Journal for Re-Attach Therapy and Developmental Diversities
eISSN: 2589-7799
2023 August; 6 (1): 1624-1634

Impact Of Yoga Practices On Heavy Load Factory Workers Suffering From Acute Lower Back Pain: An Experimental Study

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ABSTRACT

Background: Back pain is a common and costly condition. Pain occurring in the region between the neck and the pelvic region at any point on the spinal column is termed as back pain. Yoga has a positive impact on back pain. Various studies have exhibited significant role of yogasana, meditation and relaxation techniques in the improvements at physical & psychological health level in healthy subjects.
Aim: To study the effect of yoga on factory worker having low back pain.
Objectives: To assess the effect of yoga practices on WHO-quality of life, Quebec scale, fatigue severity scale, work and adjustment scale, DASS scale, emotion regulation questionnaire-ERQ in back pain participants working in factory.
Materials & Method: Eighty heavy lord factory workers (Appolo Tyres) with age range between 25 to 45 (mean/sd=34.44±6.43) were assigned for the study. Participants performed one hour yoga practice for six days per week for three months. Participants with physical disability, neurological & psychological problem were excluded from the study. Quality of life (WHOQOL-Brief: Quality of life), Fatigue (FSS: Fatigue Severity Scale), Work & social adjustment, Functional disability QBPDS: The Quebac Back Pain Disability scale, ERQ: Emotional regulation Questionnaire, DASS (Stress, anxiety, Depression) were used to assess before and after three months.
Result: There were significant improvements on WHO-QOL (Physical health (P<0.001), Psychological health (P<0.001), Social relation (P<0.001), Environment (P<0.001). FSS (P<0.001), WSAS (P<0.001), QBPDS (P<0.001), ERQ (R- (P<0.001), S- (P<0.001), DASS-S (P<0.001), DASS-A (P<0.001) & DASS-D (P<0.001) after three-month yoga practice.
Conclusion: Three months of yoga practice was beneficial in improving functional disability, fatigue, emotional level, social adjustment, stress, anxiety, depression and quality of life among factory workers having back pain. The Yoga practices showed significant changes in many parameters which were set to track the effect on factory workers. Yoga practices may be used to manage back pain in dose wise manner based on severity.

Key words: *Yoga, back pain, factory worker, quality of life, fatigue, social adjustment.*

Introduction

Back pain is a common and costly condition occurring in men and women. Low back pain (LBP) is a common musculoskeletal problem globally (Wu et al., 2020). Pain occurring in the region between the neck and the pelvic region at any point on the spinal column is termed as back pain. Any difficulty in bending forward to touch the toes and in resuming the upright position also comes under this category (Savigny et al., 2009).
Acute low back pain can be defined as six to 12 weeks of pain between the costal angles and gluteal folds that may radiate down one or both legs (sciatica). Acute low back pain is often nonspecific and therefore cannot be attributed to a definite cause. However, possible causes of acute low back pain (e.g., infection, tumor, osteoporosis, fracture, inflammatory arthritis) need to be considered based on the patient's history and physical examination (Casazza, 2012; Koes et al., 2010; McIntosh & Hall, 2011).
The prevalence of Low Back Pain estimated to be 60-70% in industrialized countries such as Finland, Denmark, Ukraine, Germany and United States (one-year prevalence 15–45%, adult incidence 5% per year) as well as it shows high range between age 35-55 years whereas the large population country like China has 64% (1- year prevalence of LBP) (Hoy et al., 2012).
Research done by Indian Medical Council in three places, Jodhpur, Delhi, & Dibrugarh shows 9.53% prevalence in musculoskeletal disorder. Overall, the prevalence of Musculo-skeletal Diseases (MSDs) among the adult population was found to range between 6.92% - 76.8% (Kishor et al., 2019).
Worldwide, 37% of Low back Pain (LBP) was attributed to occupation, with two-fold variation across regions. The attributable proportion was higher for men than women, because of higher participation in the labor force and in

occupations with heavy lifting or whole-body vibration. Work-related LBP was estimated to cause 818,000 disability-adjusted life years lost annually (Punnett et al., 2005).

In low back patients, the reduction in quality of life is attributed to sleep disturbances, fatigue, medication abuse, functional disability and stress. Amongst these, psychological factors such as depression, anxiety fear and anger seem to have a greater impact than biomedical or biomechanical factors on chronic low back pain (CLBP) related disability and quality of life (QOL) (Tekur et al., 2010a).

Railway sahayaks were found to have high rate of musculoskeletal disorders (MSDs) which may be associated with lifting/carrying heavy loads in awkward postures (Khan & Singh, 2018).

The goals of treatment for acute low back pain are to relieve pain, improve function, reduce time away from work, and develop coping strategies through education. Optimizing treatment may minimize the development of chronic pain, which accounts for most of the health care costs related to low back pain (Becker et al., 2010).

Exercise treatment, although widely used and recommended, has only a small effect on back pain (UK Beam Trial Team) (Hayden et al., 2005; Johnson et al., 2007; Underwood, 2004) . Naturopathic care provided significantly greater improvement for patients with chronic low back pain (Szczurko et al., 2007). Therapeutic massage might be an effective alternative to conventional medical care for persistent back pain (Cherkin et al., 2001). Acupuncture was more effective in improving pain than no acupuncture treatment in patients with chronic low back pain (Brinkhaus et al., 2006). The concepts used to develop a specific module of an integrated approach to yoga therapy (IAYT) for back pain were taken from traditional yoga scriptures (the Patanjali Yoga Sutras, Upanishads, and Yoga Vasishtha) that highlight a holistic approach to health management at physical, mental, emotional, and intellectual levels. Yoga-based special technique-progressed from initial safe movements to final yoga postures to provide a traction like effect. It includes practices (1) to relax the spinal muscles by stretching, by deep resting via breath awareness, and conscious guided relaxation of all parts of the body, a traction effect, strengthening the back muscles, strengthening the abdominals. Special care while designing the module was taken to avoid acute forward or backward movements and jerky movements of the spine (Nagarathna & Nagendra, 2010).

Yoga may offer an alternative approach to the treatment of low back pain. The benefits of yoga may be greater than those of exercise alone because yoga offers a combination of physical exercise with mental focus, and patients are taught good posture, self-awareness, and self-care along with relaxation. It seen in one of the research projects recently conducted a literature review and found evidence that yoga may be an effective treatment of chronic low back pain.

A modified hatha- yoga based intervention may benefit individuals with CLB (Galantino et al., 2004; Jacobs et al., 2004). Most self-referred persons with mild chronic low back pain reported improvement on medical and functional pain-related outcomes from Iyengar yoga therapy (K. A. Williams, Petronis, Smith, Goodrich, Wu, Ravi, Doyle, Gregory Juckett, et al., 2005). Yoga was more effective than a self-care book for improving function and reducing chronic low back pain (Sherman et al., 2005). Iyengar yoga therapy improves functional disability, pain intensity, and depression in adults with CLBP (K. Williams et al., 2009a). A pilot study with yoga intervention with chronic low back pain was moderately feasible and may be more effective than usual care for reducing pain and pain medication use (Saper et al., 2009). Seven (7) days of a residential intensive yoga-based lifestyle program reduced pain-related disability and improved spinal flexibility in patients with CLBP better than a physical exercise regimen (Tekur et al., 2008a). A pragmatic multi-center randomized controlled trial of yoga has been shown as a beneficial program to adults with chronic or recurrent low back pain led to greater improvements in chronic low back pain than usual care (Cox et al., 2010). Clearing the bowel by yoga-based colon cleansing technique known as Laghu Shankha Prakshalana (LSP) was reported to be safe and offers immediate analgesic effect with reduced disability, anxiety and improved spinal flexibility in patients with CLBP (Haldavnekar et al., 2014).

Yoga & Back Pain

Yoga intervention for patients with chronic back pain has improved the health of veterans (Groessl et al., 2008). Yoga may be an efficacious adjunctive treatment for CLBP (Holtzman & Beggs, 2013). Yoga improves functional disability, pain intensity, and depression in adults with CLBP (K. Williams et al., 2009b). Yoga classes were more effective in improving function and reducing symptoms due to chronic low back pain (Sherman et al., 2011). The positive effect of yoga on back pain has been proved in earlier studies. One-week residential IAYT practice on eighty participants has shown significant improvements on quality of life & functional disability scale (Tekur et al., 2010b). No study has been done giving IAYT intervention for long term duration on factory worker so far.

The aim of the study was to see the effect of yoga on factory worker having low back pain.

There were some objectives set to assess the effect of yoga practices on WHO-quality of life, Quebec scale, fatigue severity scale, work and adjustment scale, DASS scale, emotion regulation questionnaire-ERQ in back pain participants working in factory.

Materials and Method

Total 80 male subjects were participated within the age range of 25-45, having back pain. The participants included in this study who were working seven hours per day having three shifts. The selected participants were recruited from the Appolo Tyre Company, who were doing heavy load work for 7 hours. Inclusion criteria were: age range from 25 to 45 years, male, physically healthy, history of complain of back pain, heavy load workers. Exclusion criteria were: severe chronic back pain, female, people with hypertension, hernia & other severe injuries, sedentary workers, neurological or mental disorders. The consent form was filled in by the respective subjects prior to the commencement of the study.

Intervention: Participants performed one hour yoga practice for six days per week for three months. The participants were made to do a set of yogic practices which included breathing practices, yogaasanas, relaxation techniques, pranayama and cyclic meditation specially designed and validated by Swami Vivekananda Yoga Anusandhana Samsthana (S-VYASA) for Back pain.
The participants were contacted personally through factory management. The first day of the session was set to get the details of the socio demographic information of the participants. The demographic form was given and the same was filled by participants. Assessments were measured on the first day before starting the yogic practices (i.e., day one) and the day after giving the last days practices (i.e., day 90). The interventions were given one hour/ six days in a week over a period of 90 days. The participants were given a copy of the practices to be practiced at home at the end of the programme.

Assessment Tools

QBPDS: Quebec back pain score

The Quebec back pain disability scale (QBPDS) is a condition-specific questionnaire developed to measure the level of functional disability for patients with low back pain (LBP) that was designed, developed and validated (Kopec et al., 1995). The Quebec Back Pain Disability Scale is a 20-item self-administered instrument designed to assess the level of functional disability in individuals with back pain. The scale was administered as part of a larger questionnaire to a group of 242 back pain patients. Follow-up data were obtained after several days and after 2 to 6 months. A 10-item scale designed to measure respondents' tendency to regulate their emotions in two ways: (1) Cognitive Reappraisal and (2) Expressive Suppression. Respondents answer each item on a 7-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree) (Kopec et al., 1995). Acceptability, internal consistency and content validity of the QBPDS showed good discriminating power. Validity of the QBPDS was confirmed. Comparison of the QBPDS and DPQ in this study shows that the QBPDS is better for evaluating disability (Yvanes-Thomas et al., 2002).

DASS - 21

To measure subjects' anxiety, short form of depression, Anxiety and stress scale, 21 DASS- were used. This scale has two forms: short form has 21 expressions that each been evaluated and mental structures of "depression", "anxiety", and 'stress' by seven different statements. The DASS-21 is a reliable and valid measure of depression, anxiety and stress in elderly patients with persistent pain (Wood et al., 2010). The DASS-21 subscales demonstrate adequate measurement properties for research involving groups with chronic pain. Only the DASS-21 depression subscale demonstrated adequate reliability for use with individuals with chronic pain (Parkitny et al., 2012). Cronbaach's alpha values of the DASS – subscales were 0.96, 0.91, and 0.95 for the depression, anxiety, and stress subscale, respectively. the DASS has good reliability in clinical and community samples (attridge et al., 2015). Recently The DASS-21 subscales can widely be used to measure the dimensions of depression, anxiety and stress. Reliability and validity of the questionnaire has examined and the retest reliability for depression, anxiety and stress were considered acceptable (Le et al., 2017).

Fatigue Severity Scale (FSS)

The Fatigue Severity Scale (FSS) is a self-report questionnaire designed to access disablity in all individuals. The scale was designed to investigate fatigue/function measures. The FSS, which consists of nine questions, uses a 7-point Likert scale ranging from strongly disagrees to strongly agree. The scores from each question are totaled with lower scores indicating less fatigue in everyday life. The total score for the FSS is calculated as the average of the individual item responses. The scale has been shown to be both valid and reliable with a variety of propositions. It has been shown to have good internal consistency and is sensitive to change in fatigue levels over time (Valko et al., 2008).

WHO- Quality of Life – BREF

WHOQOL-BREF provides a valid and reliable alternative to the assessment tool. WHOQOL-BREF is most useful in studies that require a brief assessment of quality of life, for example, in large epidemiological studies and clinical trials where quality of life is of interest. In addition, the WHOQOL-BREF may be of use to health professionals in the assessment and evaluation of treatment efficacy (Harper et al., 1998). WHOQOL-BREF is a reliable and valid instrument and can be used in Indian adolescents. WHOQoL-BREF scales testing the quality of life, are useful tools in the clinical assessment of individuals with back pain (Mroczek et al., 2020).

Work and Social Adjustment Scale
The WSAS is a simple, reliable and valid measure of impaired functioning. It is a sensitive and useful outcome measure offering the potential for readily interpretable comparisons across studies and disorders (Mundt et al., 2002). WSAS could be an extremely useful and meaningful measure to assess social and occupational functioning assessment (Tchanturia et al., 2013).

Emotion Regulation Questionnaire (ERQ)
Items for the Emotion Regulation Questionnaire were derived rationally, indicating clearly in each items. The emotion regulatory process intended to measure (reappraisal or suppression). In addition to these general-emotion items, the Reappraisal scale and the Suppression scale both included at least one item asking about regulating negative emotion (illustrated for the participants by giving sadness and anger as examples) and one item about regulating positive emotion (exemplified by joy and amusement) Alpha reliabilities averaged .79 for Reappraisal and .73 for Suppression. Test–retest reliability across 3 months was .69 for both scales in Emotion Regulation Questionnaire (ERQ), it is evident that ERQ has two factors, namely suppression and reappraisal (Suwartono & Bintamur, 2019). ERQ has strong psychometric properties in general community samples and can therefore be used confidently regardless of participants' student status (Preece et al., 2019). Reliability and validity of the 10-item Emotion Regulation Questionnaire is supported for use among older adults (Brady et al., 2019).

Data Analysis
Data has been being extracted based on scoring and manual key. Data has been analyzed using SPSS 20.1 for within group tests.

RESULTS

Demographic Details:

Variables	**No of Participants (N=80)**	
Age	25 years – 35 years	43
	35 years – 45years	37
Age (Mean/SD)	34.44 ±6.43	
Weight	71.89 ±10.30	
Height	14.613±59.14	
Qualification	SSLC	4
	ITI	40
	Diploma	25
	Graduation	11
Occupation	Mechanic	36
	Worker	34
	Operator	10
Working Since	1 – 5 Years	16
	6 – 10 Years	25
	11 – 15 Years	23
	16 – 20 Years	9
	21 – 25 Years	3
	25 – 30 Years	4

In Age group maximum number (45) of volunteers between age range (25-35 years) and minimum (37) were between age ranges (35- 45 years). In education maximum participants were having ITI degree. In working period, maximum workers working for 10 years.

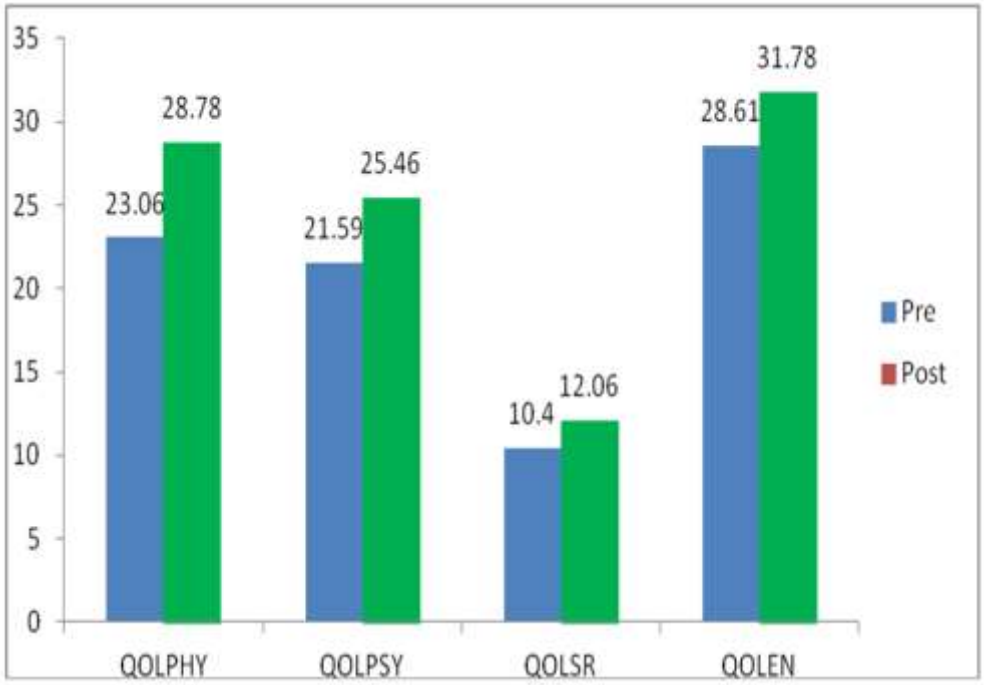
1. WHOQOL-Brief: Quality of life
Physical health has improved after yoga practice (P=0.001) with a change of (24.80 %), Psychological health has improved (P=0.001) with a change of (17.92 %), Social relationship has improved (P=0.001) with changes of (15.96 %) & Environmental domain improved (P=0.001) with a change of (11.08 %).

Variable QOL-Brief	**Yoga N=80 PRE**			**Yoga N=80 POST**			**ES**	**% Change**	**Sig- P values Between Gps (Mann-whiney)**
	Mean/SD	UB	LB	Mean/SD	UB	LB			

QOL-PHY	23.06 ±1.87	23.48	22.65	28.78 ±3.93	29.65	28.71	1.85	24.80	0.001
QOL-PSY	21.59 ±2.95	22.24	2.93	25.46 ±2.56	26.03	24.89	1.40	17.92	0.001
QOL-SR	10.40 ±1.97	10.84	9.96	12.06 ±1.30	12.35	11.77	0.99	15.96	0.001
QOL-EN	28.61 ±3.26	29.34	27.89	31.78 ±2.15	32.26	31.29	1.14	11.08	0.001

Abbreviations: PHY: Physical Health, PSY: Psychological health, SR: Social Relation, EN: Environment, WHO-QOL-Brief: Quality of life, ES-effect size.
Legend: There is a significant change in all the domain of QOL-Brief after yoga practice.

GRAPH: WHO-QOL-Bref

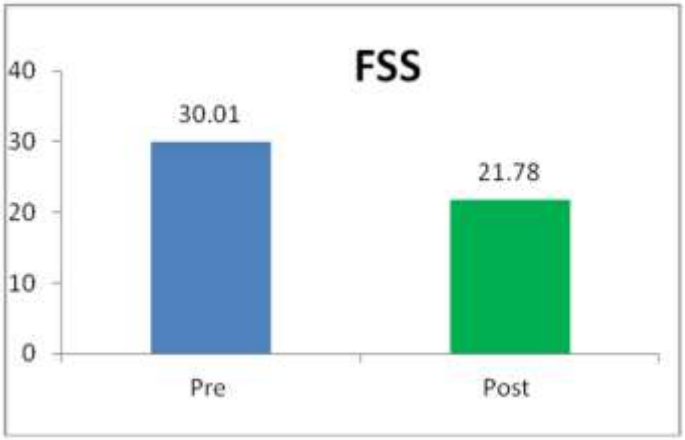


2. FSS: Fatigue Severity Scale

Fatigue Scale has improved after yoga practice (P=0.001) with a change of (27.42 %).

Variable	**Yoga N=80 PRE**			**Yoga N=80 POST**			**ES**	**% Change**	**Sig- P values Between Gps (Mann-whiney)**
	Mean/SD	UB	LB	Mean/SD	UB	LB			
FSS	30.01 ±5.39	31.21	28.81	21.78 ±3.47	22.55	21.00	1.81	27.42	0.001

Abbreviations: ES-effect size.
Legend: There is a significant change in Fatigue level after yoga practice.



3. WSAS: Work and Social Adjustment Scale

Work and Social adjustment scale improved after yoga practice (P=0.001) with a changes of (38.10 %).

Variable	Yoga N=80 PRE			Yoga N=80 POST			ES	% Change	Sig- P values
	Mean/SD	UB	LB	Mean/ SD	UB	LB			Between Gps (Mann-whiney)
WSAS	8.74 ±3.17	9.44	8.03	5.41 ±1.42	5.73	9.09	1.35	38.10	0.001

Abbreviations: ES-effect size

Legend: There is a significant change in Social adjustment level after yoga practice.

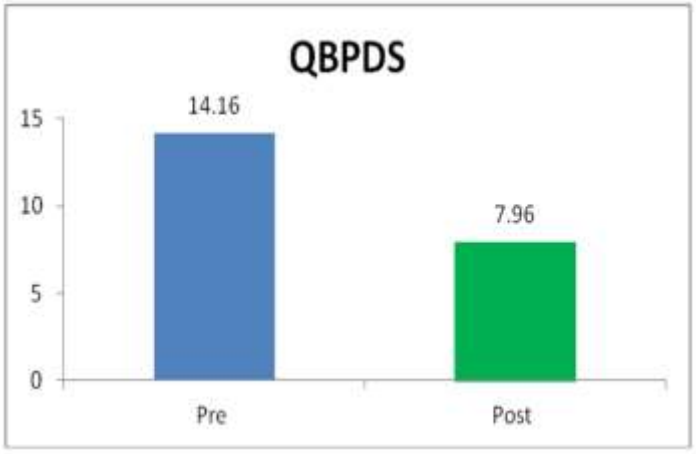
4. QBPDS: The Quebac Back pain Disability scale

Functional disability has improved after yoga practice (P=0.001) with a change of (43.78 %).

Variable	Yoga N=80 PRE			Yoga N=80 POST			ES	% Change	Sig- P values
	Mean/SD	UB	LB	Mean/S D	UB	LB			Between Gps (Mann-whiney)
QBPDS	14.16 ±8.53	16.06	12.26	7.96 ±5.23	9.13	6.80	0.87	43.78	0.001

Abbreviations: ES-effect size

Legend: There is a significant change in Functional disability level after yoga practice.



5. ERQ: Emotional regulation Questionnaire

Emotional regulation has improved after yoga practice, Reappraisal (P=0.001) with a change of (7.39 %) & Suppression has improved (P=0.001) with a change of (6.17 %).

Variable	**Yoga N=80 PRE**			**Yoga N=80 POST**			**ES**	**% Change**	**Sig- P values Between Gps (Mann-whiney)**
	Mean/SD	UB	LB	Mean/SD	UB	LB			
ERQ RE	32.73 ±1.95	33.16	32.29	35.15 ±1.99	35.59	34.71	1.22	7.39	0.001
ERQ-SUP	16.36 ±2.13	16.84	15.89	15.35 ±2.32	15.87	14.83	0.45	6.17	0.001

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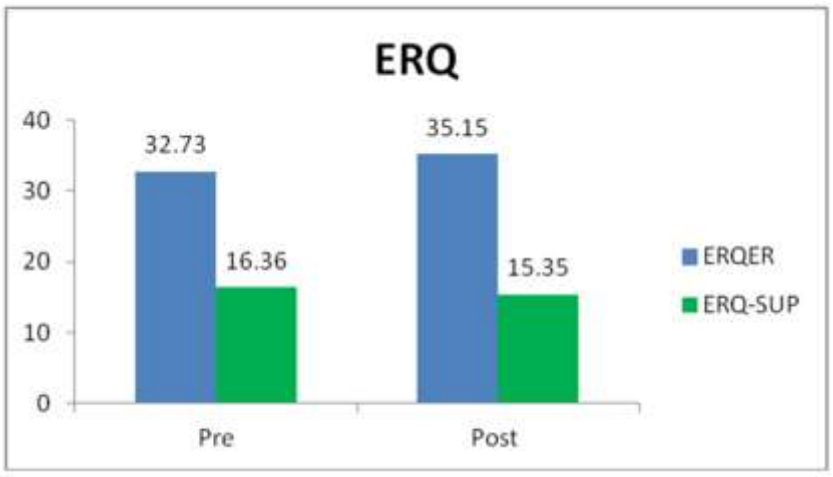
Abbreviations: ES-effect size, ER: Reappraisal, SUP: Suppression

Legend: There is a significant change in Reappraisal level & Suppression level after yoga practice.

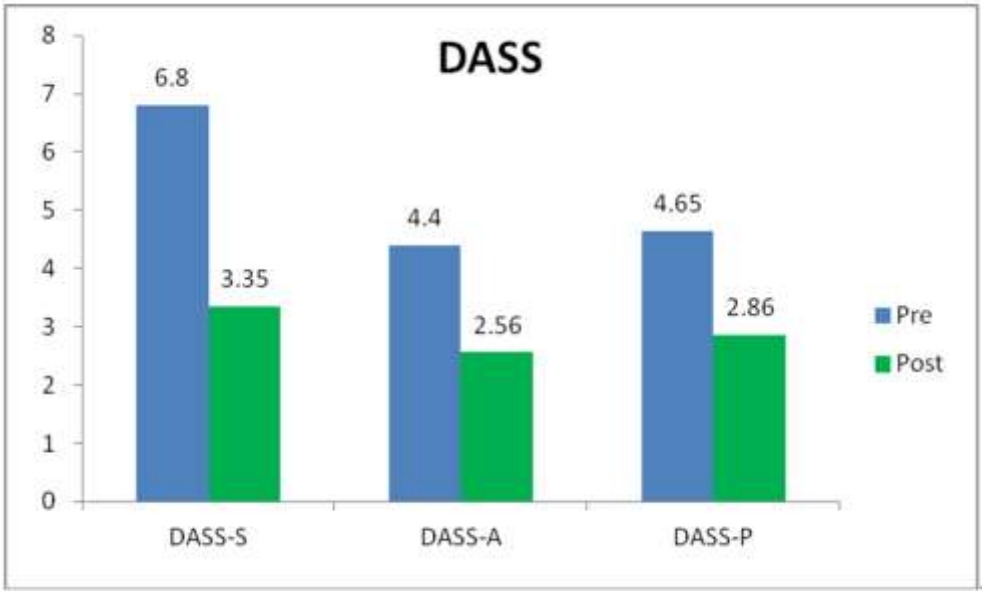


6. **DASS-21**

Stress has reduced after yoga practice (P<0.001) with a change of (50.73 %), Anxiety has reduced after yoga practice (P<0.001) with a change of (41.81 %) & Depression has reduced after yoga practice (P<0.001) with a change of (38.49 %).

Variable	Yoga N=80 PRE			Yoga N=80 POST			ES	% Change	Sig- P values Between Gps (Mann-whiney)
	Mean/SD	UB	LB	Mean/ SD	UB	LB			
DASS-S	6.80 ±1.98	7.24	6.36	3.35 ±1.67	3.72	2.98	1.88	50.73	0.001
DASS-A	4.40 ±2.28	4.91	3.89	2.56 ±1.42	2.88	2.25	0.96	41.81	0.001
DASS-D	4.65 ±2.53	5.21	4.09	2.86 ±1.85	3.28	2.45	0.80	38.49	0.001

Abbreviations: ES-effect size, S: Stress, A: Anxiety & D: Depression.
Legend: There is a significant reduction in Stress, Anxiety & depression level after yoga practice.



Discussion

Present findings showed that three months' yoga practice has a positive impact on functional disability, emotional level, Fatigue, Social adjustment, stress, Anxiety, depression & quality of life among factory workers having back pain.
Seven days of a residential intensive yoga-based lifestyle program ↓ pain-related disability and ↑spinal flexibility in patients with chronic Low back pain (CLBP) better than a physical exercise regimen (Tekur et al., 2008b).
A randomized control trial with 80 non-specific chronic low back participants has demonstrated significant ↓ pain intensity (64%), ↓ functional disability (77%) and ↓ pain medication usage (88%) in the 3-month Iyengar yoga therapy group comparing to an educational control group (K. A. Williams, Petronis, Smith, Goodrich, Wu, Ravi, Doyle, Juckett, et al., 2005).
Present study has shown significant ↓ on Fatigue (Fatigue Severity Scale) (27.42%), ↓ Social adjustment (Work and Social Adjustment Scale) (38.10%), ↓ Functional Disability (The Quebac Back Pain Disability Scale) (43.78%), Emotional regulation (Emotion Regulation Questionnaire) ↑ RE (7.39), ERQ ↓ SU (6.17), ↓ Stress (DASS-S) (50.73), ↓ Anxiety (DASS-A) (41.81), ↓ Depression (DASS- D) (38.49). WHO-QOL-Brief, ↑ physical health (24.80 %), ↑ Psychological health (17.92 %), ↑ Social Relation (15.96 %) & ↑ Environmental (11.08 %) after three month of yoga practice.
Strength of The Study: All the participants were regular in yoga intervention which was for long intervention duration. It is a first study in Thrissur, Kerala rural population with no dropouts in spite of they having various shift schedule.

Limitation of the Study were: Study covered only in heavy load workers, only male participants were included in the study and no control group & small sample size.

Suggestion for Future Research: Study can be covered other part of Kerala & India, need to have large sample size, RCT trial to be done to know more details, more objective tools can be used. Further, study can be expanding other sections of factory, need to create more awareness programme.

Conclusion:

Three months of yoga practice is more beneficial in improving functional disability, fatigue, emotional level, social adjustment, stress, anxiety, depression and quality of life among heavy load factory worker having back pain. Yoga practices may be boon for those who work in heavy load factory where more load is exerted on lower back muscle & joints with psychological and physiological pressure. The Yoga practices showed significant changes in many parameters which were set to track the effect on factory workers.

Conflict of interests: Authors declare no conflict of interests.

Acknowledgement: We are thankful for the management and administration of factory and S-VYASA for supporting the research to carry out in all the way.

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