By adequately addressing the predominant origin of chronic somatic dysfunction, treatment of recurrent episodes of related pain can be expected to be considerably better in outcome. The same can be true for allopathic schemes for treatment.

The initial observation that prompted this direction of inquiry occurred in about 1980 when two students of ballet at Texas Christian University (Fig. 5).

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presented with a report of a disparate ability to perform pirouettes (turns) *en pointe* (Fig. 6). Their concern rested with the fact that the student that was more able in turns was otherwise far less advanced in ballet training than was the other student.

Figure 6. A figure of a ballerina performing a *pirouette en pointe* of the foot.
Why was the dancer with the advanced training not also far better at *pirouettes en pointe* than was the dancer that was far less trained?

Examination of these students of dance revealed the normal variety of mild restrictions, asymmetries, and tenderness of arthrodial tissues, with no apparent contrast between either of these subjects. In search of a postural factor, plain radiography of the lumbopelvis was performed from the a/p and lateral views with these subjects in the anatomic stance. This method of radiography in either the upright or the seated position is called *postural radiography*. The osseus structures were normal, with a slight unlevelness of the sacral base: 1/8 inch for the more adept turner, and 3/16ths inch for the dancer who less able *en pointe*. Consultation with the Radiologist assured this investigator that these amounts of unlevelness are within the range of normal. Given that the dancers were pursuing optimal performance, it was considered that normal unlevelness of the pelvis might contribute to sub-optimal performance.

For both dancers, a heel lift was incorporated into the shoes for street wear, the lift being equal in thickness to the unlevelness of the sacral base. Over the next several weeks, both dancers improved in their turns, with the senior dancer improving the most. It seemed that their ability to perform these turns, in disproportion to their training, was due-in part-to the normal imperfection of posture.

Unexpectedly, both dancers reported the marked reduction or alleviation of various pains that they had accrued throughout their years of training. *This report prompted the question, “To what extent can normal posture pertain to chronic pain for the regular population?”.*

Physicians have long appreciated that *poor posture* pertains somewhat to health. Heel lifts have long been used to reduce inequality of leg lengths or the reduce unlevelness of the pelvis to relieve chronic pain or spinal scoliosis. Plato reflected on the importance of leg lengths:

"The due proportion of mind and body is the fairest and loveliest of all sights to him that has the seeing eye.....a body which has a leg too long, or which is unsymmetrical in some other respect, is an unpleasant sight, and also, when doing its share of work, is much the cause of infinite evil to its own self...".  

- *Timaeus*
An example of a classical treatment of postural asymmetry is the use of a heel lift to reduce a disparity of leg lengths as described in 1863 by John Hilton:5

“Thus I have seen many patients wearing spinal supports, in order to correct a lateral (spinal) curvature, when the deformity might have, and has been subsequently, corrected by placing within the shoe or boot a piece of cork thick enough to compensate for the shortness of a less well developed limb. Half an inch, or indeed a quarter of an inch, of difference in the length of the two limbs is quite sufficient to generate some of the outlying symptoms of hip disease, viz. a limp, and also pain...after fatiguing exercise.”

Heel lifts have long been used to reduce abnormal extents of disparity of leg lengths. Yet, we’ve not known how to easily and reliably improve normal posture or whether such improvement can be of clinical benefit. *Prima facie*, one will likely not recognize why normal posture needs improvement.

For instance, researchers report that the measured degree to which one’s posture strays from normal is not predictive of the extent to which they suffer pain of the N.M.S. (Grundy and Roberts 1984 and Dieck 1985) (Fig. 7).

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Figure 7. Abnormality of posture has a weak or insignificant predictive value for pain of the N.M.S. Thus, it is not clear that improvement of posture can result in relief of chronic pain.

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Grundy and Roberts (1984), in a study of whether unequal leg length causes (can predict) back pain, showed no predictive value for disparity of leg lengths and back pain. They did not measure the sacral base, radiographically. They concluded,

“The hypothesis that short leg causes pelvic tilt and consequently sacroiliac strain and chronic low back pain is both attractive and biologically plausible...The results of our carefully designed study cast doubt on the existence of an association between short leg and chronic back pain.”

Dieck, et al, (1985) examined the relationship between postural discrepancies in the coronal plan of freshman women, and the subsequent development of back pain (Fig. 8).

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**Figure 8. Posterior view of postural asymmetry in the coronal plane.**
These parameters were used for the measurement of postural asymmetry.

1. Deviation
   a. of the shoulder (D\textsubscript{s});
   b. of the waist (D\textsubscript{w}); and
   c. from the midline of the body (D\textsubscript{m}).

2. The vertex of the head is A.

3. The location of the 7th cervical vertebrae is C-7.

4. The midpoint between the two points that determine the shoulder elevation is M, and C is the tip of the gluteal cleft.

After 25 years a questionnaire was sent to the participants. None of these parameters was significantly associated with a subsequent report of chronic pain of the back. It was concluded that further research directing towards elucidating the role of posture in the coronal plane and the associated spinal pain is not of high priority.

This lack of correlation makes it difficult to assess when postural factors can produce pain and it also makes it difficult to assess how much postural change is required to alleviate the pain. This lack of predictive power has been said by some investigators to prove that abnormal posture is not among the common causes of chronic pain. This and other issues discussed below pave a long and controversial history of posture and pain. Here we touch on several issues that require resolution in order to permit a comprehensive and effective clinical model of posture without apparent contradiction with contemporary practice.

I. B. Reinterpretation of previous studies in light of three forms of causality.
The concept of causality is more complex than we commonly consider. Rapoport, in his book, *Operational Philosophy*, describes three forms of causality: 8

1. observational;

2. manipulative; and

3. postulational.

1. **Observational causality** means simply that ‘Watch for the occurrence of event A and you will usually observe the occurrence of event B--or at least there is a significant correlation’. Observational causality is being tested by those studies that seek to correlate the initial parameters of posture with pain. To conclude that abnormal posture does not produce discomfort is based on the lack of observational predictability of pain by posture.

Observational causality is subject to misuse. For one, this definition of this particular form of causality is not a complete description of all recognized causalities. Thus, to not find this form of causality does not necessarily mean that causality is not present. The observed absence of observational causality between posture and pain does not preclude the presence of causality of either the manipulable or postulational kinds.

2. **Manipulable causality** plays a central role in experimental science. Strong manipulable causality means simply that ‘Change A and B usually changes’; applied in the present context, ‘optimize posture and chronic pain (and idiopathic scoliosis) are enduringly reduced’. This permanence suggests that these results are an effect of moving the body from one state (normal) toward another state (optimal).

Contemporary methods for manipulation of posture have marginal benefits that gradually fade away. Efforts to reduce pain and improve function in the hospital setting by providing postural re-education for patients with orthopedic or neurologic disease typically has a benefit that gradually extinguishes after leaving the therapeutic milieu of the hospital. This short-term benefit of postural re-education for the reduction of chronic pain has been used to support the conclusion that posture is, at best, a weak player in the game of chronic pain.

An alternate possibility is that **behavioral training** is not the best method for the enduring improvement of posture and related pain. The method presented herein uses orthotics to manipulate the boundaries of posture that, in turn, reflexly regulate the entirety of the N.M.S. with minimal conscious involvement for which a therapeutic milieu is not necessary for an enduring effect.
3. Postulational causality means that there is a general rule or principle that states or implies that A causes B. Then, where we see A we are not surprised to see B. An example is the 2nd law of thermodynamics.

The entropy of an isolated system always increases.

Entropy is always present, be the system isolated or not. In the present day generalized uses of the concept, entropy is the measure of the disorder of the system. Degenerative changes of the N.M.S., an increase in entropy, can slowly advance with age unless there are interventions that can slow or reverse the aging process. The reduction of lumbar scoliosis that follows the optimization of posture is a decrease in entropy.

An example of a manipulation that caused an decreased entropy of an elderly patient, and is the first instance for this investigator to use a heel lift, with manual manipulation, aimed to level the pelvis. The patient was a 71 year-old woman with one hip replaced, a pelvis unlevel by 45 mm, and with 16 degrees of lateral angularity of the lumbar spine (Fig. 9).
Figure 9, Panel A and B. Two radiographs, pre (Panel A) and post (Panel B) treatment, of an elderly patient in the upright stance. Panel A reflects a sacral base that is unlevel by 1 and 3/4 inch, with 16 degrees of lateral angularity of the lumbar spine. Eleven months later, the patient was refilmed with a heel lift beneath the low side of the sacral base. The base of the sacrum is unlevel by 1/8 inch, and the lumbar spine is straight and vertical.

Forty-four weeks after the initiation of treatment, and two weeks after the final increase of thickness of the heel lift, the patient underwent radiography with a 40 mm heel lift in place. The sacral base was within 3 mm of level, and lateral bend of the lumbar spine was absent.

This degree of spinal straightening was surprising, given the patient’s age and degree of deformity. Also surprising for her age was the strong and multiregional reduction of her chronic pains, accompanied by a marked reduction in use of analgesic and antiinflammatory medication. What was observed but not appreciated was an example of true manipulative causality.
The conclusion of some investigators that the lack of predictive value of abnormal posture for pain proves the lack of causal relation between posture and pain is overly broad because the reduction of pain following the optimization of posture evidences causality of the manipulable kind. 9

Of anecdotal interest is the response by an orthopedic surgeon 10 when he was asked to view the above films and to comment on the changes. To begin, he reversed the order of these two films on the view box, such that the film in Panel B was on the left and the film in Panel A was on the right. He commented that he preferred to read films in sequential order from past to present, left to right.

The films were then returned to the placement as it is in Fig. 9, and it was related to the orthopedist that the film (Panel B) was the treatment outcome. He studied the films, turned on his heel and said, as he walked away, “This case is either a fraud or it is something we don’t know about”. This anecdote illustrates how this method is outside of the traditional approaches.

Altogether, the alleviation of chronic pain that follows optimization of posture is most strongly reflective of manipulative causality, and is supported by postulational causality. Also, this logic is a sort of inverse observational causality: Look for B and you will probably find A. Note chronic pain without apparent cause and you will probably find the cause is sub-optimal posture. Such chronic pain is our experience of our inaction towards the postural ideal.

I. C. Contrasting the biologic standard of ‘normality’ vs. the mechanical standard of ‘optimal’ or ‘ideal’ as therapeutic references for posture and pain.

The usual standard for reference in medicine is ‘normality’, a successful discriminant by which to sort and interpret biologic data to support a diagnosis of many diseases and disorders, and to judge the efficacy of treatment.

A practical limit for the utility of the standard of ‘normality’ is evidenced where a patient has chronic pain without objective evidence of any abnormality that is sufficient to account for the pain. This shortcoming can be

10 Personal communication, Myron Glickfield, D.O., 1981.
understood by considering separately the 1) mechanical and the 2) biologic natures of the N.M.S. The standard for mechanical situations is not ‘normal’, but instead is ‘optimal’, an ideal and enduring state where there occurs greatest action with least expenditure of energy. Normal posture is sub-optimal, mechanically, with energy costs that are somewhat in proportion to this mechanical imperfection. Given that gravitation cannot be exhausted, and that we can be exhausted in the course of resisting gravitation uneconomically, even subtle derangement of posture from the ideal can eventually destabilize the N.M.S.

This postural model agrees with the concept of form and force closure that Snijders and Vleeming applied to characterize two scenarios for joint symmetry (Snijders et al 1992, Vleeming et al 1995). 11,12 Form closure refers to stable situation with closely fitted joints surfaces, in which no extra force is needed to maintain the state of the system, given the actual loading situation. A condition for form closure is proper size, shape, and attitude of postural boundaries, on which the superincumbent load and the underlying support of a given joint is dependent.

Force closure refers to a situation where the form is less than ideal, and supplemental force is necessary to assure joint closure. These two scenarios can be expressed by the following conceptual statement.

\[
\text{Form closure} + \text{Force closure} = \text{Unity (or 1)}
\]

An objective of postural alignment is to maximize form closure and thereby minimize the exertional demand for closure of the joint by muscular force.

\[
(\text{Form closure})^{\rightarrow \text{max}}, (\text{Force closure})^{\rightarrow \text{min}}.
\]

If the structure is far enough from the ideal, the body can go into a second mode, called the compensated state, that lowers the energy consumption and increases comfort. An example of a compensatory state is postural scoliosis, which scoliosis is most commonly due to an unlevel sacral base. Under this condition, rather than

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the spine tilting towards the low side of the sacral base, like the Tower of Pisa, the vertebral spine responds to the unlevelness of the sacrum by the generation of curves of the spine in alternating directions that permits an altogether vertical stance, albeit with spinal curvatures (Fig. 10).

Figure 10. Curve patterns in idiopathic adolescent scoliosis. These curve patterns are shown in decreasing frequency. (Illustration from Fundamentals of Pediatric Orthopedics, 1998). 13

The contemporary paucity of understanding of the relation of the sacral base to otherwise idiopathic scoliosis is evidenced in the above illustration of the curve patterns of scoliosis that is absent the inclusion of the base of the sacrum. For adults with idiopathic scoliosis of the lumbar spine, leveling the sacral base by use of a heel lift is followed by reduction of about 1/3 of the lateral angularity. Thus, this portion (at least) of the angularity that is considered ‘idiopathic’ is postural scoliosis. 14 For younger people, or for those who more recently became unlevel, the angularity can be expected to be more reducible than under conditions otherwise.

In the compensated state where postural forces are better balanced, there is increase in both the comfort, economy, and the stability of the N.M.S. The lack of association of pain with scoliosis is due, in part, to the comfort of scoliosis as a compensated state.

Common, chronic pain is without apparent cause. The inapparent cause is here attributed to our lack of awareness of the cause that is inherent where the postural form is other than ideal, with chronic pain being our potential experience.

An *a priori* causality is evidenced where, as posture is manipulated towards certain geometric ideals, there occurs relief of most pain for which a physical cause is not otherwise apparent.

By *a priori* causality, it is meant:

*a priori* (def. O.E.D.): a phrase used to characterize reasoning from cause to effect, from abstract notions to their conditions or consequences, from propositions and their assumed axioms (and not from experience); deductively.

This abstract causality is in contrast to *a posteriori* causality:

*a posteriori* (def. O.E.D.): A phrase used to characterize reasoning or arguing from effects to causes, from experience and not from axioms; empirical, inductive.

Modern medical practice largely applies diagnostics and therapeutics that are based on evidence derived from the experimental model of medical science. This science argues from experience and not from axioms, and thus is an *a posteriori* enterprise.

For contemporary medicine that is absent an ideal standard for reference, left is the comparative standard of normality/abnormality. While these standards have been used quite successfully to discern candidates for cause of biologic disease and disorder, the standard of normality has not been nearly as successful as that of ideal in the relief of common pain without apparent cause. This contrast suggests that such pain is largely a mechanical rather than a biologic disorder.

Where:

1. an abstract standard of ideal/optimal is used for reference, rather than *normal* and *abnormal*, along with
2. a different concept of causality (*a priori* rather than *a posteriori*),

additional terms are useful for the comparison of an ideal standard to a given variable. Let’s establish a working definition of certain comparative terms used commonly in Medicine, and contrast these terms with several terms for those
qualities that are with respect to the ideal and optimal in this postural model. Figure 11 represents a graph of the size of the deviation from a mechanical ideal.

![Graph of normal distribution of biologic variation](image)

Figure 11. Normal distribution of biologic variation of a given identity with respect to the mechanical ideal. For convenience, an extreme example and a normal distribution has been assumed for the deviation from the ideal.

1. ‘Normal’ is the range of the distribution of biologic variation that falls within the first standard deviation from the median of this distribution. For instance, the average extent of unlevelness of the pelvis with respect to the lateral position of the legs for an adult is about 1/4 of an inch.

2. ‘Abnormal’ is any variance from the range of normal. This standard has been a successful discriminant for biologic causality. Biologic abnormality has poor predictive value for mechanically mediated pain because, except for deviations that are significantly near the ideal, the range of normal posture is not much better for assuring comfort than is posture that is abnormal in the direction of deformity.

3. ‘Deformity’ is a variation from the ideal that is larger than those values in the normal range.

4. Somatic dysfunction is identified by arthrodial 1) asymmetry; 2) restriction from the physiologic range of motion; and 3) altered tissue texture and sensitivity. Note that this definition does not apply the standard of ‘abnormal’ extents of these three attributes of somatic dysfunction, but
rather any extent that is discernable by palpation. In this way, somatic dysfunction references to an ideal rather than a normative standard for reference.

5. ‘Difformity’ (def. O.E.D.) is any variation from a standard, the present standard being that of ideal structure, optimal function, resilient tissue texture and full sensitivity, within the ideal conditions of boundary of posture. Difformity is similar to somatic dysfunction for reason that difformity includes the criteria for somatic dysfunction, and is distinctive from somatic dysfunction as difformity includes the additional (third) dimension of the sub-optimal conditions of postural boundary. Within this frame of reference for difformity are contained the complete picture of both the a priori cause of sub-optimal conditions of boundary and the corresponding effects that can include sub-acute, recurrent or chronic somatic dysfunction, visceral dysfunction, and/or pain.

Somatic dysfunction need not be solely the result of chronic postural difformity, though usually present, since it can result from a limited traumatic event (classified Type II); however, the far greater incidence of somatic dysfunction (classified Type I) is attributed to posture. Visceral disease, with segmental facilitation and dysfunction, can also affect the segmental findings of the Type I class. Failure to recover from a limited and traumatic event from which recovery would usually be expected, can be due to underlying postural difformity that constrains the capacity for recovery and homeostasis.

The concept of difformity has several substantial advantages not afforded by the concepts of abnormality, deformity, and dysfunction. Where the standard for therapeutic intervention is a discernable departure from the ideal, most people have a correctable potential for optimization of their posture with correspondent relief of chronic pain, improvement in balance, reduction of secondary fatigue, etc. If one emphasizes abnormality (in the direction towards deformity) as an indication for treatment, only the minority of the population are viable candidates for relief from treatment.

6. ‘Ideal symmetry’ is a static image of geometric perfection found only in imaginary forms, such as a perfect right angle in the perpendicular intersection of two lines, then there is symmetry since the intersecting line leans neither one way or the other with respect to the intersected line.

A practical example of a nearly ideal symmetry as seen from the coronal view is that of a film made post P.O.P., where the base of the sacrum is reduced from the average unlevelness of 6 mm to 2 mm by the use of a heel lift on the low side. The lateral angularity of the lumbar spine, compensatory to the sacral unlevelness, reduced from 6 degrees (Fig. 12, Panel A) to 2 degrees (Fig. 12, Panel B).

![Figure 12. A typical before and after postural study of a the lumbopelvis.](image)

In contrast to posture that is normally sub-optimal, under ideal conditions of postural symmetry, there is no imbalanced torque from uneven weight bearing or support (Fig. 13).
As a consequence of the eccentric force, the line of action of the eccentric force and the line of action of the force of resistance do not coincide. This results in a torque. For equilibrium, this torque is balanced by a counter torque that is generated by muscular action or by loading of ligaments. This equilibrium does not remove the undesirable stress on and in the member, and chronically misloads the musculature and, with sufficient disequilibrium there can be chronic loading of ligaments that safe sure the boundaries of joint motion. With the optimization of posture, there is least stress of joints that bear weight, and a near minimum of counter torque generated by muscle.

7. ‘Optimal function’ relates to a physiologic range of motion and a dynamic harmony of the interaction of dissimilar constituents that include bone, muscle, nerve, ligament, fascia, and vascular supply, all interacting in the gravitational field.

8. “Boundary conditions” means the state of the postural limits within which there is altered structure, function, and sensation-both of tenderness and texture-of the tissue palpated. 17

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Three goals in the adjustment of boundaries are to approximate the

a. ideal with respect to statics; an example being levelness of the sacral base, and the

b. optimal with respect to kinetics; an example being the mechanical oscillation of a proper gait; in the context of

c. normality with respect to biologic functions.

9. “Mechanical joint disease” refers to the pain, impaired function, and degeneration of a joint due, substantially, to mechanical stress.

Beal (1977) noted the need for investigation of the possibility of preventing osteoarthritis, known to be mechanically mediated, in the knee and hip. An example of joint degeneration that is mechanically mediated is osteoarthrosis, a degenerative joint disease of the joint(s) due to chronic mechanical stress (Fig. 14).

![Figure 14. Plain radiograph that shows osteoarthrosis of the L4-5 joint on the left side. Evidenced are the three characteristics of osteoarthrosis: 1) narrowness of the joint space, 2) exostotic spurs(s), and 3) eburnation, an increased density of the joint margins.](image)

Osteoarthrosis is evidenced by three characteristics:

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1. narrowness of the joint space;

2. exostotic spurs; and

3. eburnation of the osseus margins of the joint.

The most common cause for hip replacement is advanced osteoarthrosis that occurs predominantly on the high side of the unlevel pelvis, towards which side the weight of the torso is shifted in compensation. The focal, increased, and eccentric mechanical stress that results from this lateral displacement of weight mediates the joint degeneration. Mechanically mediated osteoarthrosis is distinct from biologically mediated arthritis, such as rheumatoid arthritis for which the immune system is a co-factor.

Mechanical stress is also a co-factor for rheumatoid arthritis, and can increase the inflammatory component of rheumatoid arthritis. Both of these arthritides can be exacerbated by the mechanical stress of difformity. Importantly, the symptoms (and perhaps the advance) of both of these arthritides can be reduced by sufficient reduction of the routine mechanical stress of sub-optimal posture. This normal misloading as a co-factor for arthralgia is correctable without a significant change in behavior such as in diet or routine activity.

The qualities of 1) the net amount of body weight, and 2) the eccentric focus of a portion of this weight across the surface of a joint can be contrasted in their import. If the net weight of the body were the greater factor in the genesis of pain, one would expect to see greater pain and somatic dysfunction in proportion to obesity. If so, one’s waiting room would be biased in make-up towards the obese in pain. Anecdotally, this is not the typical case. If at all, there seems to be a morphic bias for those with common, chronic pain towards the meso- and ectomorphic phenotypes, being medium in proportion or slender and tall, instead of that of the endomorph, being short and wide.

10. “Compensated difformity” occurs where the living system is able to adjust to postural stress without pain.

11. “Uncompensated difformity” occurs where the living system is not able to adjust to postural stress without pain.
12. “Decompensated difformity” is present where the living system was once able to adjust to postural stress without pain, but no longer.

Any departure from the symmetric ideal or from optimal function with respect to gravitation is a difformity that taxes the energy required to maintain the stable, compensated state. On this postural model, common, chronic pain is regarded as the experience of uncompensated or decompensated difformity. Conversely, every enduring increase in postural symmetry substantially reduces this constraint, and increases the net system stability, compensation, and comfort.

Michael Kuchera, D.O., refers to posturally-related somatic dysfunction as gravitational strain pathophysiology. An advantage to this phrase is that it is descriptive of tissue strained by gravity to cause somatic dysfunction, disease and/or disorder. This linkage of gravitation with strain and pathophysiology is a valuable concept. A limit to this phrase is that these terms do not draw attention to the underlying and crucial change of the standard for medical reference from that of normal/abnormal for contemporary pathophysiology to that of ideal for posture. Without such notice, one is left to interpret gravitational strain pathophysiology in the context of normality, with the cognitive difficulties as discussed above.

A crucial issue here is that some people do not have problems as a result of normal posture, but others do. Globally, those with pain can be said to be ‘posturally decompensated’, but this is rather like saying that those without money are broke. This paper offers no objective explanation for why these differences in the experience of pain occur, but it does offer a

1. philosophic basis for an a priori cause of the greater portion of pain without a physical cause that is apparent;

2. comprehensive schema of posture that models the sub-systems of the N.M.S. in correspondence with gravitation; and

3. therapeutic means of correcting much of this common cause of chronic pain by optimization of posture.

The phases of development of this clinical procedure were the resolution of what is the postural ideal for the pelvis, a later, the feet, and most recently, in theory, for the cranium.

I. D. Determination of the ideal reference for measuring the pelvic level: the sacral base vs. the relative heights of the femoral heads.

A common reference for evaluating posture is the attitude of the pelvis. There is controversy as to which anatomic reference best indicates the pelvic level. Cailliet states that to determine the pelvic level is essentially an evaluation of leg lengths.

"Regardless of the cause, the significance of disparity of leg lengths resides in its effect on the pelvic level and ultimately in its effect on spinal alignment. Since the spine is vertically dependent upon the horizontality of the pelvis, an oblique sacral base can produce a superincumbent scoliosis. This relation is limited in that a difference of leg lengths less than 3/4 of an inch rarely needs correction by orthopedic shoe lift and does not adversely affect the scoliosis." 21

Subsequent research demonstrates that leveling the sacral base by the use of a heel lift significantly reduces lumbar scoliosis, initially thought to be idiopathic but proven to be partly postural in origin. 22 The foregoing suggests that the disparity of leg lengths relates less directly to the pelvic level and spinal alignment than does the attitude of the sacral base.

The sacral base is posited by the author and others 23, 24 to be the preferred reference for the pelvic level for reason that this base directly supports the vertebral spine. Where leg lengths or other references for the pelvic level relate less directly to the pain and/or scoliosis than does the attitude of the sacral base, then lesser extents of sacral unlevelness can be more significant clinically than is a similar disparity of leg lengths.

While the leg lengths are a plausible reference for the pelvic level, this and other references have been used to measure the pelvic level in the upright stance by plain radiography. Examples are the relative heights of the alar notches, heights of the iliac crests, and the attitude of the sacral base by the transverse stratum of bony eburnation (Fig. 15).

**Figure 15. Bony references used by previous investigators for delineation of the sacral base.** These are labeled the A) most posterior superior margin of the sacral base; B) lateral junction of the superior articular process with the sacral ala (alar notch); C) most superior aspect of the sacral alae; and the D) radiopaque stratum of eburnation used for this study.

This transverse strata of bony eburnation (4) forms a radio-opaque margin that extends transversely and approximately perpendicular to the long axis of the spinous process of L-5. This radio-opaque stratum (Fig. 16) is thought to be a physiologic response to the compressive stress of weight bearing in accord with Wolf’s Law, and thereby to truly delineate the weight bearing plane of the sacral base (F.M. Wilkins, personal communication, 1980).
Figure 16. Radiograph that demonstrates the radiopaque stratum of eburnation used to delineate the weight bearing plane of the sacral base.

Often, immediately below the most superior stratum having the greatest radio-opacity, one can discern multiple and parallel strata immediately neighboring each to the other. These strata are thought to represent laminar depositions of calcium within the trabecular matrix of the first sacral segment consequent to the compressive stress of weight bearing.

The delineated attitude of the sacral base is extended laterally both to the right and to the left (Fig. 17).
Figure 17. Delineation of the attitude of the sacral base by drawing a line that is parallel to the base and extending this line laterally.

This laterally extended line is intersected by two vertical lines drawn one each through the apex of each of the femoral heads (Fig. 18).
Figure 18. Panel A: The delineated attitude of the sacral base (Line segment A) intersects with a vertical line constructed through the apex of each of the femora, both right and left sides (Line segments B<sub>rt</sub> and B<sub>lt</sub>). The difference in vertical span of Line segments B<sub>rt</sub> and B<sub>lt</sub> equals the mm of unlevelness of the sacral base (Line segment C) with respect to the lateral position of the femoral heads. Panel B: A level sacral base due to the correct thickness of lift beneath heel on the side of the sacral base that previously was low. Note the correspondent and vertical alignment of the lumbar spine.

The attitude of the sacral base is correlated with the lateral angularity of the lumbar spine. Ideally, the pelvis is level and the lumbar spine is straight and vertical. Under these ideal conditions, the spinal load would be most evenly balanced, right-to-left, with least torque and greatest stability. Actually, the pelvis of the adult population, on the average, is unlevel by about 1/4 inch. Teleologically, in order to maintain postural balance, the vertebral spine of the lumbar region, on the average, is laterally angled towards the high side of the sacral base by approximately 6-7 degrees.

For an adult population with idiopathic lateral angularity (scoliosis) of the lumbar spine, as well as normal unlevelness of the pelvis (Fig. 19), the author studied the
effect that leveling the pelvis has on idiopathic and lateral angularity of the lumbar spine measured in an adult population in the anatomic stance.

![Figure 19. Depiction of an unlevel sacral base with correspondent and lateral angularity of the lumbar spine.](image)

The effect of reduction of normal extents of pelvic unlevelness on the normal angularity of the lumbar spine is tested, using the attitude of the sacral base as delineated by the radiographic line of eburnation as the reference for the pelvic level (Fig. 20).
Figure 20. Effect of a heel lift on unlevelness of the sacral base.

Repeated independent measurements of sacral unlevelness gave 6.7 mm ± 1.0 mm, initial, and a final of 2.6 ± 0.4 mm, measured with the heel lift in place and two weeks after the final adjustment of the lift. 25

For this same population, the degree of lateral angularity of the lumbar spine was measured initially and at the conclusion of the course of treatment with the heel lift in place (Fig. 21).

Figure 21. Measurement of lateral angularity in the lumbar spine by the method of Ferguson. This figure depicts an a/p view of the lumbar vertebrae with a measurable degree of lateral angularity.

This lateral angularity was reduced from an average of 7.5 degrees to a mean of 5.3 ± 0.8 degrees; a reduction by approximately 30% (Fig. 22). 26

This reduced portion of lateral angularity that is usually considered to be idiopathic is *postural scoliosis* that is imbedded within the angularity considered to be idiopathic. This significant effect points to the therapeutic potential for the reduction of idiopathic scoliosis by optimizing posture, even from that posture which is normal. *Importantly, this effect of leveling of the sacral base on lateral angularity of the lumbar spine points to a potential for the arrest of advancement as well as the reduction of adolescent scoliosis, with the avoidance of bracing or surgery for some.*

From the above result, we can see that Cailliet’s claim that leg lengths with a difference of less than 3/4 of an inch do not relate to scoliosis may be correct, and if so it would show that there is a weak correlation between uneven leg length and unlevelness of the sacral base to the extent that leg lengths relates only weakly to the spinal condition.

A second factor, in addition to the attitude of the sacral base, that bears on the corresponding spinal scoliosis is the proportions of the height to width of the vertebral bodies of the vertebral spine (Fig. 23).
Figure 23. **Classification of vertebral bodies.** Among individuals, vertebral bodies have varying proportions of height to width. Those bodies that are more tall than wide (typical for female vertebrae) are less stable with respect to supporting an eccentric load than are those bodies with greater width than height (typical for male vertebrae).

The proportion of the vertical and transverse axes of the vertebral body is gender linked, where females are prone to bodies that are more tall than wide, and males are prone to vertebrae that are more wide than tall. A meaning of this gender bias is that the vertebral spine of the average female is less stable than for that of males, hence (in part) the greater degree of postural scoliosis of the vertebral spine of females than for males, among those adults with a similar extent of pelvic unlevelness (Fig. 24). This population underwent sacral leveling by heel lift and manual manipulation. to test the contrasting effect of greater vs. lesser stability of the vertebral bodies on the reducibility of lumbar scoliosis.

Figure 24. **A graphic comparison of the degrees of lumbar scoliosis, pretreatment and post treatment, for those people with below average stability of the lumbar vertebrae.** The principle column of angularity for the less stable population is 6 degrees, and for the more stable group is 4 degrees.
Those subjects with less stability have the greater degree of scoliosis, initially, and a significant reduction of this degree, post treatment. For the more stable population, there is a less strong reduction of scoliosis (Fig. 25).

![Figure 25](image)

Figure 25. A graphic comparison of the degrees of lumbar scoliosis, pretreatment and post treatment, for those people with above average stability of the lumbar vertebrae.

A meaning here is that the vertebral spine of the average female is better able to posturally compensate for an unleveled pelvis by lateral angularity of the spine, as well as better able to be straightened post leveling.

The lateral angularity was removed very well for some but not for others. This contrast in the reduction was found to be partly due to gender-linked differences in the proportionality of height to width of the vertebral bodies, discussed in greater detail, below.

One could consider using the iliac crests as a reference in substitute for the sacral base, perhaps for reason of ease of palpation of the iliac crests. Dott, et al, report a significant disagreement in sacral unlevelness where measured by the stratum of eburnation, when compared to the unlevelness measured using as reference the heights of the superior margin of the iliac crests, both delineated radiographically. Were the palpatory assessment of unlevelness of the iliac crests reliable, the heights of the crests themselves are not a reliable reference for the attitude of the sacral base.

To illustrate the extent of disagreement between the heights of the femoral heads and the attitude of the sacral base, uncommonly, the femoral heads can be unequal

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with the low femora on the side opposite to the low side of the sacral base (Fig. 26).

**Figure 26. A picture where the slope of unlevelness of the sacral base is opposite to the slope of unlevel femoral heads.** In this case, the slope of the sacral base is the preferred reference for heel lift therapy. (Illust. from Clinical Biomechanics of the Lower Extremities by R.L. Valmassy.)

Where the slope of unlevelness of the sacral base (U.S.B.) is opposite to the slope of unlevel femoral heads, the slope of the sacral base is considered by Greenman to be the preferred reference for heel lift therapy. 28

This recommendation by Greenman is supported experimentally where a heel lift was used to equalize the heights of the femoral heads for a group (N=23) of adults the lateral angularity of the lumbar spine somewhat increases (Fig. 27). 29

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29 Irvin: unpublished research.
Figure 27. Effect on lateral angularity of the lumbar spine by the use of a heel lift to level the femoral heads

The extent of agreement and even the direction slope of the F.H.H., compared to the attitude of the sacral base, varies. After equalizing the femoral heads, the initial unlevelness of the sacral base was variably reduced, sometimes reversed in the direction of slope, or least commonly, increased with the equalization of the F.H.H. If one admits the sacral base as the better of these two references, this variance of the F.H.H. from the attitude of the sacral base explains the lesser reduction and even an increase of lumbar scoliosis that follows equalization of F.H.H.

Given the manipulability of the sacral base and the correspondent reduction of scoliosis, it remains to relate the effect of this procedure on common, chronic pain.

I. E. Pancorporeal and strong effects of postural optimization on chronic pain.
Prior to 1986, a population of 42 adults were studied for the number of regions with recurrent, chronic pain or a duration ≥ 3 months, which pain is without apparent cause according to the traditional models, and this incidence was recorded before and after P.O.P. 30,31,32. This population reported recurrent discomfort (at least one memorable episode within any two week period), in 43% of eight regions (Fig. 5).

They next were treated to optimize their posture by the combined use of 1) a heel lift to level the sacral base, 2) foot orthotics to improve the foot and ankle alignment, and 3) manual manipulation to reduce somatic dysfunction. The initial and final presence and distribution of chronic pain, region by region, were compared (Fig. 28).

![Figure 28. Graphic effect of optimization of posture on regional incidence of chronic and otherwise idiopathic pain.](image)

Pretreatment, the subjects report recurrent discomfort in 43% of eight regions. Post treatment, the subjects report recurrent discomfort in 13% of the eight regions, reduced from 43%. For seven of these eight regions, the number of patients for whom previously recurrent discomforts were absent was statistically significant (p<.01 for three regions and <.001 for four regions).

Altogether, the method for postural optimization alleviated chronic pain in approximately 70% of the number of regions in which pain originally presented. Some patients had their discomfort alleviated in 100% of such regions, and everyone participating in the study received complete relief in at least 50% of the regions in which chronic pain was initially present. Anecdotally and for all subjects, of the three regions that remain symptomatic, there was marked relief reported for two of these three regions, and moderate relief of the least affected region.

The foregoing is an extraordinarily strong and, indeed, a novel clinical outcome. Much of the interim research since 1986 has been aimed to explain this outcome.
Anecdotally, the current procedure for optimization of posture is significantly more effective today than it was in 1986 when the above results were first reported. In the interim and in contrast to the above method and results, the

1. method for optimization of foot orthotics is developed (Sect. IV.4);

2. an ischial lift is routinely used (where the sacral base is unlevel ≥ 3 mm) to level the pelvis in the seated position (Sect. IV.7);

3. therapeutic postures are developed to broadly reduce multi-regional restriction reflective of the initial posture (Section VII); and a

4. theoretic basis is posited for correlation of dental malocclusion with postural affects and the genesis of extracranial pain of the N.M.S.

Anecdotally, the present extent of relief for common, chronic pain without apparent cause that follows P.O.P. is ~ ≥ 90%. Based on the strength of this effect, difformed posture can be concluded to be the manipulable origin of such pain, until proven otherwise. Given those with normal posture and who are without chronic pain, there may exist an unrecognized co-factor which mediates one’s susceptibility to postural pain.

The results of this study are peculiar in at least three ways: the effect is surprisingly uniform, is very strong, and is unexplainable given the much less success of models currently in favor. Further, there is a didactic difficulty to the effective training of potential practitioners in this method. In order to appreciate the implication of these results, we can look in detail at how these peculiarities present themselves.

I. F. Lack of ready explanation for the effect of optimized posture on chronic pain: a need for a new principle.
This outcome from the P.O.P. is unexpected in at least three ways.

For one, the uniformity of the effect of P.O.P. is surprising. Considered in terms of either causality or somatic dysfunction, a lift placed beneath one heel has a far more direct effect on the attitude of the pelvis than it does on the attitude of the head. One can expect that the effect of a heel lift on multiregional and chronic pain would be far greater for the low back than for other regions that are more remote to the directed change. Instead, there occurred a similar reduction of pain
for all regions, a nearly uniform and pancorporeal effect. The link between leveling the attitude of the sacral base and the reduction of pain appears to be direct to all regions.

A second peculiarity is the strength and distribution of the effect of P.O.P. on chronic pain. It would not be very surprising if improvement of even normal posture was followed by a small but significant reduction of arthralgia of the weight bearing joints. Instead, the distribution of the alleviation of chronic pain is both strong and pancorporeal, or throughout the body. Not only is pain alleviated from the majority of the number of painful regions (approx. 70%), pain also (reported anecdotally) is markedly reduced for the remaining <30% of the regions that continued to be somewhat symptomatic. Also anecdotally, arthralgia of the upper extremity is strongly relieved. This relief of arthralgia of a region that does not bear much weight (such as the upper extremity) is difficult to explain in terms of mechanical stress alone.

By arthralgia, it is meant:

arthralgia (def.): Pain of the tissues that comprise a joint: nerve, artery, vein, muscle, tendon, ligament, fascia, cartilage, or bone.

That arthralgia alleviated by P.O.P. can be termed postural arthralgia.

postural arthralgia (def.): Pain of the tissues that comprise a joint that is alleviated by optimization of posture.

Thirdly, using the class of simple biomechanical models this investigator had available, no explanation was found as to how a small deviation from optimal, and one well within the range of normal, could have such a large effect. This inadequacy in the simple biomechanical models is of such a nature that it would be present in refinements of this type of model. For instance, a team might try using a model that is adequate to describe the component forces of muscular action during normal gait. Over 177 simultaneous equations are necessary (Fig. 29).
Figure 29. An illustration of the unmanageability of the biomechanical model. If we only describe the component forces of muscular action during normal gait, over 177 simultaneous equations are necessary.

Further work in this direction to include the physics of weight bearing leads from a biomechanical model of structure and function toward a model with a complexity which the author finds unmanageable to one that is untenable. A physicist consultant cautions:

“The situation is more complicated than the Figure 29 suggests. The representation of the upper half of the body is inadequate for a human. Additionally, there is a complication that is not readily apparent, in that into the M and G functions is input from the sensory system, reflexes, and volition. Also, of particular interest and not included in the model are the stress of the tissue and the short and long term effect on these tissues, and in particular the effects of weight bearing.” -Jason Ellis

Part of the difficulty is that the biomechanical models do not account for a large effect that emanates from within what is considered normal. Another part of the
difficulty is that models in physics that may be able to account for this difficulty are so terribly complex as to render them practically useless.

A fourth peculiarity contributed to the perceived need for a fundamental broadening of this model of posture. This peculiarity is not (as the others addressed were) a peculiarity of the research effect; but rather a curious non-effect, as it were. Trainees in this method for P.O.P. readily understand the basic concepts of 1) postural stress and of 2) the related pain that can be reduced by reduction of postural stress by 3) leveling the sacral base with a heel lift and optimizing the shape of the feet and ankles as bases of postural support. It was nonetheless uncommon for the typical trainee to go on to incorporate this procedure as a common practice.

This failure is indeed surprising. Let’s entertain several reasons for why this procedure might be neglected by trainees. In general, the acceptance and application of a medical procedure that is new is affected strongly by the merit of the procedure in terms of risk : benefit : cost. Perhaps the physician foresees risks associated with this treatment. Other than for those persons in the first trimester of pregnancy, the risk from the slight radiation from this procedure is negligible. There is the reversible possibility of over correction and related pain. The cost of P.O.P. for the average patient is approximately US$1,800. This cost can be compared to the cost for an M.R.I. of the lumbar spine of about U.S. $1,100, with no therapeutic affect. Given the strong benefit and the minimal risk, this procedure is both safe and an excellent value for the indicated population. Thereby, one cannot reasonably decline to provide this needed service for reason of an unacceptable ratio of risk : benefit : cost.

It can be speculated that trainees can be concerned about the way they would be perceived if they try something that falls outside of the typical rubric of medical care. This possibility is relieved by the fact that the use of heel lifts and foot orthotics, if somewhat uncommon, is well within the conventional practices of medicine. Rather than being an entirely new technique, this procedure is a refinement of methods that have long been used for treatment of some mechanical derangements that are associated with postural stress.

Given the paucity of as or a more effective treatment(s) for sub-acute, chronic and multi-regional pain, this failure by most trainees to go on to apply this procedure is indeed surprising. Imagine, if a starving people in a barren land were to be told of there being food available under most flat (and level) rocks, and without snakes, one can expect there to be quite a few over turned rocks within a few days. This
was not the case for most trainees in P.O.P.. It is as though an essential concept was not present in either our biologic model in general or the postural model in particular, and that this unnamed concept is necessary for the enduring practice of this technique.

Bertrand Russell states a criterion for knowledge.

“Every proposition which we can understand must be comprised wholly of constituents with which we are acquainted.” 33

It is possible that the then model of posture contains constituents with which we are not adequately acquainted. Such hypothetical aspects would need to be clearly identified, in order to permit the application of postural optimization in medical practice. The failure of the physicians trained in P.O.P. to use the method may possibly result from an

1. inadequacy of our common understanding of accepted principles; and/or the
2. inability of known principles to adequately reconcile these results.

These four peculiarities led to a two-year research by this investigator in the Departments of Classics and Philosophy at the University of Texas at Austin. The philosophic presuppositions of modern science were reconsidered. In a liminal experience 34 for this investigator, this research indicates that a new principle for medicine is needed. Such a principle should be consistent with the applied principles of medicine, yet facilitate the solving of problems the existing principles leave unsolved. Reconciling normal posture and chronic pain is an example of such a problem.

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34  Liminal experience: Greek mythology tells of a man who leaves his familiar land and travels afar, having strange adventures that culminate in an epiphany, or an awakening to something both Divine and previously not known to he and his countrymen. The completion of this experience is when, on return of this wanderer to his homeland, there occurs the relating of this epiphany to his countrymen, and the Divine scheme is realized.