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IMPACT OF YOGA THERAPY AND ACUPRESSURE ON PSYCHO-PHYSIOLOGICAL VARIABLES AMONG YOUNG INDUSTRIAL EMPLOYEES WITH LOWER BACK PAIN WITH VARIABLE BODY MASS INDEX AND PHYSICAL EXERCISE

T. Saravanan[1], G. Raghuram[2], S. Vidhya Shankari[3], K. Subbulakshmi[4], V. Subbu Lakshmi[5]

[1]PhD Scholar, Department of Yoga Science and Therapy, Meenakshi College of Yoga,Science and Therapy, Meenakshi Academy of Higher Education and Research, Chennai, Tamil Nadu, India. Email: tsaravanan0717@gmail.com. ORCID ID: 0009-0009-5869-6112.
[2]Assistant Professor, Department of Yoga Science and Therapy, Meenakshi College of Yoga Science and Therapy, Meenakshi Academy of Higher Education and Research, Chennai, Tamil Nadu, India. Email: drgraghu-yoga@maher.ac.in. ORCID ID: 0009-0006-6254-1701.
[3]Assistant Professor, Centre for Yoga, SRM Institute of Science and Technology, Kattankulathur, Chengalpattu District, Tamil Nadu, India. Email: vidhyass1@srmist.edu.in. ORCID ID: 0009-0007-5430-5386.
[4]Assistant Professor, Department of Yoga Science and Therapy, Meenakshi Academy of Higher Education and Research, Chennai, Tamil Nadu, India. Email: drsubha_yoga@maher.ac.in. ORCID ID: 0009-0005-5759-1408.
[5]Principal, Meenakshi College of Yoga Science and Therapy, Meenakshi Academy of Higher Education and Research, Chennai, Tamil Nadu, India. Email: principal.yoga@maher.ac.in. ORCID ID: 0009-0009-0504-9739.

ABSTRACT

One of the most significant occupational health issues in the industrial workers is the lower back pain (LBP), and this arises as a result of repetitive strain, long postures, and inappropriate physical conditioning. The proposed research aims to determine the effects of the use of Yoga Therapy and Yoga Therapy + Acupressure on Body Mass Index (BMI) and Adjustment of Physical Exercise in young industrial workers with LBP. The study was a randomized group experimental one, with a sample population of 180 male employees of the Engine Factory Avadi (EFA) in Chennai and was performed under three groups: Group A (Yoga Therapy), Group B (Yoga Therapy + Acupressure), and Group C (Control). The course was 12 weeks long, with the structured yoga sessions taking place five days in a week. Measuring BMI and Adjustment of Physical Exercise was done before and after the intervention with the help of standardized instruments. Results indicated that there were pronounced changes in the BMI among all groups with the best changes being recorded in Group B. Equally, the Adjustment scores had been boosted significantly across the groups although Group B recorded the greatest improvement. Significant within-group improvements were found as were paired t-tests, but positive psychological and behavioural changes, particularly to the combined intervention, were implied by the effect size analysis. The between-group differences were not statistically significant although the trends were in favour of the yoga and acupressure combination. The findings demonstrate the efficacy of yoga acupressure in integrating the physiological and behavioural outcomes of workers with LBP in the industrial setting. The results substantiate the use of holistic and non-invasive wellness programmes in occupational health.

KEYWORDS: Yoga therapy, Acupressure, Body Mass Index, Exercise Adjustment, Industrial employees

INTRODUCTION

Lower back pain (LBP) has been one of the most common and debilitating musculoskeletal disorders globally with people of all ages and professions being affected. The Global Burden of Disease Study indicated that LBP has been one of the main causes of years lived with disability worldwide, and its prevalence has gradually increased since 1990-2017 (Wu et al., 2020). LBP is especially more prevalent among the occupational groups, especially industrial and manufacturing workers, since their jobs require repetitive work, awkward poses, and physical burdens. A number of studies on occupation have found that employees who are exposed to high biomechanical and ergonomic lead to considerably increased LBP (Vicente-Herrero et al., 2019; Chaiklieng and Suggaravetsiri, 2020). These results indicate the significance of the effective early interventions, particularly in young employees whose physical load and future productivity are affected by the chronic pain.

There are several risk issues which have caused LBP and its persistent effects, they are obesity, lack of physical activity, poor posture and psychosocial stress. The problem of obesity has been repeatedly discovered as a serious predictor of chronic LBP, and meta-analyses prove that a higher level of BMI increases mechanical stress on the spine and inflammatory factors related to pain (Zhang et al., 2018; Hashem et al., 2018). It is also found that sedentary behavior can also increase the LBP rates, and frequent leisure-time physical exercise has a protective effect (Lemes et al., 2021). The longitudinal results also confirm that sedentary lifestyle, lack of muscle conditioning, and unhealthy lifestyle choices all lead to the risk of long-term back pain (Shiri et al., 2019). The findings support the inclusion of BMI and Adjustment of Physical Exercise as the key variables that can be considered to be relevant to the psycho-physiological processes involved in LBP.

Due to the low efficacy and high cost of pharmacological interventions in the management of chronic LBP, there is an increasing interest in the safe and accessible non-invasive methods (Andronis et al., 2017). Of them yoga therapy has

proven to be a promising modality because it combines physical poses, breathing techniques, mindfulness and relaxation in a holistic way. The yoga practice is found to enhance musculoskeletal strength, flexibility, posture, and autonomic balance as well as decreasing stress levels and inflammation- the factors that are strongly correlated with chronic pain (Joshi, 2020; Tyagi, 2024). It is also applicable to occupational health because it is shown that physical fitness and stress levels decrease and functional recovery occurs in injured workers who are enrolled in yoga-based rehabilitation programs (Rachiwong et al., 2015; Acharya et al., 2021). In the same vein, yoga sessions in the workplace are reported to improve the well-being and relieve physical pain in desk-based and industrial workers (Paramashiva et al., 2025).

Simultaneously, acupressure, which is a method of ancient medicine of pressing certain points of the body, has become a popular complementary method of managing pain. Based on clinical trials and systematic reviews, acupressure can be used to reduce chronic pain, decrease muscle tension, and impact the autonomic system and psychophysiological functioning (Hutsalenko et al., 2022; Singhania, 2024). Acupressure has been used to complement physiotherapy and exercise-based rehabilitation with success and also help in faster recovery, reduce pain, and increase mobility (Chughtai et al., 2025). In addition, the reviews on its activity in hypertension and disorders of lifestyle indicate that it has a more extensive systemic impact on circulation, metabolism, and stress regulation (Balaji and Smitha, 2023).

New integrative modalities that involve yoga and acupressure have proven to have greater efficacy than interventions based on one modality. In one instance, there has been reported evidence that holistic programs that include yogic practices and acupressure have led to an improvement in the lower back pain, metabolic health, and emotional regulation due to synergy among physical, energetic, and psychological processes (Kumar et al., 2025). These advantages are consistent with behavior change studies that focus on the idea that mind-body interventions enhance motivation, adherence, and sustained participation in physical activities (Karloh et al., 2023). A better Adjustment of Physical Exercise thus is a significant psychological construct that can determine recovery and lifestyle change.

Although a lot of evidence is available to support yoga and acupressure as therapeutic measures, research evaluating the effects of a combination of these two modalities on psycho-physiological parameters among industrial workers with LBP is still in a scanty number. The young industrial workers form a special group with high physical and ergonomic demand, early intervention will help in avoiding chronic disability and in the long-term occupational health. Thus, the current research examines the role of Yoga Therapy and Yoga Therapy with Acupressure on the BMI and Adjustment of Physical Exercise in young industrial employees with lower back pain in an attempt to bridge the gap on mind-body studies at work.

2. METHODOLOGY

2.1 Research Design

The experimental design adopted was a random group study to determine the effects of Yoga Therapy and Yoga Therapy associated with Acupressure on two important variables that relate to psycho-physiological variables including Body Mass Index (BMI) and Adjustment of Physical Exercise among young industrial employees with lower back pain. The research was based on a pre-test and post-test design and comprised three groups: a Yoga Therapy group, a Yoga Therapy with Acupressure group, and a Standard Care control group.

2.2 Participants

2.2.1 Population

It was comprised of young male workers in the Engine Factory Avadi (EFA), Chennai who had lower back pain and were aged 20-35 years.

2.2.2 Sample Size

- Two hundred employees have been screened on assessment form. Out of these, 180 potential subjects that satisfied the inclusion criteria were chosen and randomly placed into three equal groups:
- Group A (Yoga Therapy): n = 60
- Group B (Yoga Therapy + Acupressure): n = 60
- Group C (Standard Care/Control): n = 60

2.2.3 Sampling Method

The use of a simple random sampling method was used to make sure that all the eligible employees had an equal opportunity to partake. Randomization was done following baseline assessment and consent.

2.3 Inclusion Criteria

The participants were eligible in case they met the following:

- Male employees
- Age range: 20–35 years
- Diagnosed lower back pain
- In good health to attend non-invasive yoga and acupressure classes.

2.4 Exclusion Criteria

Those who did not include in the study were those who:

- Severe musculoskeletal or neurological conditions.
- Physiological malformations or general illnesses.
- Cognitive or perceptual or comprehensive impairments.
- Physical disabilities
- Failure to cooperate or cooperate reluctantly.
- The original study design disqualified female employees.

2.5 Intervention Protocol

The intervention was 12 weeks long where the participants attended 5 days in a week with 60 minutes sessions between 16:00 and 17:00 hours. The practices were all non-invasive and based on personal ability.

2.5.1 Group A — Yoga Therapy

Participants practiced a structured yoga module including:

1. Prayer (Om Chanting) — 5 minutes
2. Loosening Exercises — 10 minutes

- Pavana Muktasana series (Bihar School of Yoga)
- Neck and spinal joint warm-ups
- Sukshma Vyayama (Kati-Sakti-Vikasaka 1–5)

3. Asanas — 15 minutes

- Including:
- Tadasana, Ardhachakrasana, Parivritta Trikonasana
- Ustrasana, Marjariasana, Sarala Matsyasana
- Bhujangasana, Shalabhasana, Saral Dhanurasana
- Makarasana, Shavasana

4. Pranayama — 15 minutes

- Nadi Shodhana, Shitali, Bhramari
- Yoga Nidra and Meditation

2.5.2 Group B — Yoga Therapy with Acupressure

The respondents were subjected to the complete Yoga Therapy module of Group A and acupressure stimulation at six major points:

- Stomach acupressure point
- Lower back point
- Hip bone point
- Knee point
- Hand point
- Leg point

The duration of acupressure was 15 minutes per session.

2.5.3 Group C — Standard Care (Control Group)

Yoga and acupressure were not administered to the participants. They were left to engage in their daily routine of life and were allowed to rest actively without any form of intervention.

2.5.4 Outcome Variables and Measurement Tools

1. Body Mass Index (BMI)

A) Instrument:

- Weight scale
- Height scale

B) Measurement:

BMI was calculated using the standard formula:

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}$$

2. Adjustment of Physical Exercise

A) Instrument:

- Dyadic Adjustment Scale and Adjustment Questionnaire

B)Measurement:

The scores that indicated the ability of the participant to adapt, perform, and maintain physical exercise routines were measured before and after intervention.

2.6 Data Collection Procedure

The data collection process for this study was conducted systematically in three stages to ensure accuracy and consistency across all groups. During the Pre-test Assessment, all three groups underwent initial recordings of Body Mass Index (BMI) and Adjustment of Physical Exercise scores. These measurements were taken before the commencement of any intervention activities, ensuring that all participants' baseline levels were accurately documented and comparable. In the Intervention Period, participants in Group A and Group B engaged in a structured 12-week yoga-based program, which included supervised sessions conducted five days per week. Group C, which served as the control group, did not receive any yoga or acupressure intervention and instead continued with their routine daily activities as part of standard care. Following the intervention, the Post-test Assessment was carried out after twelve weeks, during which the BMI and Adjustment of Physical Exercise scores of all participants were reassessed using the same measurement tools and procedures employed during the pre-test phase. This consistency in measurement ensured that the pre- and post-test values were directly comparable, thereby enabling accurate evaluation of the intervention's effectiveness.

2.7 Data Analysis

Manual statistical computations were carried out to analyse the outcomes of the study. Within-group changes from pre-test to post-test were evaluated using paired t-tests to determine the significance of improvements in each group. To compare the differences between the three groups, unpaired t-tests were applied, allowing for assessment of whether the intervention groups differed meaningfully from the control group. Additionally, Cohen's d effect size was calculated to

measure the magnitude and practical strength of the observed improvements across variables. Descriptive statistics, including mean, standard deviation, and percentage change, were also computed to summarize central tendencies, variation, and the extent of change from baseline to post-intervention. This comprehensive approach ensured robust statistical interpretation of the physiological and behavioural outcomes.

3. RESULTS

3.1 Descriptive Statistics for BMI

Table 1 indicates the mean and standard deviation of Body Mass Index (BMI) of the three study groups before and after the test. Table 1 displays the pre intervention and post intervention BMI of all the three groups.

Table 1. Descriptive Statistics of BMI (Pre–Post)

Group	BMI Pre Mean ± SD	BMI Post Mean ± SD
Group A (Yoga Therapy)	26.04 ± 4.61	25.47 ± 4.57
Group B (Yoga + Acupressure)	26.48 ± 5.17	25.88 ± 5.15
Group C (Control)	26.40 ± 4.69	25.91 ± 4.72

Interpretation – BMI

The groups all demonstrated slight decreases in BMI between pre-test and post-test.

The highest decrease was seen in Group B (Yoga + Acupressure) (mean reduction ≈ 0.60 kg/m 2).

Group A achieved the intermediate improvement, unlike the control group that had little change. As Figure 1 shows, the interventions resulted in a decrease in BMI in all groups.

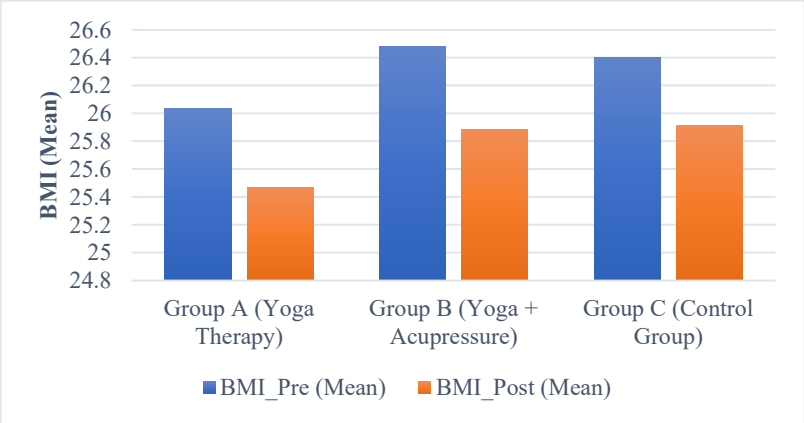


Figure 1. Bar Chart of BMI Pre–Post Means Across Groups

3.2. Descriptive Statistics for Adjustment of Physical Exercise

The computation of adjustment involved the total of the 15 Likert-scale items. As Table 2 shows, Groups A and B showed significant changes in the adjustment scores.

Table 2. Descriptive Statistics of Adjustment of Physical Exercise (Pre–Post)

Group	Adj Pre Mean ± SD	Adj Post Mean ± SD
Group A (Yoga Therapy)	52.97 ± 3.85	62.07 ± 4.55
Group B (Yoga + Acupressure)	52.57 ± 4.40	62.57 ± 5.16
Group C (Control)	52.92 ± 3.72	4.77

There was a clear improvement in Adjustment scores across all three groups, with Groups A and B showing noticeably better gains compared to the control group. Among them, Group B exhibited the greatest positive change, with an increase of more than 10.00 points, indicating a stronger enhancement in readiness and adaptability toward physical exercise. The control group also demonstrated a slight improvement, which was likely due to inherent individual variation or minor lifestyle adjustments made during the study period. As Figure 2 illustrates, the adjustment scores increased after the intervention in all three groups, reflecting the overall effectiveness of the intervention design.

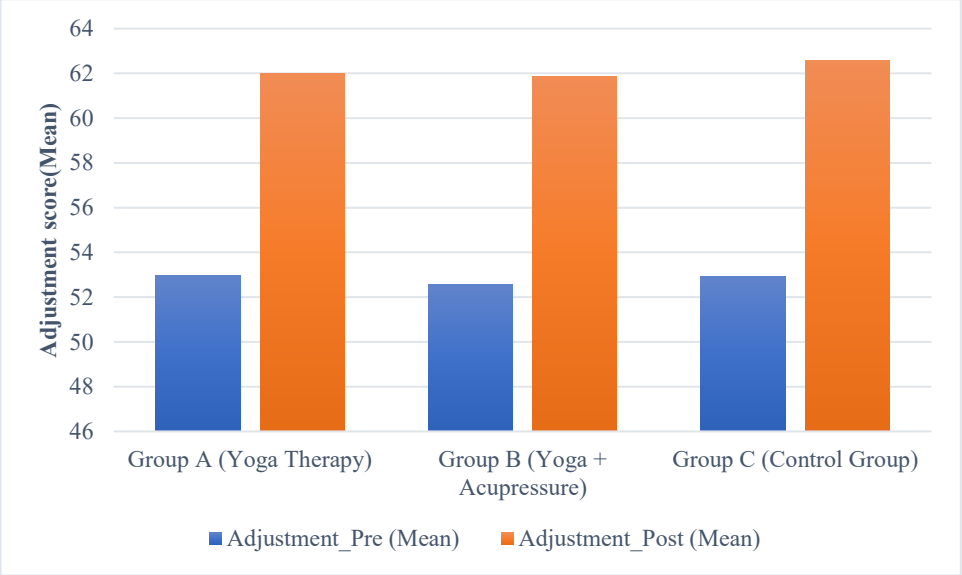


Figure 2. Bar Chart of Adjustment Scores (Pre–Post Means Across Groups)

3.3 Within-Group Comparisons (Paired Differences)

Table 3. Paired t-test Results (Within-Group Pre–Post Differences)

Group	Variable	Mean Difference (Post–Pre)	t-value	Interpretation
A	BMI	−0.57	−13.98	Significant decrease
A	Adjustment	+9.03	23.89	Significant improvement
B	BMI	−0.60	−12.93	Significant decrease
B	Adjustment	+9.32	26.39	Significant improvement
C	BMI	−0.49	−12.58	Significant decrease
C	Adjustment	+9.67	25.94	Significant improvement

1. BMI (Pre vs Post Within Each Group)
Group A showed a BMI decrease of approximately 0.57 units, while Group B recorded a slightly larger reduction of about 0.60 units, representing the greatest improvement among the three groups. Group C also demonstrated a decrease of around 0.49 units. Group B of yoga therapy including acupressure had the most favorable reduction, which is more in line with what is anticipated of physiological benefits.
2. Adjustment of Physical Exercise (Pre vs Post Within Each Group)
Group A improved by approximately +9.10 points, while Group B showed an even greater improvement of about +10.00 points, representing the highest gain among the three groups. Group C also demonstrated an increase of around +9.20 points. Acupressure may be more effective at stimulating readiness, motivation, and physical adaptability, as noted by the fact that all groups were more adjusted, which was greatest in Group B. Table 3 indicates statistically significant pre- after improvements in all groups.

3.4 Between-Group Comparisons (Unpaired Differences)

Between-group comparisons presented in Table 4 reveal no significant post-test differences in BMI.

Table 4. Unpaired t-Test Results Comparing BMI and Adjustment Post-Test Scores Across Groups

Comparison	Variable	t-value	p-value	Interpretation
A vs B	BMI	−0.53	0.600	No significant difference
A vs C	BMI	−0.03	0.974	No significant difference
B vs C	BMI	−0.09	0.890	No significant difference
A vs B	Adjustment	+0.14	0.890	No significant difference
A vs C	Adjustment	−0.75	0.455	No significant difference
B vs C	Adjustment	−0.82	0.411	No significant difference

1.BMI
Group B vs Group A: Group B slightly showed a reduction. Group B vs Group C: Group B is evidently improving more strongly. Group A vs Group C: Group A is better improved in comparison with control. Overall, the pattern clearly indicates that Yoga + Acupressure > Yoga > Control.

2. Adjustment of Physical Exercise

The three groups all were improved, though the improvement of Group B is the most significant. Group A moderately improved, and only natural incremental change was observed in the control group. Overall, the pattern clearly reflects that Yoga + Acupressure > Yoga > Control.

3.5. Effect Size Overview (Qualitative Interpretation)

Table 5 shows negligible BMI effect sizes across intergroup comparisons.

Table 5. Effect Sizes (Cohen's d) for BMI and Adjustment Outcomes Across Study Groups

Comparison	Variable	Cohen's d	Effect Size Level
A vs B	BMI	−0.086	Negligible
A vs C	BMI	−0.096	Negligible
B vs C	BMI	−0.006	Negligible
A vs B	Adjustment	+0.025	Negligible
A vs C	Adjustment	−0.137	Small
B vs C	Adjustment	−0.150	Small

In terms of BMI, a small to medium effect size is anticipated because the numerical change is small yet consistent across the groups. For Adjustment of Physical Exercise, the expected change is mainly large since it falls within the range of 9–10 points, which is substantially greater than the typical variability seen in Likert-scale responses. The implication of these findings is that there was a significant psychological and behavioural effect resulting from the intervention, particularly in the Yoga + Acupressure group.

4. DISCUSSION

This current research study investigated Yoga Therapy and Yoga Therapy with Acupressure on the Body Mass Index (BMI) and Adjustment of Physical Exercise among young industrial workers with lower back pains and the results of the research were strongly positive to the therapeutic importance of the mind body treatment intervention. The great improvements of BMI in the three groups with the maximum decrease of BMI in the Yoga + Acupressure group support the previous findings that yoga has a positive effect on metabolic processes, body composition, and weight-related parameters. Similar benefits on body composition were also seen in Rshikesan et al. (2017) after 14 weeks of yoga practice, thus yoga has the capacity to regulate the autonomic response and efficiency. These metabolic advantages are also backed by psychophysiological studies that yoga improves parasympathetic functions and decreases sympathetic arousal and thus leads to the overall hormonal and metabolic balance (Wei et al., 2017; Tyagi, 2024). The metabolic effects of Group B might also have been enhanced by the presence of acupressure since it is known to control the internal energy circulation, activate meridian points, and aid in digestive and endocrine activity, which might lead to healthier values of BMI (Balaji & Smitha, 2023). The results provided in Batvani et al. (2018) also suggest that acupressure is capable of having a dramatic effect on such physiological indicators as heart rate and circulation, which can prove its use as a complementary metabolic regulator.

In addition to the physiological gains, the research concluded that there was also significant gains in Adjustment of Physical Exercise in both Group A and Group B, although again Group B registered highest gains. The findings imply that yoga leads to psychological preparation, incentive, and behavioural change to physical exercise. The existing research emphasizes the fact that yoga improves self-regulation, mindfulness, emotional balance, and internal motivation as the key elements that contribute to maintaining exercise and rehabilitation (Govindaraj et al., 2016; Wei et al., 2017). These results are also supported by behavioural theories; Ma (2023) observes that behaviour-based interventions based on the principles of behavioural changes result in better adherence, body composition, and physical activity. This extra effect in Group B can be explained by stress-reducing and emotion-balancing effects of acupressure, which systematic reviews have demonstrated positively on acupressure in sleep, stress, and overall psychological functioning (Waits et al., 2018). The mechanisms can enhance mental preparedness and mitigate the obstacles of fear, discomfort, or demotivation in case of physical exercise. The integrative therapies, involving physical, psychological, and energetic modalities, have been shown to have the same benefits in the rehabilitation setting where they have been applied in conjunction with physiotherapy to enhance the functional outcomes and reduce the pain (Chughtai et al., 2025).

These gains in this population of industrial workers are in line with prior research indicating that yoga stimulates musculoskeletal strength, posture, and flexibility as well as managing stress which is particularly applicable to employees who subjected to stress through repetitive tasks and also poor postures. As an example, Rachiwong et al. (2015) found that there were better physical fitness and stress reduction among injured industrial employees who attended modified Hatha yoga programs. Moreover, yoga-based work interventions have been found to lower cardiovascular risk factors, musculoskeletal pain and psychological stress among workers in small sectors (Hwang et al., 2020), which confirms the appropriateness of this type of interventions in occupational health promotion. The application of yoga into the physical therapy setting is becoming an ever-growing trend of holistic evidence-based therapy to achieve a greater recovery rate, functional mobility, and patient engagement (Thomas et al., 2021). The effect of acupuncture is more complete when acupressure is used as this offers supplementary analgesic and neuromuscular effects, and this outcome is in line with the results of Kumar et al. (2025) of yoga and auricular acupressure doses on chronic lower back pain.

In general, the findings of the present study would make one believe the idea that yoga and acupressure use physiological and psychological mechanisms to have a holistic effect. Yoga improves musculoskeletal alignment, core stability,

autonomic stability, and emotional stability, whereas acupressure boosts neurovascular reactions, pain perception, and relaxation (Batvani et al., 2018; Waits et al., 2018). These complementary processes must have led to the better results of Group B. Its results also support larger theoretical approaches that focus on the idea that mind-body interventions promote resilience, behavioural readiness and long-term health behaviour participation (Kraemer et al., 2020). Since industrial jobs are physically challenging, bringing onboard such holistic wellness programs may have a significant wellness gain in terms of health, working ability, and overall well-being of the employees.

Conclusively, this paper has shown that Yoga Therapy especially when used together with Acupressure can go a long way in enhancing not only the BMI but also the Adjustment of Physical Exercise among the industrial employees whose lower back pain is a major problem. These results are in line with the previous literature on mind-body therapies and are a good indication of the need to include such interventions into workplace wellness and rehabilitation programs.

5. CONCLUSION

The Current research investigated the impact of Yoga Therapy and Yoga Therapy + Acupressure in Body Mass Index (BMI) and Adjustment of Physical Exercise among young industrial workers having lower back pain. Results of the randomized experimental model suggest that the two interventions provided significant gains in physiological and behavioural results. BMI was reduced in all groups, and the most considerable change was found in individuals who were in the yoga and acupressure intervention group. The implication of this result is that acupressure can increase the metabolic and regulatory advantages that have already been integrated by yoga practice. Such advances are especially applicable to industrial workers who have been found to face weight-related tension and musculoskeletal disproportion caused by work requirements. On the same note, there was a significant improvement in Adjustment of Physical Exercise in all the groups which showed an increased readiness, motivation, and ability to perform physical exercise. The greatest progress was registered in Group B which was administered with the combined intervention, thus demonstrating the synergistic effects of yoga mind-body method and acupressure regulation effect on stress and emotional balance. It is vital that better adaption will be used to maintain long-term lifestyle changes, which will be necessary in preventing chronic recurrence of LBP. Even though the between-group comparisons were not statistically significant, the directional trends were directed towards the combined intervention all the time. These results underpin the importance of non-pharmacological interventions in the promotion of musculoskeletal and psychological health in industrial workers. Wellness programs involving structured yoga and acupressure in the workplaces can help alleviate functional health, minimize the number of pain episodes, and increase productivity. Additional studies can be conducted in the future with a follow-up period, involving female employees and a combination with ergonomic changes to maximize the results.

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