INTERPRETATIONS OF SPINAL SKIN TEMPERTURE BILATERAL TEMPERATURE DIFFERENTIAL PATTERNS

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ABSTRACT

Objective: To determine consistent and persistent patterns of bilateral cervical heat differential with subjects that have never been adjusted by Upper Cervical Specific torque, toggle, recoil adjustment. Data was analyzed to see if consistent patterns of temperature differential are found and if those patterns are changed by the specific adjustment.

Design: Eighteen subjects were scanned in the cervical region with a *Thermoscribe* twice daily for five days to determine consistent patterns of bilateral temperature differential. After the fifth day, one half the subjects were adjusted by a certified Upper Cervical Specific Doctor of Chiropractic. Adjustments were made after determining each subjects misalignment from three radiographs, taken with a laser aligned x-ray using the AP open mouth, lateral cervical, and the base posterior views.

Results: A comparison of the means with an independent t-test revealed no significant difference between the pre and the post readings, for both the adjusted and non-adjusted groups. The data also demonstrated readings with confidence intervals typically in the range of 0.5-1.5.

Conclusion: Through visual analysis of the readings there appeared to be consistency of pattern, with the adjusted and non-adjusted groups before and after the adjustment. The confidence interval at 95% confidence was typically 1.5 or less. With a more experienced person utilizing the *Thermoscribe* and possible modifications to the instrument, it is possible that the confidence intervals would be lower. The mean values for the adjusted and non-adjusted groups were not significantly different when compared for pre and post adjustment.

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INTRODUCTION

Instrumentation has been a vital element of chiropractic clinical practice for over 65 years. Instrumentation supplements case history, spinography, neurological testing and orthopedic examination in the clinical setting for chiropractic evaluation of subluxation and in assessment of adjustment procedures. Chiropractors have an objective; to locate spinal subluxation which causes altered neurophysiology.

The subluxation in chiropractic is defined as a loss of normal juxtaposition of a vertebrae with the vertebrae above and the vertebrae below, resulting in occlusion of the foramen, encroachment on nerve tissue and interference with mental impulse resulting in dis-ease (1). Several methods have been suggested in the one hundred year history of the chiropractic profession, to help in the location of the subluxation. One of those methods suggested is the determination of consistent persistent patterns of bilateral temperature differential in those individuals exhibiting the misalignment component of the subluxation (2). To determine these patterns of bilateral temperature differential many instruments have been used. The first instruments used in the chiropractic profession was thermoelectric instruments using the thermocouple instrument (3). Many different thermocouple instruments are used in chiropractic practice. The *Thermoscribe* will be the instrument discussed in this paper. The mechanism for measurement of paraspinal skin temperature is produced by the *Thermoscribe,* with the glide of the thermocouples on the skin which generate an electromotive force, and if the temperature is the same on each side the electromotive force generated by each side would be the same and the indicator would not move and the graphing instrument would produce a straight line (4). If the bilateral temperatures were different, than the graph would deflect to the side of greater temperature. When a person has a bilateral temperature differential that is consistently similar he is said to be in "pattern". When this reading shows a consistent, persistent pattern of identical temperature differential, change and adaptation are not evident (2). "Persons free of neurological interference tend to display skin temperature differentials which continually change" (5). Change and adaptation are the greatest components of life and when these are absent there is a lack of life or death. If adaptability is decreased by some quantity then the organism exhibits less life or dis-ease. "The vertebral subluxation limits the adaptability of the body to further stress encountered in the external and internal environment. A limitation of adaptability is a limitation of defense. The body is no longer capable of harmonizing or adapting to various aspects of the environment" (6). If this situation is present, then temperature readings will show consistently similar patterns, but when a specific chiropractic adjustment is applied, these patterns would be changed and continue to show change until the subluxation returned, at which time the pattern would remain fixed lacking adaptability (2)

Historically, the neurocalometer was invented by Dossa D. Evins in 1923 (7). Instruments to determine paraspinal skin temperature at different segmental levels have been used since 1925, when B.J. Palmer published his controversial article on the neurocalometer in "The Fountain Head News" (8). Although technology has produced temperature detecting instruments other than the neurocalometer, they all measure physiologic response of the vertebral subluxation complex, which is mediated via the sympathetic nervous system (9). The sympathetic nervous system provides the major control and regulation of skin temperature of the body (10,11). The research of Dr. Irvin Korr demonstrates interaction of the sympathetic nervous system with skin temperature (4). Dr. Korr described, through electrical skin resistance, that impaired sympathetic nerve supply yielded topographical patterns of distribution, relative to right and left sides and segmental levels of the back, which remained constant from weeks to months. The sympathetic pattern differences were attributed to disturbances of somatic or visceral origin (4). The research and opinions of Dr. Korr provide physiologic substantiation for the role of temperature differential instrumentation in revealing areas of possible neuronal dysfunction (13). In chiropractic it is essential to find confidence in instrumentation that may augment the detection and the confirmation of the reduction of neurophysiological dysfunction secondary to vertebral dysfunction.

When there is a vertebral subluxation, it is proposed that a pattern of cutaneous skin temperature alteration is unchanging and therefore established as evidence of neuronal disturbance (14). This indicates that skin temperature differentials could be used to indicate subtle neurological effects of vertebral subluxation, and therefore could be corrected by specific chiropractic adjustment, and monitored in the future to see that central nerve system dysfunction is not present (13). Evidence of this is seen from the work of Dr. B.J. Palmer, Dr. W.V. Pierce and Dr. Korr (15). Dr. Korr's studies demonstrated patterns of low electrical skin resistance, as a result of spinal subluxation, prior to the onset of symptoms in subjects who were considered healthy (13) It is important to establish individual patterns with each person being checked with an *Thermoscribe (*graphing instrument of neurocalometer) to determine if a change in that pattern was reduced or eliminated after the adjustment.

Previous work with thermocouple instruments has shown effective utilization of pattern work in the clinical setting (16). Eight cases including liver cancer, sciatica, low back pain, epilepsy (adult and child), multiple sclerosis, encephalitis, hydrocephalus and tumors, showed dramatic health improvement after being monitored with NCM pattern analysis and adjusted at the upper cervical vertebrae (16). All of these patients were examined medically, prior to the chiropractic evaluation.(17) Much more of this type of research is needed in a more controlled setting, to evaluate pattern consistency and persistence in individual subjects before and after an adjustment has been made.

MATERIALS AND METHODS

The Neurocalograph (*Thermoscribe*) is a bipolar instrument and it consists of a galvanometer, thermocouple circuit, and housing. The galvanometer used in the neurocalometer is especially designed and constructed for extreme sensitivity, accuracy, and durability, but the principle on which it operates is the same as other galvanometers.(4) It consists of a horse-shoe magnet which makes the field circuit. Between the poles is inserted an armature, to the shaft of which is attached the indicator.(4) Dissimilar elements form the thermocouple, which is connected to the galvanometer so that its action is dual, that is, one side is working antagonistic to the other side.(4) The temperature generates the electromotive force, and if this temperature was the same on each side, the electromotive force generated by each side would be the same, and the indicator would not move because there would be a definite balance between the two.(4) If the temperature was greater on one side it would generate more force on that side and would move the indicator to that side.(4) After an adjustment the neurocalograph (*Thermoscribe*) is used to determine whether or not the subluxation has been corrected.

The study was performed by taking eighteen subjects who have never been adjusted by upper cervical specific adjusting. Each subject was be scanned from C7 to the occiput with the *Thermoscribe* two times a day for five days to determine consistent and persistent patterns of bilateral heat differential. All scans taken were at least 30 minutes apart on any given day. On the sixth day, eight subjects received an upper cervical specific adjustment according to the major listing of misalignment determined from the three views of spinographs. Each of these people were x-rayed with laser aligned x-ray using protocol for Upper Cervical Specific chiropractic, the AP open mouth, lateral cervical, and the base posterior views, to determine possible misalignment of the occipital-atlantal-axial vertebral complex. Seven subjects of control were also x-rayed. Following the adjustment, all eighteen subjects were then scanned twice per day for three days. The results were calculated, by dividing the scan into eight equal parts and assigning a value to the corresponding point on the graph at each level.(Figure 19). The values for each level were read from the chart and the mean values were determined at these levels for both pre and post adjustment periods. A Student t-test was performed on the mean values of pre and post adjustment readings at each of the levels C0 through C2. Confidence intervals were also calculated for these data sets.

RESULTS

An evaluation of the algebraic mean values of pre and post adjustment readings at spinal level C0 thru C2 were determined to be not significantly different for both the adjusted and non-adjusted group. This was determined by a t-test performed at the levels of Occiput, Atlas and Axis. When visualizing the mean readings, there appears to be a consistency in readings for both adjusted and non-adjusted individuals.(figures 1-18)

Figures 1 thru 18 display a graph readout of the mean values for the pre adjustment period and the post adjustment period. This representation appears to show a close relationship between the scans taken in the pre adjustment period and the taken in the post adjustment period. Figures 1 thru 8 represent individuals receiving 1 adjustment, and figures 9 thru 18, those who received no adjustment at all. With the exception of subjects: 377, 224, and 900, the subjects appeared to run consistent pattern at the C0, C1, C2 levels. This was typical of our results of no significant change after adjustment. Confidence intervals of 1.5 or less at the 95% confidence level, were found for 81.67% of the non-adjusted subjects and 77.08% of the adjusted subjects. At 1.25 or less there were 55% non-adjusted and 58.33% adjusted. At 1.0 or less there were 48.33% non-adjusted and 43.75% adjusted. Finally at 0.75 or less there were 31.67% non-adjusted and 16.67% adjusted. Tables 1 and 2 show the results for the confidence intervals of the pre and post readings of both the adjusted and non-adjusted groups at the levels of C0, C1, and C2. Tables 3 and 4 show the mean values of the pre scans and post scans for the adjusted and non-adjusted groups at the levels of C0, C1, and C2. T-tests were performed using the mean pre and mean post readings, of both the adjusted and non-adjusted groups at the levels of C0, C1, and C2. The lowest t-value was 0.193 and the highest was 2.94, most values falling below 1.50. The t-critical values at the 95% confidence level ranged from 2.262 to 2.120, with the degrees of freedom ranging from 9 to 16. The extremely low t-values indicates that there is not a significant difference in the means for each subject pre and post, accept at one level for one subject.

DISCUSSION

The data shown here displays no significant difference in the mean values pre and post readings for both groups. This indicates that there was no statistically significant change in the readings after the subjects received an adjustment. Potential variables in our study that may have influenced this result include the small subject size. Analysis of x-rays, and the adjustments were performed on the same day possibly not allowing sufficient time for accurate analysis of the films. Subjects were scanned 45 minutes after adjustment, but were not able to be scanned until three days later due to events outside of our control. This does not allow us to record whether the readings had changed in those three days. Finally the subjects were chiropractic students, and did not fully refrain from being adjusted by other means in the course of the study.

Upon visualization of the scans, there appears to be consistency of the mean values of the pre and post readings.(figures 1 thru 18)The confidence intervals were in the range of 0.75-1.5, which exhibits a fairly large dispersion of the data. Although the dispersion is large, when determining patterns it is stated by Dr. B.J. Palmer, that graph readings within two points of each other at the same levels, with breaks in the same direction show similar characteristics and therefore, shall be considered a pattern.(13) With this protocol in mind, the data appears to show these properties in better than 80% of the cases for the non-adjusted group and only slightly less than 80% of the cases in the adjusted group. This seems to lead to the establishment of a consistent pattern in most subjects, at most times. Also, these readings were taken by a student intern with one year experience and may have been more accurate if taken by a more skilled practitioner. Also, modification of the speed of the graph paper to match that of the speed of the instrument glide may help to standardizes the readings. The graph readings taken, varied in length from 40 to 77 mm for the same subject. This provides another variable that will alter the position of the breaks in the readings.

Considerations for further research

Further work must be done in the area bilateral spinal skin temperature analysis. With the importance of documentation, instrumentation plays a vital role in objectifying chiropractic science. With the success in clinical trials of these devices, more scientific data is needed. Considerations of a larger sample size, as well as more readings taken for the pre and post, may help to elicit more significant data. Also, possible modifications to the *Thermoscribe,* providing a more constant length of scan, equal to the distance of the glide, may allow more statistically significant reproducibility of the readings.

CONCLUSION

This study has shown no statistical significant difference between the pre adjustment readings and the post adjustment readings, for all subjects. This is evident, because the data remained constant and very low t-values were calculated. Also there was a fairly large dispersion of the data, with confidence intervals as ranging from 0.75 to 1.5. The authors feel that the readings are clinically useful in determining pattern through visual analysis, due to the constancy of the mean value readings seen in the figures 1 thru 18, and in correlation with Dr. Palmers described use for pattern determination, the confidence intervals appear acceptable. With modifications in the study design and protocol, as described above we feel that more statistically significant results can be obtained using the *Thermoscribe* instrument to detect pattern of bilateral temperature differential.

ACKNOWLEDGMENTS

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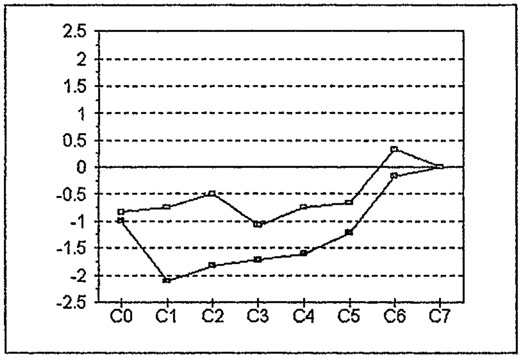
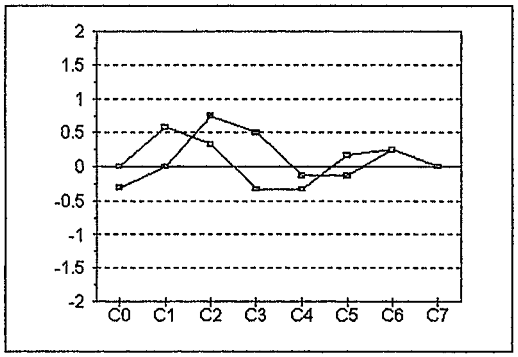
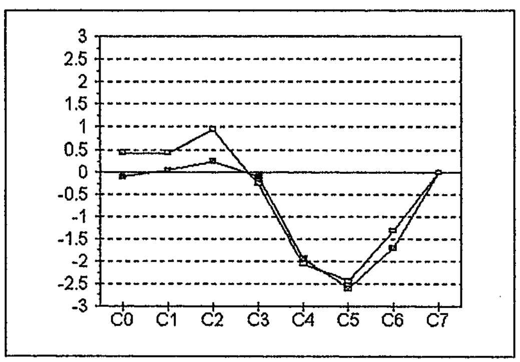
FIGURES 1-18 MEAN VALUES PRE AND POST



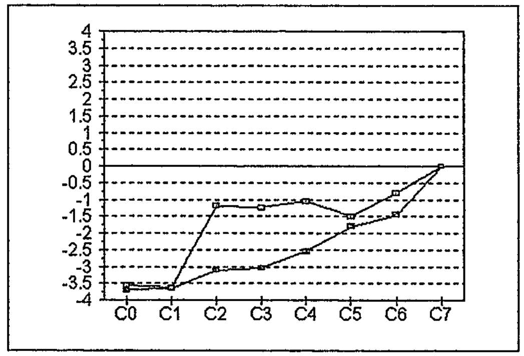
SUBJ. # 054 ADJUSTED (FIG. 1)



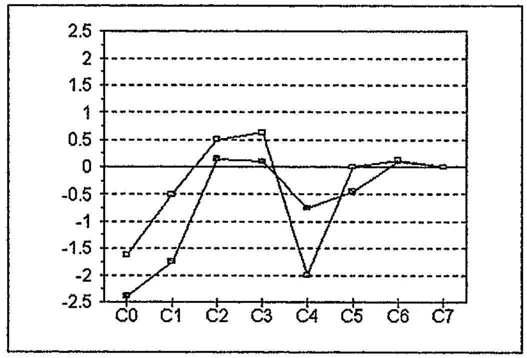
SUBJ # 113 ADJUSTED (FIG. 2)



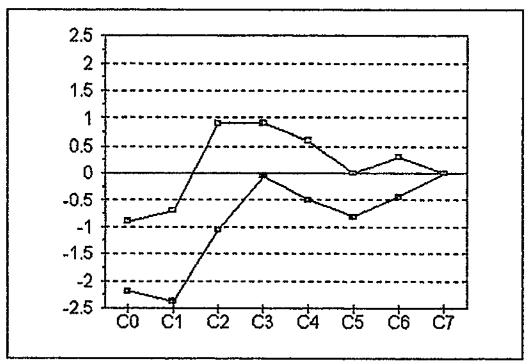
SUBJ. # 124 ADJUSTED (FIG. 3)



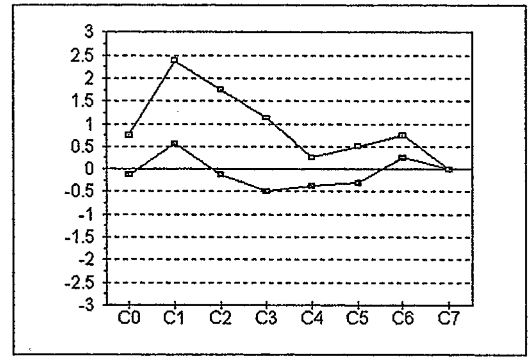
SUBJ. #222 ADJUSTED (FIG. 4)



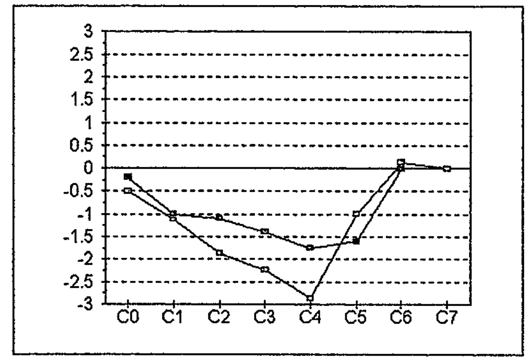
SUBJ. # 330 ADJUSTED (FIG. 5)



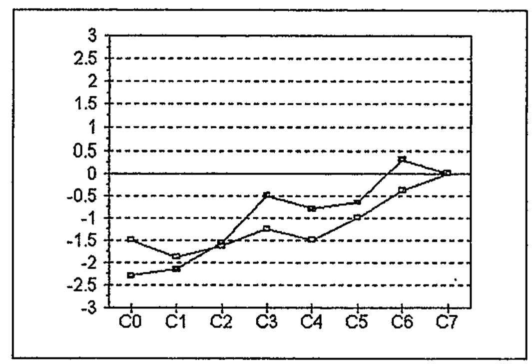
SUBJ. # 622 ADJUSTED (FIG. 6)



SUBJ. # 780 ADJUSTED (FIG. 7)



SUBJ. # 997 ADJUSTED (FIG. 8)

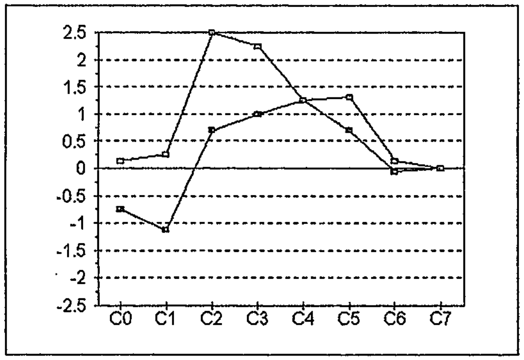


SUBJ. # NOT ADJUSTED (FIG. 9) #9

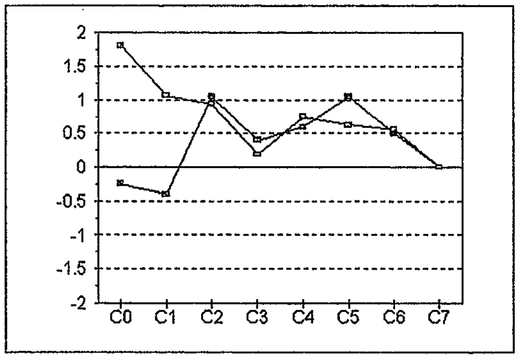
□—□ POST ADJUSTMENT

■—■ PRE ADJUSTMENT

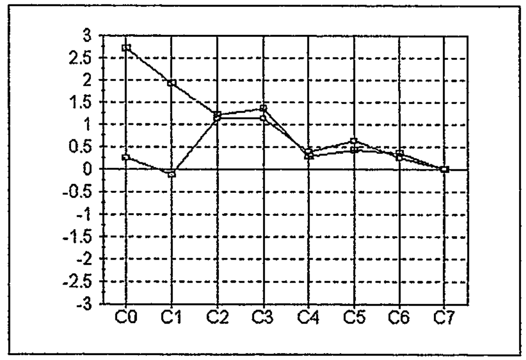
FIGURES: 1 THRU 18



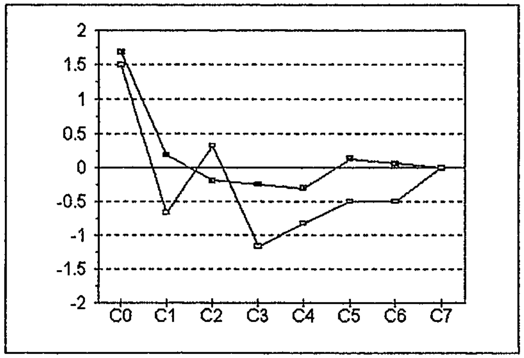
SUBJ. # 011 NOT ADJUSTED (FIG. 10)



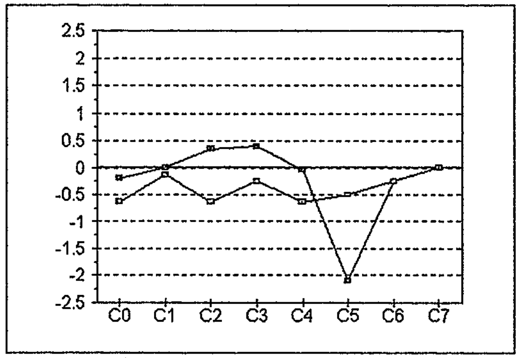
SUBJ. # 377 NOT ADJUSTED (FIG. 13)



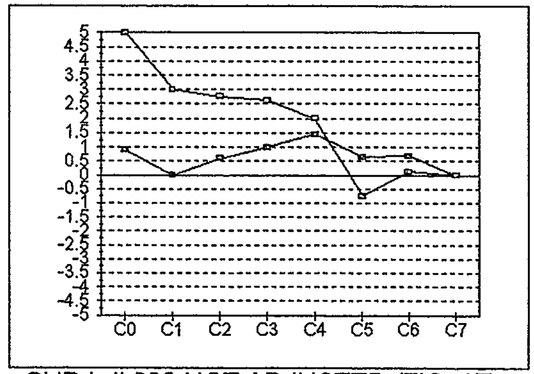
SUBJ. # 660 NOT ADJUSTED (FIG. 16)



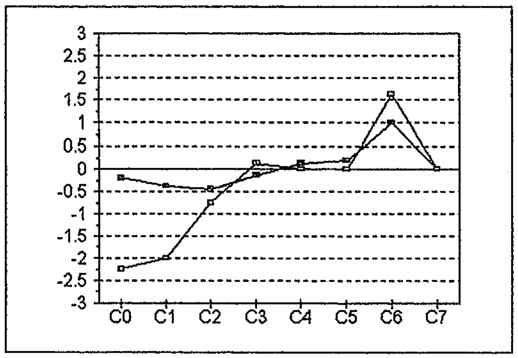
SUBJ. # 109 NOT ADJUSTED (FIG. 11)



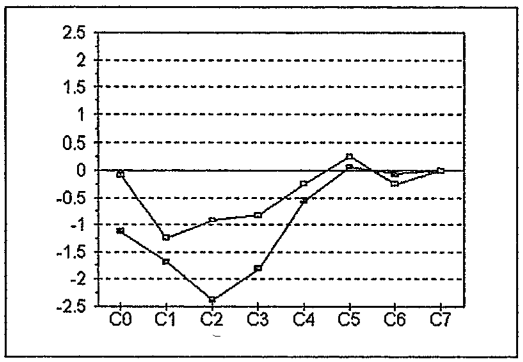
SUBJ. # 444 NOT ADJUSTED (FIG. 14)



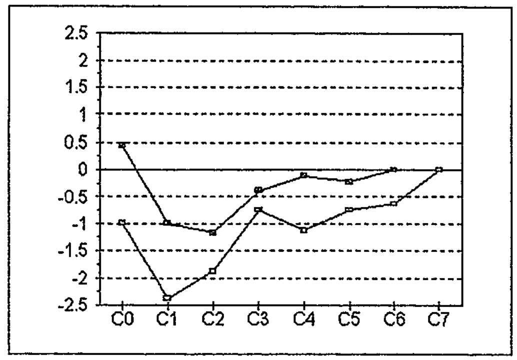
SUBJ. # 900 NOT ADJUSTED (FIG. 17)



SUBJ. # 224 NOT ADJUSTED (FIG. 12)



SUBJ. # 568 NOT ADJUSTED (FIG. 15)

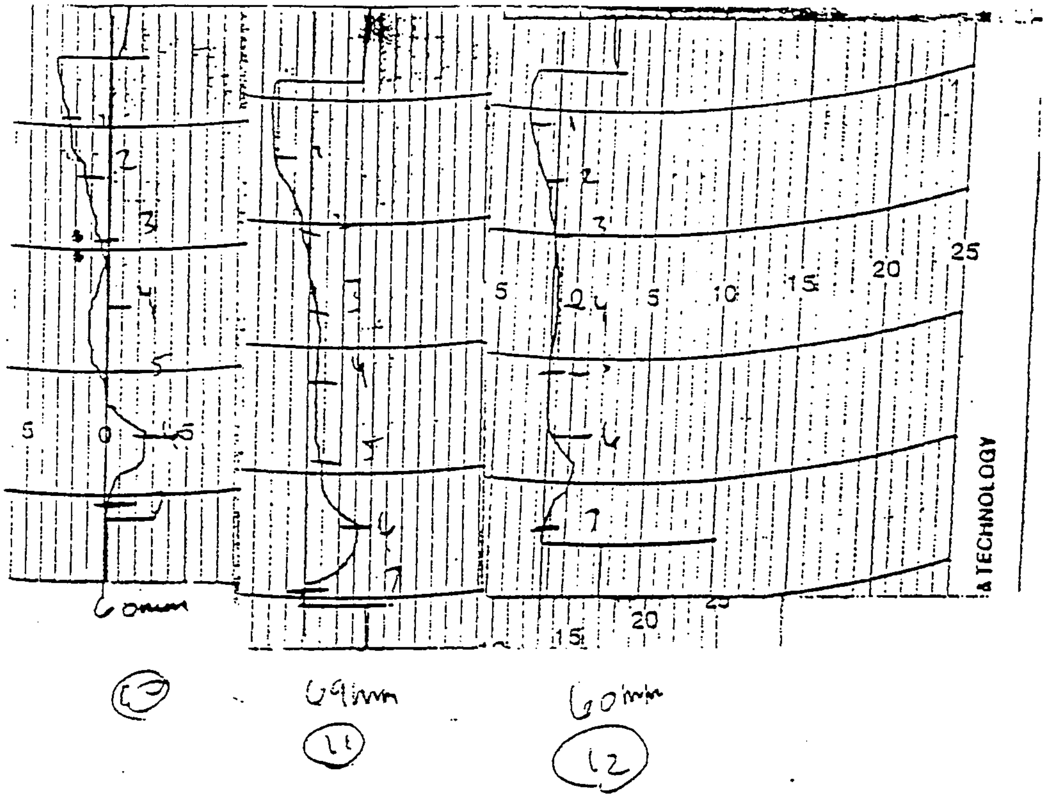


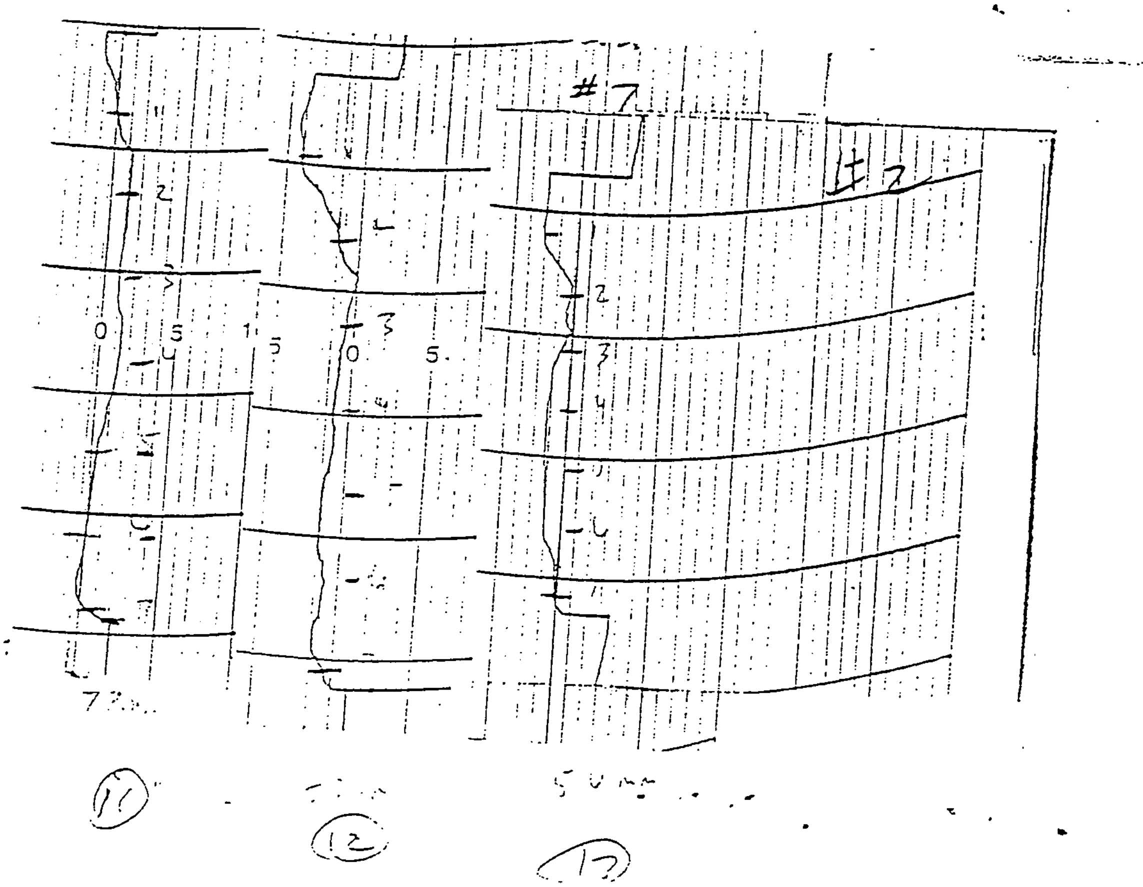
SUBJ. # 999 NOT ADJUSTED (FIG. 18)

POST ADJUSTMENT

PRE ADJUSTMENT

Figure 19: Examples of Raw Data





TABLES 1 THRU 4

TABLE 1: CONFIDENCE INTERVALS
ADJUSTED GROUP

	PRE ADJUSTMENT			POST ADJUSTMENT		
LEVELS	C0	C1	C2	C0	C1	C2
SUBJ #						
54	1.096	0.906	0.8	1.573	2.357	1.659
113	0.961	0.997	1.064	1.497	1.224	0.653
124	0.682	0.61	0.532	0.773	0.773	1.022
222	1.627	1.86	1.221	1.651	1.886	1.156
330	1.238	1.47	1.44	0.488	0.844	0.661
622	0.943	1.345	0.751	1.531	1.568	1.176
780	0.711	1.702	1.123	0.869	1.133	1.11
997	0.348	1.248	1.255	2.626	2.42	1.49

TABLE 2: CONFIDENCE INTERVALS
NON ADJUSTED GROUP

	PRE ADJUSTMENT			POST ADJUSTMENT		
LEVELS	C0	C1	C2	C0	C1	C2
SUBJ #						
9	1.224	0.654	1.088	1.687	0.538	0.451
11	1.142	1.319	1.185	1.319	1.482	1.398
109	1.897	1.515	1.792	1.697	1.778	0.577
224	1.013	0.976	0.074	0.633	0.4	0.49
377	1.181	0.967	0.707	0.64	0.505	0.837
444	0.467	0.485	1.18	0.944	0.741	0.598
568	0.481	1.013	1.293	0.589	0.972	0.927
660	2.241	1.832	1.35	1.856	1.158	1.407
900	1.289	1.62	1.28	3.801	3.177	3.382
999	0.874	0.611	0.633	1.386	1.349	1.407

TABLE 3: MEAN READINGS
ADJUSTED GROUP

	PRE ADJUSTMENT			POST ADJUSTMENT		
LEVELS	C0	C1	C2	C0	C1	C2
SUBJ #						
54	-1	-2.11	-1.83	-0.83	-0.75	-0.5
113	-0.31	0	0.75	0	0.58	0.33
124	-0.1	0.05	0.25	0.44	0.44	0.94
222	-3.7	-3.65	-3.1	-3.56	-3.63	-1.19
330	-2.4	-1.75	0.15	-1.63	-0.5	0.5
622	-2.19	-2.38	-1.06	-0.9	-0.7	0.9
780	-0.13	0.56	0.13	0.75	2.38	1.75
997	-0.2	-1	-1.1	-0.5	-1.13	-1.88

TABLE 4: MEAN READINGS
NON ADJUSTED GROUP

	PRE ADJUSTMENT			POST ADJUSTMENT		
LEVELS	C0	C1	C2	C0	C1	C2
SUBJ #						
9	-2.3	-2.15	-1.55	-1.5	-1.88	-1.63
11	-0.75	-1.13	0.69	0.13	0.25	2.5
109	1.69	0.19	-0.19	1.5	-0.67	0.33
224	-0.19	-0.38	-0.44	-2.25	-2	-0.75
377	-0.25	-0.4	1.05	1.81	1.06	0.94
444	-0.2	0	0.35	-0.63	-0.13	-0.63
568	-1.13	-1.69	-2.38	-0.08	-1.25	-0.92
660	2.71	1.93	1.21	0.25	-0.13	1.13
900	0.9	0	0.6	5	3	2.75
999	-1	-2.38	-1.88	0.44	-1	-1.17

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