

Comparison of Ergonomic Advice versus Physiotherapy Intervention in Courier Delivery People with Low Back Pain

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Abstract:

Background: Musculoskeletal disorders are among the most prevalent occupational disorders in various designations. Low Back Pain is the commonest problem that is responsible for majority of medical reasons based work offs. In order to prevent occupational low back pain, ergonomic interventions are frequently implemented at the workplace to reduce biomechanical and psychological load and also physiotherapy interventions focusing in treating and preventing these problems must be incorporated at workplaces. Ergonomic and physiotherapy outlook is important in courier delivery boys as they are always stuffed up with heavy back packs leading to the occurrence of musculoskeletal problems.

Method: 72 subjects were taken and divided into 2 groups where Group A was given ergonomic advices and modifications and Group B was given physiotherapy interventions.

Outcome Measures: NPRS (Numeric Pain Rating Scale), Modified Oswestry Low Back Pain Disability Questionnaire

Results: On Statistical analysis it was observed that group B showed better improvements in comparison to group A.

Keywords: Low Back Pain, Ergonomics, Physiotherapy

Introduction

Musculoskeletal disorders are among the most prevalent occupational disorders in various designations¹. Among which low back pain is very common health problem and major cause of pain that affects work performances and well-being. Low Back Pain can be acute subacute or chronic though several risk factors have been identified such as occupational posture depressive moods obesity body height or age. The cause of the onset of Low Back Pain remains unclear and diagnosis is difficult to make. 'Global burden of disease 2010 estimated that Low Back Pain is amongst top ten disability adjusted life years causing disease and injury³.

Risk factors for Low Back Injury include frequent and sustained bending and twisting static posture sedentary occupations lifting rapid speed of movement awkward postures pushing and pulling repetitive work, high work intensity exposure to whole body vibration and balance loss when back is under load².

Industrial work related musculoskeletal disorders are a primary cause of lost work day productivity and revenue⁴. In 2017 The Musculoskeletal Health Research to benefit couriers' messengers and baggage handlers' published to highlight the musculoskeletal disorders among baggage handlers and courier delivery people.

The courier delivery occupation is considered as the main risk factor for work related musculoskeletal disorders⁵. Prevalence of musculoskeletal symptoms among manual handling workers is 69.6%. The most common site of musculoskeletal problems among manual handling workers is Low Back Pain⁶. One of the factors in refining the production in courier delivery person's performances is Low Back Pain.

The various phases or components which consist a typical activity in a courier delivery person consists of amount of posture require back flexion carrying and lifting of heavy loads and traveling during performance of different courier delivery tasks⁷.

Ergonomic is defined as 'That branch of science and technology that includes what is known and theorized about human behavioral and biological characteristics that can be validly applied to the specification design evaluation operation and maintenance of products and systems to enhance safe effective and satisfying use by individuals groups and organizations⁸.

In order to prevent occupational low back pain, ergonomic interventions are frequently implemented at the workplace to reduce biomechanical and psychological load⁹. One rapid way to prevent musculoskeletal disorder is to expand ergonomic knowledge and use interventions among employees¹⁰. The common strategy of ergonomic intervention is targeted at preventing occupational risk factors¹¹. Ergonomic intervention has become more prominent and is one of a kind of many proposed interventions for treatment and prevention of work related musculoskeletal disorders¹⁰. Ergonomic process includes identifying opportunities for improvement, built solution, implement prototype, evaluate prototype, adapt solution and prevent ergonomic problem¹².

Apart from ergonomics, physiotherapy intervention is also an effective method for the prevention of risk of low back pain. Physiotherapy intervention includes various exercises and stretches for avoiding the further pain and to improve overall strength.

A strong positive comparison between ergonomic and physiotherapy intervention has been proved by various studies¹³. Therefore, the purpose of this study is to find the comparative effect of ergonomic VS physiotherapy intervention for low back pain in courier delivery boys.

The Numeric Rating Scale (NRS) for pain is a unidimensional measure of pain intensity (I) in adults, including those with chronic pain. The scale is a single 11-point numeric scale in which a respondent selects a whole number (0-10 integers) that best reflects the intensity of their pain. With 0 representing one pain extreme (no pain), and 10 representing the other pain extreme (worst pain). The reliability of the scale in high-retest reliability has been observed in both literate and illiterate patients ($r=0.6$ and 0.95 respectively) before and after medical consultation¹⁴.

The Modified Oswestry Low Back Pain questionnaire has been designed to give information as to how your back pain has affected your ability to manage in everyday life. The score is calculated in percentage. Test-retest reliability was investigated using the intraclass correlation coefficient model

($r=0.89$, 95% confidence interval). Validity was calculated using Pearson correlations and a 2-way analysis of variance for repeated measures ($p=0.02$)¹⁵.

Aims and Objectives

- To study the Effect of Ergonomic Advice in Courier Delivery People with Low Back Pain.
- To study the Effect of Physiotherapy Intervention in Courier Delivery People with Low Back Pain.
- To compare the effects of Ergonomic Advice versus Physiotherapy Intervention in Courier Delivery People with Low Back Pain.

Methodology

Study Design: Experimental Study

Study Population: Courier Delivery Boys

Sample Size: 72

Study Duration: 6 Months

Study Setting: This study was conducted at Ekart Logistics Private Limited, Aurangabad and Instakart Logistics Private Limited, Aurangabad, Maharashtra, India.

Inclusion Criteria:

- Courier Delivery Professionals.
- Gender: Males.
- Age: 20-50 years.
- History Low Back Pain of greater than one month.
- Subjects willing to participate.

Exclusion Criteria:

- Acute Pain.
- Age group above 50 years.
- People with any severe systemic illness or cardiovascular and/or neurological problems, giddiness or balance disorders.

Methodology

Anthropometric Data:

- Height and weight were taken.
- Body Mass Index (BMI) was calculated using $\text{Weight (kg)} / \text{Height (m}^2\text{)}$
- Baggage dimensions were taken using inch tape. Height, weight, width and length of the baggage were measured in inches.

Procedure:

- Before beginning the study, approval was taken from ethical committee and higher authorities of Courier Company. Courier Delivery people were assessed for the inclusion and exclusion criteria and were all provided with the written consent forms. They were explained thoroughly about the study and also that there were no potential risks.

- The study experienced no withdrawals from the subjects.
- Two independent groups were made using convenient sampling method. A prior consent was taken from subjects. Each subject was given Numerical Pain Rating Scale and Modified Oswestry Low Back Pain Disability Questionnaire for pain assessment and to know if Low Back Pain has affected the ability in managing everyday life.
- The assessment of both the scales was taken from each subject on 1st day (baseline). After this, Group A subjects were given the demonstration of Ergonomic Advices and Group B subjects were given the demonstration of exercises as a part of Physiotherapy Intervention. This study was conducted for 4 weeks and the subjects actively performed all the given activities for 4 weeks
- After 4 weeks again the subjects were given Numerical Pain Rating Scale and Modified Oswestry Low Back Pain Disability Questionnaire to know the difference.

Group A – Ergonomic Group:

In this group total subjects were 36. In this group all the subjects were given a demonstration of various ergonomic ways according to their occupation.

Demo 1 – Lifting an object from floor:

- Position yourself on center and close to the object.
- Stand with your feet apart
- Keep feet flat on the floor
- Tighten your stomach muscles to help support the back
- Bend your knees, keep the back straight and lift
- While lifting, do not twist the body

Demo 2 – To set an object down:

- Keep load close to your body
- Bend your knees
- Keep your back straight, do not twist
- Avoid use of accessory muscles

Demo 3 – While Bike Riding:

- Keep your back straight
- Do not bend your elbows, keep them straight
- Avoid carrying on your back and shoulder while riding
- To avoid weight on your back, try to tie the baggage to your bike

GROUP B – Physiotherapy Intervention Group:

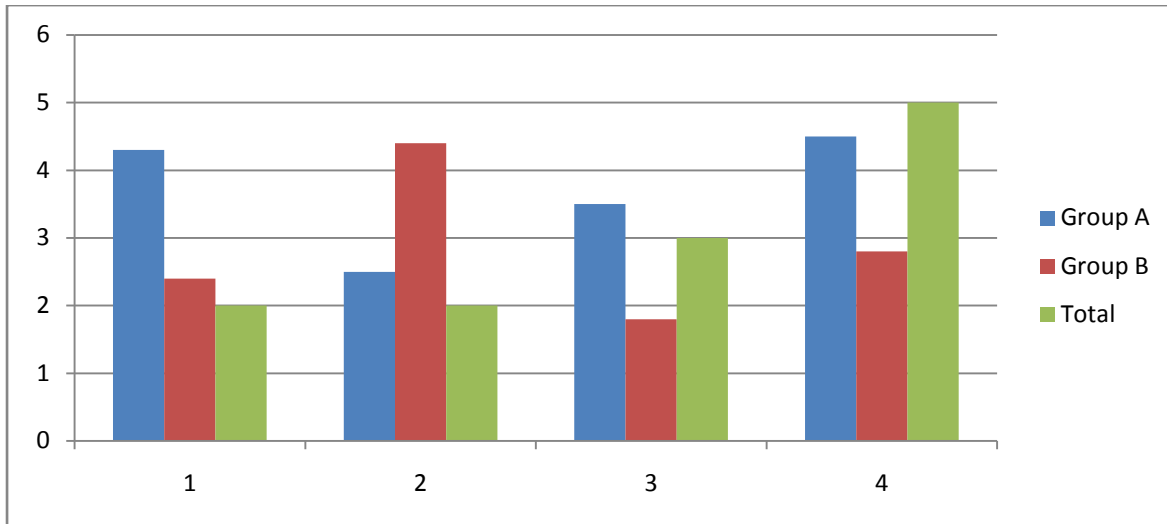
In Physiotherapy Intervention Group total subjects were 36. In this group the subjects were demonstrated with various Physiotherapy Exercises as follows:

- McKenzie Extension Exercises – The McKenzie method is a classification system and a classification-based treatment for patient with Low Back Pain. Starting position in prone lying for 10seconds and progression in prone lying on elbow and prone lying on hands with 10seconds hold with 5 repetitions.
- Williams Flexion Exercises – Set or system of exercises intended to enhance lumbar flexion, avoid lumbar extension, and tighten your abdominal and gluteal muscles. Williams flexion exercises performed in supine position with single knee to chest and bilateral knee to chest with 10seconds hold and 5 repetitions.
- Static Abdominals Exercises – Static Abs exercises relax the muscles of the lower back and open the thoracic spine. It allows the muscles of the low back to release gradually and passively using your own body weight and gravity. Done with 10seconds hold with 5 repetitions.
- Stretches:
 - Inner Thigh Stretches (Butterfly stretch) – 30seconds hold with 3 repetitions
 - Torso Stretch - 30seconds hold with 3 repetitions
 - Spinal Twist Stretch - 30seconds hold with 3 repetitions
 - Seated Hip Stretch - 30seconds hold with 3 repetitions

Results

Table No. 1 – Demographic data age group of participants according to Group A and Group B. Maximum subjects (56.94%) were seen in 21-30 age group

Age	Group A	Group B	Total (%)
<20	1	3	5.5%
21-30	21	20	56.94%
31-40	11	9	27.77%
41-50	3	4	9.72%
Total	36	36	100%

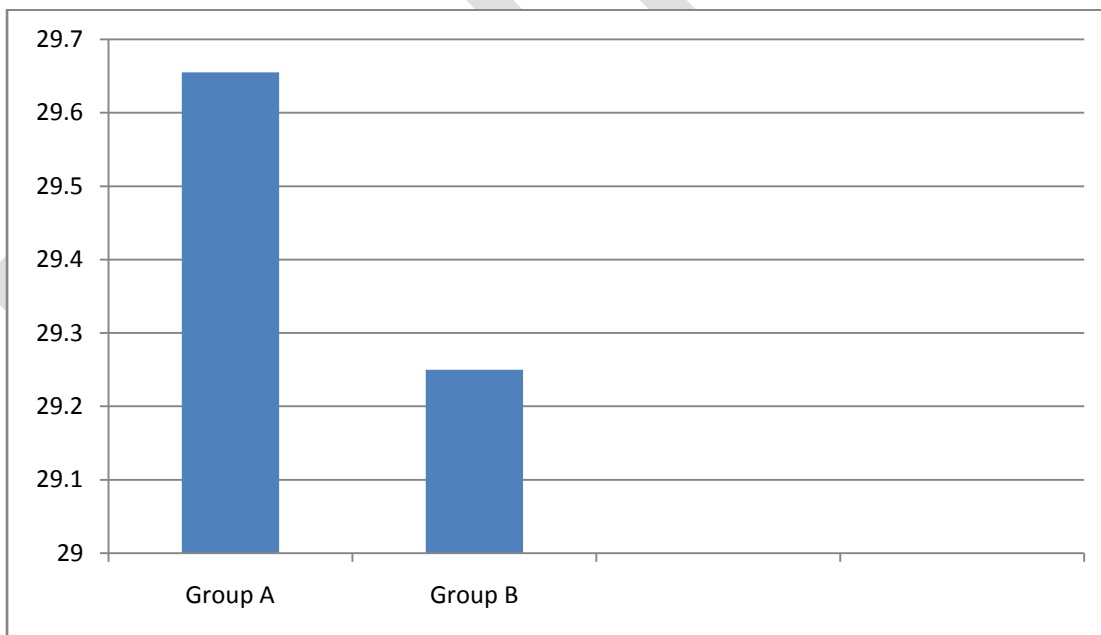


Graph No. 1 – 2D Bar Graph shows distribution of Age Groups of Group A and B

Table No. 2: Comparison of Mean of Age Groups of Group A & B

Table No. 2 shows the mean and SD ± 6.425 of Group A and mean and SD ± 6.897 of Group B and t value is 0.1945 and p value is 0.8463

Age Group	Group A		Group B		t value	P value
	Mean	SD	Mean	SD		
	29.655	6.425	29.250	6.897	0.1945	0.8463

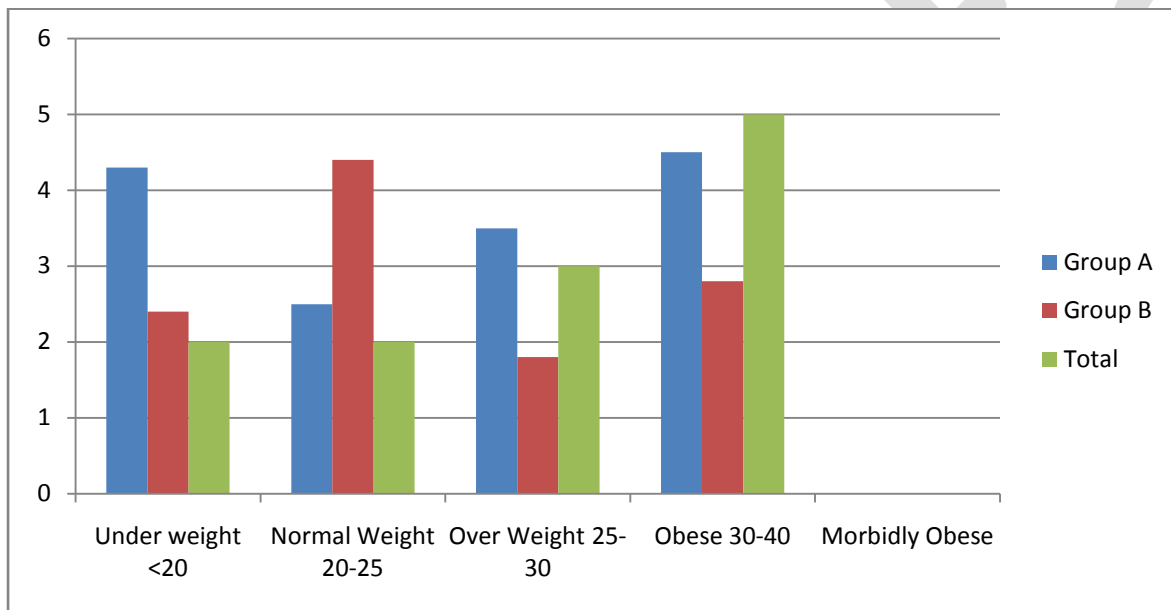


Graph No. 2 – 2D Bar Graph shows comparison of Mean of Age Groups of Group A & B

Table No. 3: Body Mass Index Wise Distribution

Table No. 3 shows Body Mass Index distribution of participants. Maximum subjects (15) are seen to be normal weight in group A as well as maximum subjects (14) are seen to be overweight in group B.

BMI	Group A	Group B	Total (%)
Under Weight <20	13	11	33.33
Normal Weight 20-25	15	9	33.33
Over Weight 25-30	7	14	29.16
Obese 30-40	1	2	4.16
Morbidly Obese >40	0	0	0



Graph No. 3 – 2D Bar Graph shows BMI related to group distribution with Groups A & B

Table No. 4: Comparison of Mean of Baggage Weight of Group A & B

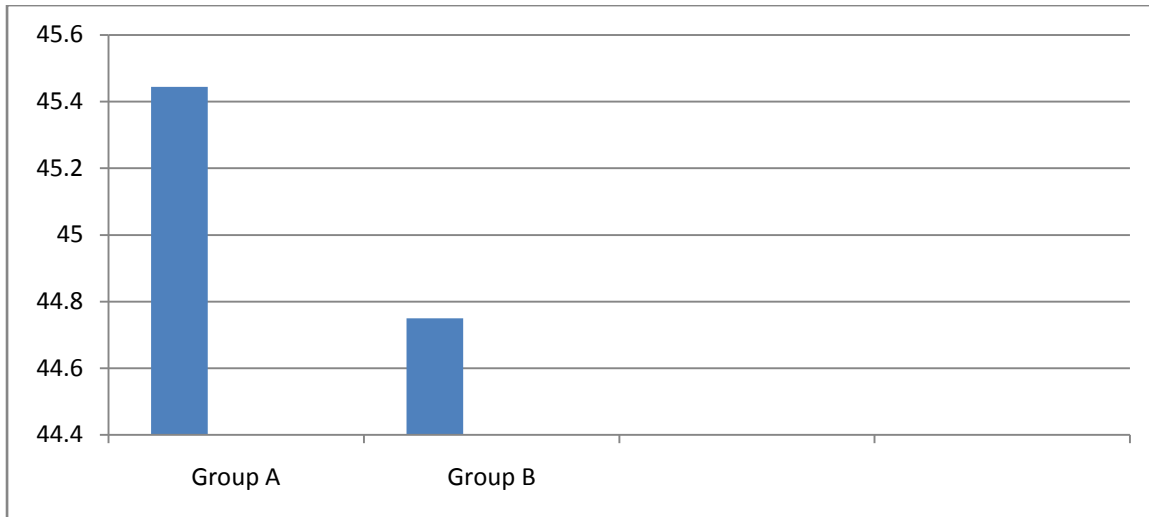
Table No. 4 shows the mean and SD ± 9.11 of group A and SD ± 6.767 of group B and t-value is 1.438 and p-value is 0.1548.

	Group A		Group B		t value	P value
	Mean	SD	Mean	SD		
Weight	36.333	9.11	33.611	6.767	1.438	0.1548

Table No. 5: Comparison of mean of distance travelled by group A & B per day in kilometers

Table No. 5 shows the mean and SD ± 32.554 of group A and mean and SD ± 15.539 of group B and t-value is 0.1155 and p-value is 0.9085

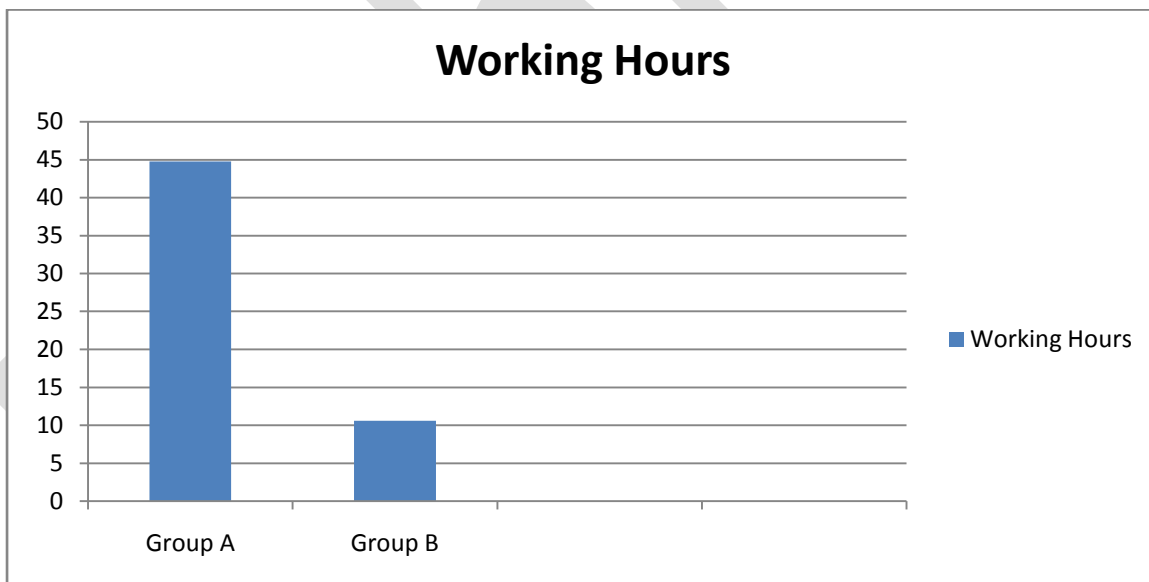
	Group A		Group B		t value	P value
	Mean	SD	Mean	SD		
Kilometers	45.444	32.554	44.750	15.539	0.1155	0.9085



Graph No. 4 – 2D bar graph shows comparison of mean of distance travelled by groups A & B per day in kilometers

Table No. 6: Comparison of mean of working hours of group A & B

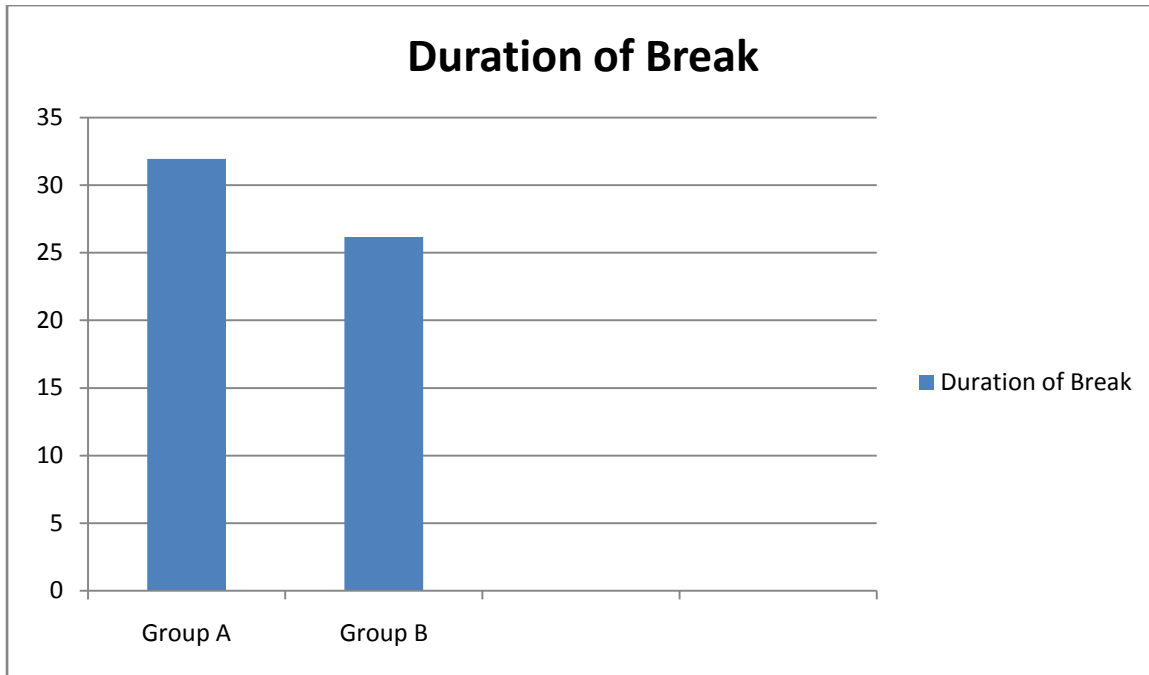
	Group A		Group B		t value	P value
	Mean	SD	Mean	SD		
Working Hours	44.750	15.539	10.611	2.66	12.990	1 <0.0001



Graph No. 5 – 2D bar graph shows comparison of mean of working hours of Groups A & B

Table No. 7: Comparison of Mean of Duration of Break of Groups A & B.

	Group A		Group B		t value	P value
	Mean	SD	Mean	SD		
Duration of Break	31.944	16.617	26.917	23.940	1.035	0.3041

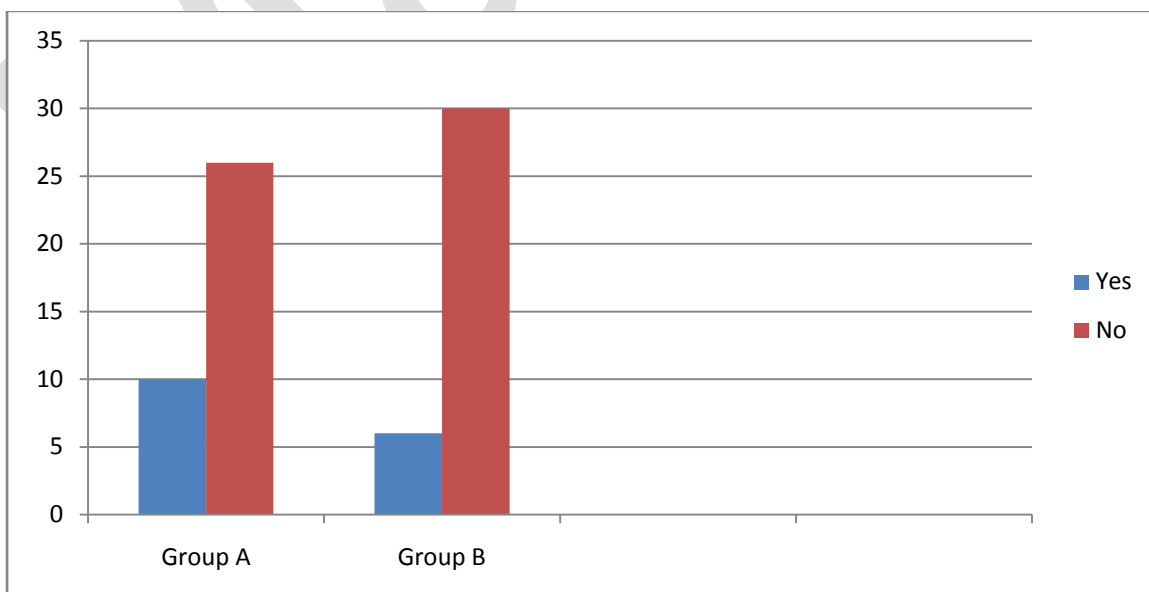


Graph No. 6 – 2D bar graph shows comparison of mean of Duration of Break of Groups A & B

Table No. 8: Recreational Activities

Table No. shows recreational activity based on yes and no according to Group A & B. Maximum subjects (77.77%) are seen with “No Recreational Activities”.

Recreational Activity	Group A	Group B	Total (%)
Yes	10	6	22.22%
No	26	30	77.77%
Total	36	36	100%

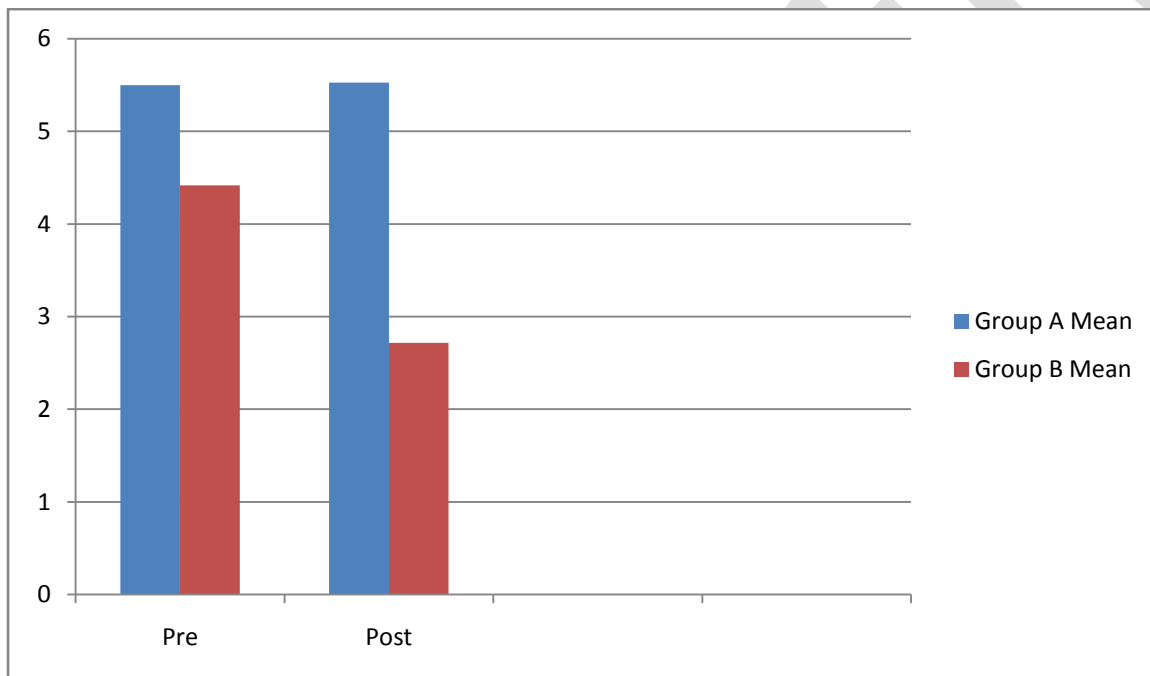


Graph No. 7 – 2D bar graph shows Recreational Activity based on Yes and No according to Groups A & B

Table No. 9 Comparison of Mean of Numeric Pain Rating Scale of Groups A & B

Table No. 9 shows pre values mean and SD ± 1.502 of Group A and mean and SD ± 0.8102 of Group B, t-value 0.0764 and p-value 0.9225. Post values mean and SD ± 1.933 of Group A and mean and SD ± 1.017 of Group B and t-value 4.502, p value <0.0001 .

NPRS	Group A		Group B		t-value	p-value
	Mean	SD	Mean	SD		
Pre	5.500	1.502	5.528	0.8102	0.09764	0.9225
Post	4.417	1.933	2.718	1.017	4.502	<0.0001



Graph No. – 2D bar graph shows comparison of mean of Numerical Pain Rating Scale (NPRS) Pre & Post of Groups A & B

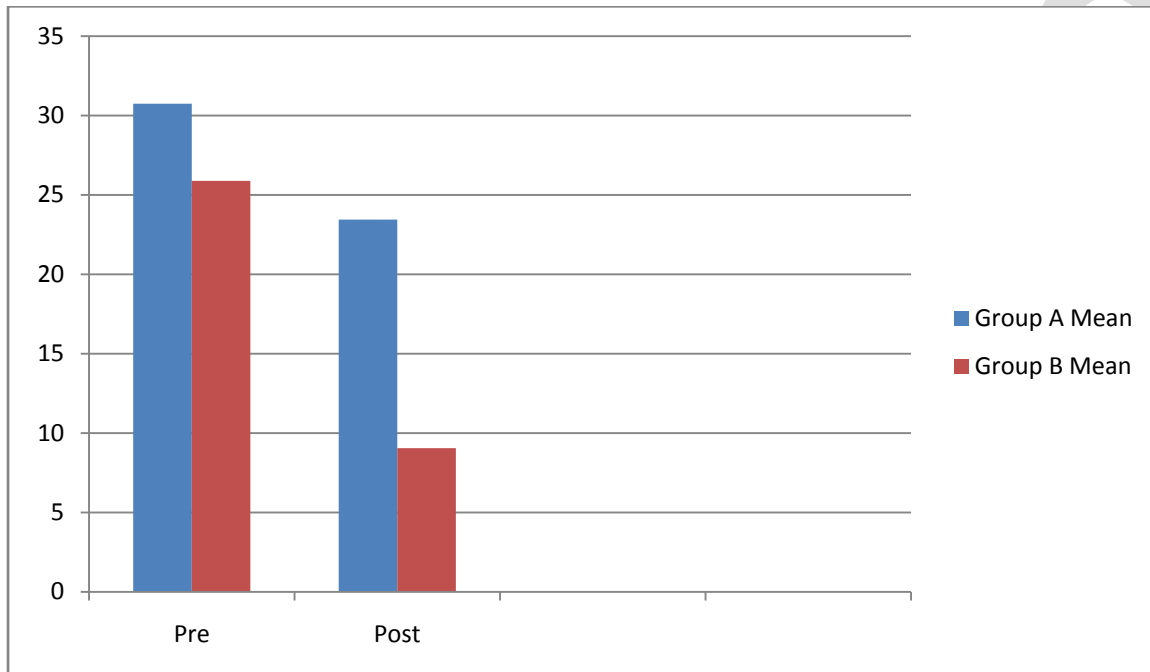
Table No. 10 Comparison of Mean Difference of Numerical Pain Rating Scale (NPRS) of Groups A & B in Pre and Post Values

Table No. 10 shows pre versus post values of mean difference 1.083, t-value 4.638 p-value <0.0001 of Group A and mean difference 2.750, t-value 13.981 and p-value <0.0001 of Group B.

NPRS	Group A				Group B			
	Mean Difference	Significance	t-value	p-value	Mean Difference	Significance	t-value	p-value
Pre vs Post	1.083	Significant	4.638	<0.0001	2.750	Extremely Significant	13.981	<0.0001

Table No. 11: Comparison of Mean of Modified Oswestry Disability Questionnaire (MODQ) of Group A & B in Pre and Post Values

	Group A				Group B			
	Mean	SD	t-value	p-value	Mean	SD	t-value	p-value
Pre	30.75	15.61	1.588	0.1169	25.889	9.096	1.588	0.1169
Post	23.944	21.271	4.098	0.0001	9.056	4.769	4.098	0.0001



Graph No. 9 – 2D bar graph shows comparison of mean of Modified Oswestry Disability Questionnaire (MODQ) of Group A & B in Pre and Post Values.

Table No. 12: Comparison of Mean Difference of Modified Oswestry Disability Questionnaire (MODQ) of Groups A & B in Pre and Post Values

Table No. 12 shows the mean difference 6.806, t-value 2.089 and p value 0.0441 of Group A and mean difference 16.833, t value 11.676 and p value <0.0001

MODQ	Group A				Group B			
	Mean Difference	Significance	t-value	p-value	Mean Difference	Significance	t-value	p-value
Pre vs Post	6.806	Significant	2.089	0.0441	16.833	Extremely Significant	11.676	<0.0001

Statistical Analysis

The data collected was entered in Microsoft Office Excel Worksheet 2008. The data was statistically analyzed using mean, standard deviation, p-value and t-value which were calculated using Graph Pad InStat version 3.10.32 bit for windows software. The data was presented using tables bar diagrams and graphs in Microsoft Office Word 2008. Paired t-test was used for analysis of data within the group. t-test was used for analysis of data between the groups.

Discussion

As a result of the study, according to body mass index distribution of participant, maximum subjects are seen to be normal weight in Group A as well as Group B. The baggage dimensions taken were same in all the participants. Compared to pre-test and post-test values, in ergonomic advice versus physiotherapy intervention, the group of courier delivery people who underwent 4 weeks exercise program showed difference in the intensity of low back pain as well as improvement in professional workings. It is observed that physiotherapy intervention subsidized more than ergonomic advices also proved beneficial for the group participants and the result also was satisfactory.

In this study, shortage of time was the main obstacle because of overload of work of the participants and their working hours. Every workplace can implement an action plan which will analyze the necessities of the workplace to improve participants' working capacity and productivity⁷. During the study we observed that the manager of the workplace and the participants were not fully aware of the ergonomic as well as physiotherapy intervention. The managers, and employees should need to get aware about the value of ergonomic and physiotherapy intervention and implement in their workplace to get more productivity and prolonged intervention from musculoskeletal disorders^{10, 13}. The active participation is most important to get better results. Appropriate physiotherapy intervention and ergonomic advice should be taken in account.

Physiotherapy intervention is more effective to reduce the physical the physical and psychosocial exposure to risk factors⁹. Courier delivery occupational Low Back Pain developed as a result of exposure to factors such as heavy baggage lifting frequent forward bending twisting using waist and body, riding bike for prolonged duration and inappropriate working condition are common causes of injury². It is considered that Low Back Pain is more frequent as a result of body movements despite the spread the spread of technology⁶. Because of this more research can be done based on physiotherapy intervention and ergonomic advice with low back pain.

Results of current study presented an extremely significant improvement in participants treated by physiotherapy intervention which is Group B and also there was a significant improvement in participants under the group with ergonomic advice which is Group A. There is a slight difference between the results in Group A and Group B as ergonomic advice could have been given for more prolonged time to get beneficial results as compared to physiotherapy intervention program is satisfactory enough by concentrating on pain reduction and improvement in quality of life of the participants.

For the betterment of the employees and to get more productivity the managers and the supervisors of the company can implement physiotherapy intervention and ergonomic advice program on a regular

basis. Many heavy weight manual handling tasks can be done with the help of various assisted devices to avoid injuries and musculoskeletal disorders.

Conclusion

This study concludes that there is more significant benefit of physiotherapy intervention in courier delivery people with Low Back Pain. It is determined that due to physiotherapy intervention there is an improvement in the productivity and the revenue. Also improvement in their working capacity and strength was observed.

Limitations

Large sample size should be advised in future studies in order to obtain strongest determination. Participants included in this study were only males. More frequent follow-ups were not implemented due to time management issues. There was no inclusion of electrotherapy modalities in this intervention program. Also as it was a short duration study, ergonomic advice group did not show better results.

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