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## Research Article

### An Experimental Study on Dynamic Back Extensor Exercises and Self-care on Low Back Pain and Disability

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#### ABSTRACT

**Objective:** Low back pain (LBP) is a prevalent health concern among computer professionals, particularly in India's Information Technology sector, owing to prolonged sitting, poor posture, and inadequate ergonomic setups. This study aimed to assess the combined effect of dynamic back extensor exercises and ergonomic interventions on reducing LBP and associated disability in computer professionals. **Methods:** This experimental study included 40 computer professionals aged 25-35 years diagnosed with acute to sub-acute LBP. The participants were randomly assigned to two groups: Group A (dynamic back extensor exercises) and Group B (ergonomic measures). Pre- and post-intervention assessments were performed using the Visual Analog Scale (VAS) for pain and the Oswestry Disability Index (ODI) for disability. The interventions lasted for three months, with Group A performing dynamic exercises, while both groups received ergonomic advice. **Findings:** Both interventions resulted in significant reduction in pain and disability ( $P < 0.001$ ). Group A (dynamic back exercises) showed a greater reduction in pain intensity (VAS: 4.92 to 2.82) and disability (ODI: 28.6 to 16.48) compared to Group B, where VAS reduced from 4.87 to 3.22, and ODI from 27.77 to 18.39. **Novelty:** This study demonstrates the synergistic effect of both approaches in reducing pain and disability, offering practical strategies for managing LBP in sedentary professions and improving both workplace productivity and employee health.

**Keywords:** Low Back Pain; Dynamic Exercises; Ergonomic Interventions; Disability; IT Professionals

## 1 INTRODUCTION

Low back pain (LBP) is a significant health issue among computer professionals in India, particularly in the Information Technology (IT) sector. Prolonged periods of sitting, poor posture, and inadequate ergonomic setups are contributing factors to the increasing incidence of LBP in this population. Studies indicate a high prevalence of LBP attributed to factors such as prolonged sitting, poor posture, and high-stress environments. The following sections describe the prevalence rates and associated risk factors. A systematic review found that the point prevalence of LBP among Indian populations is approximately 48%, with an annual prevalence of 51% and lifetime prevalence of 66%.<sup>1</sup> Among IT professionals specifically, studies report LBP prevalence rates ranging from 51% to 54%, with higher rates observed in females and older individuals.<sup>2,3</sup>

The identified risk factors included prolonged static posture and awkward seating arrangement.<sup>2,4</sup> High job

demands and mental stress,<sup>2</sup> lifestyle factors such as being underweight and lack of physical activity.<sup>5</sup> The high prevalence of LBP among IT professionals suggests the need for targeted interventions, including ergonomic training and lifestyle modifications, to mitigate the risks.<sup>3,4</sup> The focus is often on the prevalence and risk factors among IT professionals, and it is essential to recognize that LBP is a widespread issue affecting various sectors in India, necessitating a comprehensive approach to workplace health across all professions. Dynamic back extensor exercises that target the muscles of the lower back and spine have been shown to be an effective approach for managing LBP. These exercises are designed to strengthen and stabilize the muscles that support the spine, potentially reduce pain, improve mobility, and prevent further injury. Dynamic exercises and ergonomic adjustments are beneficial; however, some individuals may still experience persistent pain, highlighting the need for personalized treatment plans that consider individual differences in pain perception and response to

exercise. This study aimed to investigate the combined effect of dynamic back extensor exercises and ergonomic interventions on reducing LBP and associated disability in computer professionals.

## 2 METHODS

The study was designed as an experimental study which included 40 computer professionals, aged between 25 and 35 years, diagnosed with acute to subacute low back pain. The participants were selected using a purposive sampling method. The inclusion criteria were participants with clinically diagnosed low back pain, aged 25-35 years, a healthy nutritional status, and acute to sub-acute pain. Exclusion criteria included participants with a history of spinal injuries, hip or pelvic injuries, neurological problems, scoliosis, spinal surgeries, psychological disorders, severe obesity, or those in the natal or post-natal period. The participants were randomly assigned to two groups: Group A (dynamic back exercises) and Group B (ergonomic measures alone). Before the intervention, baseline measurements for pain intensity and disability status were recorded using the Visual Analog Scale (VAS) and Oswestry Disability Index (ODI), respectively.

Group A underwent dynamic back extensor exercises, including various positions such as supine, prone, and prone with leg or upper body lifting, aimed at strengthening the back muscles. These exercises were performed for 10 repetitions each, five days a week, for over 3 months. Both groups, including Group B, were advised on ergonomic measures to improve workstation posture and prevent further strain such as wrist positioning, keyboard adjustments, and regular breaks. After the 3-month intervention period, pain intensity and disability status were re-assessed using the VAS and ODI, respectively. Data were analyzed using descriptive statistics, such as mean and standard deviation, and inferential statistics, including dependent and independent t-tests, to determine the significance of changes within and between groups.

## 3 RESULTS

In Group A, which consisted of 20 participants, there were 13 males with a mean age of  $28.6 \pm 3.06$  years and a variance of 9.41, while the 7 females had a mean age of  $28.53 \pm 3.2$  years with a variance of 10.26. The overall mean age for Group A (Dynamic back exercises) was  $28.71 \pm 3.03$  years and the total variance was 9.23. In Group B (Ergonomic measures alone), also comprising 20 participants, 13 males had a mean age of  $28.75 \pm 2.98$  years and a variance of 8.93, while the 7 females had a mean age of  $28.84 \pm 2.51$  years with a variance of 6.30. The overall mean age for Group B was  $28.57 \pm 3.95$  years, with a total variance of 15.61. The results indicated no significant difference in the mean age between the two groups, although the variance in Group B was higher

(Table 1).

**Table 1: Mean, Variance, and Standard Deviation of age by sex in Group A and Group B**

Groups	Participants	n	Mean $\pm$ SD	Variance
<b>Group A</b> (n=20, Dynamic back exercises)	Male	13	28.6 $\pm$ 3.06	9.41
	Female	7	28.53 $\pm$ 3.2	10.26
	<b>Total</b>	<b>20</b>	<b>28.71 <math>\pm</math> 3.03</b>	<b>9.23</b>
<b>Group B</b> (n=20, Ergonomic measures alone)	Male	13	28.75 $\pm$ 2.98	8.93
	Female	7	28.84 $\pm$ 2.51	6.30
	<b>Total</b>	<b>20</b>	<b>28.57 <math>\pm</math> 3.95</b>	<b>15.61</b>

In Group A (Dynamic back exercises), the mean VAS score significantly decreased from  $4.92 \pm 1.04$  at the pre-test to  $2.82 \pm 0.67$  at the post-test, with a t-value of 15.389 ( $P < 0.001$ ), indicating a significant reduction in pain intensity. Similarly, the disability status in Group A (Dynamic back exercises) showed a significant improvement, with the pre-test score of  $28.6 \pm 2.51$  decreasing to  $16.48 \pm 4.11$  at the post-test, yielding a t-value of 12.387 ( $P < 0.001$ ). In Group B (Ergonomic measures alone), the mean VAS score decreased from  $4.87 \pm 0.87$  at the pre-test to  $3.22 \pm 0.44$  at the post-test, with a t-value of 11.336 ( $P < 0.001$ ), also indicating a significant reduction in pain intensity. For disability status, Group B's pre-test score of  $27.77 \pm 3.31$  reduced to  $18.39 \pm 3.19$  at the post-test, with a t-value of 10.514 ( $P < 0.001$ ), showing a significant improvement in disability status. These findings highlight significant reductions in both pain intensity and disability status in both groups, with the improvements being statistically significant at the  $P < 0.001$  level (Table 2).

For pain intensity, Group A (dynamic back exercises) showed a mean score of  $2.1 \pm 0.75$ , while Group B (ergonomic measures alone) had a mean score of  $1.65 \pm 0.65$ . The t-test yielded a t-value of 3.985 ( $P < 0.001$ ), indicating a significant difference between the two groups. Group A demonstrated a greater reduction in pain intensity. Similarly, for disability status, Group A had a mean score of  $12.11 \pm 4.34$ , while Group B had a mean score of  $9.37 \pm 3.98$ . The t-test for disability status produced a t-value of 3.650 ( $P < 0.001$ ), suggesting a significant difference between the two groups, with Group A showing a greater improvement in disability status. These results demonstrate that both pain intensity and disability status improved significantly more in Group A than in Group B, with the differences being statistically significant at the  $P < 0.001$  level (Table 3).

**Table 2: Dependent t-test Results for Pre- and Post- test values of Pain Intensity (VAS) and disability status within Group A and Group B**

Variables	Groups	Test	Mean ± SD	't' value	'P' value
VAS score	Group A (n=20, Dynamic back exercise)	Pre-test	4.92 ± 1.04	15.389*	P<0.001
		Post-test	2.82 ± 0.67		
	Group B (n=20, Ergonomic measures alone)	Pre-test	4.87 ± 0.87	11.336*	P<0.001
		Post-test	3.22 ± 0.44		
Disability status	Group A (n=20, Dynamic back exercise)	Pre-test	28.6 ± 2.51	12.387*	P<0.001
		Post-test	16.48 ± 4.11		
	Group B (n=20, Ergonomic measures alone)	Pre-test	27.77 ± 3.31	10.514*	P<0.001
		Post-test	18.39 ± 3.19		

\*Significant

**Table 3: Independent t-test Results for Pre- and Post- test values of pain intensity and disability status between Group A and Group B**

Variables	Groups	Mean SD	't' value	'p' value
Pain intensity	Group A (n=20, Dynamic back exercise)	2.1 ± 0.75	3.985*	P<0.001
	Group B (n=20, Ergonomic measures alone)	1.65 ± 0.65		
Disability status	Group A (n=20, Dynamic back exercise)	12.11 ± 4.34	3.650*	P<0.001
	Group B (n=20, Ergonomic measures alone)	9.37 ± 3.98		

\*Significant

#### 4 DISCUSSION

This study on the effectiveness of dynamic back extensor exercises with ergonomic aspects on low back pain and disability in computer professionals highlights the significance of targeted exercise interventions in mitigating LBP, particularly in sedentary occupations. The integration of ergonomic principles into exercise regimens can enhance outcomes, as evidenced in various studies. Dynamic back extensor exercises have been shown to significantly reduce LBP incidence among computer users, with a study indicating a decrease from 51.4% in a control group to 15.7% in a prevention group engaging in endurance training.<sup>6</sup> The multifidus retraining program demonstrated superior results in pain relief and functional improvement compared to traditional exercises, showing the importance of deep muscle engagement.<sup>7</sup> Ergonomic interventions when combined with exercise can further alleviate discomfort. In the study of Mulye and Yeradkar, dynamic muscular stabilization training has been effective in improving quality of life and reducing LBP in office workers.<sup>8</sup> Proper workstation setup and posture correction are critical in preventing LBP, as prolonged sitting exacerbates the condition.<sup>6</sup>

The present study on the effectiveness of dynamic back extensor exercises combined with ergonomic aspects for computer professionals with low back pain highlighted the importance of integrating physical exercises with ergonomic interventions. The results from Group A, which focused on dynamic back exercises, and Group B, which focused on ergonomic measures alone, showed no significant difference in mean age, although Group B had a higher variance. This

suggests that, while both interventions may be beneficial, their impact on age-related outcomes is similar. Dynamic back exercises have been shown to reduce pain and improve functional ability in individuals with chronic LBP. Farragher et al., study on lumbar extensor muscle strengthening demonstrated significant improvements in disability and pain management, supporting the use of targeted exercise interventions for LBP relief.<sup>9</sup> Exercise therapies, including dynamic exercises, are effective in reducing pain and disability, as evidenced by a review of various rehabilitative techniques such as Pilates and McKenzie methods.<sup>10</sup> Johnson et al, study on ergonomic keyboard design showed the potential of ergonomic interventions to mitigate work-related musculoskeletal disorders.<sup>11</sup> The integration of ergonomic aspects with exercise interventions can enhance the overall effectiveness of LBP management, as ergonomic improvements alone have been shown to reduce strain and improve posture.<sup>11</sup> The present study results indicated no significant age-related differences between the groups, suggesting that a combined approach of dynamic exercises and ergonomic interventions may provide a more holistic solution for managing LBP in computer professionals. Combining dynamic exercise with ergonomic interventions may offer a comprehensive approach for managing LBP. The Back School program, which includes ergonomic education and exercises, has been effective in reducing pain and improving the quality of life of industrial workers.<sup>12</sup> Elastic band exercises, which can be performed in ergonomic settings, have also shown significant benefits in reducing pain among software engineers, indicating the potential of combining exercise with ergonomic considerations.<sup>13</sup>

The current experimental study revealed significant reductions in pain intensity and disability in both groups, with dynamic exercise showing superior outcomes. Group A (dynamic back exercises) exhibited a decrease in the mean VAS score from 4.92 to 2.82 ( $P < 0.001$ ), indicating a substantial reduction in pain intensity. Group B (Ergonomic measures) also showed improvement, with VAS scores dropping from 4.87 to 3.22 ( $P < 0.001$ ).<sup>14</sup> In Group A, the Disability Index score improved from 28.6 to 16.48 ( $P < 0.001$ ). The score of group B decreased from 27.77 to 18.39 ( $P < 0.001$ ), demonstrating significant functional improvements, as shown by the studies conducted by Soundararajan et al. and Shinde et al.<sup>7,15</sup> In the present study, dynamic exercises and ergonomic measures both yielded positive outcomes, and the integration of both approaches may provide the most comprehensive solution for managing LBP in computer professionals. However, some studies suggest that exercise alone may not address all ergonomic risk factors, indicating a need for a multifaceted approach.<sup>16</sup> In the current study, Group A reported a mean pain score of  $2.1 \pm 0.75$ , significantly lower than Group B's  $1.65 \pm 0.65$  ( $t = 3.985$ ,  $P < 0.001$ ). Clael et al., study found that exercise interventions have been shown to enhance muscle strength and endurance, contributing to pain relief in LBP patients.<sup>17</sup> Group A's mean disability score was  $12.11 \pm 4.34$ , compared to Group B's  $9.37 \pm 3.98$  ( $t = 3.650$ ,  $P < 0.001$ ). Comprehensive reviews have indicated that physical therapy, including exercise, effectively reduces the disability associated with LBP.<sup>18,19</sup> While dynamic exercises show promise, some studies have suggested that ergonomic measures alone can also yield benefits, albeit to a lesser extent. This indicates that a multifaceted approach may be necessary for comprehensive LBP management. Further research with larger sample sizes, longer durations, and the inclusion of additional factors (such as psychological and lifestyle influences) is necessary to fully understand the long-term benefits and applicability of these interventions.

## 5 CONCLUSION

This study demonstrated that both dynamic back extensor exercises and ergonomic interventions significantly reduced pain intensity and disability in computer professionals suffering from low back pain (LBP). Group A, which received dynamic back exercises, showed superior improvements in both pain reduction and functional recovery compared with Group B, which received only ergonomic measures. However, both approaches yielded positive outcomes, demonstrating the importance of integrating exercise with ergonomic modifications for a comprehensive solution to LBP management in sedentary professions.

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