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Effect of Work-Based Exercise Program Among Industrial Workers having Non-Specific Neck Pain Using ICF Core Set: A Pre-Post Experimental Study

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Abstract

Unfortunately, there are many causes of neck pain, the most prevalent ones are long periods of sitting, bad workplace ergonomics and keeping an unnatural neck posture. Studies show that small-scale industries lack awareness of and comprehension of ergonomics. Unpredictable schedules, long hours, hazardous workplaces, and all these problems, including inadequate vocational training, may negatively impact employees' HRQOL and restrict their capacity to take part in and carry out activities. Progressive resisted training, neuromuscular training exercises, stretching, and ergonomic recommendations are all recommended. To enhance the quality of life of industrial workers, fitness programs must be implemented. The aim is to ascertain how a work-based exercise program affects industrial workers with nonspecific neck discomfort in terms of activity limitation and participation restriction. To determine the risk of nonspecific neck discomfort among industrial workers, the RULA scale was administered to 92 individuals in the study who had VAS values ranging from 3-6. Neck ROM was also recorded. An ICF documentation form was used to ascertain the engagement and involvement. Over the course of two weeks, the subjects received a work-based exercise program on alternate days. ROM, RULA, and ICF documentation were among the outcome variables that were assessed both before and after the intervention. The result was that there was a noteworthy distinction noted between the RULA, ROM pretest and post-test scores as well as ICF codes. Differences between the pre and post-test of VAS were significant difference (Z=8.3290, p=0.0001). To conclude the study found that industrial workers lacked knowledge about ergonomics. Therefore, exercises and ergonomics helped manage neck pain and improve the range of motion.

Keywords: Ergonomics, Head Posture, ICF Model, Industrial Workers, Neck Pain, Nonspecific Neck Pain, Stretching

Abbreviation

HRQOL - Health-Related QOL
PRT- Progressive Resisted Training
RULA - Rapid Upper Limb Assessment VAS - Visual Analogue Scale
ICF - International Classification of Functioning ROM - Range of Motion
WMSDs. - Musculoskeletal Disorders connected to the Workplace SD - Standard Deviation
BMI - Body Mass Index
ICC - Intraclass Correlation Coefficient MSDs - Musculoskeletal Disorders

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1. Introduction

Musculoskeletal Disorders connected to the Workplace (WMSDs) are a global issue that affects both developed and developing countries[1]. A wide range of employment "risk factors," such as individual factors, mental stressors, and physical task components like posture, force, motions, and vibration, have been connected to WMSDs[1].

Neck discomfort ranks as the fourth most prevalent cause of disability worldwide, with a prevalence that ranges from 5.9% to 38.7% in the adult population (ages 15–74). With an annual incidence rate of above 30%, its pervasiveness has a detrimental effect on both the economy and public health. 50% of people continue to experience discomfort whether they receive treatment[2-3].

It is a frequently used tool designed to investigate work posture. The main purpose of RULA was to look into the level of risk associated with upper limb dysfunction in specific workers. The purpose of this tool is to look at working postures all at once[4].

It is thought that PRT functions by automatically resetting muscle spindles, allowing measurements of sarcomere length, tone, and lengthening in the contracted knotty regions. When applying the PRT method, the muscle is submerged in the most comfortable posture[5].

It is a commonly used instrument made to examine one's posture during work. RULA's primary goal was to investigate the degree of risk connected to upper limb dysfunction in particular workers. This tool's objective is to examine multiple working postures simultaneously[4].

PRT is considered to work by automatically resetting muscle spindles, which makes it possible to assess the length, tone, and lengthening of sarcomeres in the contracted knotty areas. The muscle is immersed in the most comfortable posture when using the PRT method[5].

2. Materials and Method

The Institutional Ethical Committee granted ethical approval with the ethical clearance certificate number 748. The institutional ethics committee of the KAHER Institute of Physiotherapy, JNMC, Nehru Nagar, Belagavi, Karnataka, India no. 628 provided ethical clearance. Under the Clinical Trial Registry of India, the trial is prospectively registered under trial number CTRI/2022/09/045950.

After determining the inclusion and exclusion criteria, research participants who were willing to participate were chosen. The study's purpose was presented to the participants. Written informed consent was obtained from every person who was recruited. Considering the current pandemic condition, the Indian Council for Medical Research's (ICMR) recommendations for COVID-19 were adhered to during the research period.

The intervention was administered to the subjects over the course of two weeks on alternate days and included a work-based fitness program and a positional release technique for neck pain. The individual completed the activities at home the remaining days, keeping a journal about them. Pre- and post-intervention evaluations were conducted for outcome measures such as ROM, RULA, and ICF documentation.

Inclusion Criteria

- Individuals with a VAS score between 3-6,
- who were willing to participate in the study were included.
- Industrial workers are assessed for the risk of nonspecific neck discomfort using the RULA scale and neck range of motion.
- An ICF documentation form was given to them to track their involvement and activities.

Exclusion Criteria

- Diagnosed with neurological conditions.
- Participants have pain secondary to trauma, spondylitis, and infection in the neck and shoulder region.
- Participants are already undergoing pain treatment before the commencement of the study.

3. Outcome Measure

3.1 Visual Analogue Scale (VAS)

The visual analogue scale is a tool widely used to measure pain on a scale of 0-10 where 0. Indicates no pain and 10 indicates worst possible pain. The change in the score represents a relative change in the magnitude of pain sensation[6].

3.2 Goniometer

Neck ROM is assessed by a Universal Goniometer. Movements include flexion, extension, lateral flexion,

and rotation. The physiotherapist may use it to make a diagnosis, develop a prognosis, create a care plan, monitor the patient's development, and assess the effectiveness of the treatment[7].

3.3 RULA

It is used in ergonomics studies of workplaces to document work-related problems in the upper limbs. It provides a fast evaluation of the positions of the head, neck, trunk, and upper limbs, as well as the function of muscles and the external stresses received by the body, all without the need for any specific equipment[8].

3.4 ICF

ICF evaluation presents the assessment result in all components of functional, environmental, and personal factors, with feedback from both the health professional and the individual, providing a detailed summary of a person's functioning state. The ICF functioning profile will assist the rehabilitation team in gaining a better understanding of a person's functioning and identifying the rehabilitation needs.

4. Procedure

All participants provided written informed consent after being told of the study's purpose. The ICMR recommendations were followed, and all relevant COVID-19 measures were performed.

Before being enrolled in the study, each participant was screened according to the inclusion and exclusion criteria.

Individuals with a VAS score between 3-6 who were willing to participate in the study were included. Industrial workers are assessed for the risk of nonspecific neck discomfort using the RULA scale and neck range of motion. An ICF documentation form was given to them to track their involvement and activities.

The intervention was administered to the subjects over the course of two weeks on alternate days and included a work-based fitness program and a positional release technique for neck pain. The individual completed the activities at home the remaining days, keeping a journal about them. Pre- and post-intervention evaluations were conducted for outcome measures such as ROM, RULA, and ICF documentation.

Ethical clearance the institutional ethics committee of the KAHER Institute of Physiotherapy.

The study was registered in the Clinical Trial Registry of India.

All participants provided written informed consent.

Before enrolling in the study, assess the inclusion and exclusion criteria.

Pre-outcome measures taken.

The intervention was given for 2 weeks.

Post-outcome measures taken.

Statistical analysis.

5. Results

5.1 Statistical Analysis

Version 29.0 of the statistical package for the social sciences was used. The PRE and POST data were assessed using the Wilcoxon matched pair test. RULA and ICF correlation was performed using correlation according to Spearman rank. The data are described using numbers, percentages, the mean, and the SD. The demographic profile of industrial workers, including age, gender, BMI, years of employment, labour hours, and type of job, was used to obtain nominal data. A probability value deemed statistically significant was one that was set at less than 0.05.

5.2 Comparison of VAS and RULA Scores for the Pre- and Post-Test Phases Using the Wilcoxon Matching Pairs Test

Pre- and post-test scores for the VAS (Z=8.3290, p=0.0001) and RULA (Z=8.2839, p=0.0001) showed a significant difference.

It indicates that there is a significant difference between the post-test and the pretest RULA and VAS ratings. Stated differently, following therapy, a large 70.21% shift in RULA was accompanied by an 86.31% change.

5.3 Pre- and Post-Term Comparison of the Cervical Rom

Right and left lateral flexion, left and right lateral rotation and cervical flexion and extension scores showed a significant difference between the pre-and post-tests, with a p-value of 0.0001. It indicates that the test results were much lower on the pretest than on the post-test.

As stated otherwise, there was a change of 24.34% in cervical flexion, 24.12% in cervical extension, 21.65% in right lateral flexion, and 22.5% in left lateral flexion. Similarly, there were changes in the right and left lateral rotation of 18.92% and 21.47%, respectively.

A comparison of the pretest and posttest of ICF was made and all the ICF codes were statistically significant with a p-value of 0.0001. d4151 code had a maximum percentage of change which is 96.66, and d4553 code shows a minimal percentage of change which is 58.62.

5.4 Correlation between RULA and ICF Was Done by Spearman Rank Correlation

The correlation between the pre-test of ICF scores and the pre-test of RULA scores was found to be positive and statistically significant. Similarly, the Correlation between the post-test of ICF scores and the post-test of RULA scores was found to be positive and statically significant.

"s76000 (cervical vertebral Column), d4103 (Sitting), d4104 (Standing), d450 (Walking) were the least affected codes".

All the other ICF codes had mild to moderate difficulty.

Mild to Moderate barriers were noticed in the domain of Environmental factors.

6. Discussion

The purpose of the current study was to ascertain how WBEP affected industrial workers with nonspecific neck pain in terms of activity limitation and participation restriction. Additionally, the ICF core sets to create an ICF functional profile among industrial workers experiencing non-specific neck pain.

The Goniometer was used to measure cervical range of motion, the VAS was used to measure discomfort, and RULA was utilized to analyze the risk factors related to working. It was developed in the realm of ergonomics in response to recognized upper extremity issues at work.

The VAS is a subjective tool used to gauge how much pain a patient is experiencing right now in comparison to the worst pain they have ever experienced. It is a widely used method for evaluating pain severity and alleviation due to its ease of use, and research has shown that VAS has high ICCs with 95% confidence intervals.

VAS was employed as an outcome measure in the present investigation to evaluate pain. Pre- and post-intervention assessments were conducted to see if there had been any improvement in the degree of pain. When comparing the pre-posttest, a statistically significant outcome was seen (p=0.0001). The subjects' enhanced perceptions of pain were 86.31%.

Three codes from the body's structure and two codes from its function were selected from among the eighteen codes available across the four ICF domains. Together with the RULA scale, a questionnaire about the activities and participation of industrial workers is formed by

11 categories about activity limitation and participation restriction and 2 codes about environmental conditions.

Workers in the packing business were given the RULA to assess their working position. According to the study's findings, RULA can be used to assess bad posture and prevent discomfort and health-related issues. It was also advised that management and assessment be done of manual material handling. To prevent bad posture during working hours, ergonomic guidance was provided, and the current study analyzes the development of risk variables. The results showed that the worker's posture had significantly improved[9].

A study was conducted on participants with persistent neck discomfort to see if progressive resisted exercises could help with pain and impairment. The intervention was administered for nine sessions to 127 individuals, and it was noted that there was a significant improvement

in the NPRS, strength, and disability. Similar results were seen in the current trial when 92 individuals received a work-based fitness regimen on different days for a total of 14 days. Following the intervention, the VAS score was found to have dramatically decreased[10].

An investigation was conducted to assess the impact of stretching, active rotation, and joint mobilization on people with non-specific neck discomfort. This 38-person study found that increasing cervical range of motion with a stretching exercise program was more beneficial, but there were differences in pain and disability. Similarly, stretching was added to PRT in this study along with neuromuscular exercises and ergonomics, and all these factors significantly increased the cervical range of motion. Additionally, a difference in the VAS score was observed, and this resulted in a reduction in the pain score following the intervention[11].

Evaluations were conducted on the immediate effects of trigger point release and PRT on cervical range of motion and neck pain. Sixty individuals in the 18-35 age range were split into two groups, with one receiving PRT in a shortened position and the other receiving MTrP release in a neutral position.

Pre- and post-first sessions, as well as after the fourth session, were used to measure the range of motion and pain intensity. There was a decrease in pain intensity and an increase in cervical range of motion in both groups. The current study examined the effects of a work-based exercise program among 92 industrial workers with nonspecific neck pain using PRT in conjunction with neck stretching neuromuscular exercises and ergonomics. It found that there was a significant increase in cervical ROM and a significant decrease in VAS score[12].

The impact of ergonomics education on the prevalence of MSD disorders in different working environments populations has been the focus of a lot of studies. In a study, Brisson *et al*. discovered that upper extremity anxiety decreased from 19% to 3% after watching the video display instructions.

Bhor also found that fewer MSD complaints and pain are reported by skilled workers. Johnson claims that among study participants, there was no appreciable decline in MSD related to the workplace. The current study offers ergonomic recommendations for improving posture at work and altering the work environment. These recommendations led to a decrease in the RULA score, indicating a low to no risk of developing MSDs[13].

In a study by Nada *et al*., patients with neck pain were assessed using ICF. The domains of bodily functions and activity participation are studied in this study. Nine codes from activity participation and four from bodily functions were used. The majority of patients' unique functional problems in the study showed a good fit model with the ICF model, the study concluded. Codes about domestic life, mobility, and other areas demanded a multidisciplinary team's all-encompassing approach. There are eighteen codes from four domains in this study. Thirteen codes relate to activity and participation, two to environmental factors, three to body structure, and two to body function. It was discovered that the majority of participants experienced mild to moderate difficulties. Similarly, most codes related to body structures and functions showed mild to moderate impairment, and the environmental factors domain revealed moderate barriers[14].

7. Conclusion

The study found that industrial workers lacked knowledge about ergonomics. Therefore, exercises and ergonomics helped manage neck pain and improve the range of motion.

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