International Journal of Physical Medicine & Rehabilitation

Afolabi et al., Int J Phys Med Rehabil 2018, 6:6
DOI: 10.4172/2329-9096.1000496

Research Article Open Access

Comparative Effectiveness of Lumbar Stabilisation Exercises and Vertical Oscillatory Pressure in the Management of Patients with Chronic Low Back Pain

Oluwasegun Taofik Afolabi*, Michael Ogbona Egwu, Chidozie Mbada and Aanuoluwapo Deborah Afolabi

Department of Basic Medical Sciences Medical Rehabilitation, Obafemi Awolowo University, Nigeria
***Corresponding author:** Oluwasegun Taofik Afolabi, Department of Basic Medical Sciences Medical Rehabilitation, Obafemi Awolowo University, Nigeria, Tel: +2348062177476; E-mail: eriiyanu2017@gmail.com

Received date: July 23, 2018; **Accepted date:** November 23, 2018; **Published date:** November 24, 2018

Abstract

Background: Chronic Low Back Pain (CLBP) can lead to a diminished ability to engage in a variety of activities such as work. Some of the treatments of CLBP are manual therapy techniques such as Vertical Oscillatory Pressure (VOP) and therapeutic exercises such as Lumbar Stabilization Exercises (LSE).

Objective: This study assessed and compared the effectiveness of LSE, VOP and VOP combined with LSE on pain intensity, disability level, health related quality of life, anxiety level and spinal range of motion in patients with CLBP.

Methods: This quasi-experimental study involved 63 patients with CLBP. Participants were recruited purposively from Out-patient Physiotherapy Clinics of two Hospitals in Nigeria. Participants who gave their consents were randomly assigned into one of three treatment groups. Treatment effects were assessed in terms of pain intensity, anxiety level, disability index, health related quality of life and spinal ROM using Visual Analogue Scale, Beck Anxiety Inventory, Oswestry Disability Index, Short Form-12 questionnaire and F-F method at baseline, third week and sixth week of treatment. Participants underwent treatment twice weekly for six weeks. Measurements of outcomes were done at baseline, third week and sixth week of treatment. Descriptive statistic of mean, standard deviation and inferential statistics of One-way and Repeated measure ANOVA were used to analyse data. Alpha level was set at $p<0.05$ of significance.

Results: The results showed VOP had significant effects on disability level and pain intensity while LSE had significant effects on anxiety, pain intensity and health related Quality of Life. Combination of VOP and LSE significantly affected disability level, anxiety level, pain intensity, health related quality of life and spinal ROM.

Conclusion: The study concluded that Vertical Oscillatory Pressure (VOP) and Lumbar Stabilization Exercises (LSE) were effective independently, however combined VOP and LSE seems to be more effective in the management of CLBP.

Keywords: Chronic low back pain; Vertical oscillatory pressure; Lumbar stabilization exercise

Introduction

Low Back Pain (LBP) was defined as pain in the area on the posterior aspect of the body from the lower margin of the twelfth ribs to the lower glutaeal folds with or without pain referred into one or both lower limbs that lasts for at least one day [1].

Based on duration of symptom, LBP is often classified as acute (6 weeks duration), sub acute intermediate (that less than 6-12 weeks) and chronic (more than 12 weeks). Chronic low back pain (LBP) defined as back pain lasting more than 12 weeks, affects over 50% of the general population [2]. LBP can also be classified based on aetiology as specific and non- specific. Nonspecific LBP has no serious underlying pathology and specific has direct causes like metastatic cancer, spinal osteomyelitis, epidural abscess. Balthazard et al. [3] explained that psychosocial, physical and behavioural components play an important role in the occurrence of chronic low back pain.

Low back pain (LBP) is well documented as an extremely common health problem [4-6]. It is the leading cause of activity limitation and work absence throughout much of the world [7] and it causes an enormous economic burden on individuals, families, communities, industry and governments [8,9]. As part of the Global Burden of Disease 2010 Study, the global burden of musculoskeletal conditions was estimated using updated methods that address methodological limitations of previous GBD studies [10-13]. Burden was expressed in disability-adjusted life years (DALYs).

Clinically, a link has been sought between abnormal or impaired function of 'stabilizing' muscles and the onset and persistence of low back pain [14]. A careful history and physical examination are vital to evaluation, treatment, and management [15]. Several studies have supported the efficacy of different treatment modalities such as transcutaneous electrical nerve stimulation (TENS) [16], interferential therapy [17], laser [18] and short wave diathermy [19]. Different

exercises including lumbar flexion, extension, isometric flexion, passive extension, and intensive dynamic back exercise are used in the management of low back pain [20]. It has been claimed that there is a link between dysfunction within the activation and timing of lumbar stabilisation muscles and back pain [21,22]. Lumbar stabilization Exercises aimed at improving the neuromuscular control, strength, and endurance of the muscles that are central to maintaining the dynamic spinal and trunk stability [23].

Manual therapy is hands on treatment which includes gentle stretching of joint or mobilization to improve spinal joint mobility [23]. Different spinal manual therapy techniques have become an effective tool used in the management of LBP [25-27]. The manipulative techniques that are employed usually includes vertical oscillatory pressure (VOP), lumbar rotatory technique [27] spinal traction, rotation manoeuvres, flexion manoeuvre .Vertical oscillatory pressure is a technique used for the treatment of back pain [28-30]. Vertical Oscillatory Pressure (VOP) has been reported to be effective in relieving the pain of patients with mechanical low back pain [27]. There has been assumption that combination of manual therapy and lumbar stabilization exercises may be more beneficial in treating patients with low back pain than either manual therapy or Lumbar Stabilization Exercises [31].

Part of interventions considered in the management of chronic low back pain includes Vertical Oscillatory Pressure (VOP) [32,25] and Lumbar Stabilization Exercise (LSE) [33]. The effectiveness of both VOP and LSE techniques in the management of CLBP have been tested individually and supported with different researches from different parts of the world [23,29,30, 34].

Therefore this study was planned to assess and compare the effectiveness of Lumbar Stabilization Exercises (LSE), Vertical Oscillatory Pressure (VOP) and combination of both VOP and LSE on disability level, pain intensity level, anxiety level, health related quality of life and the spinal range of motion of the patients with Chronic Low Back Pain.

Material and Methods

63 patients from Outpatient Physiotherapy Departments of Osun State Specialist Hospital, Osogbo and State Hospital, Iwo, Osun State, Nigeria, participated in this quasi experimental study. Participants were purposively recruited but were consectively allocated into three intervention groups with 21 participants in each group Group A: received Vertical Oscillatory Pressure (VOP) as treatment intervention, Group B: received lumbar stabilization exercises (LSE) and Group C: received VOP followed by LSE that is combination of VOP and LSE using adopted protocol of application. Each participant received treatment twice per week for six (6) weeks and a total of 12 visits.

Beck Anxiety Inventory for anxiety level, Oswestry Disability Index for disability level, SF 12 Health status questionnaire (Physical activity subscale) for health related quality of life and Visual Analogue Scale for determining pain intensity, were administered pre intervention in first week which is the baseline, then at third week and at sixth week of intervention for each of the group. Spinal range of motion Test using Finger-to-floor method (F-F) in forward flexion, backward bending, side flexion (left and right) was measured pre intervention at baseline, third and sixth week for each of the groups.

For group A Vertical Oscillatory Pressure (VOP) was performed as described by Nwuga [26] and Egwu et al. [30] on each participants belonging to this group. VOP was administered by placing my thumb on the spinous process of the already identified vertebra of one of the participant while prone position, digital pressure to the already identified vertebra then oscillate with grade II mobilization force as described by Snodgrass et al. [35]. Oscillation was repeated every 6 s for 60 s (that is 10 oscillations) then digital pressure and oscillations was reapplied using the above procedure after 20 s rest after which cryotherapy was applied following tissue reaction due to digital pressure Plate. Stop watch was used for timing oscillatory and rest duration; this procedure was repeated for each participant of this group twice per week for six weeks.

For group B each session of Lumbar Stabilization Exercises (phase 1) lasted for 25minutes, was performed twice per week for 6 weeks. Each participant in this group stretched and warmed up for 5 min before main exercise that took 20 min. Each of the exercise was performed for 4 sets of 10 repetitions (10 repetitions in 2 sets for Lumbar multifidus and 10 repetitions in 2 sets for tranversus abdominis) with 1 min rest between sets and exercise. There are three phases of the stabilization exercises as purposed by Luqus et al. [32] and Vasquez et al. [33].The participant was taken through only phase I of Lumber Stabilization Exercise. Stop watch was used to time the hold, release time and rest.

Phase I or initial stage of LSE involves segmental control over primary stabilizers which involve the activation and training of lumbar multifidus and transversus abdominis. This can be done in the decubitus supine, prone. The simplest indication is to ask the patient to "suck in the abdomen" as if to bring the belly button towards the spine to hold their breath, which causes sinking of the abdomen. A strategy to avoid this is to ask the participant to count out loud in order to facilitate normal respiration.

Activation of multifidus: In order to get a suitable activation of lumbar multifidus, the participant was in prone position, then performed the abdominal hollowing manoeuvre in which the participant was instructed to "take a relaxed breath in and out, hold the breath out and then draw in lower abdomen without moving the spine then lift one of the lower limb in reverse straight leg, sustained for 10 s and brought the lower limb down to the platform where it was lifted then repeat for 10 times that is 10 repetitons then repeat the same for other limb making it 2 sets for lumbar multifidus .

Activation of Transverses abdominis (TrA): In order to get suitable contraction of TrA muscles, the participant was in supine position then performed the abdominal hollowing manoeuvre in which the participant was instructed to "take a relaxed breath in and out, hold the breath out and then draw in lower abdomen without moving the spine then lift one of the lower limb in straight leg, sustain it for 10 s then brought down to the level where it was lifted, this was done in 10 repetitions then repeat for the other limb, making it 2 sets for tranversus abdominis.

Statistical analyses were performed using the statistical package for the social sciences (version 21.0). Descriptive analysis of age and physical characteristics were done. Repeated measure of Analysis of Variance (ANOVA) was used for comparison within group and one way ANOVA was used for comparison across the three groups. A level of $p<0.05$ was considered significant.

Results

A total of 63 Chronic Low Back Pain (CLBP) patients (26 males: 41.3% and 37 females; 58.7%) with mean age of 45.2 ± 11.66 (Table 1), participated and completed in this study.

A repeated ANOVA showed that there were significant effects of VOP on disability index (p=0.038), pain intensity level (p=0.001) and spinal range of motion (backward bending) (F=3.307, p=0.043) of the participants in group A. (p<0.05) (Table 2). There were significant differences in anxiety (F=4.340, P=0.017), quality of life (F=6.733, P=0.002), and pain intensity level (F=4.591, P=0.014) of the participants in group B (Table 3). However, repeated ANOVA revealed there were significant differences in disability index, anxiety, quality of life, pain intensity and spinal range of motion: (Side Flexion Right (SFR), Side Flexion Left (SFL), Forward Flexion (FF), Backward Bending (BB) of the participants in group C (Table 4). Furthermore, One-way ANOVA comparison of effects of VOP, LSE and combination of VOP with LSE There were no significant differences in disability index, pain intensity, quality of life, anxiety and spinal range of motion of the participants at first week (P<0.05) . At third (3rd) week, the result showed that there was significant difference in the anxiety level of the participants. And at 6th week the result showed that there were significant differences in health related quality of life and spinal ROMs of the participants across groups (Table 5). Post hoc test using Fisher LSD for significance indicated that, at week 3, anxiety level reduced significantly for group compared to group A or B. Also at week 6, post hoc test indicated that participants in group C had improved health related quality of life compared to those in group A or group B (Table 5).

Variables	GRP A (X ± S.D)	GRP B (X ± S.D)	GRP C (X ± S.D)	F-ratio	P-values
Age (years)	47.1 ± 10.20	45.1 ± 13.85	43.4 ± 10.92	0.52	0.6
Weight (kg)	79.5 ± 9.14	77.2 ± 9.75	76.5 ± 9.22	0.55	0.58
Height (m)	1.66 ± 0.66	1.66 ± 0.07	1.66 ± 0.07	0.01	0.99
BMI (kg/m^2)	28.9 ± 3.70	28.2 ± 3.77	27.9 ± 3.47	0.45	0.64

Table 1: Comparison of physical characteristics of participants across 3 groups.

Variables	Week 1 (X ± S.D)	Week 3 (X ± S.D)	Week 6 (X ± S.D)	F-ratio	P-value
Disability level	26.0 ± 12.67	19.2 ± 12.64	16.0 ± 12.63	3.454	0.038*
Anxiety level	1.95 ± 3.04	1.2 ± 2.36	0.9 ± 1.58	1.041	0.359
HQoL(Physical)	59.0 ± 17.99	66.1 ± 18.85	66.2 ± 26.33	0.726 0.465	
Pain intensity	4.9 ± 1.36	3.7 ± 1.00	3.4 ± 1.50	8.074	0.001*
SFR	15.3 ± 3.38	15.2 ± 2.46	15.3 ± 3.16	0.006	0.994
SFL	16.1 ± 2.47	14.8 ± 3.01	16.0 ± 3.69	1.125	0.332
FB	2.8 ± 4.28	2.4 ± 4.25	3.5 ± 5.88	0.25	0.78
BB	23.7 ± 2.87	22.1 ± 2.21	21.8 ± 2.57 3.307		0.043*

Table 2: Repeated Measure of ANOVA of the effect of Vertical Oscillatory Pressure on pain intensity, anxiety level, and health related quality of life, spinal range of motion.

Variables	Week 1 (X ± S.D)	Week 3 (X ± S.D)	Week 6 (X ± S.D)	F-ratio	P- values
Disability level	30.7 ± 18.49	24.9 ± 15.70	19.3 ± 13.36	2.668	0.078
Anxiety level	4.7 ± 4.99	2.6 ± 3.14	1.4 ± 2.04	4.34	0.017*
HQoL (Physical)	54.3 ± 16.70	64.3 ± 17.04	73.0 ± 16.01	6.733	0.002*
Pain intensity	4.3 ± 1.53	3.2 ± 1,61	2.9 ± 1.68	4.591	0.014*
SFR	17.0 ± 3.34	16.3 ± 3.49	15.7 ± 3.74	0.806	0.451
SFL	17.1 ± 4.20	16.1 ± 3.44	15.9 ± 3.19	0.706	0.497
FF	3.7 ± 3.47	4.1 ± 4.62	3.4 ± 4.52	0.151	0.86

BB	24.9 ± 8.37	24.2 ± 6.50	23.3 ± 5.84	0.251	0.779

Table 3: Repeated Measure of ANOVA of the effect of Lumbar Stabilisation Exercises on pain intensity, disability level, anxiety level, health related quality of life, spinal range of motion.

Variables	Week 1 (X ± S.D)	Week 3 (X ± S.D)	Week 6 (X ± S.D)	F-ratio	P- values
Disability level	33.3 ± 14.81	25.0 ± 13.36	17.2 ± 13.74	6.916	0.002*
Anxiety level	2.9 ± 4.16	0.6 ± 1.02	0.8 ± 2.82	3.683	0.031*
HQoL(Physical)	59.4 ± 14.79	70.7 ± 14.70	20.3 ± 5.00	95.536	0.000*
Pain intensity	4.90 ± 1.45	3.4 ± 1.29	2.6 ± 1.60	13.442	0.000*
SFR	18.1 ± 8.37	14.7 ± 3.50	76.7 ± 14.70	257.229	0.000*
SFL	17.7 ± 7.22	13.7 ± 3.60	12.7 ± 4.57	5.063	0.009*
FF	6.2 ± 6.70	3.1 ± 4.60	12.1 ± 3.87	16.446	0.000*
BB	27.4 ± 11.20	23.6 ± 7.14	2.1 ± 4.94	58.271	0.000*

Table 4: Repeated Measure of the effect of combination of Vertical Oscillatory Pressure and Lumbar Stabilization Exercises on pain intensity, disability index, anxiety level, health related quality of life and spinal range of motion.

Variable	GRP A (X ± S.D)	GRP B (X ± S.D)	GRP C (X ± S.D)	F-ratio	P-values
Week 1(baseline)					
Disability level	26.0 ± 12.67	30.7 ± 18.49	33.3 ± 14.80	1.174	0.316
Anxiety Level	1.9 ± 3.04	4.7 ± 4.99	2.9 ± 4.16	2.336	0.105
HQoL(Physical	59.0 ± 17.99	54.3 ± 16.67	59.4 ± 14.79	0.612	0.545
Pain intensity	4.9 ± 1.35	4.3 ± 1.54	4.9 ± 1.45	1.283	0.285
SFR	15.3 ± 3.38	17.0 ± 3.34	18.1 ± 8.37	1.412	0.252
SFL	16.0 ± 2.47	17.2 ± 4.20	17.7 ± 7.22	0.539	0.586
FF	2.8 ± 4.29	3.7 ± 3.47	6.2 ± 6.7	2.535	0.088
BB	23.7 ± 2.87	24.9 ± 8.39	27.4 ± 11.21	1.141	0.326
Week 3					
Disability level	19.2 ± 12.64	24.9 ± 15.70	25.0 ± 13.36	1.163	0.319
Anxiety level	1.2 ± 2.36a	2.6 ± 3.14b	0.6 ± 1.02c	4.006	0.023*
HQoL(Physical)	66.0 ± 18.85	64.3 ± 17.04	70.7 ± 14.70	0.79	0.458
Pain intensity	3.7 ± 1.00	3.2 ± 1.60	3.4 ± 1.28	0.688	0.507
SFR	15.2 ± 3.01	16.3 ± 3.49	14.7 ± 3.52	1.245	0.295
SFL	14.8 ± 3.01	16.1 ± 3.44	13.8 ± 3.57	2.664	0.078
FF	2.4 ± 4.24	4.1 ± 4.63	3.1 ± 4.60	0.775	0.465
BB	22.1 ± 2.21	24.1 ± 6.50	23.6 ± 7.14	0.753	0.475
Week 6					
Disability level	16.0 ± 12.62	19.3 ± 13.40	17.3 ± 13.74	0.329	0.721

Anxiety level	0.9 ± 1.57	1.4 ± 2.04	0.8 ± 2.83	0.479	0.622
HQoL(Physical)	66.2 ± 26.33a	73.0 ± 16.01b	20.3 ± 5.00c	53.179	0.000*
Pain Intensity	3.4 ± 1.50	2.9 ± 1.68	2.6 ± 1.59	1.429	0.248
SFR	15.3 ± 3.16a	15.7 ± 3.74b	76.7 ± 14.70b	329.431 0.000*	
SFL	16.0 ± 3.68	15.9 ± 3.19	12.7 ± 4.59	5.137	0.009*
FF	3.5 ± 5.88	3.4 ± 4.52	12.1 ± 3.86	22.913	0.000*
BB	21.7 ± 2.57	23.3 ± 5.84	2.1 ± 4.94	134.797 0.000*	

Table 5: Across group comparison of the effect VOP,LSE and combination of VOP with LSE on disability level, Pain intensity, quality of life, anxiety level and spinal ROM using one-way ANOVA at baseline, 3th and 6th week.

Discussion

Low back pain is one of the most common health problems and creates a substantial personal, community and financial burden globally [4,5]. This study focused on assessing and comparing the effectiveness of Lumbar Stabilization Exercise (LSE) only, Vertical Oscillatory Pressure (VOP) only and combination of LSE and VOP on pain intensity level, disability index, health related quality of life, anxiety level and spinal range of motion of the participants.

Physical characteristics of age, weight, height and Body Mass Index of the participants were compared across the group, the result of this study showed that there is no indication that the effectiveness of these techniques depend on the physical characteristics of the participant ($P<0.05$).

When the effectiveness of VOP on the variables was assessed, it was observed that VOP was more effective on disability index and pain intensity of the participants. This result is similar to a study by Adesola et al. [31] which reported that VOP can be useful in ameliorating pain and disability of patients with Low Back Pain (LBP), also similar to a study by Aure et al. [36] which reported that manual therapy technique (VOP) had a significant effect on pain intensity and disability index. Arti et al. [37] also concluded that manual therapy such as posterior-anterior central pressure (VOP) had significant effect on pain, function (disability level) and spinal range of motion compared to other conventional therapy. Different previous literatures explained that the increase in pain intensity has direct effect on increasing disability of the participant which Arnstein et al. [38] pointed out in a study that high pain level is an important factor on increasing the disability level. The physiological evidence available for effectiveness of VOP on pain intensity was explained by Skyba et al. [39] who observed that joint manipulation produced anti–hyperalgesia via descending inhibitory mechanism that utilizes serotonin and noradrenaline. Therefore the direct thrust on spinous process in VOP may decrease mechanical pressure generated by inflammation and collagen deposits on soft tissues in and around the intervertebral foramen to restore mobility while descending electrical activity in type III and IV fibres through normalization of blood flow and vertebral alignment. Oscillation to the pressure-pain threshold may generate sufficient wide dynamic range neuron modulation of nociceptor specific neurons, down tune the amplitude of sinusoidal-voltage oscillation in membrane to decrease muscle spasm and hyper-excitation leading to analgesia, reduction of pain intensity and recovery function (reduce disability) [40,41].

Exercise plays a role in the management of CLBP with previous systematic reviews showing that exercise is effective in improving pain and function [42,43]. Lumbar Stabilization Exercise (LSE) is one of the recent specific exercises prescribed by healthcare professional. Lumbar Stabilization Exercises generally involve teaching the patient co-contraction of the abdominal (Transversus abdominis) and lower back muscles (Multifidi) to improve stability and control of the lumbar spine [44]. Studies have shown that patients with LBP have weaker back muscles than their asymptomatic peers, suggesting that strength improvements in these muscles could decrease the occurrence of LBP [45]. Lumbar Stabilisation Exercises can also be thought of as actively involving the patient in their own rehabilitation process, which is an important component of successful treatment strategies for chronic LBP. It has been claimed that there is a link between dysfunction within the activation and timing of local spinal stabilisation muscles and back pain [21,46]. Consequently a therapeutic exercise regime known as LSE aimed at these muscles was developed, designed to 'retrain' motor skills and the activation dysfunction [46]. Ferreira et al, [47] in a multicenter randomized control trial where general exercise was compared with Lumbar Stabilisation Exercise (LSE) in patients with CLBP. May et al. [48] and Vasseljen et al. [49] explain in their systematic reviews that Lumbar Stabilisation Exercise (LSE) is effective in the relief Low Back Pain following local back activation, also, Benjamin et al. [50] reported that there is a strong evidence that stabilisation exercises improve LBP symptoms especially pain intensity. The aforementioned literatures are in parallelism with the result of this study that Lumbar Stabilization Exercises had effect on pain intensity of the participants.

Research has been provided on level A evidence that depression, anxiety, distress and related emotions are related to pain and disability [51] also there is a strong impact that high pain intensity has on disability and chronic pain that leads to anxiety [52,53]. Altug et al. [54] reported in a study that exercise has shown significant effect on the anxiety and stress level, this is also similar to another study by Sethi et al. [55] which concluded that exercise especially LSE decreases level of depression and anxiety. Therefore previous literatures showed that there is significant effect of LSE on the anxiety level of patient with chronic low back pain and is similar to the result of this study. And in a study by Goldly et al. [45] which concluded that LSE were more effective than manual therapy in pain intensity reduction and disability index similarly Shaughnessy et al. [57], in a pilot study discovered that program of Lumbar Stabilisation Exercise is effective in improving quality of life and functional outcome in patients with chronic low back pain. Shadab et al. [58] concluded in a trial to support the view

that the functional integration of Stabiliser Biofeedback training directed at the deep abdominals and the lumbar muscles are effective in reducing pain and functional disability in patients with chronic low back pain. Thus, affirmed Panjabi's hypothesis, that spinal stability is dependent on an inter play between the passive, active, and neural control systems. Specific training of the muscles considered to provide dynamics stability to the lumbar spine may act to maintain the neutral zones of the motions segment within more normal limits during functional activity. However, it should be utilized in conjunction with other techniques such as VOP in order to have the best result reducing pain, disability and improving quality of life.

Many studies mentioned earlier have looked at the effectiveness of the Vertical Oscillatory Pressure (VOP) and Lumbar Stabilisation Exercises (LSE) individually. Each treatment has been shown to have success on its own, Hides et al. [58] found specific exercise therapy to be more effective in reducing reoccurrences of low back pain while manual therapy has also been shown to have immediate effects in reducing pain, regardless of whether a randomly assigned or therapist selected technique was used [60]. Goldby et al. [44] examined the differences between lumbar stabilization exercises and manual therapy and found stabilization exercises to be more effective at reducing disability 12 months after the initial intervention, but found both treatments to be better than no treatment at all. In contrast, Aure et al. [36] compared groups receiving either manual therapy or exercise therapy and found significantly greater improvements in the manual therapy group, although both groups showed improvements. In a review by Alban, [59], three studies were placed under review as to which study treatment is more effective, only one study provides evidence that LSE was more effective compared to a manipulative therapy technique while two studies support manual therapy providing better improvements. Other studies have also shown stabilization exercises to be more effective than manual treatment in reducing the reoccurrence of low back pain [61].

Previous research has suggested that a combination of manual therapy and specific adjuvant exercises is beneficial in treating low back pain [62]. Fewer studies have examined the effectiveness of using both treatment methods together. However Geisser et al. [63] did find a combination of stabilisation exercises and manual therapy to be more effective than either treatment individually. And Balthazard et al. [3] also reported that combination of manual therapy and stabilization exercise had significant effect on pain and disability index Considering manual therapy can provide immediate analgesic effects, it could theoretically be used to decrease a patient's pain thus allowing them to better perform stabilization exercises, which could positively affect their overall long-term outcome regarding chronic and recurrent episode of CLBP. As a result of the available previous literature reviews that support the combine effect of LSE following manual therapy (VOP) and the outcome of this study which found that the combination of Vertical Oscillatory Pressure and Lumbar Stabilization Exercises had significant effects on all the variables (disability index, anxiety, quality of life, pain intensity, and spinal ROMs) considered in this study than each of VOP and LSE, which further confirmed that it is beneficial to combine both intervention in the management of patient with Chronic Low Back Pain.

Conclusion

It was concluded that Vertical Oscillatory Pressure (VOP) and Lumbar Stabilisation Exercise (LSE) was individually effective. However, combination of Vertical Oscillatory Pressure and Lumbar Stabilization Exercise was more effective on disability, anxiety level, quality of life, pain intensity and spinal range of motion among participants with Chronic Low Back Pain (CLBP) than each of Vertical Oscillatory Pressure and Lumbar Stabilisation Exercises.

References

1. HoyD, March L, Brooks P, Blyth F, Woolf A, et al. (2014) The global burden of low back pain: estimates from the Global Burden of Disease 2010 study. Ann Rheum Dis 73: 968-974.
2. Rozenberg S (2008) Chronic low back pain: defnition and treatment. Rev Prat 58: 265-272.
3. Balthazard P, de Goumoens P, Rivier G, Demeulenaere P, Ballabeni P, et al. (2012) Manual therapy followed by specific active exercises versus a placebo followed by specific active exercises on the improvement of functional disability in patients with chronic non specific low back pain: a randomized controlled trial. BMC Musculoskelet Disord 13: 162.
4. Andersson GBJ (1999) Epidemiological features of chronic low-back pain. The Lancet 354: 581-585.
5. Dionne CE, Dunn KM, Croft PR (2006) Does back pain prevalence really decrease with increasing age? A systematic review. Age Ageing 35: 229-234.
6. https://www.ncbi.nlm.nih.gov/books/NBK11812/
7. Lidgren L (2003) The bone and joint decade 2000-2010. Bull World Health Organ 81: 629.
8. Rapoport J, Jacobs P, Bell NR (2004) Refining the measurement of the economic burden of chronic diseases in Canada. Chronic Dis Can 25: 13-21.
9. Deyo RA, Cherkin D, Conrad D, Volinn E (1991) Cost, controversy, crisis: low back pain and the health of the public. Annu Rev Public Health 12: 141-156.
10. Steenstra IA, Verbeek JH, Heymans MW (2005) Prognostic factors for duration ofsick leave in patients sick listed with acute low back pain: a systematic review of the literature. Occup Environ Med 62: 851-860.
11. Kent PM, Keating JL (2005) The epidemiology of low back pain in primary care. ChiroprOsteopat 13: 13.
12. Thelin A, Holmberg S, Thelin N (2008) Functioning in neck and low back pain from a 12-year perspective: a prospective population-based study. J Rehabil MeD 40: 555-561.
13. Murray CJ, Vos T, Lozano R, Naghavi M, Flaxman AD, et al. (2013) Disability-adjusted life years (DALYs) for 291diseases and injuries in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet 380: 2197-223.
14. World Health Organisation. The global burden of disease: 2004 update. Geneva: World Health Organization, 2008.
15. Stokes IA, Gardner-Morse MG, Henry SM (2011) Abdominal Muscle Activation Increases Lumbar Spinal Stability: Analysis Of Contributions Of Different Muscle Groups. Clin Biomech (Bristol, Avon) 26: 797-803.
16. ICSI (2005) Adult Low Back Pain. Institute for Clinical Systems Improvement.
17. Brosseau L, Milne S, Robinson V, Marchand S, Shea B, Wells G, Tugwell P (1991) Efficacy of the Transcutaneous Electrical Nerve Stimulation for the Treatment of Chronic Low Back Pain: A Meta-Analysis. Pain 47: 53-63.
18. Werners R, Pynsent PB, Bulstrode CJ (1991) Randomized trial comparing interferential therapy with motorized lumbar traction and massage in the management of low back pain in a primary care setting. Spine 24: 1579-1584.
19. Bjordal JM, Couppe C, Chow RT, Tuner J, Ljunggren EA (2003) A systematic review of low level laser therapy with location-specific doses for pain from chronic joint disorders. Australian J Physiother 49: 107-116.
20. Sweetman BJ, Heinrich I, Anderson JAD (1993) A randomized controlled trial of exercises, short wave diathermy, and traction for low back pain, with evidence of diagnosis-related response to treatment. J Ortho Rheumatol 6: 159-166.

21. McKenzie RA (1979) Prophylaxis in recurrent low back pain. N Z Med J 89: 22-23.
22. Hodges P, Richardson C (1996) Inefficient muscular stabilisation of the lumbar spine associated with low back pain: A motor control evaluation of transversus abdominis. Spine 21: 2640-2650.
23. Hodges PW, Richardson CA (1999) Altered trunk muscle recruitment in people with low back pain with upper limb movement at different speeds. Arch Phys Med Rehabil 80: 1005-1012.
24. Standaert CJ, Weinstein SM, Rumpeltes J (2008) Evidence-informed management of chronic low back pain with lumbar stabilization exercises. Spine 8: 114-120.
25. Nwuga VCB (1982) Relative efficacy of vertebral manipulation and conventional treatment in back pain management. Am J Phys Med 61: 273-275.
26. NwugaVCB (2007) Case Histories in Manual Treatment of Back Pain. (2nd edition) William Publishers, pp: 199-211.
27. Akinbo SRA (1998) Physiotherapy management of low back pain. Manipulating therapy andthermal therapy techniques. J Nigeria Medical Rehabil Ther 3: 32-35.
28. Harvey E, Burton AK, Moffett JK, Breen A; UK BEAM trial team (2003) Spinal manipulation for low-back pain: a treatment package agreed to by the UK chiropractic, osteopathy and physiotherapy professional associations. Man Ther 8: 46-51.
29. van de Veen EA, de Vet HC, Pool JM (2005) Variance in manual treatment of nonspecific low back pain between orthomanual physicians, manual therapists,and chiropractors. J Manipulative Physiol Ther 28: 108-116.
30. Egwu MO, Adeoshun IO, Olaoogun MOB, Ikem IC, Ukponmwan OE (2012) Cortical electrophysiological changes during vertical oscillatory pressure therapy in patients with low back pain. Intercontinental J Medical Sci 2: 1-7.
31. Adesola O, Ojoawo Mathew O, Olaogun Sunday A, Odejide Abiodun A (2013) Badru mechanical low back pain using Roland Morris Disability questionnaire. Tanzania J Health Res 15: 1.
32. Luque-Suárez E, Díaz-Mohedo I, Medina-Porqueresand T, Ponce G (2012) Stabilization Exercise.
33. Vásquez-Ríos JR, Nava-Bringas TI (2014) Lumbar stabilization exercises. Cirugía y Cirujanos 82: 306-313.
34. Hoy D, Brooks P, Blyth F, Buchbinder R (2010) Epidemiology of Low back pain. Best Pract Res Clin Rheumatol 24: 769-781.
35. Snodgrass SJ, Rivett DA, Robertson VJ (2007) Manual forces applied during cervical manipulation. J Manipulative Physiol Ther 30: 17-25.
36. Aure OF, Nilsen JH; Vasseljen, O (2003) Manual therapy and exercise therapy in patients with chronic low back pain: a randomized controlled trial with 1-year follow up. Spine 28: 525-531.
37. Sharma A, Alahmari A, Ahmed I (2015) Efficacy of Manual Therapy versus Conventional Physical Therapy in Chronic Low Back Pain Due to Lumbar Spondylosis. A Pilot Study. Medical Sci 3: 55-63.
38. Arnstein P, Caudill M, Mandle CL, Norris A, Beasley R (1999) Self efficacy as a mediator of the relationship between pain intensity, disability and depression in chronic pain patients. Pain 80: 483-491.
39. Skyba DA, Radhakrishman R, Rohlwing JJ, Wright A, Sluka KA (2003) Joint manipulationreduces hyperalgesia by activation of monoamines receptors but not opiod or GABA receptors in the spinal cord. Pain 106: 156-168.
40. Shacklock M (1995) Neurodynamics. Physiotherapy 81: 9-16.
41. Croft PR, Papageorgiou AC, Thomas E, Macfarlane GJ, Silman AJ (1999) Short-term physical risk factors for new episodes of low back pain. Prospective evidence from the South Manchester Back Pain Study. Spine 24: 1556-1514.
42. Koes BW, van Tulder MW, Thomas S (2006) Diagnosis and treatment of low back pain. Br Medical J 332: 1430-1434.
43. Henchoz Y, Kai-Lik So A (2008) Exercise and nonspecific low back pain: a literature review. Joint Bone. Spine 75: 533-539.
44. Goldby LJ, Moore AP, Doust J, Trew ME (2006) A randomized controlled trial investigating the efficiency of musculoskeletal physiotherapy on chronic low back disorder. Spine 31: 1083-1093.
45. Barr KP, Griggs M, Cadby T (2005) Lumbar stabilization: core concepts and current literature, part 1. Am J Phys Med Rehabil 84: 473-480.
46. Richardson C, Jull G, Hodges P, Hides J (1999) Therapeutic Exercise for Spinal Segmental Stabilization: In Lower Back Pain. Edinburgh, Churchill Livingston.
47. Ferreira ML, Ferreira PH, Latimer J, Herbert RD, Hodges PW, et al. (2007) Comparison of general exercise, motor control exercise and spinal manipulative therapy for chronic low back pain: A randomized trial 131: 31-37.
48. May S, Johnson R (2008) Stabilisation exercises for low back pain: a systematic review. Physiotherapy 94: 179-189.
49. Vasseljen O, Fladmark AM, Westad C, Torp HG (2009) Onset in abdominal muscles recorded simultaneously by ultrasound imaging and intramuscular electromyography. J Electromyogr Kinesiol 19: e23-e31.
50. Linton SJ (2000) A review of psychological risk factors in back and neck pain. Spine 2000 25: 1148-1156.
51. Lame IE, Peters ML, Vlaeyen JWS, Kleef MV, Patijn J (2005) Quality of life in chronic pain is more associated with beliefs about pain, than with pain intensity. Europ J Pain 9:15-24.
52. Smith BE, Littlewood C, May S (2014) An update of stabilisation exercises for low back pain: a systematic review with meta-analysis BMC Musculoskelet Disord 15: 416.
53. Altug F, Buker N, Kaylak E, Kitis A, Caylak U (2013) Relationship between disability, pain intensity and quality of life in patients with chronic neck pain. Romanian J Phys Ther 9: 69-73.
54. Altuğ F, Kavlak E, Kurtca MP, Ünal A, Cavlak U (2015) Comparison of Pain intensity, emotional status and disability level in patients with chronic neck and low back pain. J Back Musculoskelet Rehabil 28: 505-508.
55. Vanshika S, Pragya D (2012) Impact of short duration (4 weeks) core stability exercise indepression, anxiety and stress status of adult patients with chronic low back pain. J Pharma Biomed Sci: 23.
56. Shaughnessy M, Caulfield B (2004) A pilot study to investigate the effect of lumbar stabilization exercise training on functional ability and quality of life in patients with chronic low back pain. Int J Rehabil Res 7: 297-301.
57. Uddein S, Ahmed F (2013) Effect of lumbar stabilization exercises versus pressure feedback training in low back ache patients: Annual International Interdisciplinary Conference, Azores, Portugal.
58. Hides JA, Jull GA, Richardson CA (2001) Long-Term Effects of Specific Stabilizing Exercises for First-Episode Low Back Pain. Spine 26: e243-e248.
59. Alban Merepeza (2014) Effects of spinal manipulation versus therapeutic exercise on adults with chronic low back pain: a literature review. J Can Chiropr Assoc 58: 456-466.
60. Rasmussen-Barr E, Ang B, Arvidsson I, Nilsson-Wikmar L (2009) Graded Exercise for Recurrent Low-Back Pain: A Randomized, Controlled Trial With 6-, 12-, and 36-Month Follow-ups. Spine 34: 221-228
61. Lewis JS, Hewitt JS, Billington L, Cole S, Byng J (2005) Karayiannis S. A randomized clinical trial comparing two physiotherapy interventions for chronic low back pain. Spine 30: 711-721.
62. Chiradejnant A, Maher CG, Latimer J, Stepkovitch N (2003) Efficacy of "therapist-selected" versus "randomly selected" mobilisation techniques for the treatment of low back pain: a randomised controlled trial. Aust J Physiother 49: 233-241.
63. Geisser ME, Wiggert EA, Haig AJ, Colwell MO (2015) A randomized, controlled trial of manual therapy and specific adjuvant exercise for chronic low back pain. Clin J Pain 21: 463-470.