The Effects of Neurovascular Reflexes on Surface Temperature: Randomized Controlled Trial

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Abstract

Background and Purpose - To explore the effect of treating Bennett's reflexes on surface temperature.

Methods- This study utilized surface thermometers to measure changes in surface temperature over thyroid, stomach, teres minor and pectoralis major, clavicular division during treatment of one of two of Bennett's neurovascular reflexes or a sham location on the cranium. Manual muscle tests of the muscles above and muscle response to the subject touching (therapy localization) the reflexes in question were also recorded. 53 chiropractic students were randomly assigned to receive active or sham treatment for 2 visits. Participants came in for two 30 minute treatments.

Results-19 of the 23 participants in the treatment group showed an increase in temperature with stress thermometers. All 19 responded to treatment with increase in muscle strength. Only 5 of the 26 participants in the sham group showed an increase in muscle strength.

Conclusions- The locations of temperature changes were not consistent with the neurovascular reflex that was treated, whereas the changes in muscle strength were much more consistent with which neurovascular reflex was treated.

Key Indexing Terms: *Applied Kinesiology, Chiropractic, Neurovascular Dynamic Technique*

Introduction:

The rationale for this study was to explore the effect of treating Bennett's reflexes on surface temperature. This study is the continuation of an initial study overseen by Bert Hanicke and a group of Logan students on the effects of Bennett's Neurovascular Reflexes on temperature changes observed by a thermograph in April of 1995. Terrance Bennett claimed that lightly holding these reflex points increased blood flow to a related organ. (1) David Walther adds, "Terrance Bennett discovered locations about the head that he felt influenced the vascularity of different organs and structures." (2) Investigation of the blood flow to a muscle was implemented. Goodheart states, "The response of neurovascular reflexes is rapid, typically within twenty seconds, but the effects are long lasting with a corresponding increase in circulation of the associated organ." (3) Walther adds, "During the mid-1960s, Goodheart found that he could improve muscle function, as determined by manual muscle testing, by stimulating the Bennett reflexes" (pg. 48). Frost, an Applied Kinesiologist in the 1970s states, "He (Goodheart) also found that when one of Bennett's reflex points strengthened a weak-testing muscle, it also had an apparent positive effect upon the organ and/or gland associated with the muscle in Goodheart's own research. This further confirmed his muscle-organ/gland associations," (4) Increased blood flow to the area will increase the surface temperature.

The model for the therapeutic effect of neurovascular reflexes is based on embryological development. After three weeks, the embryo begins to develop nerve buds that are the first signs of neurological development. These buds fuse with the aortic loops which forms the heart. However, before the heart is formed, there are blood vessels that pulsate independent of the heart with the direction of this early nervous system. As the embryo develops, the growing tissues create a stretch on the blood vessel supplying it and the reflex causes an increase in vasodilation of the blood vessels. After the heart begins to beat, these vasomotor reflexes play a secondary role to the heart and are no longer the primary source of circulating blood, like a backup generator. The vasomotor control center is located in the medulla, which controls the diameter of the arterioles and the capillaries of the skin and subcutaneous tissues. This provides the rationale to use surface temperature readings to detect changes in vascular flow to a tissue (2).

Theoretically, skin surface temperature should increase as blood flow permeates the regional area of skin and muscles specific to a Bennett's Neurovascular reflex. Additionally, blood should be shunted toward the related organ associated with a specific sclerotome, demonstrating the muscle-organ relationship outlined by Dr. George Goodheart DC. Blood is shunted toward muscles and organs related to specific Bennett's reflexes without affecting or affecting to a lesser degree those sclerotogenous segments untreated. This clinical manifestation would present itself in temperature changes of superficial skin temperature of treated reflexes related to specific sclerotomes (i.e. muscles, skin, related organs). This assumes that skin surface temperatures would not change when unrelated to a specific Bennett's reflex, as in the case of the sham treatment group.

Methods:

Materials - Four digital surface thermometers (Dr. Lowenstein's Stress Thermometers. See Appendix B) were attached to the participant's skin with duct tape. The participant lay supine on a flat chiropractic table and a dividing screen separated the subject from Examiner 2 who recorded temperatures.

Participants- Fifty-three subjects participated in the study. There were twenty-three in the experimental and twenty-six in the control group, and four remaining subjects whose results were pulled from the statistics due to operational or technical error. The participants were recruited from the student body of Logan College of Chiropractic. The inclusion criteria were being18 years of age or older and having a stomach and a thyroid. Participants were excluded if they had insulin-dependent diabetes, pregnancy, injury to the teres minor or pectoralis major clavicular division muscle groups, women going through menopause with hot flashes, people with health problems concerning the stomach or thyroid, or anyone who had consumed food or drink within a half hour of testing.

Randomization - There were two groups, a control and an experimental group. Included participants were assigned the next sequential subject number upon arrival. Odd numbers were assigned to the treatment group (experimental) and even numbers were assigned to the sham (control) group. The examiner monitoring the temperatures was blind to the assignment of the participants. The experimental group received treatment of the Bennett's reflex for the stomach and the thyroid. The control group received treatment of one of 2 designated sham reflex points.

Study Protocol - The participants came in for two 30 minute treatments. Inclusion and exclusion criteria were verified and each subject completed a demographic questionnaire at the first visit. If included, the participant then read and signed an informed consent form and was assigned a subject number. If participants had been in extreme temperatures, they were instructed to sit in the room for an extra ten minutes to normalize skin temperature. The participant lay supine on a treatment table. Examiner 1 tested the PMC and Teres Minor on the left and recorded the result as grade 5/5 or 4/5 or lower. Therapy Localization (patient touching) to Bennett's reflexes with the patient's hand was tested against the related muscles, either PMC or Teres Minor and any change in muscle strength was recorded. Temperature sensors were attached with tape to the skin over the thyroid, R teres minor, stomach, and R PMC muscle. Regional

movement of the upper extremity increased body temperature temporarily, so MMT was performed on the side opposite the side where muscle temperature was recorded.

Continuous temperature recordings were monitored by Examiner 2 who was screened from the patient. A baseline temperature value was obtained by allowing all thermometers to level off and maintain a constant temperature for 30 seconds and the temperatures were recorded. Examiner 1 then treated the neurovascular reflexes for the teres minor, PMC, or sham, according to group assignment on a pre-randomized list of subject numbers organized as an odd-even distribution determined as patients signed up. In the experimental group, the point treated during the first session was the Stomach neurovascular if it therapy localized, but if not, the Thyroid neurovascular was treated. In the 2nd session, the point treated was the one not treated in the first session, regardless of whether the muscle was weak or whether the neurovascular point therapy localized. In the sham group, in the first session the Sham 1 point was treated and in the second session the Sham 2 point was treated. Reflexes were treated by lightly touching specifically identified reflex points bilaterally on the face or head as described by Dr. Bennett for 2 minutes. Post treatment temperatures were recorded. The subject was scheduled to come back for a follow-up appointment where the alternate active NV or sham point was treated in the same manner. (See appendix A on page 6 for location of points). Muscles were retested by the examiner following the treatment and the results were recorded on the data sheet.

Outcome measures – Temperature changes and changes in muscle strength on manual muscle tests were observed, recorded and measured and the results analyzed and tabulated.

Results:

	Avg. Temp. (℃) Change Thyroid	Avg. Temp. (℃) Change Teres Minor	Avg. Temp. (℃) Change Stomach	Avg. Temp (℃) Change PMCD
Treatment	-0.132	0.235	-0.016	-0.058
Sham	-0.090	-0.177	-0.224	0.000

	Standard Deviation Thyroid	Standard Deviation Teres Minor	Standard Deviation Stomach	Standard Deviation PMCD
Treatment	0.658	0.366	0.421	0.286
Sham	0.345	0.396	0.365	0.203

Two participants demonstrated a weak teres minor and the one in the treatment group responded to treatment with restored muscle strength on testing. The one in the sham group did not change. Ten participants demonstrated a weak PMCD - 3 in the treatment group and 7 in the sham group. Two of the three in the treatment group that received the stomach neurovascular treatment were restored to full strength. One participant from the sham group that demonstrated a weak PMCD became strong after the sham treatment. Nineteen of the 23 participants in the treatment group who showed positive therapy localization over a neurovascular point, 19 were treated successfully and only 5 of the 26 participants in the sham group improved in terms of muscle strength. Four participants did not return for a second visit.

When the stomach neurovascular was treated, there was a significant increase in temperature on skin surfaces over teres minor, stomach, and over pectoralis major (clavicular division). When the thyroid neurovascular was treated, there was a significant increase in temperature over the stomach and pectoralis major (clavicular division), but not the thyroid. When the sham 1 group was treated, there was a significant increase in temperature over the teres minor muscle and the skin surface covering the stomach, but not over the skin surface covering the thyroid or the pectoralis major (clavicular division). When the sham 2 group was treated, there was a significant increase in temperature over the skin surface of the teres minor muscle and the skin surface of the stomach, but not over the skin surface covering the thyroid or the pectoralis major (clavicular division). When the stomach neurovascular reflex was treated, there was a significant increase in surface temperature over the pectoralis major (clavicular division) compared to all sham. When the thyroid neurovascular was treated, there was no significant increase in any site compared to sham groups.

Stomach treated:	T Test paired	Mean Change
Thyroid Temp pre-post	0.563	0.079
T Minor Temp Pre-post	**0.000**	0.317
Stomach Temp pre-post	**0.000**	0.288
PMC Temp Pre-Post	**0.004**	0.167

Thyroid Treated:	T Test paired	Mean Change
Thyroid Temp pre-post	0.553	0.078
T Minor Temp Pre-post	0.344	0.079
Stomach Temp pre-post	**0.002**	0.237
PMC Temp Pre-Post	**0.009**	0.148

Sham 1 Treated	T Test paired	Mean Change
Thyroid Temp pre-post	0.061	0.108
T Minor Temp Pre-post	**0.023**	0.192
Stomach Temp pre-post	**0.026**	0.119
PMC Temp Pre-Post	0.892	0.004

Sham 2 Treated	T Test paired	Mean Change
Thyroid Temp pre-post	0.332	0.080
T Minor Temp Pre-post	**0.045**	0.174
Stomach Temp pre-post	**0.001**	0.328
PMC Temp Pre-Post	0.059	0.096

Stomach Treated vs all shams	Unpaired T Test	Mean Change Tx	Mean Change Sham
Thyroid Temp pre-post diff	0.90	0.079	0.094
T Minor Temp Pre-post	0.16	0.317	0.184
Stomach Temp pre-post	0.44	0.317	0.222
PMC Temp Pre-Post	**0.03**	0.167	0.049

Thyroid Treated vs all shams	Unpaired T Test	Mean Tx	Mean Change Sham
Thyroid Temp pre-post diff	0.89	0.078	0.094
T Minor Temp Pre-post	0.29	0.079	0.184
Stomach Temp pre-post	0.86	0.237	0.222
PMC Temp Pre-Post	0.07	0.148	0.049

Discussion:

The study's main focus was detecting surface temperature changes as a result of blood flow to specific tissues of the body, some being of subcutaneous nature and some in the abdominal cavity. The correlation of surface temperature change to underlying tissue change is not fully defined.

Weaknesses: Due to space availability, testing sessions were in 2 different rooms of quite different sizes. This may have affected the stability of temperature readings between the first and second treatments and between subjects. Compliance of patients to the 30 minute rule of no food or liquids before the study could not be verified. Controlling this variable better would have also strengthened this study.

The research excluded anyone with thyroid and stomach problems, which is the group of people who would be expected to benefit most from the treatment. Including these people could have produced more drastic changes and more definite results. Very few people in the treatment group had positive therapy localization to the reflex being treated. Very few subjects had muscles that tested 4/5 or below. Since most of the subjects were normals, the power of the study to detect significant change was probably insufficient.

The surface thermometer accurate to the 10^{th} degree and took several minutes to stabilize to achieve baseline readings. A thermometer with a continuous computerized read-out would have made it much easier to establish a baseline. The measured locations were not shielded from air currents in the large testing room, which may have affected the precision of the readings.

The study design was complicated in that there were 2 visits and different treatments at each visit. A simpler design would have made data analysis much simpler.

Strengths: Recruitment- Difficulties in recruitment for initial visits by Logan Students were minimal. Out of 53 participants, there were four that did not return for their second visit. No adverse effects were reported during this study.

Masking of the examiner reading the thermometers from treatment being performed was a strength.

Most of the changes in muscle strength and therapy localization occurred in the treatment group. The largest temperature changes also occurred in the treatment group, as expected. However, the locations of temperature changes were not necessarily consistent with the neurovascular reflex that was treated, whereas the changes in muscle strength were much more consistent with which neurovascular reflex was treated. This may be because the reflex as described by Dr. Bennett had more to do

with blood flow to an organ rather than a surface temperature change as was assumed by the researchers. Since the blood flow was supposed to change to the directed organ or muscle, the amount of blood going to that organ would change, but the total amount of blood in the muscle or skin might still be constant. Future studies need to be done to further the understanding of how and why these neurovascular reflex points work as they are reported in the field. Participants with thyroid and stomach diseases must be included to obtain more definitive results. The environment needs to be kept constant and prevent air flow through the testing area. It would also be beneficial to use Doppler ultrasound to track the changes in flow of blood rather than using surface temperature.

Conclusion:

We were unable to demonstrate a consistent increase in temperature over the predicted areas**.** However when the treatment group for the stomach was treated, there was a significant increase in the skin surface temperature of the teres minor muscle, temperature of the skin surface of the stomach, and temperature of the skin surface over the pectoralis major (clavicular division). When the thyroid neurovascular was treated, there was a significant increase in temperature over the stomach and pectoralis major (clavicular division), but not the thyroid. When the sham 1 group was treated, there was a significant increase in temperature over the teres minor muscle and the skin surface covering the stomach, but not over the skin surface covering the thyroid or the pectoralis major (clavicular division). When the sham 2 group was treated, there was a significant increase in temperature over the skin surface of the teres minor muscle and the skin surface of the stomach, but not over the skin surface covering the thyroid or the pectoralis major (clavicular division). When the stomach neurovascular reflex was treated, there was a significant increase in surface temperature over the pectoralis major (clavicular division) compared to all sham. When the thyroid neurovascular was treated, there was no significant increase in any site compared to sham groups.

Competing Interests: Competing Interests include the fact that four of the five investigators have been studying Applied Kinesiology and the appropriate utilization of Bennett's Neurovascular Reflexes as indicated for subclinical muscle conditions. This indicates the possibility of biased outcome measures post therapeutic intervention.

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