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Chiropractic: Physical Effects of Chiropractic Therapy on Postural Balance*

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Abstract: While this research was completed nearly a decade ago, for private health reasons, it was never been published, presented at any conference or submitted to any other award contest. The paper is concerned with the effects of general chiropractic therapy related to the states of normal and abnormal human postural physiology. In this research, the effects of general chiropractic therapy on patients' postures were recorded by taking notes of actual physical postural changes measured in postural balance of 896 patients against the force of gravity with an anatomical level. Patients, who were failing to produce postural changes after ordinary hands-only chiropractic therapy, were later treated with percussion hammers, the Trigger Point Hammer (TPH) and TriggerCiser (TC).

After general chiropractic therapy, which includes hands-only articular manipulation, instrumental percussion therapy and administration of heel-lifts, most patients (99, 11 %) either had or naturally assumed improved postural balance. Said results of postural effects were physically displayed with an anatomical level and are described in this paper. The research recorded how the different states of postural physiology react to ordinary hands-only chiropractic therapy, including administration of heel-lifts. This research also aimed to determine whether some percussion hammers, the previously mentioned TPH and TC, were appropriate instruments to use in normal clinical chiropractic practice. Said percussion instruments were used with specific directional thrusts and several gross manual movements against affected tissues in order to activate dysfunctional tissue sensors, but also mobilise tissue structures. Using thrusts in specific directions made treatments cautious, as proper direction, which lessened

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the structural crookedness, seemingly reduced tissue tension while also triggering increased motion and circulation. While the impacts of the thrusts clearly irritated affected tissues, proper direction of the therapeutic thrusts seemingly reduced tension in the supportive connective tissues while they activated dysfunctional sensory receptors in both superficial and deep tissues. As postural balance clearly improved by the activation of the sensory receptors, this effect also increased structural motion and circulation.

The instrumental treatments also included vibratory effects, which came from the high-speed percussions of the built-in mechanical mechanism in said instruments. In general, both ordinary hands-only chiropractic therapy as well as the instrumental thrusts/vibrations made by arm movements in specific directions produced improvements of postural balance, apparently from activating normal functions in sensory receptors. The activation of the sensory receptors was indicated by the measurements of anatomical positional changes in postural balance (pelvic alteration) against the force of gravity. The measurements of said structural changes were done with an anatomical level before and after therapy.

Although the aforementioned percussion instruments work differently from other chiropractic instruments of the same type, they do not create any lasting side-effects, unless they are overused. In patients who were resistant to postural changes after ordinary hands-only chiropractic therapy, the instruments were used several times with various subjectively selected forces, both against previously treated tissues and other seemingly less affected tissues. The effects of the treatments produced postural changes, which were controlled by an anatomical level to be symmetrical improvements. As these improvements took place only after inflamed tissues had been properly treated, the sensory receptors of these tissues were conceivably made inactive by compressions of inflammatory swellings. Thus, compression of inflammatory swelling against sensory receptors is beyond doubt the most common cause of dysfunctional sensory receptors resulting in poor postural coordination.

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I. INTRODUCTION

Human physiology has advanced its functions since the dawn of time and has evolved to possess inborn homeostatic functionalities, some of which are designed to cope with the excess burdens of bearing the body weight in various positions, including all of those encountered in daily life, even bearing children. Therefore, a proper posture has for centuries been regarded as important for weight-bearing functions in the body. Medical and chiropractic practitioners have equally regarded proper posture to be important for many health reasons. Governments, on the other hand, have looked at the costs of poor posture, neck and back pain in official health systems. The costs of musculoskeletal disorders have skyrocketed and do not seem to be slowing down. Posture is one of the pillars of neuromusculoskeletal healthcare and improvements in posture ought to have an impact on many musculoskeletal disorders.

In this research, a newly discovered physiological autonomy of postural balance has been divulged as a primeval fundamental function, which even precedes deformations of scoliotic compensatory reactions against spinal discus protrusions into the spinal canal. The autonomic postural balancing effects show that the body has an innate "gyro-like" function, which automatically balances the upright human body in a vertical position with perfect horizontality of the transverse iliac crest line (TICL) to establish preceding functions of bearing loads against the force of gravity. By discovering the perfection of this autonomic function, we have learned about the remarkable specificity of the body's coordinative postural balance. This precise coordination of posture with a particularly specific synchronization of the pelvic structures making up the perfect TICL horizontality is wholly maintained by homeostasis and it seemingly takes place in all humans. These facts reveal that the function of maintaining the TICL perfectly horizontal is of fundamental importance in human physiology, and it appears that the homeostatic maintenance of this specific horizontality is one of the most central functions in the body and it certainly affects chiropractic therapy.

Chiropractic therapy generally treats one, two or sometimes even three areas of inflamed tissues, often referred to as subluxations. The tissues surrounding

spinal vertebrae are commonly diagnosed by detecting painful inflammation and swelling, often using motion-palpation and various orthopaedic or neurological tests. However, when ordinary chiropractic therapy against such affected tissues fails to produce expected postural changes, this research has tested some new percussion hammers (TPH/TC) used as clinical instruments, which were applied to other (different) tissues, which were seemingly less affected.

The imaginary line of the uppermost transverse horizontal plane touching the superior crests of the two pelvic bones , referred to as the transverse iliac crest line or TICL, signifies the horizontality of the weight-bearing foundation of the torso, including the sacrum, spinal column, cranium and the upper extremities. Although it is stressed by being an important weight-bearing foundation, it is also affected by muscular attachments from the lower extremities, thereby exposed to enormous physical forces in everyday life. When a divergence of TICL horizontality decreases or becomes perfectly horizontal after a chiropractic treatment, such an event reduces much postural stress, particularly in the pelvic and lumbosacral area. Although total postural balance may still be imperfect when the TICL becomes perfectly horizontal, it still has become more optimised by a naturally improved coordination of all articulations in the total posture. Thus, perfect TICL horizontality is considered a great diagnostic sign of a successful treatment.

The importance of measuring improvements of TICL horizontality, as evidence for an improved postural balance, is based on empirical science. Chiropractic schools have taught chiropractic students that a reduced TICL deviance implies a successful treatment improving posture; this is still rightly taught today. By maintaining perfect TICL horizontality and avoiding TICL divergences, the muscular workloads on the other postural structures will be greatly reduced. Any abnormal deviance in the TICL horizontality from poorly coordinated postural balance will in general produce tremendous physical strains, not just on the pelvic structures and the lower back, but also in the rest of the posture. Therefore, by being exposed to poor posture with a TICL deviance for a prolonged time, the supportive connective tissue will commonly become overloaded and overworked, causing muscular tendons to become painfully inflamed along weaker parts of posture. Later in this text, the surprising finding showing that seemingly all patients strive to assume posture with an absolutely perfect TICL horizontality, whether they are treated or not, will be discussed.

As it is assumed that a healthy nervous system maintains proper balance of the total posture, it was hypothesised that dysfunctional sensory receptors transmitting inconsistent information to central neurons caused the posture to

become uncoordinated, resulting in a diverging TICL. However, by using instruments intended for triggering sensory receptors (TPH/TC) and thereby producing a coordinated posture with them, normal coordination restored postural balance so the TICL became automatically perfectly horizontal. This was physically proven by measuring the positions of the pelvic bones with an anatomical level called the Pelvic Angle Indicator (PAI). The PAI clearly demonstrates that both forms of chiropractic therapy, ordinary hands-only chiropractic therapy as well as instrumental percussion therapy with the TPH and TC, affect the nervous system in various patients and will optimise postural balance producing perfect TICL horizontality instead of a diverging TICL. Thus, the PAI physically proves that an uncoordinated posture with a diverging TICL becomes re-coordinated after therapy and that the TICL becomes perfectly horizontal due to autonomic positional alterations of the structures of postural balance.

With the TPH and TC, treatments may mobilize and activate more tissue areas in the same treatment session (mobilizing and producing vibrations in them) than ordinary chiropractic hands-only manipulative treatments. Therefore, after using both instrumental treatments (TPH/TC) and ordinary chiropractic manipulative treatments, the total treatment scheme activated most, if not all, of the superficial and deep dysfunctional sensory receptors. This indicated that previously inactive (dysfunctional) sensors began transmitting afferent nerve impulses to centres of balance in the brain/brain stem. Clinical experience and general motion-palpation together with other subjective clinical orthopaedic and neurological tests also helped identify inflamed areas with hidden dysfunctional sensory receptors.

This research is in agreement with normal physiology and asserts that postural structures assume anatomical positions based on demands of natural loading conditions in tissues. Such loading conditions activate sensory receptors in tissues throughout the body and relay afferent sensory nerve impulses in nervous pathways from the periphery of the body to neuronal centres of balance in the brain/brain stem. It is assumed that the coordinative processes predominantly take place in the brain stem, effectively coordinating and optimising postural balance according to loading conditions. Thus, human homeostasis involves the maintenance of all structures of postural balance in ideal weight-bearing positions against gravity while it maintains optimal functional mobility and cooperative articular motion of tissue structures. In this research, the postural coordination seemingly functions primarily as structural weight-bearing and, to a lesser extent, the mobility of articulations and circulation of body fluids. In all humans, the weight-bearing, or postural, structures of the body primarily adapt to assume ideal anatomical positions for bearing loads.

This research found that there are generally two reasons why neuronal centres for coordinating postural balance do not properly maintain ideal postural alignment, often leading to inflammatory pain of supportive structures. The first reason is the swelling of tissue around sensory receptors affecting nervous system transmissions from the periphery of the body to the central nervous system. The second cause is gross anatomical deficiencies, which are too great for natural physiological compensation. Sometimes, both factors, sensory disturbances and anatomical deficiencies, produce anomalies of postural balance. However, these causes may commonly be revealed in chiropractic clinics through the use of anatomical levels. In view of that, an anatomical level may identify the source (beginning/background) of many of the existing neck and back pain of musculoskeletal problems expressed by patients. This instrument not only provides physical proof for the effects of chiropractic therapy on postural balance, but it may also confirm the results of most chiropractic treatments administered to patients. Therefore, the clinical use of anatomical levels should be taught to all chiropractic students.

Chiropractors most commonly treat neck and back pain. They deliver adjustments (manipulate) bone alignment to activate peripheral sensory receptors against normal responses to gravity to reduce postural imbalances and thereby structural loading conditions. This is accomplished by adjusting the spine and/or adjacent articulations, thus neurons coordinating posture according to homeostasis will strive to create better weight-bearing positions, which also improve health through increased mobility and circulation.

Before this research commenced in 2008, it was planned to construct a PAI with a meter scaling and displaying degrees of horizontality of the TICL. However in the autumn of 2007, during a testing period with the PAI, it was discovered that most patients naturally assumed perfect TICL horizontality after treatments when conventional chiropractic treatment techniques were applied. It was discovered that improved postural changes in the pelvic region came about whether treatments took place in the cervical, thoracic or lumbosacral regions. Because so many patients changed their diverging TICLs to perfectly horizontal TICLs during said testing period, it was decided that the PAI should not be produced with a meter scaling degrees, but rather constructed in a normal way with an air bubble positioning itself in the middle, very similar to carpenter's levels, as an upper pelvis with perfect TICL horizontality is in general a very objective finding on a macroscopic level.

The fact that most patients had positive postural improvements showing that the TICL became more level was not unexpected, but displaying a perfect TICL horizontality in so many patients was very surprising. Therefore, the

previous intension to simply record improvements the TICL horizontality from a scale (meter) of a PAI before and after therapy was transformed into a curiosity about the recorded percentage of how many patients achieved perfect TICLs after their treatments. Thus, due to the testing period in 2007, perfectly horizontal TICL became the new standard for measuring optimally balanced posture in patients.

An anatomical level (the PAI) was constructed to measure the immediate effects of chiropractic therapy both before and after administering various manipulative techniques on patients over 13 years of age. The main reason for selecting patients more than the age of 13 for this research is because it is many times difficult to fasten an anatomical level on top of the iliac crests on patients below the age of 14 and also make them stand still.

The anatomical level in question should measure postural changes in the pelvic bones of patients standing upright and it was constructed to observe a patient's TICL by placing the level's arms on top of the superior part of both iliac crests from behind a standing upright patient. Like a carpenter's level, this anatomical level utilized an air bubble in water to determine a patient's postural position. This level displayed any horizontal changes in the TICL both before and after chiropractic treatments, which then were recorded. If the TICL became more level, or even perfectly horizontal, the anatomical positions of weight-bearing structures of posture had naturally improved its balance and one could say that chiropractic adjustments had been correctly performed. This research therefore makes it clear: Afferent nerve impulses from properly functioning sensory receptors to neurons in the brain and the brain stem will be coordinated by said neurons and the positions of the postural structures will be positioned in the body relative to the force of gravity, not the direction in which they were adjusted by general chiropractic therapy.

It should be advocated by this research that specific directional adjustments mainly reduce (avoid) chances of trauma and tissue tearing, but they do not affect the positional placement of postural structures, which seemingly solely depend on neuronal coordination of loading conditions on postural structures relative to the force of gravity. As all body structures rely on one another in weight-bearing balance and motion, homeostasis achieves optimal postural balance through improving symmetry, which also improves loading conditions, mobility and circulation. All of these improvements are a source of better health in the body.

The horizontal perfection of the TICL is maintained by neurologically controlled balancing functions primarily developed in humans between the

ages of one till three years, although human balance is not considered to be fully developed until puberty has passed. In general, the TICL should stay perfectly horizontal when walking with small movements of the lower limbs. With larger movement, for example, long walking steps and running, the horizontality should sway from side to side, back and forth a few degrees to maintain the upright balance of the total body. This is one of the reasons why runners should get their leg lengths checked and, if needed, corrected properly with the help of an anatomical level. Any deviance in the vertical asymmetry of any postural structure will produce extra workloads for muscles and supportive tissues in general.

This study of patients with musculoskeletal problems (mainly neck and back pain) continued throughout 2008. The results were analysed in January, 2009. Postural responses of patients with musculoskeletal problems, who were at least 14 years old and up, were recorded before and after chiropractic therapy. Additionally, only patients who had not received treatments from any chiropractor for at least two months prior to this research were included in the research records. Consequently, the clinical examinations were narrowed to 896 patients during 2008, and the PAI was specially constructed for this research.

Mostly for the need of the chiropractor, but also to some degree for patients, a Leg Length Regulator (LLR) was also constructed. This LLR was primarily used for measuring both sides of the body more correctly in a clinical test called Symmetry Test. It is not strictly necessary to use a LLR for diagnosing leg length deficiencies, but it simplifies and eases the clinical work of busy chiropractors, as it eases the work of diagnosing the size of heel-lifts, thereby simplifying the treatments of gross anatomical asymmetries of posture.

As prolonged loads on postural structures and stresses of poorly coordinated weight-bearing balance on musculoskeletal structures gradually will produce negative consequences (inflammatory pain with swelling), these general findings may be summarized as follows:

- Horizontal deviations of the TICL indicate poor postural placement and balance.

- Chiropractic therapy produced improved, or perfectly horizontal, TICL for patients by realigning postural structures.

- Improved neuronal postural coordination led to an improvement of the horizontality of the TICL, which resulted in a reduction of postural stress.

- Diverging TICLs improved instantly after chiropractic therapy (observed with a PAI), assumedly because afferent nerve transmissions from previously dysfunctional sensory receptors were re-activated, starting transmitting normal sensory signals to central neurons, thus coordinating postural balance better (optimally).

- In an upright position, the lower back and pelvis bear the greatest load, and when the upper part of the pelvis bears loads horizontally in standing upright position, it means that the sensory nervous system is functioning properly and that the total posture distributes loads on all structures better (more evenly).

- The Symmetry Test was developed as a means of identifying structural compensations through use of the anatomical level and measuring patients for required heel-lifts. The need for precise measurements on each side of the body is required to overcome the body's natural compensatory reactions of postural balance, which is different on each side of the body and for each leg length.

- The Symmetry Test with a PAI and a LLR represents a new era of prophylactic services in chiropractic therapy. This test will provide better services for patients seeking proper healthcare and those who want to maintain proper posture for general health reasons as well as avoiding sudden onsets of musculoskeletal pain.

- The TPH and the TC are valuable clinical instruments needed in the chiropractic clinic for chiropractors to administer more optimal treatments to all patients.

- A part of this research was aimed at elucidating information about the TPH and the TC relative to ordinary hands-only chiropractic therapy, to validate these instruments as clinically efficient aids, and therefore advocate for their use in training as well as general chiropractic practice.

This study demonstrates chiropractic therapy's effectiveness on postural balance. By treating dysfunctional receptors of the sensory nervous system, chiropractic therapy improves sensory functions in local peripheral tissues throughout the body. The use of an anatomical level allows the detection and demonstration of this improved posture.

Chiropractors are taught to use orthopaedic and neurological tests to check and recheck postural responses by observing the postural effects of their chiropractic therapy on their patient's sensory nervous system. However, many orthopaedic

and neurologic tests used to check these results have been proven unreliable. As a result, chiropractic clinical examinations have been relatively subjective. It should, therefore, be taken into account that chiropractors often measure leg lengths when patients are laying on a bench, before and after therapy, not considering that the bench presses against the body and changes patient's actual posture and thereby also leg length measurements.

Additionally, normal healing generally takes an extended amount of time and the long-term effects of chiropractic therapy have in general had to be validated by evidence-based research. Many of these evaluations were based on subjective perceptions of pain in patients, making it difficult to establish acceptable quantitative research to validate chiropractic therapy to the therapy of other medical professionals.

Since perfect TICL horizontality indicates optimally balanced posture and properly functioning sensory receptors, the horizontal perfection of the TICL may function as an anatomical frame of reference for optimal postural homeostasis (not a perfect posture). In general practice of chiropractic therapy, the perfection of this horizontality may identify false therapeutic treatment systems and flawed diagnostic findings and signs. If a diagnostic system considers deviation of the TICL horizontality as abnormal because it is believed that such deviations have derived from a short leg or a subluxated iliac bone, then there is something wrong with this system. Such deviations are in fact caused by the inconsistent coordination of total posture by the sensory nervous system or by gross anatomical deficiencies (or both). The position of the bones should therefore not be treated unless there is a lesion or tissue dysfunction present, like poor mobility and inflammation, which is often referred to as a chiropractic subluxation. Picking subluxations off x-ray findings is therefore totally wrong.

Chiropractic therapies cannot prove effectiveness for many of the conditions they treat. As such, patients have preferred other forms of healthcare with more definitive and faster results. While chiropractors use adjustments to treat subluxations, the definition of a subluxation has thus far been little understood and been a myth to many other healthcare professions. In view of the aforesaid, a subluxation may just be defined as "inflamed tissues of a joint reducing normal joint movements and causing disturbances of normal physiology".

Chiropractic schools teach chiropractors to treat spine-related disorders and some to treat subluxations, but determining how chiropractic therapy successfully treats these disorders remains elusive. Most chiropractic schools teach students to verify physical results of their therapeutic efforts by placing flat hands on top of the pelvic girdle to see if the levels of the two iliac bones

have become more symmetrical; however, using measurements of an anatomical spirit level for this purpose would have revealed how homeostasis gradually seeks to achieve attaining perfect TICL horizontality in standing upright position.

Chiropractic researchers have sought more evidence-based research methods to connect the effects of chiropractic therapy on certain disorders, but with minimal success. Thus, chiropractors have remained under scrutiny, justifiably so, since several chiropractic practices use too many personal and subjective ways and reasons for treating patients.

Chiropractic practitioners need an anatomical frame of reference for what a specific chiropractic therapy may achieve on a particular chiropractic malady– a reference fitting most descriptions of the therapeutic effects of chiropractic treatments. This lack of a standardized reference of treatments and their effects also partly led to the inspiration behind this study.

Since chiropractic therapy should improve functional movement and posture, using an anatomical level measuring relative to the force of gravity could provide more accurate feedback. A level is an instrument containing an air bubble that always positions itself perpendicularly to the earth's gravitational pull. Checking the position of the air bubble before and after chiropractic therapy provides a quite objective way to determine whether there were actual postural changes, particularly when the result is perfect TICL horizontality. An anatomical level would, therefore, be better than the standard clinical Deerfield leg-checks, which are done in a lying position, with the bench pressing against the body, and consequently changing the patient's posture and leg lengths. An anatomical level would objectively demonstrate with measurements relative to gravity when the lengths of patients' legs became more even while also showing how the posture adapts while maintaining perfect TICL horizontality. Thus, an examination with an anatomical level would render objective postural measurements when performed correctly and it will also establish a standard control for the therapist, quantifiably identifying the effects of certain treatments for review and use by other chiropractors and scientists.

In the autumn of 2007, a steel factory was contacted to construct anatomical levels. The levels were designed to display a true horizontal position of the upper transverse iliac crests (TICL). Unexpectedly, as simply slightly uneven pelvises were anticipated, clinical testing of the levels showed many patients already had perfectly horizontal TICLs. This suggested that while homeostasis brought optimal balance of posture, pain relief was not immediate but gradual. Instead, the body produced a perfectly horizontal TICL as a part of the normal healing process and optimally balanced posture. Thus, perfectly horizontal

TICLs would become an anatomical frame of reference for optimal postural balance. Thus, chiropractic therapy improved postural symmetry in a way that always produced perfectly horizontal TICL positions in most patients. In other words, ordinary hands-only chiropractic therapy not only helped clients achieve more symmetry, but perfect TICLs, even before the pain was gone.

In general, this study has based its findings on patients achieving perfect TICL horizontality (optimal postural balance) immediately after therapy instead of mere improvements of the horizontality. All patients, 14 years old or older, and their pelvic planes were assessed before and after their treatments. Babies, younger children and patients with other non-articular musculoskeletal syndromes were not included in this study. Then, if the patients in the study did not achieve perfect TICLs, they received TPH and TC treatments.

TICLs becoming more properly horizontally aligned after therapy have always implied improvement of the postural weight-bearing balance. Although chiropractors have measured TICLs subjectively by using flat hands to touch the iliac crests after therapy sessions in order to identify any improved deviation in the upper pelvis, chiropractors have never before suggested that the TICL ought to be measured in order to observe whether it became perfectly horizontal, as it was always expected that most people had tiny diverging TICLs as normality, especially because people in general have different sizes of dual organs/structures (more or less) in their bodies. No one suspected that a neuronal autonomy balanced total posture in such a way that the TICL always is maintained in a perfectly horizontal position when standing upright.

As the horizontal plane of the upper pelvis typically is the weight-bearing foundation in a standing position, the pelvis also serves as the muscular centre for the greater musculature of the lower limbs. Thus, finding that homeostasis seeks to assume perfect TICL horizontality in standing upright position, it should revolutionize chiropractic physiology and thinking, and many chiropractic therapeutic systems must therefore be re-written.

The horizontal perfection of patients' TICLs indicates that postural balance is coordinated according gravitational loading conditions by neurons, which is why all patients with a properly functioning nervous system should achieve this through general chiropractic therapy. This is the reason why this research has shown that a physiological balancing autonomy in the human body constantly strive to maintain a perfectly horizontal TICL even when the difference in leg length is less than 7–9 mm, or a near-horizontal TICL when leg length difference is greater than 7–9 mm. However, of the 896 patients examined,

there was one patient who was able to compensate for more than 20 mm in leg length and did not need a heel-lift to attain perfect TICL horizontality while another only could compensate for 2 mm and she had to get a heel-lift to achieve perfect TICL horizontality. This shows that the mainstream of patients may adapt to about 7 – 9 mm, but that there are exceptions to this rule making practicing chiropractic more difficult.

Dysfunctional tissue sensors affect normal afferent nerve reflexes to the central nervous system (CNS) neurons responsible for coordinating posture, and since chiropractic treatments produce changes in upright postural balance and perfectly horizontal TICLs, inflamed tissue is the likely to cause poor postural balance; this puts strain on the whole musculoskeletal system. It is therefore indicated that poor postural conditions over a prolonged period often lead to structural deformities and degenerative changes in tissues because they are vulnerable to weight-bearing overloads. Previously, physical examinations may have revealed dysfunctional joint movements and weight-bearing irregularities in the posture and now the anatomical level may add another needed dimension to chiropractic examinations, making chiropractors treat postural balance more adequately.

Postural balance is generally examined before and after administering chiropractic treatments since one of the most commonly observed effects of chiropractic therapy is improved postural symmetry. The most common way of clinically diagnosing chiropractic conditions has been the art of diagnosing leg length deficiencies and measuring the positions of pelvic bones; this has been very central to general chiropractic clinical examinations.

For the past century, one common sign of successful chiropractic treatment was subjectively observing a reduction in horizontal divergence of the TICL. Today, while detecting this deviance, it is still considered that an improvement in postural balance and is essential for general patient care. Verifiable TICL improvement indicates better musculoskeletal symmetry and balance in an upright posture. This was previously assumed, but not yet proven. Through the invention of the level called PAI, this research has now established a more objective way of measuring TICL improvement. A level is based on the force of gravity and it is a perfect scientific measuring instrument to determine the horizontality of an object. Such an instrument is therefore perfect for measuring the horizontality of the TICL since it enables exact and objective clinical measurements on a macroscopic level.

Over the course of this study, patients who already had or achieved to attain a perfectly horizontal TICL were only treated with ordinary hands-

only chiropractic techniques. They did not receive instrumental treatments with the TPH and/or TC. However, the non-responsive patients were treated further with TPH or TC. To produce better TICLs in the non-responsive patients, TPH and TC were used to stimulate a wider range of affected tissues. This type of extra treatment resulted in perfect TICL horizontality in more than 99 % of all patients (close to 100%). Of the 896 patients, there were eight patients who never achieved perfectly horizontal TICLs. However, after this study was completed, those eight patients were rechecked with a new Symmetry Test and then treated again accordingly with heel-lifts. All of them attained perfect TICL horizontality. This recheck revealed these eight patients had concealed postural deficiencies, which their bodies, seemingly gradually, had developed to compensate for imperfect alignment. Hence, when these patients were treated with proper heel-lifts, they all attained perfect TICL horizontality. Of course, a therapeutic result of 99, 11 % is unheard of in medical circles, but a this result is not concerned with symptoms of pain, but rather a clinical normality, like the normality of laboratory results, and that some patients had to use heel-lifts to attain perfect TICL horizontality, the results are really not so strange. Additionally, the gross but still objective measurement of a perfectly middle placement of an air-bubble in the middle of the meter of an anatomical level may still have unknown microscopic deviations, which cannot be registered by the naked eye. So, only the future will tell.

Screening the patients with the PAI singled out those who needed instrumental treatments when ordinary hands-only therapy had failed to achieve perfect TICL horizontality. When the non-responsive patients attained perfect TICL horizontality after receiving treatments with the TPH or the TC, it suggested these percussion instruments increased the efficacy of chiropractic therapy for patients with compounded musculoskeletal problems resulting in neck and back pain. This validates the need for chiropractic practitioners to utilize percussion instruments for patients with ailments that are difficult to treat with ordinary chiropractic methods. While most patients only required hands-only treatments, enough of the patients needed extra treatment, and this fact justifies the need for these instruments in chiropractic offices.

Patients' TICLs were measured at the beginning of their treatment session, and at the end. The lasting effect of their treatment was not determined, however, after the first treatment session, about close to 50% of patients with initially non-horizontal TICLs returned for their next treatment with perfect TICL horizontality. Most of these patients already felt less pain, more unlike those who returned with a diverging TICL; however, this is a subjective conception and needs further research. Except for patients with excruciating symptoms, most patients starting therapy were scheduled to get their treatments

every other day. Hence, the daily impact of patient activities resulted in about 50% of patients returning for the second visit with diverging TICL horizontality. However, after the third or fourth treatment session, almost all patients returned with stable and perfectly horizontal TICLs. It was extremely rare that patients needed more than 10 visits to achieve stable and perfect TICL horizontality, with even fewer patients never attaining a perfectly horizontal TICL during the study. However, these facts are subjectively perceived, as they were not recorded; they need further research.

It was also subjectively perceived that patients who followed directives of maintaining proper posture, like proper sitting, proper bending and using low back supports, attained perfect TICLs faster and felt well sooner than those who did not follow this advice.

While 99.11% of all patients (896 patients minus 8) achieved perfect TICL, about 30% of the 896 patients said they still experienced some neck and back pain. This fact suggests that producing a perfectly horizontal TICL does not correct all pain/symptoms in patients, but rather indicates that this is normality, which produces a better foundation for normal healing of inflammations. In other words, the conclusion is that general chiropractic therapy makes patients feel good instantly by reducing pain. It is good for our health, as it improves postural balance, which facilitates normal gradual healing; however, it does not remove all pain instantly.

Although this research does not determine which therapy is most efficient, the ordinary hands-only chiropractic therapy or the instrumental percussion therapy with the TPH and/or the TC, the anatomical level does show what type of treatment produces improved postural balance in individual patients. It was also a reasonable expectation that one therapy would respond better in one patient and another therapy would respond better in another patient, as different therapies work differently in different patients.

Inflamed tissues selected for chiropractic therapy should be diagnosed properly; as such tissues usually have dysfunctional sensory receptors producing an uncoordinated posture with a deviating TICL. However, when treatments do not result in perfect TICL horizontality, the diagnosis of dysfunctional sensors is likely faulty, although treatments may also be poorly administered and should therefore be tried again. However, as too many attempts may produce tissue soreness and worsen a condition, it is generally best to try out instrumental percussion therapy for resistant conditions.

Treatments based on false presumptions of existing dysfunctional sensors do not correct diverging TICLs as such therapy will not affect postural coordination.

Other inflamed areas should therefore be treated either with ordinary chiropractic manipulative therapy or with a percussion-reflex hammer. The working hypothesis is that chiropractic therapy triggers mechanotransduction responses, activating dysfunctional sensors. It was hypothesized that TPH and TC treatments are effective because as central neurons received proper and consistent nerve reflexes, they re-coordinate total posture, which perfects TICL horizontality.

Pain is the major reason why patients seek chiropractic therapy. Pain thresholds were not recorded in this study since it pain can be caused by many variables that improvements of posture cannot alleviate. Pain is one of the four cardinal signs of inflammation, with swelling as main contributor to the sensation of pain. Indeed, most swelling occurs due to micro-tears, usually in inflamed connective tissue, and is attributed to stress from motional and/or static loads from strenuous exercises, poor postural positions, poor postural coordination of the CNS, heavy lifting, too many repetitive movements among others. Pain is often immediately reduced by increased mobility and circulation from chiropractic therapy since those treatments reduce swelling and thereby eliminates pain at its source. Pain is frequently caused by swelling that compresses nerve fibres in adjacent tissues, and it gradually disappears when swelling ceases due to decreasing loads on postural structures. So, by excluding the symptoms of pain in this research, actual physical postural effects of chiropractic therapy may be better evaluated.

Thus, the purpose of omitting pain to separate the purely objective physical effects of a proper posture from the subjective and often mental evaluations of pain was to clarify the effects concerned with the physical advantages of optimal postural homeostasis as a primeval, fundamental function. Pain is an immediate sensation and has several physiological control mechanisms. Even though improved posture may produce some immediate reduction of pain and a few other instant health advantages, improved posture is believed to have many important long-term effects on the total health of the body. These observations should be further studied in the future.

II. METHODOLOGY

The Research of 2008 lasted 12 months, and patients who were 14 years of age or above, and who sought chiropractic healthcare at the clinic called, Kiropraktorklinikken i Sentrum, in Ålesund, Norway during the year 2008, were treated and the position of their pelvic bones were measured with an anatomical level before and after receiving therapy. They were registered methodically in the clinic's computer as they entered the clinic and the results were logged in their digital record. Some patients were difficult to measure with the PAI (anatomical level), mostly due to obesity or anatomical varieties like

inward pointing iliac crests. However, in addition to extra effort and clinical experience, these patients were measured so many times that it became quite certain that the measurements were correct.

The chiropractic treatment techniques used in this research were primarily ordinary hands-only manipulative techniques, such as Gonstead, Palmer diversified, etc., all of which are normally taught in chiropractic schools. However, using therapeutic percussive treatments with TPH and TC against affected tissue areas were also used in this research. These instruments were used, as previously mentioned, when postural changes were not observed after ordinary hands-only chiropractic therapy. Although patients tend to seek help for neck and back pain (musculoskeletal pains syndromes) and not for postural problems in particular, chiropractors treat such painful symptoms by improving posture, which generally is checked both before and after therapy by general orthopaedic tests and leg length measurements, as the use of anatomical levels is generally not taught is school and therefore unfamiliar to most chiropractors.

Since perfect TICL horizontality is so important for diagnosis of proper functions of the neurobiological balancing mechanism in the standing upright posture, the TICL horizontality was chosen as a biological marker for successful therapeutic corrections of postural balance, but also because diagnostically checking the upper horizontality of the pelvic bones subjectively with flat hands on top of the iliac crests commonly has been regularly taught in most chiropractic schools. Thus, the transverse horizontality of the upper pelvis has always been a critical component for diagnosing the neurobiological balancing mechanism of the sensory nervous system of upright posture. Thus, the PAI was crucial to this research, as it is particularly precise on a macroscopic level when it comes to deciding diverging and perfect horizontality. As it is a specifically constructed instrument for measuring whether or not patients' TICLs had become perfectly horizontal, it may also quite objectively register whether patients' TICLs were more diverging, less diverging or unchanged.

Patients in this research were exposed to a variety of ordinary hands-only chiropractic manipulative techniques. The techniques were consistently performed until perfect TICL horizontality attained by the patients. However, those patients, who were unable to attain perfect TICL horizontality in a fair amount of time in the first part of the first session, received treatments with different but suitable chiropractic hand-only techniques. When some patients still did not attain a perfectly horizontal TICL after several rounds of ordinary chiropractic hands-only treatments and seemingly no ordinary hand-only chiropractic technique worked, they received instrumental treatments with the TPH or the TC, mostly in different tissue areas and sometimes even several tissue areas at the same

time. In the beginning, this seemed like an impossible task for the TPH and the TC; however, the instrumental treatments were surprisingly successful in general, as less than one percent (eight patients of 896) did not attain perfect TICL horizontality while this study took place.

Some patients entering the clinic with musculoskeletal problems (neck and back pain) already had perfect TICL horizontality. Some of them had had their problems for a very long time and assumedly healed naturally with their crookedness, stabilising it by calcifications, until the TICL had become perfectly horizontal naturally without any help from chiropractic therapy. This is possibly one of the reasons why so many patients (about 30% of the 896 patients) already had perfect TICL horizontality when seeking chiropractic help for musculoskeletal pain.

Many of the elderly patients had symptoms seemingly deriving from various forms of spinal stenosis, either from bone growths into the spinal canal or from various discus hernias narrowing the spinal canal and affecting spinal nerves pathways. Those with too excessive bone growths were generally referred to medical physicians to be evaluated for surgery.

A common clinical sign for patients with bone growths, even those who had developed very crooked spines, were their perfectly horizontal TICLs. Similarly, those with constrictions in the spinal canal, even acute scoliosis, also achieved perfect TICL horizontality, which may be another reason why so many patients had perfect horizontality of their TICLs (about 30%). Basically, all patients were treated with ordinary hands-only manipulative chiropractic adjustments; however, patients with suspected stenosis (hernias, etc.) also received their chiropractic adjustments with more traction-like motion in order to cautiously reduce eventual bulging of discus hernias during treatments, as this also seemingly reduced some of their pain.

Furthermore, patients may have both a hernia and dysfunctional sensory receptors producing diverging TICL horizontality. Consequently, the latter types of patients were first treated cautiously with the purpose of achieving perfect TICL horizontality while they also underwent treatments with traction-like adjustments to reduce compression on herniated spinal discs. Usually, when these patients got a perfectly horizontal TICL, they still had quite crooked postures to look at; however, when perfect TICL horizontality had been naturally assumed after therapy, some of the pain would usually disappear. Thus, they felt that they had improved from the treatment received and they were quite.

If pain symptoms were not reduced after therapy, patients may discontinue treatments. It was therefore important to make patients happy about their

chiropractic treatments. So, when perfect TICL horizontality was established, but some pain still lingered, patients with hernias were still treated cautiously with traction-like adjustments reducing their lingering pain. In general, such patients with very crooked postures were, much more often than usual, checked and rechecked methodically before and after chiropractic therapy.

The instrumental treatments with the TPH and TC were performed with a punching or stamping thrusting-technique, which is somewhat different than the ordinary hands-only chiropractic techniques. The stamping technique is produced by using arm movements with the weight of the body as a part of the therapeutic motion, which was sometimes as little as a nodding motion of the head. The reason for describing it here is that the instruments and this technique were developed particularly for triggering dysfunctional sensory receptors. It is simple and easy to learn, but best learned in a seminar. With said instrument in hand, the stamping physical movements will trigger an additional high-speed mechanical thrust from inside the instrument when the tip of the instrument hits and move against the patient's tissue. The tip of the instrument should be held (kept) with a slight pressure against the site of impact for about less than ½ second. Such a stamping technique and body motion will stop the TPH or TC from bouncing back and instead transfer the motion energy into the affected tissues, increasing the heat and energy in the affected tissues, thereby promoting circulation in them.

This therapeutic thrusting technique is generally a non-traumatic and efficient way to transfer motion-energy into inflamed tissues. Additionally, by using the force of short but high-velocity mechanical thrusts, several impacts in a sequence against inflamed tissues may still be painless, although increasing mobility and circulation. Conversely, when healthy tissues are wrongly treated in this way, the therapeutic thrusts would simply be absorbed by homeostatic reactions in a normal way. Thus, healthy tissues should not have any noticeable side-effects when they are mistakenly treated with the TPH or TC.

Normally, energy transferred by mechanotransduction (as described above) is dealt with by normal physiological equalization responses of homeostasis, and generally takes place with very little to no pain or side-effects. However, excessive instrumental therapy could cause side-effects. Overdoing the instrumental therapy will result in pain due to increased inflammatory responses. Therefore, clinical experience is needed to avoid inappropriate use of these percussion instruments in chiropractic therapy.

Percussive treatments activate ordinary mechanotransduction responses in affected tissues. In the first few hours after therapy, treatments with these

instruments will increase normal inflammatory responses in previously inflamed tissue as well as produce swelling and pain. These responses will subside, activating normal healing processes for (clinically evaluated) about two day, when treatment should be repeated in order to stimulate healing further. This is very similar to ordinary tissue reactions to hands-only chiropractic therapy.

Since PAIs are precise scientific instruments, the method used in this research is straightforward and should be considered acceptable. On the other hand, as this research was done in a private chiropractic clinic, further studies to assess anatomical levels are welcome.

Even though the method of measuring the TICL may have some methodical weaknesses, f. ex. placing the PAI properly onto the iliac crests, one may overcome these difficulties by teaching proper measuring techniques to chiropractic students and practicing chiropractors, and minimize subjectively recorded measurements. Therefore, a procedure for using an anatomical level (PAI) properly has been posted for everyone to read on the website link, called https://palmer.academia.edu/JensAndersKjersem.

To improve the methods of measuring with an anatomical level, one may, for example, record each measurement several times, and even record many more times when anatomical shapes cause uncertainty. Such precautions will make measurements much more objective.

Although the outcome of this research was unexpected, the results are very exceptional, as they uncover a true discovery of quantitative physical proofs establishing a new standard reference, a perfectly horizontal TICL as a common frame of reference for postural balance, which may be used to further explore and research most treatments of musculoskeletal syndromes (like neck and back pain), both in ordinary clinics as well as in institutions.

III. DISCUSSION

This research has revealed that the percussion-reflex instruments, the TPH and the TC, are valuable clinical instruments for practitioners of chiropractic therapy. The non-responsive group of patients treated with the TPH and/or the TC has shown that even hard-to-treat patients can achieve perfectly horizontal TICLs. Thus, this research showed that instrumental treatments significantly increased the number of patients attaining perfect TICL horizontality, verifying the therapeutic efficiency of the TPH and the TC and confirming that they are valuable as clinical aids in general for chiropractic therapy. In the future,

these instruments may help advance chiropractic therapy and make it into a more sophisticated and broadly accepted therapy.

All humans are genetically inclined to possess anatomical differences and have various asymmetrical anomalies. While these anomalies vary, chiropractors most commonly examine differences in leg lengths. With this accepted knowledge, chiropractors have not believed it possible to create perfect TICL horizontality for each of their patients, even when physical proofs display this as a fact. Yet, laboratory results of blood and urine have standard ranges for physiological values of normality and now it is time for chiropractors to start believing in what they have been sceptical to. This research has shown that postural balance in standing upright position will assume perfect TICL horizontality if sensory receptors are functioning normally and gross anatomical deficiencies are treated properly with heel-lifts.

Nevertheless, after investigating and repeatedly testing treatments-both with instruments and with ordinary hands-only chiropractic therapy-new measurements made with a clinical anatomical level have confirmed the measurements and logical conclusions of this research. Therefore, the only conclusion to be drawn from the result of the Research of 2008 was that a previously unidentified physiological factor had to be involved. Assumedly, this previously unidentified factor had to involve an independent postural balancing autonomy with priority for a perfect TICL horizontality relative to gravitational loading conditions, probably because the TICL region carries the greatest loads in body and therefore depend much more than other structures on a perfect horizontal weight-bearing position.

To prove the existence of this previously concealed physiological autonomy, which self-regulates postural balance in order to align the TICL exactly horizontal, a new device, the heel-lifting LLR, was built. The LLR may clinically lengthen individual leg lengths when standing on it and while a PAI is mounted on the iliac crests of a person with a perfectly horizontal TICL. Thus, when an individual leg is somewhat lengthened, one may physically observe how the TICL horizontality instantly self-corrects in a standing upright position as postural balance changes and thereby continues to maintain the horizontal perfection. In other words, prior to increasing the length of one leg by using the mechanism of the LLR, while the PAI is already mounted on the superior iliac crests, the patient standing on the LLR should keep straight legs and not move any other part of the body. Then, when increasing the length of one leg (e.g. 5 mm) without touching the horizontally-positioned anatomical level on the iliac crests, the PAI will reveal the independent postural balancing autonomy shifting the balance of total posture, keeping the TICL perfectly horizontal.

The TICL measurements were made as methodically and correctly as possible with a PAI. Since perfectly horizontal TICL can be used as an anatomical frame of reference for postural balance, it can also help diagnose a dysfunctional sensory nervous system. Thus, measuring the TICL may be used in any treatment of musculoskeletal pain syndromes to diagnostically seek differentiating abnormal from normal distortions. If the newly discovered physiological autonomy functioned as it was understood, any patient standing on the LLR, when in a relaxed upright stance, should automatically assume a shift in total postural balance to produce perfect TICL horizontality. Such a shift in postural balance should take place, regardless of which leg was longer than the other. This would prove the existence of a special physiological balancing autonomy of TICL horizontality. Thus, a perfectly horizontal TICL is normal for an optimally coordinated posture in any human structure with moderate asymmetries and could be used as an anatomical reference of normality both in research and in general chiropractic practice.

This postural balancing must also be a factor in other aspects. When the horizontality of the TICL diverges, it is, unless gross anatomical deficiencies exist, generally due to a sensory nervous system dysfunction, a neurological disturbance with an uncoordinated and poorly coordinated postural balance. Consequently, apart from extreme leg length deficiencies and great differences in the sizes of dual organs/structures, a perfectly horizontal TICL is indicative of a healthy sensory nervous system. Thus, the horizontality of the TICL could be used more specifically as an anatomical frame of reference for whether patients possess optimal postural homeostasis and whether the sensory nervous system functions is healthy.

The LLR may increase leg lengths individually by levels of 2, 5 mm at a time. It may be used in connection with measurements of the TICL, as the horizontality of the TICL is not directly related to the increase of leg lengths, only within normal compensatory standards. For example, when one leg is increased 5 mm and measured, and the other leg is increased 7, 5 mm and measured, the anatomical level, which is pre-mounted on the superior pelvic crests, may show that horizontality of the TICL remained the same (perfectly horizontal) before and after either leg length was increased. This means that the postural balance compensates on both sides of the body by producing a postural shift in the entire balance of the upright posture to keep the TICL perfectly horizontal.

Additionally, patients with a diverging TICL may maintain the same divergence just as if it was perfectly horizontal. For these patients, the sensory receptors in the periphery of the body convey information about an optimally coordinated

posture, which it is certainly not. This indicates that inflammations in peripheral tissues of the body affect sensory receptors and that they convey inconsistent information to neurons in the brain regarding postural balance, thereby keeping the TICL in a diverging position. An increase in leg length will generally not be able to change such a divergence, unless it increases the length of the "short leg" more than the body is able to compensate for. For centuries, large leg length corrections have been made erroneously, both by chiropractors as well as medical doctors, when treating large leg length deficiencies with heel-lifts.

The physiological autonomy will maintain the TICL in a diverging horizontality until the dysfunctional sensors are physically treated or the inflammations heal naturally. It is possible that if TICL divergences remain for a prolonged time, tissues may adapt and heal with abnormal curvatures and develop calcifications to support articular asymmetries. It is also possible that such crooked twists and bends in the anatomy prevail permanently when tissues heal and thereby gradually making the TICL more or perfectly horizontal. Thus, this may hypothetically be the reason for some, if not all, of the adapted curvatures producing postural crookedness and degenerative joint diseases. This needs to be researched further.

Many patients with a perfectly horizontal TICL were also tested on the LLR. The tests found that human posture compensated for normal anatomical variations in leg lengths within an average range of 8 mm; it was not uncommon to observe patients with individual variations in between 7–9 mm; however, it was difficult to assess with certainty in this research endeavour. Normal leg length compensations beyond 10 mm ranges were also fairly frequent, but as the ranges increased the frequency decreased. All significant leg length discrepancies, which were beyond autonomous TICL compensation, could seemingly be balanced by heel-lifts to help the body naturally assume perfect TICL horizontality.

A patient with an anatomical leg length deficiency of 8 mm or less is capable of producing an autonomous postural shift, seemingly rearranging all postural structures to assume perfect TICL horizontality. Such postural shift compensates for genetic anatomical leg length deficiencies of up to about 8 mm in order to attain perfect TICL horizontality.

Common chiropractic theory suggests patients will improve their health with better postural symmetry. It is therefore common in chiropractic practice to try to reduce twists and bends of compensatory curvatures, and furthermore, an anatomically short leg length should therefore be therapeutically (adequately)

lengthened with heel-lift. However, if administration of heel-lifts is not done correctly, abnormal compensations will usually take place in postural balance, generating undue postural crookedness and distortions stabilised by calcifications and degenerations while homeostasis of postural balance, possibly for weight-bearing reasons, seeks to naturally assume perfect TICL horizontality in standing upright position.

To find out how much a short leg due to an anatomical deficiency should be lifted, the LLR may be used as a diagnostic test platform. A neurological diagnosis for the quantity difference for dynamic postural compensation may be recorded by increasing the leg length of one leg by using the LLR and then notice when the TICL starts to deviate. This process should then be repeated with the other leg. By subtracting the smallest measurement from the largest, the difference will be a quantity measurement for dynamic compensation of postural balance. A heel-lift with that height would correct the deficiency and improve the symmetry of total posture. Please note that the "short leg" is on that side of the body, which needed the greatest increase in leg length in order to make the TICL start diverging. (The other side needed a lesser increase to overcome the body's natural postural compensatory autonomy maintaining the TICL in horizontal perfection.)The testing of both legs is referred to as the Symmetry Test. This is basically the measurement of the recommended height of a heel-lift in the shoe of the leg on the same side as the longest measurement, which actually is the side of the "short leg" or the side where the divergence may point down and therefore it needs to be increased. (Whether a TICL divergence points down on one side or not, depends on the size of the deficiency. If the body's natural postural compensatory autonomy maintaining the TICL in horizontal perfection is not able to compensate for all of the deficiency, it will point down on one of the sides to some degree.)

The quantity difference found in dynamic postural compensations may have to be changed after patients have been using a heel-lift for days, usually after a week or sometimes even longer, all depending on how stable, or calcified and degenerated, postural articulations have become over time. It is important to have patients return to the clinic for more treatment sessions in order for the practitioner to check on their posture and treat it. Even if the TICL remains perfectly horizontal in a naturally relaxed upright stance with straight legs, their posture may have changed by inflamed tissues' healing. This should be divulged by a Symmetry Test. Additionally, a plumb line should be available to try to get a good subjective clinical observation of the changing symmetry of posture. The LLR and PAI may here be used for checking the compensations on both sides of the body to find concealed deficiencies. Thus, the clinical instruments, PAI and LLR, may be valuable even when the TICL already is

in a perfectly horizontal condition, as postural compensations on each side of the body may still differ from each other, whether these differences come from heel-lifts, chiropractic treatments or natural healing.

When TICL divergence does not respond to a heel-lifts, it means that the CNS and the corrective physiological compensatory TICL autonomy received distorted information from tissue sensors, thus, maintaining the TICL divergence as if it was already perfectly horizontal. However, if the TICL does respond to a heel-lift by improving the divergence or becoming perfectly horizontal, it usually means that the CNS (including the physiological TICL autonomy) has received intact nerve transmissions and that the TICL divergence was simply caused by a large anatomical leg length deficiency (usually a large dual organ/structure size difference). Therefore, a clinical test with the PAI and the LLR was developed. This test was a Dynamic Leg Length Deficiency Test, now referred to as Symmetry Test, to distinguish the PAI-LLR's leg lengthening test from other leg length deficiency tests.

It should be noted that heel-lifts produce both anatomical and physiological changes in posture. The physiological, or postural, changes may often connected to acute symptoms of pain and diverging TICLs if structures become overloaded and inflammatory swelling happens. However, such patients heal faster with ordinary hands-only chiropractic therapy, which usually produces a stable perfectly horizontal TICL within one to four treatments. On the other hand, more chronic patients with calcified anatomical changes take much longer to heal. Most of them have already healed from much of their pain while gradually assuming perfect TICL horizontality. They will usually change their posture much more gradually. Thus, patients with already perfect TICL horizontality will continue to produce postural changes in order to cope with everyday life's wear and tear. Although a plumb line is a more subjective evaluation than the use of a PAI, they will after consistent, ordinary chiropractic therapy show better total postural symmetry relative to a plumb line, as the TICL already is perfectly horizontal.

When patients already have a perfectly horizontal TICL, postural changes will usually take place at a slower pace, commonly within one to two years with regular chiropractic treatments and activities, like exercising, caring for proper posture, using a support pillow in the lower back and a small (generally lower) neck pillow at night. It is also important that the dynamic leg length symmetry is checked on occasions with a clinical anatomical level and a LLR, or Symmetry Test, as the body posture is dynamic and may produce various unexpected changes. It is therefore recommended to conduct the Symmetry Test at least twice a year. Patients should also exercise more often (motion therapy

like walking) when they undergo chiropractic therapy, as cautious mobilisation of structures will work against poor mobility and thereby prevent overloads and symptoms to rebound under such therapeutic healthcare.

The use of the clinical anatomical level on all patients will make a practitioner more aware of existing deficiencies and thereby allow them to implement all necessary techniques designed to produce optimal postural homeostasis. Possibly, the eight patients (of the 896) who did not achieve a perfectly horizontal TICL during the Research of 2008 would have attained horizontal perfection if they had received proper heel-lift corrections before they started healing with their concealed anatomical leg length deficiencies.

Some of the 896 patients participating in the Research of 2008 already had a perfectly horizontal TICL prior to treating their musculoskeletal problems (mostly neck and back pain). Those, who had a perfectly horizontal TICL before their treatment sessions commenced, had generally done an MRI examination verifying the presence of a spinal discus hernia or they possessed a grossly deformed posture due to an antalgic scoliosis (muscular contractions in order to avoid pain) indicating some form of acute stenosis (e.g. bulging discus hernia). The MRI findings indicated the degree of stenosis in the spinal canal. However, the medical MRI examiner labelled only a smaller percentage of these patients as having serious protrusions of spinal discus material into the spinal canal; the rest were labelled as clinically insignificant protrusions, even though some of them had very grave symptoms from protrusions. This is unfortunately a common problem. Still, a common indicator among all of these patients was their perfectly horizontal TICL despite their neck and back pain.

All patients with both perfect and imperfect TICL horizontality were included in the total group of 896 patients and they were all first treated with a variety of ordinary hands-only chiropractic treatments. However, the patients diagnosed with spinal disc problems also received the same type of treatments, but with more traction-like techniques to reduce discus bulging and symptoms during the actual physical performance of the adjusting techniques, thereby administering more cautious treatments for eventual bulging spinal discs. Some of the patients diagnosed with spinal discus hernia, who had both a perfectly horizontal TICL as well as a diverging TICL, were first treated cautiously to affect sensory receptor dysfunctions, and after their TICLs became perfectly horizontal, they were treated symptomatically for their spinal discus hernias. If the chiropractic hands-only treatments produced perfect TICL horizontality in patients with both sensory and spinal conditions, this was registered as such in the clinic computer.

The above-mentioned information about spinal stenosis and perfect TICL horizontality is a remarkable offshoot from the work of this research. This discovery is a branch of human physiology that has previously been unknown. In the future, it may be significant to practitioners of chiropractic therapy, as it concerns an autonomous function performing independently even when the postural balance shifts and produces a totally different posture. Even when a postural shift is due to a discus tearing or inflammation in the spinal canal, a practitioner may notice that the TICL still stays perfectly horizontal. Gross antalgic scoliotic shapes are commonly observed in patients with an acutely inflamed and swollen ruptured spinal discus, but amazingly enough, the TICL stays perfectly horizontal and is unaffected by gross lateral shifts of the whole body. Thus, when total posture assumes antalgic scoliosis in a grossly crooked shape, the autonomy of proper postural balance with a perfectly horizontal TICL will still function.

A combination of perfectly horizontal TICL and gross postural crookedness seems illogical and quite inconsistent with normal physiology. However, both conditions fit within the findings of this research, suggesting that sensory receptors maintain the TICL in perfect horizontality in an upright position, but also precede effects of grossly crooked acute scoliosis produced by spinal discus hernias. The neuronal autonomy of vertical postural balance will react normally by producing perfect TICL horizontality and simultaneously try to reduce loading conditions on a damaged disc. This shows that both neurological systems work in unlike parts of the nervous system while in somewhat different ways. When these functions coincide, it looks like perfect TICL horizontality of the sensory nervous system prevails. Hence, when a very large spinal discus hernia protrudes into the spinal canal, pressing against the medulla spinalis, it does not necessarily affect the TICL. Instead, gross scoliotic shapes in posture form to relieve pressure from a spinal discus hernia, all while the TICL remains perfectly horizontal.

Postural distortions to compensate for spinal hernias may produce micro-tearing and swelling against sensory receptors. These compressed sensors may then begin transmitting inconsistent nerve impulses to central neurons responsible balancing posture. If this happens, as it did for about 70% of the 896 patients with musculoskeletal problems, the neurological coordination of the postural balance would function abnormally and the TICL would diverge. However, if the crookedness does not affect any sensory receptor, but only affects tissue in the spinal canal, then the TICL may be measured with an anatomical level as perfectly horizontal.

This research did not just lead to the construction of the PAI and the LLR, but more importantly, it brought forth information leading to two new and very important findings in physiology:

- Establishing an anatomical frame of reference for optimal postural homeostasis.

- Identifying pathognomonic effects of spinal discus hernias on postural balance.

A few patients did not participate in this research because they were too young (13 years or younger) or because they were referred to medical healthcare after clinical examination. These patients were few in numbers (less than 20 patients) and therefore they would not have affected the outcome of this in any significant way.

During this study, both the practitioner and patients were aware of the possibility of making inaccurate records by mounting the PAI imperfectly onto the iliac crests of patients. By mounting the PAI differently, inaccuracy could occur and this would lead to poor evaluations of the anatomical variations of structural placements in patients, resulting in erroneous conclusions. However, if inaccuracy did taken place, the research project produced records for so many patients that faulty conclusions would be improbable. Though, this possibility will be eliminated by conducting similar studies with a PAI and a LLR, as this paper is herewith published the university, RCU Maria Cristina de El Escorial in Spain, and thereby made available for others. Additionally, to avoid diagnostic inaccuracies made with the anatomical level, patients examined with a PAI were asked to hold on to the arms of the PAI. They were asked to hold on to it lightly, pressing it downwards onto the iliac crests in a horizontal fashion and pushing it very slightly forwards. When holding the PAI in this locked position, it was also quite easy to observe how the posture naturally assumed perfect horizontality when one leg length was increased by e.g. 5 mm.

Although chiropractic therapy in general instantly produces at least a less diverging TICL in most patients having such divergences, it may be a fair possibility that increased mobility connected to improved horizontality may be the reason why many patients feel better directly after chiropractic treatments. However, it may also be quite possible that other physiological regulations of pain may control the feeling of pain, such as the placebo effect.

The human body possesses self-healing and self-regulating functions, which through the functions of homeostasis immediately will seek to produce a less painful environment for the body. However, one may also look at another possibility to this question: Why does homeostasis maintain such perfection of

the TICL in all standing human bodies when the present pain level is not necessarily directly affected by this perfection? Future research may consider this further.

Vital body functions especially concern the gradual musculoskeletal responses of degeneration that take place gradually over a long period in people with poorly coordinated posture. An immediate correction of postural balance should therefore not be expected to do anything more than reducing pain responses through increased mobility and circulation.

Other and more important responses concern the long-term effects of overloads. For that reason, postural corrections should primarily be associated with long-term effects of maintaining proper posture. The instant improvement of symptoms from the effects of a more symmetrical postural balance producing less muscular tension and pain in that moment may be of primary concern for the patient when the pain is there; however the primary concern of the physician performing the therapy (chiropractor), should primarily be the reduction of weight-bearing loads in an improved posture.

When normal functions interact with poorly functioning neurons over a prolonged time, uncoordinated musculoskeletal structures may heal improperly or they may gradually become more overloaded and inflamed with painful swellings. These factors leave normal healing with few choices and will commonly result in structural crookedness with misaligned compensations, like degenerative joint diseases with large calcifications. In such cases, a trivial movement may suddenly produce acute overload of such poorly healed supportive tissues. The short-term acute symptoms will gradually start to produce less pain, but when long-term overload persists, it is more likely that a vicious circle of increasing muscular fibrosis and articular calcifications will continue to cope with the symptoms. Thus, when a dysfunction-caused diverging TICL is not corrected at an early stage, homeostatic functions will generally attempt to let the body heal with fibrosis and thereby restore a perfectly horizontal TICL and better loading conditions, but with postural crookedness.

Laboratory research has shown that sustained muscle contractions compress local nerve tissue and blood vessels, thereby reducing local supply of oxygen and nutrients. This basically disturbs nerve functions and causes a build-up of metabolites in overloaded tissues, which further increase nervous dysfunctions. However, there is still much research to be done concerning the long-term effects of depletion of nutrient energy, adenosine triphosphate (ATP), in local tissues due to the increased weight-carrying loads in a poorly coordinated posture.

As humans age, the body structures also age, which result in a gradual decline in the structural integrity, and a reduction of the dynamic health of the body. Maturing people gradually develop more and more geriatric symptoms of structural deformities, such as degenerated joints, articular calcifications, loss of bone mass and muscular strength. The decline of dynamic functionality is a part of becoming older, and therefore properly balanced posture may be even more important at an old age. Other times, when the structural integrity changes earlier in life, it is referred to as a disease, like arthrosis, osteoarthritis, various forms of infantile, juvenile, or adolescent scoliosis. Although the actual causes of these diseases may be unknown, they are generally related to excess burdens on weight-bearing structures over prolonged periods.

When normal physiology is not affected by sensory dysfunctions, the efferent nerve reflexes from central neurons should always balance posture with perfect horizontality of the TICL, even in persons who have developed various degrees of postural crookedness. Thus, the positions of the upper pelvic structures attaining horizontal perfection should be considered normality, as this is a natural primal function of homeostasis producing the most acceptable loading conditions. In old age, good postural loading conditions and proper symmetrical balance of the body structures, even when they are weakened by age, will delay most forms of degeneration.

Some anatomical differences, for example, the sizes, shapes and positions of the pelvic bones, which previously have been considered abnormal because they have assumed different positions in each vertical half of the body, may in fact be normal for that person if the TICL stays perfectly horizontal. It may therefore be totally wrong to adjust positions of the pelvic bones if the body has healed in perfect TICL horizontality. It should therefore be stated that healed crookedness and anatomical asymmetries (deficiencies) in the vertical halves of the body may assume quite normal positions. For example, if the TICL is perfectly horizontal and there exists a sacroiliac joint irritation, which may occur due to excessive strain in a weak part of the tissue, the sacroiliac joint at the point of irritation may be generally mobilized, but one should preferably look elsewhere along the posture for other causes of said strain. Neither the sacrum nor an iliac bone should be directionally adjusted by chiropractic therapy to assume better symmetry as such adjustments in general are totally wrong and may even cause further strain and irritation.

In the past, the positions of bones have often been treated with chiropractic therapy as abnormal distortions just because they have been dysfunctional. However, if the TICL is perfectly horizontal in these cases, such treatments would in general have been incorrect because homeostasis may have caused

these structures to assume perfect TICL horizontality, carrying their loads more optimally. Homeostasis may even have caused calcifications and degenerations in order to further stabilise them. Any treatments of such conditions must be given time in order to gradually regress. If pain persists along with such conditions, most practitioners should consider conservative treatments. Such conditions may be stenosis in the spinal canal with calcified tendinous or ligamentous deformities, degenerations, discus hernia protrusions or general discus bulging with swelling, but also other varieties of swelling from inflammatory sources in the spinal canal.

Shifts in the postural balance are generally due to normal physiological balancing responses. These postural shifts will balance posture while keeping the TICL perfectly horizontal. However, it may be unavoidable to produce normal asymmetries (perceived as structural crookedness) in the vertical anatomical halves of the body, often more in one side than the other.

With the very common occurrence of genetic leg length deficiencies, the body normally assumes asymmetric structural positions to attain a perfectly horizontal TICL through the positioning of the pelvic structures along with the total postural balance. In female patients, who have rounder hip curves than male patients, anatomical leg length deficiencies are more easily observed due to an asymmetrically flattening of the normal round hip curve on the side of the short leg. Even though such a flattened hip curve is not abnormal and may also be due to normal postural compensations by the body, the general postural movement symmetry of such a patient may still be corrected by adding an insert into one of the patient's shoes, increasing the height of a heel or sole in the patient's shoe. If the length of one leg was so much longer than the other and the neurological autonomy of the postural balance was unable to compensate for this, an extra sole or a heel-lift would help the autonomy assume perfect TICL horizontality. Such a correction would equalize the leg length deficiency and make the patient assume better anatomical symmetry throughout the whole body. If the body already has assumed perfect TICL horizontality, such a leg length increase should take place gradually, letting the body posture have time to gradually adjust total posture.

When women get such deficiencies corrected, they will immediately produce more symmetric movements and also attain almost symmetrical rounded hip forms, but not completely, as some parts of the posture usually take a longer time to adapt postural balance to such corrections. In general, the most radical autonomic postural changes usually take place within the first few weeks of treatment, but complete symmetrical structural adaption of postural balance will normally occur within one to two years, depending on the age of the person and the elasticity of the tissue. During this time, the patient should be

checked and rechecked to see if the symmetry stays consistent. If the postural changes are inconsistent, the height of the heel-lift or shoe sole should be changed to better comply with the postural symmetry, but still followed.

The positions of the pelvic structures are generally affected by muscle tension, both in the upper and lower parts of the body, since the pelvis is the centre of balancing functions of the whole body. Therefore, any long-term deviation in TICL horizontality will put additional stress on the supportive muscles. Such stress is the main source of tissue inflammations, spur formation, structural deformations, discus degeneration and will usually develop over time to varying degrees. Secondary tissue damage, like spinal hernias or deep inflammatory irritations with swelling into the spinal canal, may also be the result of such prolonged stress.

As the measurements of the clinical anatomical level were recorded after several adjustments in several areas, the outcome could not assess the performance of a single adjustment, technique, or a diagnosis of a specific area. The knowledge of the performance of single adjustments could help understand why an audible adjustment does not always produce a perfectly horizontal TICL or optimal postural homeostasis. Inaudible stretches of joint tissues or muscular pressure treatments of tight muscle nodes (trigger points) would also produce perfect TICL horizontality. This should be investigated further.

When measuring the TICL with a very precise instrument like a clinical anatomical spirit level, it is important to make known that it was primarily a single chiropractic adjustment in a specific area that generally triggered the biological balancing mechanisms to produce a perfect TICL horizontality. It was not uncommon that patients received several ineffective chiropractic adjustments against small inflammations until the exact area producing a perfectly horizontal TICL was treated. Occasionally, treatments against one, two or more areas produced a slight improvement of the TICL horizontality until the TICL finally became perfectly horizontal; thus, several areas sometimes had to be treated to achieve perfect TICL horizontality. The term ‘ineffective adjustment’ simply meant that the TICL did not become perfectly horizontal, not that the patient did not have any benefits from adjustments, as pain reduction also occurred after “ineffective adjustments”. To most chiropractors, it is quite clear that treating inflamed tissues with chiropractic therapy to mobilize articulations in inflamed areas usually will have reduced pain as a reward.

When patients received ‘ineffective adjustments’, they were selected for treatments with percussions from the TPH or the TC over one or several other seemingly affected tissues. Of all the 896 patients in the research project, 89 patients (a little less than 10% of the total number of patients) were treated

with the TPH and the TC. These percussion instruments were used to make percussive thrusts against affected tissues, as previously described, and these instrumental treatments effectively increased the number of patients who attained perfect TICL horizontality, bringing the total up to nearly 100%. Although much more research should be done in this field, the instruments should still be regarded as valuable clinical aids for increasing the efficiency of chiropractic therapy.

An important observation in this study was that very grossly twisted postures, unquestionably due to hernias of spinal discs and verified by MRIs, did not produce a horizontal divergence of the TICL. These facts suggested that perfect TICL horizontality is a fundamental biological function of homeostasis, which also was verified by the fact that such TICL horizontality was present even in patients with grossly twisted and crookedly shaped scoliotic curvatures. It is therefore logical to regard perfect TICL horizontality as a basic function of normality maintained by homeostasis in optimally balanced posture and that the horizontal perfection of the TICL in the future may be regarded as a common frame of reference for measuring structures of postural balance.

For patients, the success of treatments is the alleviation of pain and almost every patient expressed a feeling of improved mobility, less muscle tension and less pain. Therefore, it became apparent that a body experiencing physical improvements in the horizontal symmetry of the TICL, generally also experiences an instantaneous subjective feeling of less pain. Hypothetically, this seems to be correct in relation to improved posture, as treatments improved postural balance, which also increased articular mobility and thereby produces less muscular tension, which reduces pain. However, healing of tissue inflammations does not take place immediately and usually the immediate subjective feeling of reduced pain will also often disappear and then return after a while; however, the feeling of pain usually seems to return to a lesser degree. This is also consistent with the physical finding showing that all patients who do not attain perfect TICL horizontality, at least improve the horizontality of the TICL a little bit. After treatments, the pain level was not proportionate to the stability of the TICL horizontality for most patients; though, it was not too far off either. This must be of course researched further.

IV. CONCLUSION

Nervous System Interference

Based on common physiological knowledge, the balance of the human posture is maintained by the afferent nerve transmissions coming from sensory

receptors in tissues throughout the body. When a human body with diverging TICL horizontality immediately assumes a posture with perfect TICL horizontality directly after sensory receptors in inflamed tissues have been stimulated by chiropractic therapy, it indicates that the afferent nerve transmissions from the previously dysfunctional sensory receptors have been triggered and transmit normal sensory signals to the central coordinating neurons. Under the influence of the force of gravity, the central neurons then re-coordinate the whole posture, including perfect TICL horizontality. The instant presence of perfect TICL horizontality after chiropractic treatments logically implies that an optimal distribution of structural loads has been assumed by the body's posture, with that the perfect horizontal position of the TICL as a normal part of that posture.

A Physiological Autonomy

Since chiropractic treatments produce perfect TICL horizontality in almost 100% of patients, this therapy may affect a fundamental function of the nervous system, which automatically coordinates posture and assumes perfect TICL horizontality in standing upright position. Consequently, when physically restoring objective measurable horizontality of the TICL away from a measurable divergence of the TICL, this physically proves that chiropractic therapy affects an autonomic function in the nervous system. Said physiological autonomy of the nervous system restores postural balance and produces a perfectly horizontal TICL, which assumedly is a proper coordination of the optimal postural balance.

A Perfectly Horizontal TICL

Horizontal deviations of the TICL indicate a poor distribution of the postural loads. These loads are carried by the body's structures and the stress of uncoordinated weight-bearing balance on musculoskeletal structures usually has negative consequences. However, an improvement of the postural coordination leading to an improvement of TICL horizontality has been regarded as a reduction of postural stress. It may of course be true that such an improvement reduces postural stress, but a mere improvement of the TICL horizontality is not the same as a perfectly horizontal TICL. When a divergence of the TICL horizontality is still present, one or more tissue dysfunctions must exist somewhere in the body. These dysfunctions may commonly be found by subjective palpation of inflamed connective tissue during physical examinations as well as in measurements of the postural balance.

Force of Gravity

Due to the precise horizontal perfection of the TICL maintained by the nervous system, it is inferred that this perfection is produced as the body's counter to gravity. Common physiological knowledge upholds that upright humans maintain their body posture in a vertical position against the force of gravity. Therefore, the neurons coordinating the same posture must also be affected by this constant natural universal force.

Optimal Postural Homeostasis

As perfect TICL horizontality may be considered normal physiology, it also indicates that this homeostatic coordination by the nervous system seeks optimal postural homeostasis. Thus, perfect TICL horizontality may therefore be used as an anatomical frame of reference for diagnosing dysfunctions in the sensory nervous system and confirming if treatments are successful. It is also clear that the part of the posture that carries the greatest weight loads is the pelvis, and it is therefore logical that homeostasis as normality in standing upright position should keep this part of the posture perfectly horizontal to reduce weight loads on these extremely interconnected structures of the posture, at least on a macroscopic level.

Anatomical Frame of Reference

The frame of reference of a perfectly horizontal TICL may be a cornerstone for future research, as it may guide practitioners of chiropractic therapy in diagnosing normal and abnormal articular distortions of the posture. It may also help practitioners to select optimal therapies, and even clarify misapprehended therapeutic systems. However, additional research is needed to shed light on the many other subjective impressions expressed freely in this private research project. It may also help to clarify many subjective views held and considered by many other practitioners of chiropractic therapy.

Research Objective

Some of the intentions of this study were to elucidate and seek both personal as well as general approval for the clinical value of the TPH, TC, PAI and LLR instruments. However, this research also led to a very significant discovery in physiology: a common frame of reference for postural balance and homeostasis' perfectly horizontal TICL.

The primary findings of this research demonstrate that the instruments, the TPH and the TC, are important clinical aids for chiropractic therapy and treatment with these instruments may produce an optimal posture with a perfectly horizontal TICL when ordinary hands-only chiropractic therapy fails to do so.

A new discovery in physiology is presented with physical evidence for the existence of physiological autonomy providing a perfectly horizontal TICL in upright human posture. Due to this innate postural balancing autonomy, all upright humans, including those in need of using heel-lifts to accommodate proper postural balance, may be able to attain posture with perfectly horizontal TICL coordinated by neurons that are affected by the force of gravity. As the horizontal perfection of the TICL keeps the pelvic weight-bearing foundation of the upper body perfectly level, the human body is better able to maintain balance of posture with less weight-bearing stress.

Research by Simpson and Gemmell found (citation) “a lack of quantity and quality of orthopaedic tests for the spine” and (citation) “a lack of high quality research regarding the accuracy of spinal orthopaedic tests. It was therefore suggested that over-reliance on single orthopaedic tests is not appropriate”.

According to the aforementioned citations, an anatomical level is certainly needed for proper objective orthopaedic examinations by chiropractors. Due to the poor orthopaedic tests in clinical use, the PAI has been constructed specially for this type of clinical research, and it is an exceptionally precise anatomical level, which may be used to diagnostically measure the effects related to postural loading conditions and the horizontality of the TICL.

As a subjective impression of this research, it is was clear that patients who followed the clinical procedures of proper postural maintenance, such as proper sitting with a sway lumbar lordosis, proper bending with a straight spine, using lower back supports and small sleeping pillows, definitely attained and kept TICL horizontality much sooner than those who did not respect these advices.

The LLR is a diagnostic device to increase the length of one leg compared to the other without touching the pre-mounted PAI on the top of each iliac crest. The combined diagnostic use of the LLR and the clinical anatomical level physically demonstrated that physiological autonomy keeps the TICL perfectly horizontal, whether the length of only one leg is increased or not. It therefore proved that small asymmetric differences in leg lengths do not affect the horizontality of the TICL.

The clinical anatomical level may physically prove (objective proof) that spinal discus hernias confirmed by an MRI do not affect the horizontality of the TICL. A gross antalgic scoliosis with a perfectly horizontal TICL is diagnostically a fairly clear indication of a spinal discus hernia and may be considered as pathognomonic. Irritations produced either by dysfunctional sensory receptors or from the medulla spinalis are usually very distinct, as they are made in separate parts of the nervous system. They will, therefore, usually represent dissimilar symptoms, which are characteristic of the affected part of the nervous system.

The Symmetry Test is a new diagnostic test evolved from the using the PAI and the LLR to diagnose and treat anatomical asymmetries of posture with heel-lifts. The test was developed during this research and finds more easily leg length deficiencies and scoliotic curvatures concealed by postural compensations, which do not affect the TICL horizontality. Therefore, the test may help chiropractic treatments improve postures with asymmetries, especially in those patients who have postures with an already perfectly horizontal TICL.

For patients seeking healthcare to justly maintain proper posture for general health reasons, but also to avoid onsets of sudden pain, the Symmetry Test will represent a new era for prophylactic services in chiropractic therapy. The prophylactic services are very similar to the prophylactic removal of dental plaque by dentists, as patients desire to keep their posture in perfect balance while they try to keep proper posture in their own lifestyles. The established findings of perfect TICL horizontality, as optimal postural homeostasis, can now be provided as a truthful, necessary and clearly needed health service that should be provided as part of preventive chiropractic healthcare.

Further research contributing to improving posture may help reduce the number of neuromuscular and skeletal disorders and such improvement may help decrease healthcare costs in general. However, proper posture is important for everybody in some respect, both concerning proper health and reduction of costs. The outcome of future research in this field still has a long way to go and additional research is needed to shed further light on true effects of chiropractic therapy. Future research of short-term or long-term effects of chiropractic adjustments may now use the long overdue need of an anatomical level (PAI) to bring about information concerning various other desirable neurological effects of chiropractic therapy.

Appendix:

In this research, the numbers in percentage have been specified to the closest round number of 5 or zero (rounded), for example 68, 7 % becomes

about 70, 0 % and 66, 3% becomes 65, 0 %. This is a slack of 2, 5 % on either side of the number. As the numbers are given within plus or minus 2, 5 % of the actual findings, other researchers wanting to use the PAI for the same purpose will have a guiding platform for which numbers (percentages) they ought to find. The reason for providing findings in percentages like this is that these numbers are uncovered from individual forms of chiropractic treatment, as basically all chiropractic treatments are individually performed. Therefore, those who want to recheck and test the findings of this research (Research of 2008), will never be able to duplicate the same numbers (percentages) exactly similar to this research, but they should be able to find numbers (percentages), which are close to (relative to) those provided here in this study. As it is expected that other researchers want to test my findings, they should at least find out that more than 90 % (plus or minus 2, 5 %) of all patients should achieve attaining perfect TICL horizontality right away (immediately) after therapy, even though only about 50 % of these patients would keep this horizontal perfection stable for two days. In consequence, on a macroscopic level, perfect TICL horizontality should be quite easy to observe objectively by anyone with the help of an anatomical level.

An estimated 20 to 30 patients of 896 patients, who are included in this research project, had chiropractic treatments prior to two months and possibly returned for follow-up treatment sessions. They may have had diverging TICL horizontality before starting their treatment sessions in 2007 and when this divergence changed due to their previous treatments, they may have kept this perfect TICL horizontality also when they started their follow-up treatment sessions some months later in 2008. (In other words, their TICL horizontality may have changed from diverging to perfectly horizontal due to their prior treatments and when they were measured in 2008, they still may have kept their perfect TICL horizontality from the effects of those prior treatments.) Thus, this may be one of the reasons why there were such a high percentage of patients with neck and back problems (30%) who already had perfect TICL horizontality. However, this may be taken into consideration in future research.

The reason for the high number of all patients (100%) achieving perfect TICL horizontality after therapy is still unknown and may seem quite unacceptable in scientific fields. However, the only explanation that can be given is that divergences (probably) may exist on a microscopic level, not on a macroscopic level as used in this research. However, it is also well-known that normal physiology works individually and normality is generally provided within ranges. Thus, it should therefore be expected that the ranges of what is normality of perfect horizontality should be found on a microscopic level, possibly sometime in the future when a measuring instrument using e.g. ultrasound has been constructed.