Efficacy of Toftness Technique Validated by Infrared Thermography

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ABSTRACT:

Studies were conducted to determine the validity of the Toftness Adjusting system through use to thermographic system. Survey and images (from Agema Thermography system) obtained from the pre-adjustment and post adjustment were evaluated and the data reports that there was significant change in temperature as well as decrease in pain. Twenty-three subjects were divided randomly into two groups with one being control group and the other the experimental group. These subjects were either symptomatic or asymptomatic with pain of NMS origin. Experimental group received the Toftness adjustment and the control group received a sham adjustment. When data were compared, the experimental group demonstrated significant thermal changes within the body as well as decrease in pain of NMS origin. Therefore, we conclude that Toftness system adjustment was effective in detecting and treating pain of NMS origin.

Chapter 1: The Problem

A. Introduction:

Abnormal function of any body part will give some sort of sign or symptom. Inflammation, heat, edema, muscle tightness, pain, loss of joint motion, and trigger points are good examples of symptoms of dysfunction. Correspondingly, there have been many studies performed and many devices invented to detect these signs. X-rays, ultrasound, thermometer, neuroscope/tempo-scope, sensometer, infrared thermograph, and palpation have been utilized for years to help diagnose patients.

Temperature, whether it's hot or cold, is one of the best ways to detect any alteration of normal body function. Detection of heat by Infrared Thermography gives the most accurate analysis of temperature change. Infrared Thermography involves the detection of endogenously generated radiation whose energy level and wavelength spectrum are related to the temperature of the point on the body emitting it.[1]

The Toftness chiropractic technique, through the use of a Sensometer (developed by Dr. I.N. Toftness) offers the practitioner what is thought to be a reliable way to detect microwave emission from the body in the area of a subluxation. The Toftness practitioner then uses this information in the detection and treatment of vertebral subluxations.

This study will examine the validity of the Toftness system through the use of Infrared Thermography. Pre- and post-adjustment Infrared Thermography scans will be performed on patients to assess the effectiveness of the Toftness technique.

B. Background:

Chiropractic began utilizing temperature sensitive assessment devices in the 1920's with the development of the neurocalometer (NCM) by B.J. Palmer and D. Evans. The NCM utilized the paraspinal cutaneous temperatures to determine the side of the spine, which was giving off more heat. Paraspinal cutaneous thermal anomalies have been suggestive of vertebral subluxation. A review of analytical theories relating to thermography and its use in chiropractic indicated a need for a more complete understanding of the relationship between thermographic data and spinal health. [2]

The Toftness system, developed by I.N. Toftness, D.C. has been studied extensively over the past 60 years. However, only during the last seven to eight years have any studies of the Toftness system been exposed to critical review. Dr. Toftness theorized that each subluxation contains two negative components:

1. The most common component, and best known by all chiropractors, is that subluxation reduces the body's ability to function by reducing its ability to adapt.
2. The subluxation gives off an abnormal microwave radiation, which is harmful to the body. [3, 4]

C. Statement of the Problem:

The Toftness system uses Logan Basic adjusting procedures for treatment. Many studies have been done to evaluate the efficacy of Logan Basic. However, few studies have been done to evaluate the effectiveness of Toftness in terms of assessing subluxation. In Toftness, subluxations are assessed through the use of a sensometer. Through this study, we will correlate the Toftness system with Infrared Thermography to substantiate the Toftness system.

D. Purpose of the Study:

The purpose of the study is to evaluate the efficacy of the Toftness technique. The end of our research project should answer the following questions: Does the use of Toftness technique benefit the patient? If so, how? Can the affects of the adjustment be measured by Infrared Thermography? If so, what does this data mean for both the doctor and patient? By using Infrared Thermography, we should be able to show how Toftness technique restores health and removes the physiological ramifications of a subluxation within individual areas of the human spine.

E. Importance of the Study:

The importance of the study is to validate the use of Toftness Technique. From a clinical standpoint, this research should provide the chiropractic clinician with more data to justify the use of this technique. From a patient standpoint, this research should provide the patient with convincing evidence that Toftness technique can restore optimum health and balance throughout the human spine.

F. Scope of the Study:

The scope of the study is aimed at enlightening the reader to the benefits and value of Toftness technique. For this to be obtained, our objective is to present the history, supporting literature, methodology of the experiments, and the results in an easily understood fashion.

G. Outline of the Remainder of the study:

Chapter 2 will be a review of related literature including Toftness system as well as the infrared thermograph system. Chapter 3 will explain the methodology of how we will perform this study.

Chapter 2: Review of Related Literature

A. Organization of Present Chapter - Overview:

This chapter will include a brief historical background and a review of the recent literature. The chapter will also justify and summarize the study.

B. Historical Background and Review of Literature:

1. Toftness System

In developing his own technique, Dr. Toftness used the low force adjusting of Logan Basic and the specific philosophy of upper cervical adjusting. He believed that both ends of the spine controlled the tension of the nerves. Therefore, nerve transmission is not determined by how much mechanical force is misplaced but rather from interference of nerve transmission where the sacral base and the occiput were not within normal tolerance of each other. One of his theories was that the subluxation had two negative effects on the body: 1) to reduce the body's ability to adapt to environmental stresses, and 2) subluxation gives off abnormal microwave radiation that is harmful to the body. Dr. Toftness developed an instrument that could detect this radiation. An advantage of this instrument is that it can detect microwave radiation from deep within tissue. From his research, Dr. Toftness developed the sensometer. [5, 6, 3]

The sensometer consists of an open cone for directing and focusing the microwave radiation on to a myelor membrane. Upon receipt of this radiation, there is a change in the surface tension of the membrane, which is perceived by the operator by manually palpating or stroking the membrane. The site at which radiation is detected is the site at which the Toftness adjustment is administered. [3, 7, 4]

The adjustment is delivered by a metered, hand held pressure applicator at the specified contact site. The line of drive, amount of force applied (2-32 oz.), and duration (10-20 seconds to 2-3 minutes) of the contact is determined by constant monitoring of the adjustment site with the sensometer. [3, 7, 4]

In research conducted by Hawkinson, Snyder, and Sanders, eight subjects all with similar musculoskeletal complaints and origin received a series of Toftness adjustments. In another experiment, fourteen subject were randomly placed into an adjusted group and a placebo group (as the control group). The eight in the experimental and other subjects receiving the adjustment showed a significant amelioration of pain after a 10-day course of treatment. The sham group did not show a demonstrative reduction of pain. [7]

In a 1992 study, Snyder and Sanders evaluated 24 subjects with chronic back pain, 19 subjects with chronic tension headaches, and 26 subjects with primary dysmenorrhea using the Toftness system. The dysmenorrhea group consisted of a questionnaire for before and after the treatment. Comparison of outcomes showed significant clinical improvement in the treatment group while those receiving sham intervention showed no improvement. This data provides further evidence of the clinical benefit derived by the subjects receiving Toftness adjustments. [8]

2. Infrared Thermography

The chiropractic profession has made use of heat measuring instruments to find vertebral subluxations for more than fifty years. The original heat measuring instruments utilized thermocouples that recorded heat differentials on a dial or graphing system. These thermocouples could only compare two small areas of the body. Recently developed liquid crystal thermography allows the examiner to obtain a "picture" of the entire area examined.

Early chiropractors lacked the advantages of modern computerized equipment and rigorous analytical techniques. They did, however, pioneer in the development of these three physiological postulations upon which most clinical cutaneous thermography is based:

1. The human body is segmented into "dermatomes";
2. Side-to-side skin temperatures are generally symmetrical unless dysfunction exists;
3. Any anomalous deviation from a gradually increasing paraspinal skin temperature from S2 to C1 may suggest the vertebral subluxation complex (VSC) or remote dysfunction.[11]

The human body loses heat in three ways: radiation, evaporation, and conduction. Liquid crystal thermography provides a thermal map of the infrared radiation from the patient's body.[9] With liquid crystal thermography, the examiner can measure skin temperature before and after the adjustment

Thermography is a test of physiology. It complements studies that determine anatomic abnormalities, such as computed tomography, magnetic resonance imaging and plain X-ray.[10] Comparisons of the reliability of thermography are usually done in relationship to a surgeon's overall opinion or findings at surgery. However, Plaugher states that comparing thermography or other physiological tests to surgical findings may not be valid. Thermography is a test of nerve physiology that may not always correspond to abnormalities detected visually at operation.[10]

4. Summary and Justification of the Study:

This study is being performed to evaluate the efficacy of the Toftness technique. Through this study we hope to compare empirical research data in order to prove that Toftness technique is a valid and valuable tool for the chiropractic physician.

Chapter 3: Methodology

A. Overview of Present Chapter:

This chapter will outline the methodological approach to the proposed research project. The description of the project will cover research design, subject selection, instrumentation, procedures, data collection, and data analysis.

B. Methodology and Research Design:

The method in which we will obtain the information needed to show the efficacy of Toftness technique is outlined as follows:

1) A random patient base will be selected.
2) A group of 20 patients will be the control group.
3) Each patient will be instructed to fill out a survey of physical complaints prior to adjustment.
4) Each patient will be instructed to complete the remainder of the same aforementioned survey after the adjustment.
5) The data collected via patient surveys and infrared thermography will be analyzed and graphed according to pre- and post-treatment results.

This experimental study will attempt to show that Toftness technique affects the patient both physiologically and holistically. With the control group set at 20 patients, we will be able to monitor the results of the thermogram and survey more efficiently as the doctor performs the adjustment. Therefore, the research design is that Toftness technique does affect and benefit the patient.

C. Subject Selection and Description of Setting:

Subjects will consist of a randomized selection of Logan students between the ages of 20 and 50 years with a musculoskeletal complaint in the cervical, thoracic, or lumbar regions. Selection will not be based on either gender, weight, or height. Subjects must not have taken any medications in the 48 hours prior to the adjustment and must not have had any other adjustments in the 48 hours prior to the study.

D. Instrumentation:

Infrared camera - Agema infrared system
Infravison v.2.0 - D & T Imaging Titronics Research & Development
Sensometer
Zenith Hi-Lo Chiropractic Table
Patient Gowns

E. Procedures:

1) The subject will be in a gown and be exposed to room temperature for approximately 10 minutes and in the mean time the subject will fill out pre-survey
2) Using the infrared camera, the exposed back of the patient will be measured. The Thermogram will not be shown to the chiropractor performing the adjustment.
3) The experienced chiropractor will perform Toftness technique to evaluate and treat the patient.
4) Approximately 5 minutes after the adjustment another infrared camera scan will be performed.
5) The subject will than fill out a post-survey and be released.

F. Data Collection:

The data collection process will consist of pre- and post-adjustment surveys that will be completed by each patient. This survey will focus on the physical complaints noticed by the patient prior to the adjustment and the resolution of such complaints after the adjustment. The collection process will also make use of Infrared Thermogram. With the use of this instrument, we should be able to visually see via graphical representation the pre- and post-adjustment results.

G. Data Analysis:

The data analysis process will entail the comparison of the pre- and post-adjustment thermogram graphs. By analyzing these graphs, we should be able to distinguish a significant temperature reduction on the post-adjustment graph. This would indicate the beneficial affects of the Toftness adjustment. Also, a comparison of the patients' survey will be analyzed. The purpose for this analysis is to determine if the adjustments caused a decrease in pain/symptoms or no change at all. A decrease in segmental temperature as interpreted by the thermogram and a decrease in the patient's initial physical complaint(s) should correlate with the efficacy of the use of Toftness technique.

H. Limitations of the Study:

Limitations of the experiment include room temperature, the temperature of the doctor's hands, and the error of measuring/graphing thermogram results.

I. Summary:

This proposal will investigate the reliability of Toftness technique. The use of Infrared Thermography will help substantiate this technique's validity. The results will be correlated and averaged from data collected from the 20 patient control group. An analysis of this data will then follow along with explanation of the results. In conclusion, the use of Toftness technique as a beneficial chiropractic technique should be without question

Discussion

Fifty percent in the experimental group stated that they felt "somewhat better" following an adjustment. In that fifty percent, one person said that they felt much "better." In contrast, in the control group, more than eighty percent of the subjects stated that there was no change following an adjustment (Table 1.0.) However, less than twenty percent in the control group said that they felt better after the adjustment.

On pre- and post- adjustments, the control group stated that the complaint(s) that they were having did not change following a sham adjustment (Table 2.0.) This value can also be compared to the experimental group's data. Twenty-five percent of experimental group stated that they had decrease in pain after the adjustment. Moreover, two of the experimental subjects stated that their symptoms were completely gone.

Comparing thermographic images of pre adjustment and post adjustment, there were three main points were emphasized. Symmetry, size, and area of complaint.

Experimental Group	Patient ID	Pre-Adjustment	Post-Adjustment	Effectiveness of Treatment
1	1	1	1	1
2	3	0	0	0
3	5	1	1	1
4	7	1	1	0
5	9	1	1	1
6	11	2	1	1
7	13	1	0	2
8	15	1	1	0
9	17	0	0	0
10	19	1	1	0
11	21	0	0	0
12	23	1	0	1
Total		1.2	0.583333333	0.583333333
Control Group	Patient ID	Pre-Adjustment	Post-Adjustment	Effectiveness of Treatment
1	2	1	1	1
2	4	2	2	0
3	6	1	1	0
4	8	0	0	0
5	10	0	0	0
6	12	1	1	0
7	14	1	1	0
8	16	1	1	0
9	18	0	0	0
10	20	1	1	0
11	22	1	1	1
Total		1.222222222	1.222222222	0.181818182

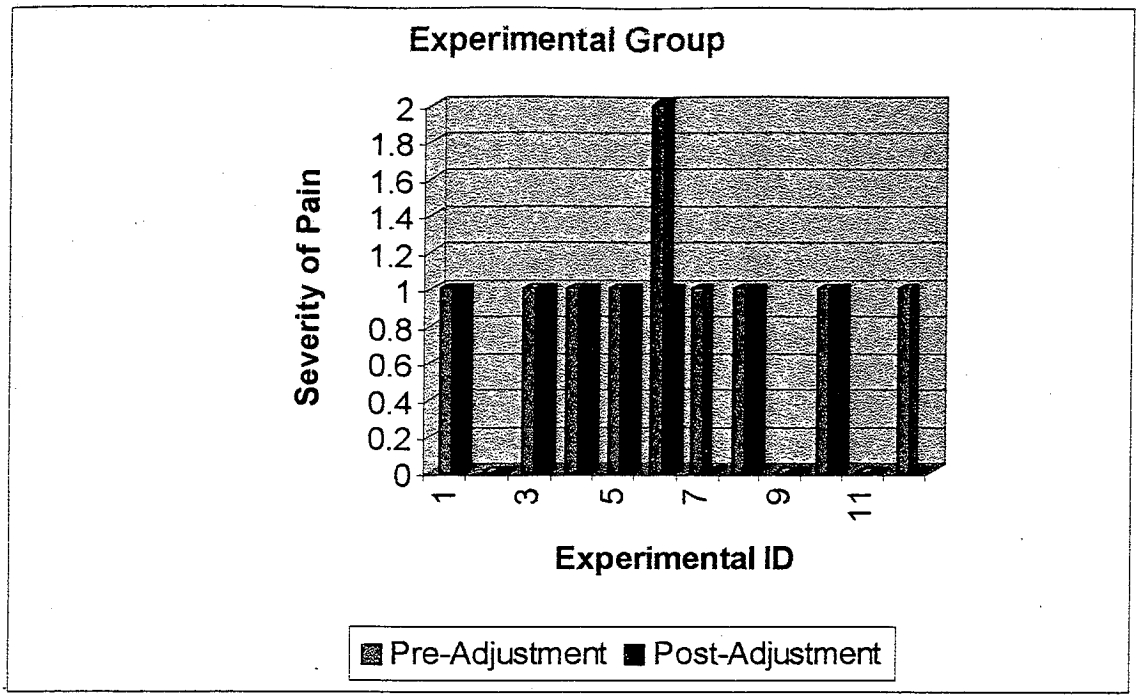
Experimental Group
Severity of Pain
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1
3
5
7
9
11
Experimental ID
Pre-Adjustment
Post-Adjustment

Table 2.0.

Conclusion:

The effectiveness of Toftness in this experiment was analyzed in two ways. First: data was compiled and analyzed subjectively by the pre and post adjustment questionnaire in which the patient was required to illustrate severity of pain before and after the adjustment. After analysis of the data there was statistical evidence to suggest that the blind experimental group showed subjective improvement. The patients that were treated were found to rate the effectiveness of treatment significantly higher than that of the control group. This information was the best indication of subjective effectiveness of treatment by the patient.

Secondly, objective data was gathered with the use of thermographic imaging techniques. Like the subjective data, the interpretation of the thermographic images was done by scanning each patient before and after the adjustment. Although the subjective data is relevant and important to the patient's perception of the value of the adjustment, objective data is considered more relevant for statistical analysis. After analysis of the data it was found that the subjective findings were inconsistent with thermographic readings. The reason for the inconsistency was due to the fact that the pre-adjustment questionnaire included the option of "no pain". These subjects were included in the study. This left no room for improvement after the adjustment.

Objective data obtained through the use of thermal imaging of the patient pre and post adjustment is best analyzed by visual interpretation of images captured through the device. These thermal images are best interpreted by symmetry and overall heat change. The heat changes observed were focal in nature and depicted specific areas of heat intensity or lack of heat that were nonsymmetrical. For example, a specific point on one side of the spine would show a temperature inconsistency from that on the other side of the spine on the pre adjustment image. In most of the subjects there was a marked decrease in temperature inconsistencies from one side of the spine to the other in the post adjustment image. This finding was a significant indicator of the effectiveness of the Toftness adjustment. Furthermore, patients within the control group showed a significant lack of symmetry in thermal patterns when comparing pre and post adjustment images. Due to the restrictions of the device we are unable to know or determine the exact temperature difference in exact locations on the body viewed from pre and post adjustments. The data from the device is difficult to scrutinize numerically. The authors then must subjectively analyze the

improvement in symmetry. In a significant number of the cases the experimental group showed improvement in symmetry. In addition, patient 19A was visualized as having a functional scoliosis in the pre adjustment image was completely resolved in the post adjustment image as well as remarkable symmetry in thermal readings on either side of the spine.

Although the data analyzed was without direct statistical weight for the effectiveness of the Toftness technique, there was a clear correlation and significant subjective data to suggest that Toftness technique is a powerful and valuable method of treatment. Further data and improved thermography computer software is a must in order to create a more objective interpretation of the data. With the tools needed for proper analysis in place one could easily interpret and weigh objective information and data.

Further Research

While performing the data acquisition, some problems could have been avoided. One such problem was the thermographic imaging program's ability to compare thermographic data from exact points of reference on the patient. In the future it may be to the experimenters benefit to examine a particular area of the body instead of the whole spine. This would allow the experimenter to reference and pinpoint afflicted areas more directly. From observation of the experimenters in this study the pelvis showed improvement most often and would be a good area to focus on.

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Research Proposal: Efficacy of Toftness Technique Validated by Infrared Thermography

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#10 **General purpose**
This study will examine the validity of Toftness Technique through the use of Infrared Thermography.

#11 **Background rationale**
Few studies have been done to evaluate the Toftness Technique in terms of finding subluxations and assessing the effectiveness of multiple treatments.

#12 **Specific aims and hypotheses**
The research hypothesis is that Toftness Technique benefits the patient both physiologically and holistically.

#13 **Previous experience**
On the basis of test experiments, the Toftness Technique showed removal of subluxations. This was indicated by diminished heat production on a treated area.

#14 **Expected groups**
There will be two groups, one control group and one experimental group.

#15 **Number of subjects**
Total of 40 subjects randomly separated into a control group and an experimental group. Each group will consist of 20 subjects.

#16 **Inclusion criteria**
Subjects not experienced with the Toftness Technique who have Musculoskeletal complaints in the cervical, thoracic, or lumbar regions. The subjects will be between the age of 20 - 50 years.

#17 **Exclusion criteria**
Subjects experienced with Toftness Technique. Subjects who have taken any medications in the 48 hour period prior to the adjustment. Subjects who have been treated with any other chiropractic technique.