

# Impact of Ergonomic Considerations on Physical Activity Limitations and Pain of Policeman Having Non-Specific Low Back Pain - Experimental Study

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## ABSTRACT

**Background:** Low back pain is a very common health problem amongst population and a major cause of disability that affects work performances and wellbeing.

**Objectives:** To determine the impact ergonomic consideration on pain, physical activity limitations having nonspecific low back pain among the policeman's

**Methodology:** It's an Experimental study was conducted 308 Sample size in police head quarter pain was measure with Numerical rating scale physical activity limitations was measure with Quebec Back Pain Disability scale and Modified Oswestry Disability Index.

**Result:** The mean of the pain intensity pre was  $2.65 \pm 1.37$  and post was  $2.09 \pm 1.09$ . Significant correlation between ergonomic strategies and pain intensity. The mean  $14.58 \pm 5.96$  of pre and post  $12.62 \pm 5.24$ . Significant correlation between ergonomic Strategies on physical activity limitations. The mean of pre  $19.995 \pm 5.377$  and post  $17.194 \pm 4.6$ . Significant correlation between ergonomic Strategies on Modified Oswestry disability index.

**Conclusion:** Implementing the Ergonomic strategies in policemen having nonspecific

low back pain can leads to reduces the pain intensity, improves physical activity.

**Keywords:** Policeman Numerical pain rating scale, non-specific low back pain, physical activity limitation, Quebec Back Pain Disability scale and Modified Oswestry Disability Index.

## INTRODUCTION

Low back pain is a very common health problem amongst population and a major cause of disability that affects work performances and wellbeing. Low back pain is defined as pain and discomfort localized below the costal margin and above the inferior gluteal folds with or without leg pain. Low back pain affects children to elderly. Non-specific low back is defined as low back pain not attributed to recognizable known specific pathology and Specific low back pain which has known pathomorphological cause. [5]

Low pain classified into 3 subtypes: 1] Acute back pain 2] Subacute back pain 3] Chronic back pain [12]. Low back pain commonly follows a recurrent course, with exacerbating overtime. Ergonomic risk factors are a major cause of musculoskeletal disorders in the workplace. High repetition, excess forces, and awkward postures are

usually cited as the important risk factors in the workplace. [2]

Physical activity by definition is any skeletal muscle body movement that results in energy expenditure. [3] In police job standing for long period of time is a routine part. In addition chasing aggressors and suspects, prolong period of sitting in a squad car or at desk and wearing weighted vests and duty belts are also culprits of back pain and sometimes called upon to run fast, wrestle or climb when body is not warmed up or stretched could certainly lead to muscle strain other causes are the heavy physical work, awkward static and dynamic posture, poor ergonomics at job site. [4] It leads to activity limitations which affects the performance in job. Activity limitations means Difficulties an individual may have in executing activities. [13]

In police force, 62% of policemen suffer from low back pain, only 9% experienced low back pain before joining the force. Policemen who recently joined the police force they are more prone for the work related musculoskeletal disorders [10]. Low back pain is an emerging problem in adults between 28 -35. [19] In police trainees who has recently join the police force they have to do the vigorous training for example Daily running, running with different types and different weighted rifles, parade, training for the stressful condition to improve the capability of the police recruit to manage the conditions like fight with the aggressors and thief's, handle the terrorist attacks by doing special training.

Ergonomic implementation can reduce risk of musculoskeletal disorders, modify the loads, provide better, comfortable working environment & also improve their work performance. [12]

## **MATERIALS & METHODS**

An experimental study, was conducted to determine the impact of ergonomic strategies on pain intensity, physical activity limitations of policemen having nonspecific low back pain by using Quebec Back Pain Disability scale and Modified Oswestry

Disability Index. The study was carried out in Police head quarter where the all the outcomes measure were taken and ergonomic strategies were given. A total 308 policeman having nonspecific low back pain age between 28-35 years were recruited by Radom sampling method. The consent taken from the all participants. Participant were excluded from the history of recent fracture, recent surgery and fall. Participant with non-co-operative patients and psychological ill were excluded. Using NPRS, Quebec Back Pain Disability scale and Modified Oswestry Disability Index pre score data collected. Work based ergonomic strategies were explained to the patient (After every 3week monitoring and correction were done) After 3 months of following ergonomics strategies NPRS, Quebec Back Pain Disability scale and Modified Oswestry Disability Index Hindi version is filled by the subjects and follow up data collected.

Following were the ergonomic strategies

## **GENERAL CONSIDERATIONS**

Educated them about ergonomics and how to implement this in daily routine at work place.

### **A) Sitting:**

Sit on chair which provide proper support to low back and feet rest on floor or foot support

The head, shoulder, and hips should all be aligned and supported in erect, well-balanced position.

The chair adjustment control should be easily accessed. The back support control should be easily adjustable to enable control of height. angle according to seat pan

If the back support of chair is flat, a small rolled towel, small pillow or cushion can be used to fit inward curve of the back

### **B) Standing posture:**

Whole body must be balanced and stabilized in correct alignment.

Heels and toes are slightly apart.

Knees are together and straight.

Hips are extended and laterally rotated slightly.

The pelvis is balanced on femoral heads  
Keep your spinal column aligned in its natural column

Ears are level, Shoulders are down and back.

Arms hang loosely to the sides, palms facing inwards towards the body.

**C) Lifting:** Get as close to the load as possible.

Plant your feet firmly-get a stable base

Bend at your knees –not your waist

Tighten your abdominal muscles to support your spine.

Get a good grip use both hands

Keep the load close to your body.

Use your leg muscles as you lift

Keep your back upright, keep it in its natural posture.

Lift steadily and smoothly without jerking.

Do not

- Twist and lift
  - lift with one hand (unbalanced)
  - lift while reaching and stretching
  - lift from an uncomfortable posture
  - do not hold your breath while lifting
- >Take more frequent mini breaks before you become fatigued.  
>Shift your posture often.

### Outcome measures:

- 1) Numerical Pain Rating Scale.
- 2) Oswestry Disability index.
- 3) Quebec back pain scale

#### 1) Numerical Pain Rating Scale.

The NPRS is a segmented numeric version of the visual analog scale (VAS) in which a respondent selects a whole number (0–10 integers) that best reflects the intensity of his/her pain. The interclass correlation coefficients of the NRS were 0.95. Excellent test-retest reliability.

#### 2) Modified Oswestry Disability Index Hindi version

**Reliability and Validity:** The intraclass correlation coefficient (ICC) for the test-retest reliability of the questionnaire was 0.877 and 0.943 for English and Marathi respectively.

The Cronbach coefficient  $\alpha=0.7541$  for English ODI and 0.9913 for Hindi ODI was recorded for the both modified versions.

#### 3) Quebec back pain disability scale

**Hindi version:** The original purpose of the questionnaire is to take into account the functional limitations related to pain, to monitor the progress of individual patients and to compare the evolution of LBP subjects incorporated in rehabilitation programs.

The translated version of the scale showed remarkable internal consistency (Cronbach  $\alpha=0.98$ ) and the intraclass correlation coefficient of test-retest reliability was excellent (ICC-0.96)

### Statistical Analysis

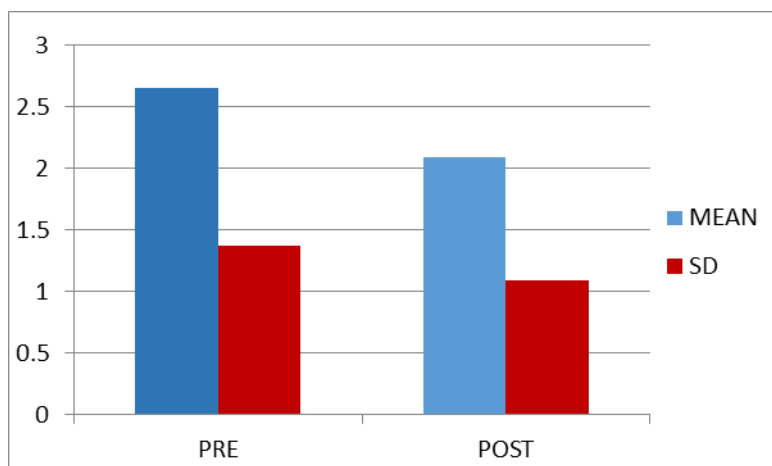
Statistical analysis was done using WinPepi software. Paired t test was used to test the hypothesis and data was analyzed using MS Excel.

Descriptive statistics, including a mean and standard deviation (SD) used to summarize the data.

### RESULT

Table 1 shows the mean  $\pm$  SD of pre and post effect in pain intensity before and after ergonomic strategies given for Policemen Having low back pain. P value is  $<0.05$  i.e the result is statistically Significant.

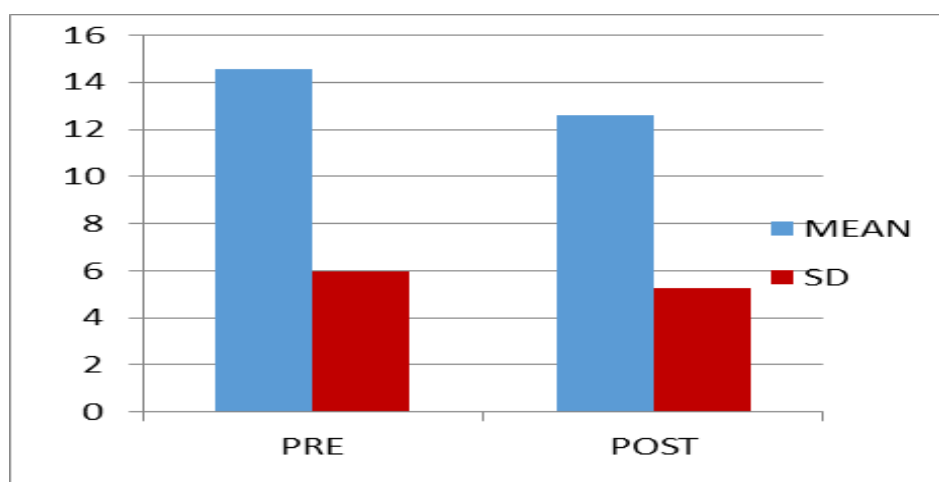
NPRS	PRE	POST
MEAN	2.65	2.09
SD	1.37	1.09
VALUE OF P	0.001	



Graph 1 shows the mean  $\pm$  SD of pre and post effect in pain intensity before and after ergonomic strategies' given for policemen having low back pain. Pre score is greater than post score.

Table 2 shows the mean  $\pm$  SD of pre and post effect on physical activity limitations before and after ergonomics strategies given for policemen having low back pain by using Quebec Back Pain Disability scale. P value is  $<0.05$  i.e. the result is statistically significant

Quebec Back Pain Disability Scale	PRE	POST
MEAN	14.58	12.61
SD	5.96	5.24
VALUE OF P	0.0078	



Graph 2 shows the mean  $\pm$  SD of pre and post effect on physical activity limitations before and after ergonomic Strategies' given for policemen having low back pain. Pre score is greater than post score.

Table 3 shows the mean  $\pm$  SD of pre and post effect on physical activity limitations before and after ergonomics strategies given for policemen having low back pain by using Modified Oswestry disability index. P value is  $<0.05$  i.e. the result is statistically significant

Modified Oswestry disability index	PRE	POST
MEAN	19.995	17.194
SD	5.377	4.6
VALUE OF P	0.0027	

## DISCUSSION

Discuss findings of your study with relevant reasoning along with proper citations/references. The purpose of this study was to find out the Impact of ergonomic considerations on pain and physical activity limitations of policemen having nonspecific low back pain. The objectives were to find out the intensity of pain, physical activity limitations and then find impact of ergonomics considerations on the pain intensity and physical activity limitations of policemen having nonspecific low back pain.

Pre intervention readings of numerical pain rating scale were taken according to this study it was found that most of the policemen having mild to moderate intensity of low back pain. Several articles have suggested an association between occupation and LBP [21]. According to research study conducted by Nabhia Douma et al. on prevalence of low back pain among policemen it was found that presence of low back pain was totally/partially linked to their work in police force [4].

Post intervention readings of pain rating scale were taken. There was significant reduction in pain intensity of low back pain in policemen after the ergonomic strategies given. Article by Stover H. Snook found Ergonomics plays an important role in low back pain, it can be reduced and managed with considerable success. [23]

Pre intervention reading of Quebec back pain scale and modified Oswestry disability scale where it was found that most of policemen suffering with low back pain having mild to moderate level physical activity limitations. An article by Abang, showed significant mild to moderate disability and activity limitation, due to pain in back in a population involved in hard manual work [18]. One more article by Pereira C.W. et al showed significant association of LBP with physical function and limitation [21].

Post intervention readings of Quebec back pain scale and modified Oswestry scale disability index scales were taken.

There was significant reduction in physical activity limitations of policemen having low back pain in policemen after the ergonomic strategies given.

An ergonomics at job site allows for good posture, fewer repetitive motions, better heights and reaches, less exertion, reduced awkward postures and high-force requirements, and more efficiency.

After comparison between the pre and post ergonomic strategies given it was found that there was significant reduction seen in pain intensity and physical activity limitations in policemen having nonspecific low back pain.

Therefore, there was significant reduction pain and physical activity limitations of policemen having low back pain. Hence ergonomic considerations will help in reduction of pain and physical activity limitations of policemen having nonspecific low back pain.

## CONCLUSION

It is concluded that there was significant reduction in pain and physical activity limitations in policemen having nonspecific low back pain after ergonomic implementation.

### *Declaration by Authors*

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**Conflict of Interest:** The authors declare no conflict of interest.

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