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EFFECT OF LUMBAR ROTATORY TECHNIQUE (LRT) ON CLINICAL VARIABLES OF PATIENTS WITH NON-SPECIFIC CHRONIC LOW BACK PAIN

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Abstract

Background: *Low back pain (LBP) is described as pain that is felt at the back of the body, from the lower margin of the twelfth rib to the lower gluteal folds and lasts for at least one day. Non-specific chronic low back pain (NSCLBP) usually is of unknown origin or cause and can be treated through manual therapy techniques such as Lumbar Rotatory Technique (LRT).*

Aim: *This study aimed to determine the effect of LRT on Spinal range of motion (forward flexion and backward extension), pain intensity and disability level.*

Method: *Ethical approval for this study was obtained from the Ethics and Health Research Committee of Physiotherapy Out-patient Clinic of the University of Medical sciences, Ondo, Ondo State before commencement of this study. This pre-experimental study involved 20 patients with NSCLBP. Participants were recruited purposively, and LRT was administered after taking consent and explaining the procedure. Treatment effects were assessed in terms of spinal range of motion (forward flexion and backward extension), pain intensity and disability level using Finger-to-floor method, Quadruple Visual Analogue Scale, and Oswestry Low Back Pain Disability Questionnaire at inception, third week and sixth week of treatment. Participants underwent treatment twice weekly for six (6) weeks. Descriptive statistic of mean, standard deviation and inferential statistics of Paired T-test, Repeated measure ANOVA were used to analyse data. Alpha level was set at $p<0.05$ of significance.*

Result: *The results showed that LRT had significant improvement in week 1 forward flexion (P= 0.010), backward bending (P= 0.000), pain intensity (P= 0.000) and disability (P= 0.000). In week 3, there was significant improvement in backward bending (P= 0.000), pain intensity (P= 0.000) and disability (P= 0.000), however there was no significant improvement in forward flexion (P= 0.105). In week 6, there was significant improvement in backward bending (P= 0.000), pain intensity (P= 0.000) and disability (P= 0.000), however there was no significant improvement in forward flexion (P= 0.140).*

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Conclusion: *In conclusion, LRT has significant effect on improving SROM of patient and reducing patient's spinal pain intensity.*

Keywords: *Lumbar-Rotatory-Techniques, Chronic-Low-Back-Pain, Pain-Intensity, Spinal-Range-Of-Motion.*

INTRODUCTION

Pain is a noxious sensory and emotional encounter intertwined with, or reminiscent of, the sensations connected to real or potential harm inflicted upon bodily tissues.[1] Pain causes widespread suffering, impairment, social impacts, and cost.[2] Worldwide, musculoskeletal (MSK) pain conditions are the leading cause of disability and significant social hardship.[3] Pain can be located at the cervical region, the thoracic region, the lumbar region, and the sacral region.[4] Back pain at the lumbar region is common, afflicting 20% of people in all countries and ethnicities on average each year, and up to 50% of individuals on average at least once in their lifetime.[5] Back pain symptoms with specific origins, such as infections, tumors, osteoporosis, spondyloarthropathies, and trauma, really make up a small proportion of cases that require a particular type of treatment.[5]

Low back pain (LBP) is characterized as discomfort extending into either or both lower extremities, sensed along the posterior aspect of the body, spanning from the inferior border of the twelfth rib to the lower gluteal creases, persisting for a minimum duration of one day.[6] LBP affects 12% of adolescents and 32% of adults in Africa.[7] Low back pain can be classified by distinguishing clinical patterns as: mechanical low back pain, low back pain with radiculopathy, pathological low back pain, and low back pain with a psychological model.[8] Low back pain can also be classified by duration as: acute (less than 6 weeks), subacute (6-12 weeks), and chronic (12 weeks longer).[9]

Acute low back pain with self-care, goes away on its own in a few days without any lasting function loss. Sometimes it takes a few months for the symptoms to go away. One year after experiencing acute low back pain, about 20% of sufferers experience chronic low back pain (CLBP) with ongoing symptoms even after the initial cause of the acute pain has been treated.[10] Musculoskeletal strains and sprains, herniated discs, pinched nerve roots, degenerative discs, or joint illness are among the causes of nonspecific or mechanical low back pain while there is specific or non-mechanical low back pain, which includes cases caused by tumors, inflammatory diseases, infections, fractures, etc.[11] Clinical symptoms which have been the most frequent cause of treatment in LBP patients is associated with physiologic impairment of pain, decreased muscular strength and endurance, functional restrictions, and loss of spinal range of motion, among others. [12] [13] [14]

Low back pain is a complex illness that has an impact on the patient's emotional and physical well-being.[15][16][17] According to the biopsychosocial model of CLBP, integrated multimodal therapies should address how social, emotional, psychological, behavioral, cognitive, and physical factors interact to exacerbate pain. [18][19][20][21] A study conducted in rural Nigeria, biopsychosocial factors like sickness beliefs, fear avoidance beliefs, catastrophizing, anxiety, depression, maladaptive coping, social support, and occupational biomechanical factors was reported.[22] Spinal mobility has been utilized by physical therapists as an objective clinical evaluation of spinal function and back pain intensity. Spinal mobility assessments like forward bending (FB) (flexion), back bending (BB) (extension), and lateral bending (LB) have been used in clinical settings to assess dysfunction, gauge the effectiveness of rehabilitation, and ultimately decide when to stop receiving physical therapy and return to work. [23][24][25]

Diagnostic imaging is advised for low back pain that has red flags. A cause worse than musculoskeletal pain may also be indicated by failure to improve, a worsening of symptoms, a chronic neurologic deficiency, or a change in the character of the pain. Most mechanical causes of low back pain can be seen with radiography using posterior anterior (PA), lateral, and oblique views.[26] Different conditions can mimic that of low back pain hence differential diagnosis of low back pain includes; structural causes (degenerative disc disease, facet joint degeneration, sacroiliac joint arthroplasty, piriformis syndrome, fracture), neurological cause (spinal sternosis), and extra spinal causes (rheumatological conditions, neoplasms, psychological, infection). [27]

According to various studies conducted, a variety of low back pain care strategies, includes surgical, pharmaceutical, physiotherapy, and conservative management, which in recent times have been classified into pharmaceutical and non-pharmacological management. [28][29][30][31][32][33][34] The selection of treatments for low back pain has been influenced by these classifications.[35][36][37]

Various spinal manual therapy techniques are being used as an efficient strategy in the treatment of LBP.[38] Lumbar rotatory technique (LRT), vertical oscillatory pressure, spinal traction, rotation maneuvers, flexion maneuvers, and hyper-extension are among the common manipulative techniques used.[39] A common manipulative method that has been utilized to lessen pain and improve spinal mobilization is rotational mobilization.[40] Hassel conducted a study that looked into the kinetics of rotational manipulation.[41]

Various school of thought have been put into consideration in the use of manual therapy and these includes James Cyriax with the principles every pain has a source, treatment must reach the source, treatment must benefit the source in order to relieve the pain[42]; Freddy Kaltenborn whose philosophy is based on the combination of physical medicine, chiropractic, and osteopathy[43] ; Geoffrey Maitland who uses oscillatory movements on a selected joint, within the patient's tolerance and the therapist's range of motion, to loosen a fixed synovial joint[44]; John Mennell who identified adhesions, postural strain, and the facet joint as contributing factors to back pain[44] and Vincent Nwuga with the concept of thorough assessment, examination, reaching a physical diagnosis and appropriate mobilization techniques.[44] Maitland school of thought involves treating the symptoms without the confusion over diagnostic terms, all anatomical structures examined with a focus on function, the two categories of problems are pain/stiffness and stiffness/pain (problems may differ from one group to the next), five grades of motion and the two types of joint motion, glide and traction, are used during treatment.[45] From the research conducted by Hengeveld and Banks, it was shown that therapy outcomes are significantly influenced by the grade, rhythm, and direction of movement used when performing treatment approaches[46]. Maitland recommended using large oscillations for

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grades II and III while defining grade I and IV mobilization as modest amplitude oscillations[47]

Nwuga school of thought involves the use of manipulative techniques which can be classified under the headings as indirect manipulation (lumbar rotatory techniques), direct manipulation (digital pressure), specific manipulation, non-specific manipulation, oscillatory techniques (Vertical oscillatory pressure) [48][49] and manipulative thrusts (vertical thrusts).[44]

However, there is scarce research on the effect of LRT on clinical variables in the treatment of patients with chronic low back pain. Hence, this study.

Twenty participant with chronic non specific low back were purposely recruited for this pre- experimental study. Ethical approval, informed consent and permission to conduct this study were obtained before the commencement of this study. Lumbar Rotatory Technique was administered as an intervention for the management of painful low back pain.Pain intensity, disability level, Spinal range of motion were assessed using Quadruple Visual Analogue Scale at first , third and sixth weeks. Intervention were given for six weeks, Data were analyzed using descriptive and inferential statistics. Significant was set at P< 0.05.

Application of Lumbar Rotatory Technique

The patient was asked to lie supine, while the physiotherapist stood opposite the involved side, placing his/her left hand on the patients opposite shoulder while grabbing the patient's lower limb at the back of the knee with his/her right hand, flexing the left hips and bringing the involved knee across the body. In the process the lumbar spine is put into rotation.

The manipulation was carried out by bringing the knee close to the ground. The left hand working to stabilize the left shoulder, which in turn stabilizes the thorax indirectly. The lumbar spine was flexion or extension to obtain some degree of localization. Adjusting the involved leg's position and the hip's angle of flexion accomplished this. Increased lumbar spine flexion results in more hip flexion, which increased the likelihood that the manipulative push fell on the lower lumbar intervertebra joints. However, as the hip extends, the opposite occurs. Lumbar Rotatory Technique was used with the application of minimal force.

Plate 1 showing application of lumbar rotatory technique

Data Analysis

Descriptive statistics of mean and standard deviation was used to analyze the physical characteristics of participants. Paired t-test was used to compare the effect of lumbar rotatory technique on spinal range of motion, pain intensity and disability within week.Repeated measure ANOVA was used to compare the effect of lumbar rotatory technique on spinal range of motion across weeks. A level of $p<0.05$ was considered significant.

RESULTS

General characteristics of the participants

The age (years) weight (kg), height (m) and BMI (kg/m^2) are presented in table 4.1. It was shown that the mean age of 55.05 ± 9.56, weight of 70.41 ± 1.63, height of 1.63 ± 0.07 and majority were normal weight.

Comparison of the effect of Lumbar Rotatory Technique on variable within each week of application using **paired t-test.**

According to table 4.2, it was shown that patients had significant improvement in week 1 forward flexion (P= 0.010), backward bending (P= 0.000), pain intensity (P= 0.000) and disability (P= 0.000). In week 3, there was significant improvement in backward bending (P= 0.000), pain intensity (P= 0.000) and disability (P= 0.000), however there was no significant improvement in forward flexion (P= 0.105). In week 6, there was significant improvement in backward bending (P= 0.000), pain intensity (P= 0.000) and disability (P= 0.000), however there was no significant improvement in forward flexion (P= 0.140).

Within the group comparison of intervention (Lumbar Rotatory Technique) on clinical variables (forward flexion, backward bending, pain intensity and disability level) across weeks using repeated measure ANOVA.

It was shown in table 4.3 that, there were significant changes of the effect of lumbar rotatory technique (LRT) on spinal range of motion (forward flexion, F= 5.588, P= 0.007. Backward bending, F= 44.329, P= 0.000), pain intensity (F= 109.771, P= 0.000) and disability (F= 30.944, P= 0.000) across weeks.

Table 2: General Characteristics of the Participants

VARIABLE	$\bar{X}$ ± S.D
Age (years)	55.05 ± 9.56
Weight (kg)	70.41 ± 1.63
Height (m)	1.63 ± 0.07
BMI (kg/m^2)	26.29 ± 5.78

Key; BMI: Body Mass Index

$\bar{X}$: Mean

S.D: Standard Deviation

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Table 3: Comparison of the Effect of Lumbar Rotatory Technique and Weeks of Application Using Paired t-Test.

	$\bar{X}$ ± S.D	t	p- value
Week 1			
FF (cm)	3.75 ± 7.2	-1.775	0.010
BB (cm)	63.68 ± 7.77	-37.80	0.000
PI	65.29 ± 12.78	-23.58	0.000
DIS	33.55 ± 16.58	-9.205	0.000
Week 3			
FF (cm)	3.36 ± 6.53	-1.696	0.105
BB (cm)	62.43 ± 7.72	-37.293	0.000
PI	56.78 ± 12.13	-21.568	0.000
DIS	27.55 ± 13.93	-8.933	0.000
Week 6			
FF (cm)	2.73 ± 5.28	-1.533	0.140
BB (cm)	60.95 ± 7.97	-35.24	0.000
PI	46.18 ± 10.58	-20.02	0.000
DIS	19.64 ± 10.35	-8.43	0.000

Key; FF: Forward Flexion; BB: Backward Bending; PI: Pain Intensity; DIS: Disability

Table 4: Within the Group Comparison of Intervention (Lumbar Rotatory Technique) On Clinical Variables (Forward Flexion, Backward Bending, Pain Intensity And Disability) Using Repeated Measure ANOVA.

VARIABLES	WEEK 1 $\bar{X}$ ± S.D	WEEK 3 $\bar{X}$ ± S.D	WEEK 6 $\bar{X}$ ± S.D	F- RATIO	p- VALUE
FF (cm)	3.75 ± 7.26	3.36 ± 6.50	2.73 ± 5.28	5.588	0.007
BB (cm)	63.68 ± 7.77	62.43 ± 7.72	60.95 ± 7.97	44.329	0.000
PI	65.29 ± 12.78	56.78 ± 12.78	46.18 ± 10.58	109.771	0.000
DIS	33.55 ± 16.58	33.55 ± 16.58	19.64 ± 10.35	30.944	0.000

Discussion

Low-back pain is a complex illness that has an impact on the patient's emotional and physical well-being.[15][16][17] Various spinal manual therapy techniques are being used as an efficient strategy in the treatment of LBP. According to Nwuga, manipulative techniques can be broadly classified into several categories[44]. Direct and indirect manipulation is a type of manual therapy technique and lumbar rotatory techniques is a type of indirect manipulation. This technique is designed to mobilize the facet joints and relieve any restrictions or pain that the patient may be experiencing. A common manipulative method that has been utilized to lessen pain and improve spinal mobilization is rotational mobilization.[40] In this study, it was evident that there was significant improvement in the effect of LRT on the clinical variables of patients with NSCLBP. This study correlates with the study by Nwuga who reported a significant increase in the forward flexion ($p=<0.01$) and backward bending ($p=<0.05$) in patients treated with rotational manipulation[50]. These findings align with the principle of manual therapy and spinal mobilization techniques, which aim to restore and enhance the range of motion of the lumbar spine.[51] Increased mobility in forward flexion and backward bending can be crucial for patients with NSCLBP as it allows them to perform daily activities with greater ease and functionality.[52] The positive effect of range of motion suggests lumbar rotatory technique may contribute to enhancing the physical functioning of individuals with NSCLBP.

In a comparative study conducted by Nwuga and Fajewonyomi, it was shown in that out of 30 patients treated with rotational manipulation, 15 were completely pain free, 5 had residual pain, 9 showed fair improvement while one had no improvement. Twenty-five of the patients were able to return to their work after 3 weeks of the experimental period and 4 returned for more treatment after 3 months. This goes in line with this study that showed significant improvement of pain and disability level of patients with NSCLBP after 6 weeks of LRT intervention[53]. Evans also carried out research using rotational manipulation and reported a significant increase in the spinal range of motion of the participants.[54]

This study demonstrated a significant reduction in pain intensity among patient who underwent lumbar rotatory technique. This result is consistent with previous studies that have highlighted the analgesic effect of manual therapy interventions.[55] Through the application of targeted mobilization to the lumbar spine, LRT may help alleviate pain in NSCLBP patients by modulating pain perception, promoting tissue healing and alleviating muscle tension.

Additionally, this study revealed a significant decrease in disability level among participants who received LRT intervention.

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Disability, which was measured using standardized scale which is the Oswetry Disability Index (ODI), reflects the impact of NSCLBP on an individual's ability to engage in daily activities and perform functional tasks.[56] The observed reduction in disability score across 6 weeks of intervention, indicates that LRT not only reduces pain intensity but also enhances functional abilities and improves quality of life for individuals with NSCLBP.

The lumbar rotatory technique is believed to function through enhancing the lumbar spine's range of motion, diminishing inflammation, and triggering the release of endorphins.[50] The rotational forces are believed to induce movement of spinal joints, which may help alleviate joint stiffness and improve overall joint mobility.[57] The technique may stretch muscles, ligaments, and other soft tissues around the lumbar spine.[58] This can potentially reduce muscle tension and improve flexibility, which might contribute to pain relief.[59] The manipulation of spinal joints can influence the nervous system.[60] This may lead to pain modulation through mechanisms such as the gate control theory, where sensory input from the manipulation competes with pain signals, ultimately leading to pain reduction.[61][62] The mechanical forces applied during the technique might stimulate blood flow to the area, promoting tissue healing and reducing inflammation.[63]

Conclusion

In conclusion, Lumbar Rotatory Technique (LRT) has significant effect on improving Spinal Range of Motion of patient and reducing patient's spinal pain intensity.

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