Publisher

Biomedical Review

www.medresearch.in

Biomedical Review-Journal of Basic and Applied Medical Science

2017 Volume 4 Number 1

E-ISSN:2349-3275

P-ISSN:2349-5502

Research Article

Kinesiophobia

Effectiveness of Stretching on Kinesiophobia and Health-related Quality of Life in Quarry Workers with Work-related Low Back Pain

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Introduction: The study was designed to compare the effectiveness of eight-week stretching exercise combined with back care education, lumbar stabilization combined with back care education and back care education on kinesiophobia and health-related quality of life in quarry workers with work-related low back pain (WRLBP). **Materials and Methods:** The randomized clinical trial involved 96 quarry workers with WRLBP randomly assigned into Stretching Exercise with Back Care Education Group (SEBCEG), Lumbar Stabilisation Exercise with Back Care Education Group (LSEBCEG) and Back Care Education Group (BCEG). Participants kinesiophobia was assessed using Tampa scale of kinesiophobia while health- related quality of life was assessed using WHO health-related quality of life. Participants were treated twice weekly and evaluated at baseline, week 4 and week 8 of the study. Data were analysed using descriptive statistics, ANOVA, Friedman's ANOVA and Kruskal-Wallis test at α 0.05. **Results:** Eighty – six participants completed the study with no significant differences in demographic and clinical characteristics between the three groups at baseline. Participants in the SEBCEG demonstrated more significant reductions ($p < 0.05$) in kinesiophobia and more improvement in quality of life than those in both LSEBCEG and BCEG at the end of week 8 of the study. There were significant within-group improvements ($p < 0.05$) in all variables for the three groups thus indicating the effectiveness of each intervention. **Conclusion:** Stretching exercises are better than lumbar stabilisation exercises and back care education in reducing kinesiophobia and improving health-related quality of life pain in individuals with WRLBP

Keywords: Kinesiophobia, quality of life, Stretching exercises, Work-related low back pain

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How to Cite this Article

Samuel Olufemi Bolarinde, Babatunde O A Adegoke, Olusola O Ayanniyi, Michael O Olagbegi, Effectiveness of Stretching on Kinesiophobia and Health-related Quality of Life in Quarry Workers with Work-related Low Back Pain. Biomed Rev J Basic Appl Med Sci. 2017;4(1):197-205.

Available From https://www.biomedicalreview.in/stretching-kinesiophobi-health-life-quarry-workers-work-related-low-back-pain-research-article

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Manuscript Received	Review Round 1	Review Round 2	Review Round 3	Accepted
2017-05-15	2017-05-16	2017-05-23	2017-05-30	2017-06-06

Conflict of Interest	Funding	Ethical Approval	Plagiarism X-checker	Note
Nil	Nil	Yes	19%	

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Introduction

Work-related low back pain (WRLBP) is any back pain originating in the context of work and considered clinically to have been probably caused, at least in part, or exacerbated by the claimant's job [1]. WRLBP remain the leading cause of disability in persons younger than 45 years old [2]. More than one-quarter of the working population is affected by LBP each year, with a lifetime prevalence of 60–80% and account for a large percentage of LBP claims for long durations - more than 90 workdays lost [3–5]. At some point in life, between 15% and 20% of adults have this syndrome which in most cases (90%) is nonspecific and occurs in all age groups [6,7].

Work-related low back pain among industrial workers leads to many consequences, which affect both employees and employers [8,9]. These consequences include restriction of the capability for work, limitation for social activities, fear of movement, emotional problems and reduced quality of life [10,11]. The resultant effects of these consequences are the loss of productive life years, high medical claims, sick leave, and unemployment [12-14].

Fear of movement (i.e. kinesiophobia) has become known as a significant predictor of pain- linked outcomes including functional disability and psychological distress across various types of pain, further overwhelming evidence had suggested a complex combination of psychological, cognitive, environmental, and neurophysiological factors in the etiology and perputuation of chronic pain [15]. Literatures has reported that patients with chronic LBP have more fear of movement, physical activities and exercising, and are more sensitive to pain and fearful of recurrence hence it has been recommended that fear of movement should be identified and treated early in patients with chronic low back pain as they are predictors of poor recovery [16,17].

Patients with low back pain (LBP) not only suffer from physical discomfort, but also functional limitation that might cause disability and interfere with their quality of life (QoL) [18]. Studies have shown that LBP can negatively affect the QoL and hence have a major impact on daily functions such as dressing oneself, standing, sitting, walking, and lifting which can severely interfere with a wide Range of life's activities [18-21]. A number of randomized clinical trials (RCTs) have been conducted separately to evaluate the effectiveness of stretching exercises, stabilization exercises and back care education in individuals with LBP and they have been found to result in long-term benefit regarding reduction in pain and decreased recurrence of low back pain episodes [18,22-26].

However, the comparative effects of stretching exercise, stabilization exercise and back care education on psychosocial variables in individuals with WRLBP have not been fully demonstrated.

This study was hence designed to compare the effects of 8-weeks lumbar stabilisation plus back care education (LSEBCE), stretching exercises plus back care education (SEBCE) and back care education (BCE) on psychosocial variables (kinesiophobia and health-related quality of life) of quarry workers with work-related low back pain.

Materials and Methods

Study design: The study was a single-blind randomized controlled trial involving individuals with WRLBP.

Setting: The study was carried out in quarry industries located in three local government areas of Ondo state of Nigeria.

Participants: The participants were consenting quarry workers with primary complain of LBP of not less than 3 months duration who were screened for work-related low back pain using a standard Nordic musculoskeletal questionnaire, history of pain and physical examination [27].

Inclusion Criteria

1. Quarry workers with primary complain of LBP of not less than 3 month duration.
2. Low back pain that is of mechanical origin and work-related.
3. Quarry workers who agreed not to engage in additional forms of physical activity or physiotherapy and other forms of medication while the study lasted.

Exclusion Criteria

1. Those with history of recent spinal surgery.
2. Those with spinal deformity or neurological deficit
3. Those with elevated blood pressure (>140/90mmHg)

Study Size: A minimum sample size of 78 (26 per group) was estimated from Cohen's table using α =0.05, power = 80% and effect size = 0.8 [28].

However, 96 participants were recruited and randomly assigned into the three intervention groups.

Procedure for Data Collection: Participants were assigned to one of the three intervention groups namely: Lumbar Stabilisation Exercise with Back Care Education Group (LSEBCEG), Stretching Exercise with Back Care Education Group (SEBCEG) and Back Care Education Group (BCEG) groups (by a physiotherapist who was not involved in participants' assessment and treatment) using a computer generated random numbers.

Ten participants did not complete the eight weeks of intervention and their data were not included in final analysis, while 86 participants (LSEBCEG=27, SEBCEG =29 and BCEG=30) completed the study thus giving an overall attrition rate of 10%.

Intervention: Interventions were conducted over 8 weeks, twice per week, lasting 45 minutes each. Sessions were supervised by the investigator, and participants were instructed to report any adverse event, related or not to exercises.

Participants were required not to alter their normal activities of daily living or take part in any additional form of physical activity or physiotherapy while the study lasted.

Participants in this group were treated individually and performed the following exercises as outlined in the following three phases:

(1) Lumbar Stabilisation Exercise with Back Care Education Group (LSEBCEG)

Phase 1: Isometric Contraction of Tranversus Abdominis and the Isometric Contraction of Multifidus Muscle were performed. The participant held the isometric contraction for 10 seconds and completed 10 repetitions. The exercises were carried out twice a week for week 1 and 2 of the study.

Phase 2: Closed chain, low velocity, low load exercises that included bridging in prone position, bridging in supine position and single-leg bridging were carried out by the participants. Each of the exercises was held for 10 seconds and for 20 repetitions from week 3 to week 5 of the study.

Phase 3: Open chain, low velocity, high load exercises that included the quadruped with alternate legs and the quadruped alternate arms/opposite leg exercises.

Each of the exercises was held for a count of 20 seconds and for 20 repetitions from week 6 to week 8 of the study. The participants in this group were also taken through back care education.

(2) Stretching Exercise with Back Care Education Group (SEBCEG)

Participants in this group were treated individually and performed stretching exercises of the erector spinae, illiopsoas, hamstring and hip adductor muscles.

All stretches were held for 10 seconds for 5 repetitions for weeks 1 and 2, for 10 seconds and 10 repetitions from weeks 3 to week 5 and for 20 seconds and 20 repetitions from week 6 to week 8 of the study. Participants also received back care education.

(3) Back Care Education Group (BCEG)

The participants were taught back care education for standing, sitting, lifting and other activities of daily living. Small handbills describing the back care education instructions were also given as a reminder for the participants.

The back care education comprised: the structure of the back bone/ spinal column, factors predisposing to back pain, bad and good postures assumed during activities of daily living, stages involved when executing a lift, tips on good (correct) back posture and exercise for prevention and / or alleviation of back pain.

Collection of Data: Participants' kinesiophobia was assessed using the Tampa Scale of Kinesiophobia (TSK) by asking them to mark the point on the TSK that corresponded to their feelings about the effect of the pain [29] while Health-related Quality of Life (HRQoL) was assessed by asking them to complete the English version of the WHO Health-related Quality of Life questionnaire - at baseline, week 4 and week 8 of the study [30].

Statistical Method: The data were analysed using SPSS 20.0 version software (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics of mean, standard deviation and tables were used to summarize the data obtained.

Friedman's ANOVA was used for withingroup comparison of participants' kinesiophobia and quality of life with Wilcoxon Signed Rank Test used for post-hoc analysis. Kruskal Wallis test was used for between-group comparison of kinesiophobia and quality of life with Man Whitney U test used for the post hoc analysis. The alpha level was at p = 0.05 and 0.017 for between-group and within-group post-hoc analysis respectively.

Results

All the participants were males. The mean age, height, weight and body mass index (BMI) of all the participants were 34.61± 6.89 years, 1.72 ± 0.07m, 68.20 ± 10.35 kg and 23.16 ± 2.96 kg/m2 respectively. One way ANOVA at α = 0.05 did not indicate any significant difference in the mean age, height, weight and BMI of participants in the three intervention groups. Participants in the three groups were hence comparable in their baseline anthropometrics (Table 1).

Friedman's Analysis of Variance (ANOVA) showed significant difference in Kinesiophobia and in HRQoL scores across the three time frames of the study for participants in the LSEBCEG (p< 0.001), SEBCEG (p<0.001) and BCEG (p<0.001) groups (Table 2).

Post hoc analysis indicated significant reduction in kinesiophobia and in HRQoL among participants in the three groups at all the time frames of the study (Table 2).

Kruskal Wallis test followed by Mann Whitney U test post-hoc analysis for comparison of the participants' treatment outcomes at the three points of the study are presented in table3.

The result indicated that there were significant differences in the groups' mean kinesiophobia and Quality of life at the end of weeks 4 and 8 of the study.

At week 4 of the study, SEBCEG had lower significant mean value for kinesiophobia than those in LSEBCEG and BCEG, similarly SEBCEG had higher significant mean value in Quality of life than both LSEBCEG and BCEG. At the end of week 8, participants in the SEBCEG had lower significant mean value for kinesiophobia than those in LSEBCEG, however there was no significant difference between LSEBCEG and BCEG similarly participants in SEBCEG had higher significant mean value in Quality of life than both LSEBCEG

Table-1: One-way ANOVA comparison of participants' demographic and psychosocial variables by treatment groups

Variables	LSEBCEG(n=27)Mean ± SD	SEBCEG(n=29) Mean ± SD	BCEG(n=30)Mean ± SD	P-value
Age (Years)	35.93 ± 7.21	34.41 ± 6.83	33.60 ± 6.68	0.442
Height (m)	1.72 ± 0.08	1.73 ± 0.07	1.70 ± 0.06	0.153
Weight (Kg)	68.04 ± 11.27	71.41 ± 9.80	65.27 ± 9.39	0.072
BMI (Kg/m²)KinesiophobiaQol Overall	23.06 ± 2.9533.04 ± 5.7269.90 ± 6.98	23.83 ± 3.3230.69 ± 6.6272.84 ± 5.41	22.61 ± 2.5330.40 ± 3.4072.14 ± 6.09	0.2820.1570.222

Table-2: Friedman's ANOVA and Wilcoxon signed ranked test comparison of Kinesiophobia and Health-related Quality of life among participants across the 3 times point of the study

Variables	Time Frame	LSEBCEG(n=27) Mean ± SD	SEBCEG(n=29)Mean ±SD	BCEG(n=30)Mean ± SD
Kinesiophobia	Baseline Week 4 Week 8 P	33.04 ± 5.72*22.15 ± 4.85†18.52 ± 2.17‡<0.001	30.69 ± 6.62*20.59 ± 3.44†17.17 ± 0.66‡<0.001	30.40 ± 3.40*22.63 ± 2.47†17.53 ± 0.90‡<0.001
QoL Overall	Baseline Week 4 Week 8 P	69.90 ± 6.98*77.84 ± 4.93†80.56 ± 4.68‡<0.001	72.84 ± 5.41*81.87 ± 4.23†87.23 ± 4.04‡<0.001	72.14 ± 6.09*75.34 ± 5.38†78.13 ± 4.68‡<0.001

Table-3: Kruskal-Wallis test comparison of Kinesiophobia and Health-related quality of life participants'
treatment outcome across the groups at baseline, week 4 and week 8

Variables	TimeFrame	LSEBCEG(n=27)Mean ± SD	SEBCEG(n=29)Mean ±SD	BCEG(n=30) Mean ± SD	H (x^2)	P – value
Kinesiophobia	Baseline Week 4 Week 8	33.04 ± 5.7222.15 ± 4.85*18.52 ± 2.17*	30.69 ± 6.6220.59 ± 3.44†17.17 ± 0.66†,*	30.40 ± 3.4022.63 ± 2.47*17.53 ± 0.90*	3.705 6.579 10.178	0.1570.0370.006
QoL Overall	Baseline Week 4 Week 8	69.90 ± 6.9877.84 ± 4.93*80.56 ± 4.68*	72.84 ± 5.4181.87 ± 4.23†87.23 ± 4.04†	72.14 ± 6.0975.34 ± 5.38*78.13 ± 4.68*	3.014 21.04 637.859	0.222 0.001 0.001

Key: Different superscript indicate where there is significance, same superscript indicate no significance

QoL Overall- Quality of Life Overall

LSEBCEG - Lumbar Stabilisation Exercise with Back care Education Group

SEBCEG - Stretching Exercise with Back Care Education Group

BCEG - Back Care Education Group
BMI = Body mass index, α = 0.05
SD – Standard Deviation

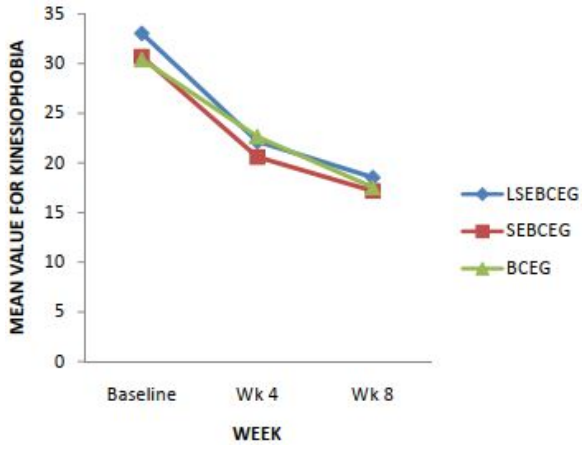
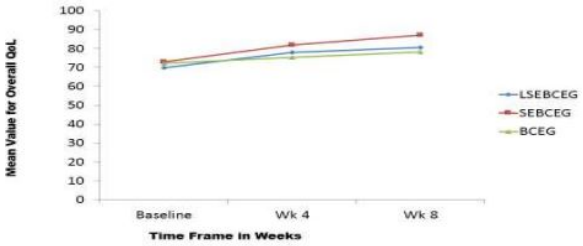


Figure-1: Trends of kinesiophobia pain for the LSEBCEG, SEBCEG and BCEG at the three time points of the study



F**igure-2: Trends of QoL overall for the LSEBCEG, SEBCEG and BCEG at the three time points of the study.**

Discussion

Effects of stretching exercise on kinesiophobia and health-related quality of life in work- related low back pain.

Within-group comparison across the 3 time- points (weeks 0-4, 4-8 and 0-8) of the study revealed that the stretching exercise had significant effects on kinesiophobia and health related quality of life. The effect of stretching exercises on kinesiophobia in this study was comparable with the outcome of the study conducted by Marshall et al [31] that reported a significant reduction in fear of movement in participants with LBP after 8 weeks of specific trunk exercises and stationary cycling. The study however differs in the use of specific trunk exercises as an intervention.

It is widely accepted that there is a direct relationship between LBP and disability and that LBP and disability can only be understood and managed in the light of a bio-psychosocial model (a model that includes physical, psychological and social elements), which describes the key psychological and behavioral factors that may help to understand current levels of pain and disability [32,33]. Previous studies have reported an association between LBP and psychosocial factors [34, 35]. Evidence suggests that psychosocial factors have an influence on the outcome of physical therapy treatment and that the extent of their influence differs considerably among patients [34].

A previous study by Smeets et al, [36] submitted that active physical therapy regimen primarily designed to reduce pain and disability such as stretching exercises, low back muscle strength and endurance can also reduce the impact of fear of movement and improvement in QoL that it did not deliberately target. It has been established that LBP results in suffering and QoL limitations such as difficulty to carry out activities, stress irritability, hopelessness, sleep disorders, depression, fatigue and incapacities, therefore an active physical therapy which focus on the psychosocial factors that bring about substantial improvement in the perception of physical conditioning, body attractiveness, overall self-worth and overall QoL of individual with LBP has been advocated [38-39]. Unfortunately, there is a dearth of studies on the effect of the stretching exercise on psychosocial variables in patients with work-related LBP. Further studies are necessary to corroborate the result of this study and to verify how stretching exercise affects psychosocial variables of patients with LBP.

Effects of lumbar stabilisation exercise on kinesiophobia and health-related quality of life in work-related low back pain.

Within-group comparison across the 3 time-points (weeks 0-4, 4-8 and 0-8) of the study revealed that the lumbar stabilisation exercise had significant effects on kinesiophobia and health related quality of life. Kinesiophobia is among the most extreme forms of fear of pain due to movement or re-injury [40]. Patients with kinesiophobia believe that movement will cause reinjury and additional pain; therefore, kinesiophobia is a risk factor for persistent pain. In the long term, kinesiophobia causes physical deconditioning, avoidance of physical activity, functional disability,

And symptoms of depression that are associated with reduced quality of life [40]. It has been reported that psychological factors play an important role in the process of chronicity of the disease [41,42]. In a study on patients with neck and shoulder pain, a strong relationship between kinesiophobia, disability, and musculoskeletal system injuries was reported [43]. In addition, patients who have chronic low back pain with high levels of fear of movement-related pain have high pain and disability scores which result in boredom, anxiety, depression and negatively affecting the quality of life [43-45]. A relationship between kinesiophobia, disability, and quality of life in patients with chronic low back pain was also reported by Thomas et al, [46]. They observed that the severity of pain and depression were closely correlated. Therefore the primary goal of treatment in patients with low back pain is to reduce the severity of pain thereby reducing disability, kinesiophobia and improve quality of life. There seems to be a scarcity of similar studies to which the result obtained in this study can be compared directly as most studies did not examine kinesiophobia and quality of life as an outcomes. However the result of this study compared favourably with that of Kumar et al, [47] which appeared to be the only study for referencing that incorporate quality of life as an outcome measure in their study. They reported a significant improvement in Qol in individuals with LBP after lumbar stabilization interventions.

Effects of back care education on kinesiophobia and health-related quality of life in work-related low back pain.

Within-group comparison across the 3 time-points (weeks 0-4, 4-8 and 0-8) of the study revealed that the back care education had significant effects on psychosocial variables of participants with work-related low back pain. The effect of back care education on kinesiophobia and health related quality of life was comparable with the outcome of previous study that reported a significant reduction in Kinesiophobia and improvement in the quality of life in individuals with LBP [19,48,49].

Fear of movement in individuals with LBP are usually enhanced by limitation of movement due to pain, decrease in physical activity, avoidance of social activities, and deterioration in physical condition which ultimately lower their quality of Life [50]. Back school programmes educate patients about the anatomy of the spine and low back pain, correct ergonomics in daily life and work, and how to cope with low back problems, thus increasing their self-esteem, quality of life and prevent recurrence [51]. A new understanding of low back problem may lead to improvement of the condition, therefore the back care education given may reduce patients' fear of movement developed due to incorrect interpretation of pain and hence improve their self-esteem and overall quality of life [51].

Comparative effectiveness of stretching, lumbar stabilisation exercises and back care education on kinesiophobia and health-related quality of life in individuals with work-related low back pain.

At baseline, there was no significant difference between the three groups in their anthropometric, kinesiophobia and quality of life hence the three groups are comparable at baseline therefore, any subsequent difference between the three groups can be attributed to the difference in the effects of interventions.

Stretching exercises with back care education (SEBCE) group had significantly more reduction in kinesiophobia and more significant improvement in health-related quality of life than either LSEBCE or BCE at the end of forth and eight weeks of the study.

From this result, it seems SEBCE are more effective than either LSEBCE or BCE on reduction in kinesiophobia and improvement of health-related quality of life in individuals with WRLB. The result of this study agree with the findings of Grunnesjö et al, [52] that reported a significant improvement in HRQoL following application of stretching exercise in the management of LBP. Heydarnejad and Dehkordi [53] also reported a significant mprovement in HRQoL following introduction of stretching exercises in older patients.

Unfortunately, there seems to be a scarcity of similar studies to which the result obtained in this study can be compared directly as few studies that compared stretching and stabilization exercises did not examine kinesiophobia and quality of life as an outcome. Further studies are necessary to corroborate the result of this study and to verify how stretching exercise affects psychosocial variables of patients with WRLBP.

Conclusion

The findings of this study have shown that stretching exercises, lumbar stabilization exercises and back care education are all effective for reducing kinesiophobia and improving health-related quality of life in individuals with work-related low back pain but stretching exercises are more effective than lumbar stabilization exercises and back care education in alleviating kinesiophobia and improving health-related quality of life.

Physiotherapists are therefore encouraged by the findings of this study to combine stretching exercises with back care education in the management of individuals with work-related low back for reducing kinesiophobia and improving health-related quality of life. Future studies should investigate and compare the effects of the three interventions on non- work-related low back pain.

Acknowledgement: The authors acknowledge the technical support received from the postgraduate lecturers at the Department of Physiotherapy, University of Ibadan, Nigeria. The authors also acknowledge all the staff of Federal Medical Centre, Owo, and Ondo State, Nigeria who were involved in participants' recruitment for the study.

Ethical Clearance: Study was carried out on human subjects in accordance with the ethical standards with permission and consent from Health Research Ethics Committee of the University of Ibadan and University College Hospital (Ref no: UI/EC/15/0142)

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