1. INTRODUCTION

- The need to protect the workers.
- Prevention of work risks.

This study is aimed to determine the existence of correlation between the changes of temperature and force, as well as, the number of movements per minute, all of this through horizontal repetitive movements, which can frequently be found at work sites. These experiments were conducted on a man and on a woman.

1.1. CUMULATIVE TRAUMA DISORDER- CTD

"It's a physical injury that develops gradually over a period of time as a result of repeated efforts on a specific part of the muscle – skeletal system."

They occur in two areas of the body:
- Upper extremity.
- Low back.


Injuries and diseases common in the area of the hand-wrist.

Institute of Arthritis and Musculoskeletal and Skin Diseases, 2009.
1.2 CARPAL TUNNEL SYNDROME

**Symptoms:**
- Numbness.
- Pain or irritation at the thumb and fingers.
- Burning and dryness in the hands and forearms.
- Loss of strength in his hands.

1.4 SENSORY AND INFRARED THERMOGRAPHY

- Cherniack, (2009) demonstrated that through the use of infrared thermography, it is possible to measure the temperatures of the hand under controlled conditions of environmental temperature.
- López, (1992) states that thermography has its historic base in the development of undersea digital thermographs used to measure the temperature under water in natural environments, and potential applications in areas such as oceanography, marine ecology, industry, among others (1).
- Up to date, no studies have been found in the human body with Sensory thermography.

1.4 SENSORY AND INFRARED THERMOGRAPHY

- E.Y.K.N.G et al (2008): mentions that thermography has various fields of application because it is a noninvasive technique and used in fields such as medicine in a way very extensive. A study using advanced techniques for breast cancer screening was performed by thermography.
- Ferreira, et. al., (2007): determined thermographic changes of temperature associated to elderly and young people, doing knee bends with a weight of 1 kilogram added to it for 3 minutes.

2. OBJETIVES

- Ming, et. al (2005) classified compassionate pathology in carpal tunnel syndrome and the use of infrared thermography. An exercise was conducted in which subjects were kept at room temperature between 22 and 25°C for 15 min. include the ambient temperature of testing room as an important factor.
- Gold J., et. al. (2004) identify differences in skin temperatures between 3 groups of office workers through dynamic thermography, there is the experiment for writing with computer keyboard for 9 minutes straight.

2. OBJETIVES

- Correlate the variables
- Temperature and Force
- Temperature and Cycles per minute
- Force and Cycles per minute
- When working with nonfrontal repetitive movements

2. OBJECTIVES

- Determine the range of operation on:
  - Temperature
  - Force
  - Cycles per minute
  - When working with horizontal repetitive movements

3.2 METHOD OF THE EXPERIMENT.

- Man (operator 1) and woman (operator 2), 24 years of age.
- Dominant hand (right hand).
- Horizontal repetitive movements, during an eight-hour journey (with only a 30-minute break) during seven days.
- Measure of movements, force, and temperature each 10 minutes.

3. MATERIALS AND METHODS.

- Personal computer with an Akela program, Software Minitab® and Excel 2007.
- Microporous tape, Adhesive tape

4. RESULTS OF THE EXPERIMENT

3.1 MATERIALS OF THE EXPERIMENT.

- Personal computer with an Akela program, Software Minitab® and Excel 2007.
- Microporous tape, Adhesive tape.

4.1 SOME CORRELATIONS FOUND PER WEEK

- Correlation between Temperature (°C) and Cycles per minute
  - Operator 1
    - r = 0.292
    - Critical value of r = 0.119
  - Operator 2
    - r = 0.172
    - Critical value of r = 0.119

1. Figure with graphics of some of the correlations from the 7 days of the operators 1 and 2.
5. CONCLUSIONS AND RECOMMENDATIONS

4.2.1 SOME OF THE CORRELATIONS FOUND PER DAY OPERATOR 1

2. Figure with graphics of some of the correlations for days of the operator 1

4.2.2 SOME OF THE CORRELATIONS FOUND PER DAY OPERATOR 2

3. Figure with graphics of some of the correlations for days of the operator 2

5.1 CONCLUSIONS

Based on the study conducted, the following was concluded:

- There exist correlation between the temperature and the cycles per minute when working with horizontal repetitive movements.
- There exist correlation between cycles per minute and force when working with horizontal repetitive movements.
- There is not any correlation between the temperature and force when working with horizontal repetitive movements.

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Critical value = 0.316

5.2 RECOMMENDATIONS FOR FUTURE TESTS

- Carry out studies in the industry, in which repetitive work is done to evaluate the study.
- Perform a group analysis (several operators).
- Carry out future tests based on statistical inference (Linear regression, difference of mediums, ANOVAS, etc.).
- Analyse if there exist any difference between genders in the average of temperatures, force and cycles per minute.

6. REFERENCES.
REFERENCES


Table A-6

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THANK YOU FOR YOUR ATTENTION.

Critical values of the correlation coefficient $r$

Critical value of correlation per day.

Critical value of correlation per week.