Due 11/10

# Math 1030

## Magnets and Pain Relief Statistical Project

Is it possible that magnetic fields can reduce pain? A fascinating study by Dr. Carlos Vallbona suggests it is.

## Background

Magnetic fields have been shown to have an effect on living tissue as early as the 1930's. Plants have been shown to have an improved growth rate when raised in a magnetic field (Mericle et al., 1964). More recently, doctors and physical therapists have used either static or fluctuating magnetic fields to aid in pain management, most commonly for broken bones. In the case study presented here, Carlos Vallbona and his colleagues sought to answer the question "Can the chronic pain experienced by postpolio patients be relieved by magnetic fields applied directly over an identified pain trigger point?"

Mericle, R. P. et al. "Plant Growth Responses" in: *Biological effects of magnetic fields.* New York: Plenium Press 1964. p183-195.

Vallbona, Carlos et. al., "Response of pain to static Magnetic fields in postpolio patients, a double blind Pilot study" *Archives of Physical Medicine and Rehabilitation.* Vol 78, American congress of rehabilitation medicine, p 1200-1203.

## Experimental Design

### Summary

Patients experiencing post-polio pain syndrome were recruited. Half of the patients were treated with an active magnetic device and half were treated with an inactive device. All patients rated their pain before and after application of the device

### Details

The experimenters recruited 50 patients who not only had post-polio syndrome but also reported muscular or arthritic pain. These patients had significant pain for at least 4 weeks and had not taken any painkillers or anti-inflammatories for at least 3 hours before the study. The subjects all had a trigger point or painful region and had a body weight of less than 140% of the predicted weight for their age and height, and had a trigger point or circumscribed painful area.

The magnets and placebos (described below) were supplied in equal numbers from Bioflex. Each magnet or placebo was placed in number coded envelopes and delivered according to its shape. The code for placebos and magnets was not broken until the end of the study.

One site of reported pain was evaluated and a trigger point for this pain was found by palpitation. The patient was asked to subjectively grade pain at the trigger point under palpitation on a scale from 1 to 10 (1 is the least pain, increasing to 10).

Following the initial pain assessment, an envelope containing a device was randomly selected from the box containing both active and inactive devices. This device was applied to the pain area for 45 minutes and then removed. The patient then evaluated his or her pain again at the region or trigger point. This second pain rating is the score analyzed here.

**Materials**

The magnets used in the study were Bioflex magnets. The magnetic field consists of concentrically arranged circles of alternating magnetic polarity. Seventy active devices and seventy identical inactive devices were used.

**Data**

Active Magnets

| Pre | Post | Change |
|---|---|---|
| 10 | 0 | 10 |
| 10 | 4 | 6 |
| 8 | 7 | 1 |
| 10 | 0 | 10 |
| 10 | 4 | 6 |
| 10 | 2 | 8 |
| 10 | 5 | 5 |
| 10 | 5 | 5 |
| 9 | 3 | 6 |
| 10 | 2 | 8 |
| 9 | 2 | 7 |
| 10 | 2 | 8 |
| 10 | 3 | 7 |
| 10 | 5 | 5 |
| 10 | 6 | 4 |
| 8 | 4 | 4 |
| 10 | 3 | 7 |
| 10 | 0 | 10 |
| 8 | 2 | 6 |
| 10 | 0 | 10 |
| 10 | 4 | 6 |
| 9 | 4 | 5 |
| 10 | 5 | 5 |
| 10 | 9 | 1 |
| 10 | 10 | 0 |
| 10 | 10 | 0 |
| 10 | 10 | 0 |
| 10 | 10 | 0 |
| 8 | 7 | 1 |

Mean: 9.42

279

Placebos

| Pre | Post | Change |
|---|---|---|
| 8 | 4 | 4 |
| 10 | 7 | 3 |
| 10 | 5 | 5 |
| 10 | 8 | 2 |
| 9 | 8 | 1 |
| 10 | 6 | 4 |
| 9 | 8 | 1 |
| 10 | 10 | 0 |
| 10 | 10 | 0 |
| 7 | 6 | 1 |
| 10 | 10 | 0 |
| 8 | 8 | 0 |
| 10 | 10 | 0 |
| 10 | 10 | 0 |
| 10 | 10 | 0 |
| 10 | 10 | 0 |
| 9 | 9 | 0 |
| 10 | 9 | 1 |
| 10 | 10 | 0 |
| 10 | 10 | 0 |
| 10 | 9 | 1 |

15 - 10

3 9

2 8

9.5

3

23/21

1.09

177

Mean: 9.42

range: 6

Math 1030 Project 2

**Magnets & Pain Relief**

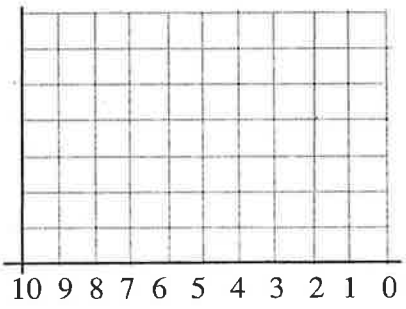
(Work in groups of two to four.)

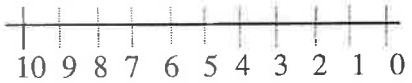
Names Stephanie Ruiz

#1 Compare the mean, range, and distribution (graphing both a double histogram using **relative frequency** and box plots) of the **pretest** for the active magnet group and the placebo group. Tell why you think the groups appear to be similar or different.

Placebo: mean = 9.5
range = 3

Active Magnet: mean = 9.6
range = 2

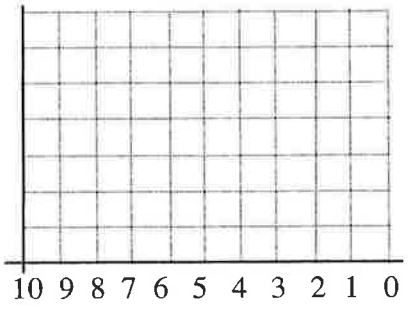


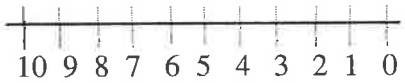




#2 Compare the mean, range, and distribution (using both histograms and box plots) of the **post-test** for the active magnet group and the placebo group. Tell why you think the outcomes appear to be similar or different.

Placebo: mean = 6.42
range = 6

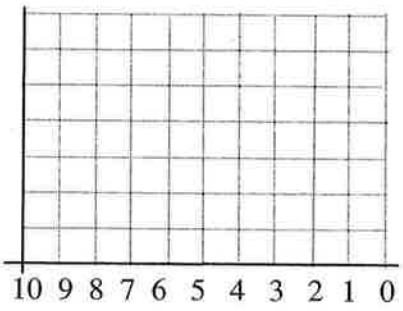
Active Magnet: mean = 4.4
range = 10



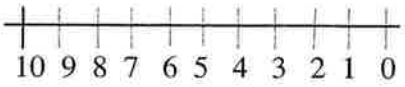



#3 Calculate the "**pain relief**," i.e. the **change between the initial pain and that reported after the treatment.** Explain how you calculated the difference and what the numbers mean. Compare the mean, range, and distribution (using both histograms and box plots) of the **change** for the active magnet group and the placebo group. Tell why you think the outcomes appear to be similar or different.

Placebo: mean = 1.09
range = 5




Active Magnet: mean = 5.2
range = 10




Write a or two paragraph reflecting how these statistics either support, refute, or are irrelevant to the claim that magnets can help relieve some types of pain. Discuss the limits for which the data can be used and why you think this is, or is not, a good study.

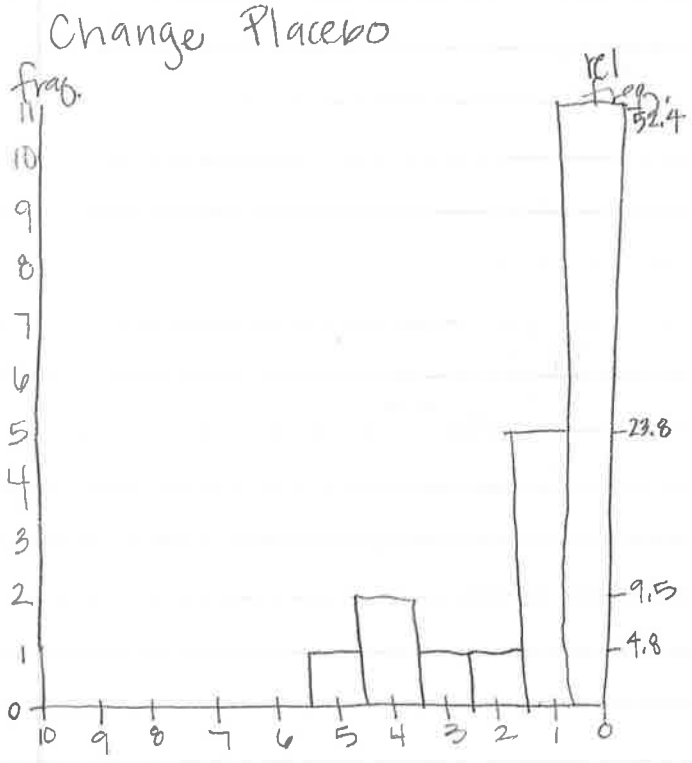
(2)

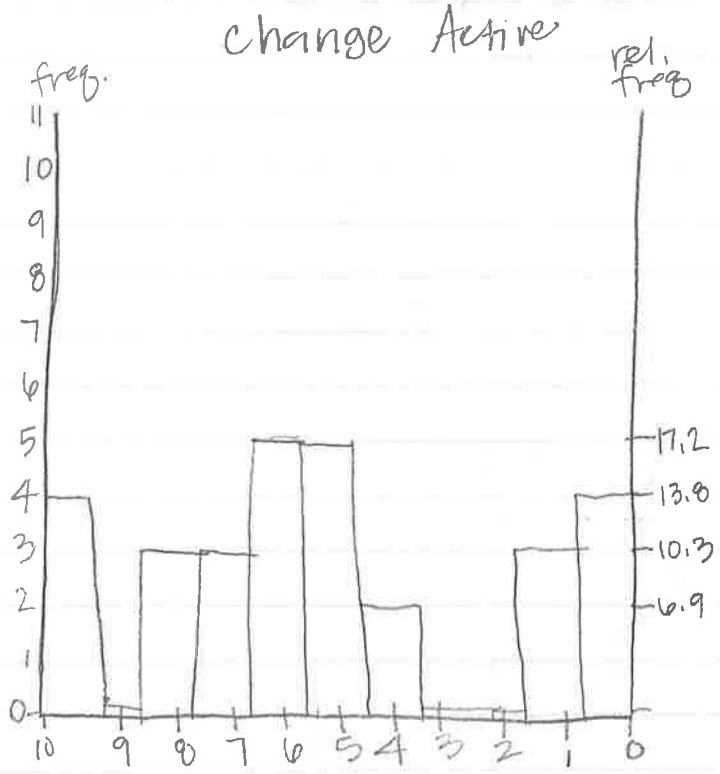
Change Placebo

| | freq | | rel. freq |
|---|---|---|---|
| 0 | 11 | 11/21 | 52.4% |
| 1 | 5 | 5/21 | 23.8% |
| 2 | 1 | 1/21 | 4.8% |
| 3 | 1 | 1/21 | 4.8% |
| 4 | 2 | 2/21 | 9.5% |
| 5 | 1 | 1/21 | 4.8% |
| 6 | 0 | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |
| Total | 21 | | |

Change Active

| | freq | | rel freq |
|---|---|---|---|
| 0 | 4 | 4/29 | 13.8% |
| 1 | 3 | 3/29 | 10.3% |
| 2 | 0 | 0/29 | |
| 3 | 0 | 0/29 | |
| 4 | 2 | 2/29 | 6.9% |
| 5 | 5 | 5/29 | 17.2% |
| 6 | 5 | 5/29 | 17.2% |
| 7 | 3 | 3/29 | 10.3% |
| 8 | 3 | 3/29 | 10.3% |
| 9 | 0 | 0/29 | |
| 10 | 4 | 4/29 | 13.8% |
| total | 29 | | |



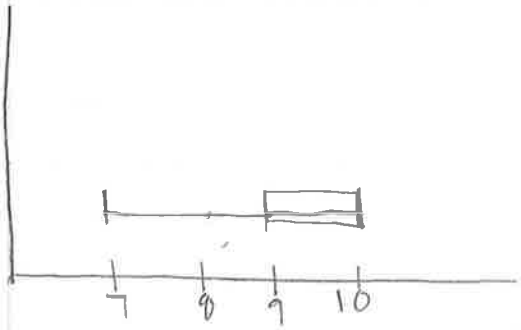




These graphs represent the percentage of change on the patients pain scale ratings.

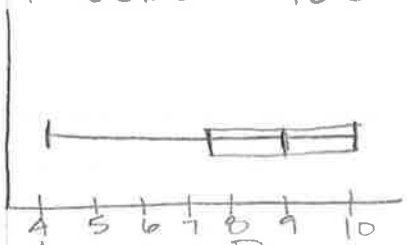
# Box plots

(1)

Placebo Pre

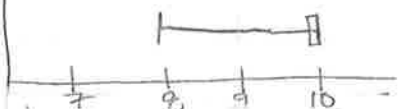



Placebo Post



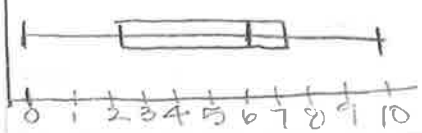

(2) Active Pre

Low: 9
Lower: 10
Median 10
Upper 10
High 10




Active Change

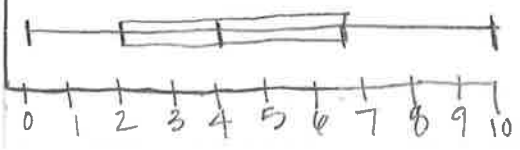
L 0
Lower 2.5
Med. 6
Upper 7.5
High 10




(3) Change Placebo


Active Post

0
2
4
6.5
10



①

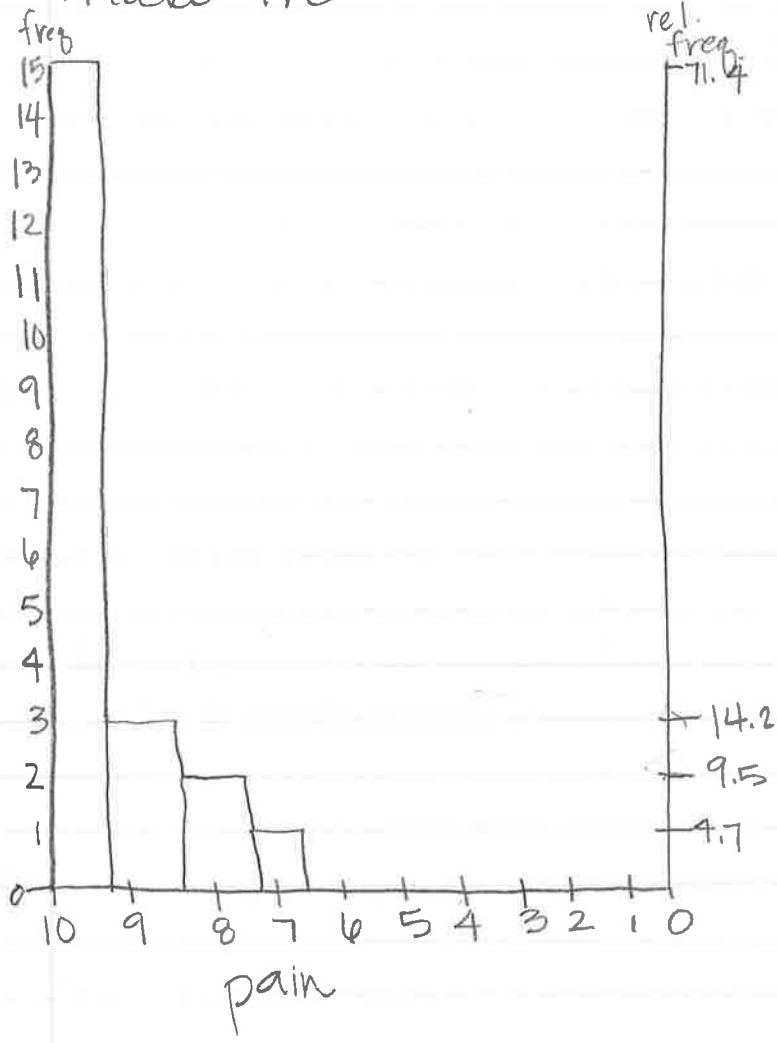
Placebo Pre

| | | | |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | 1 | 1/21 | 4.7 |
| 8 | 2 | 2/21 | 9.5 |
| 9 | 3 | 3/21 | 14.2 |
| 10 | 15 | 15/21 | 71.4 |
| Total | 21 | | |

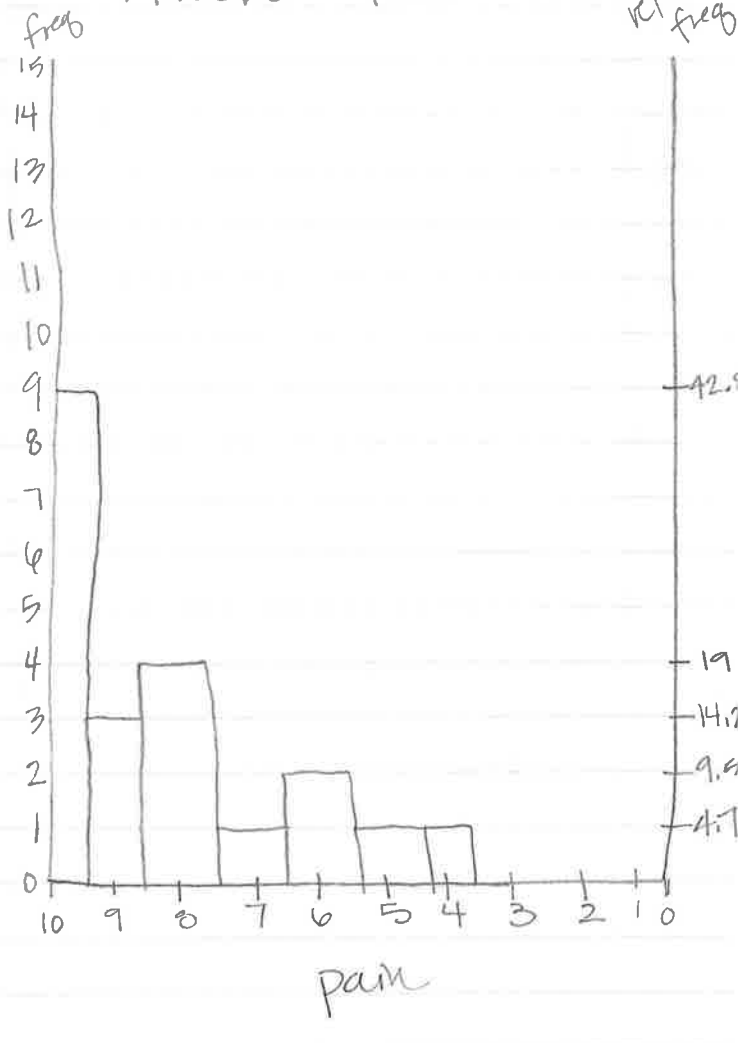
Placebo Post

| | | | |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | 1 | 1/21 | 4.7 |
| 5 | 1 | 1/21 | 4.7 |
| 6 | 2 | 2/21 | 9.5 |
| 7 | 1 | 1/21 | 4.7 |
| 8 | 4 | 4/21 | 19 |
| 9 | 3 | 3/21 | 14.2 |
| 10 | 9 | 9/21 | 42.8 |
| | 21 | | |

Placebo Pre




Placebo Post



(2)

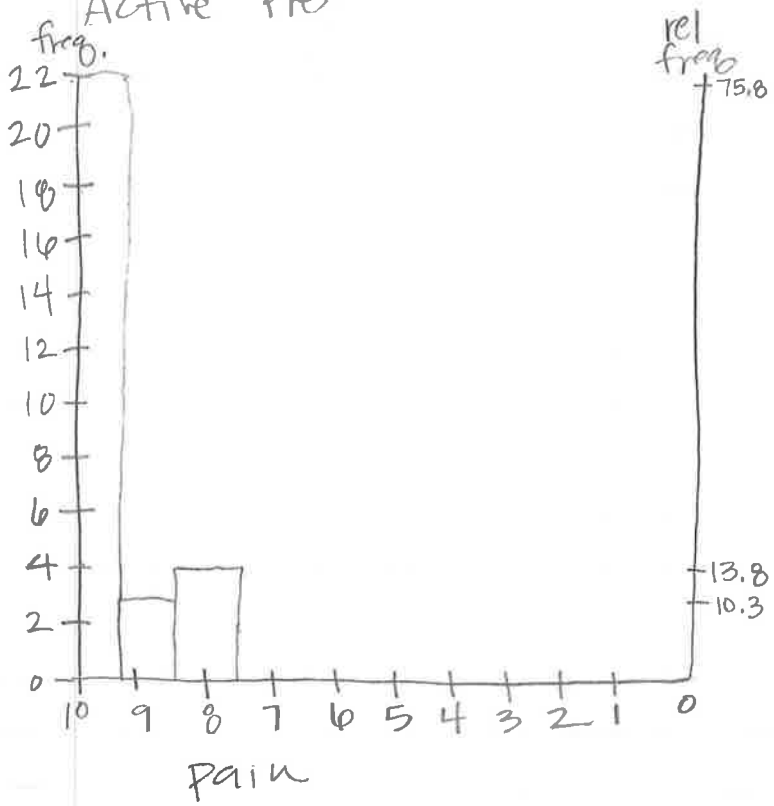
## Active Pre

| | freq. | | rel freq. |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | 4 | 4/29 | 13.8 |
| 9 | 3 | 3/29 | 10.3 |
| 10 | 22 | 22/29 | 75.8 |
| | 29 | | |

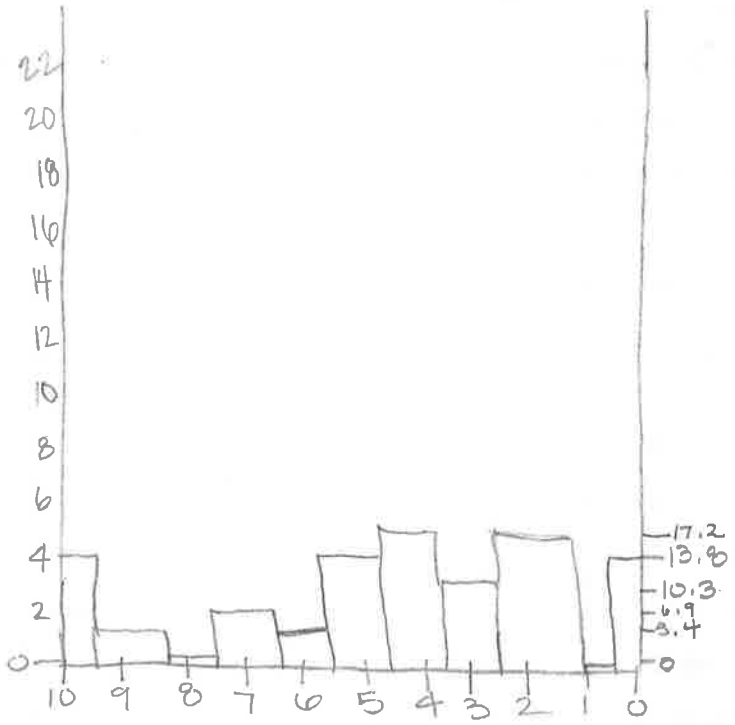
## Active Post

| | freq. | rel freq. | |
|---|---|---|---|
| 0 | 4 | 4/29 | 13.8 |
| 1 | 0 | 0/29 | 0 |
| 2 | 5 | 5/29 | 17.2 |
| 3 | 3 | 3/29 | 10.3 |
| 4 | 5 | 5/29 | 17.2 |
| 5 | 4 | 4/29 | 13.8 |
| 6 | 1 | 1/29 | 3.4 |
| 7 | 2 | 2/29 | 6.9 |
| 8 | 0 | 0/29 | 0 |
| 9 | 1 | 1/29 | 3.4 |
| 10 | 4 | 4/29 | 13.8 |
| | 29 | | |

Active Pre




Active Post



#1. I think the pre test data for the active and placebo groups look so similar because at this point of the study the groups have simply been divided. None of the patients have been given any medications yet at this point.

#2. In the data for the active post test and placebo post test you begin to see the difference between the two groups. Although both groups did show a change, the active group of patients showed the most significant change. The minimal change in the placebo group I assume is due to the "placebo affect" that has been shown in some studies.

#3.The new mean and range scores were calculated by taking the difference of the pre and post pain scales and using the new number to determine the values. The findings show a significant difference which would indicate that with the active magnet group the patients pain scale was improved, some drastically even. When looking at the number scores it would give the idea that the magnets were successful.

Reflection

Based on the simple number findings it would be indicated that the magnet therapy is a successful treatment and was successful in this study of post polio patients. The data shows that before the study the patient's pain scales were very similar. When comparing the data of the post testing and the change the scores were drastic in some areas. I think you see the largest change when comparing the pain relief scores.

However, I don't think that this would be considered a completely successful study. There are some variants that could make some believe the data is not "fair". The first is the fact that there were only 21 patients in the placebo group but there were 29 in the active group. This could sway the results some. Also, the data and effectiveness of the magnets is being based on patient's pain scales which could be considered to be very subjective. Every person has a different tolerance of pain and what one patient would consider a "10" on the pain scale another could rate it much lower.