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Comparison of General Exercises, Motor Control Exercises and Spinal Manipulation in Chronic Low Back Pain Patients

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ABSTRACT

Objective: To compare the effects of motor control exercises, general exercises and spinal manipulative therapy on pain, functional status and disability in chronic low back pain patients.
Study Design: Randomized Clinical Trial (IRCT:20200511047391N1)
Place and Duration of Study: Riphah International University, Islamabad Pakistan, from Jun to Nov 2020.
Methodology: Study was conducted on 36 chronic low back pain patients aged 18-50 years. All were randomly allocated to three groups: general exercises group, motor control group, and manipulative therapy; all were treated with eight sessions in four weeks. Numerical pain rating scale, Patient-specific functional scale and Oswestry disability index were used.
Results: Findings revealed that differences between the three groups were statistically significant (p<0.05) concerning pain score, patient-specific functional scale, and Disability index.
Conclusion: It was concluded that motor control exercises are most effective in treating chronic low backache. The results of our study showed that there is a significant difference in pain, function and disability in all the groups.

Keywords: Exercise therapy, Low Back Pain, Manipulation, SpinalPain, Pain Measurement

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INTRODUCTION

Low back pain is a common complaint having long-term effects with an expected time frequency of 70% to 85%.[1,2] For most of the patients, the clinical course is benign, with 95% of those suffering will recover within a few months of onset. At the same time, some of them will not recover and will develop chronic low back pain.[3] Chronic low back pain is defined as symptoms lasting over three months. Up-to-date management of chronic low-back aches includes a variety of different treatments such as medication, behavioural therapy and exercise.[4] The increase in the visits to the hospitals for low back aches could be due to an increase in the ratio of low back ache, increase in the ratio of people having low back ache who take medical care and can be a combination of these.[5,6]

A wide variety of conventional treatments are available for this condition when it becomes chronic abdominal trunk curls, general aerobic exercises such as swimming and walking, flexion exercises, pelvic tilt exercises and hamstring stretching are the treatments that are given in chronic low back ache.[7] However, very few experimental trials have assessed the efficiency of these diverse conventional procedures for this problem.[8,9]

Previous studies have researched exercise therapies.[10] but to our knowledge, no local research has compared spinal manipulation with exercise therapy for chronic low back patients. This study compared general exercises, motor control exercises, and spinal manipulation in patients with chronic low back pain.

METHODOLOGY

After approval from the Institutional Review Board and Ethics committee (REC/RCRS/201014), randomized clinical trial was conducted at Riphah International University, Islamabad, Pakistan from June to November 2020. The study protocol was registered with the Iranian Registry of Clinical Trial (IRCT: 20200511047391N1). The sample size was calculated using G power software taking the effect size at 0.62, and power at 0.95.[11]

Inclusion Criteria: Patients aged 18-35 years, of either gender with non-specific chronic low back pain were included.

Exclusion Criteria: Patients having neurological signs, specific spinal pathology (e.g. malignancy, inflammatory joint or bone disease), or back surgery: serious low back pathology or pregnant women were excluded.

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Randomization was done by using the lottery method (Figure-1). Written, informed, consent was taken from the participants. Each group was allocated 12 participants by using the lottery method. Three interventional groups were treated for one month, two sessions a week. Baseline treatment, including warm-up, was given to all three groups. Group-A was treated with a spinal manipulation technique applied to the lumbar spine) which was discontinued if the patient recovered before the treatment period. Grade I-IV joint mobilization was used as a pre-test for the appropriateness of manipulation, as a pre-treatment for manipulation, or as a substitute for manipulation in patients where manipulation might be contraindicated.

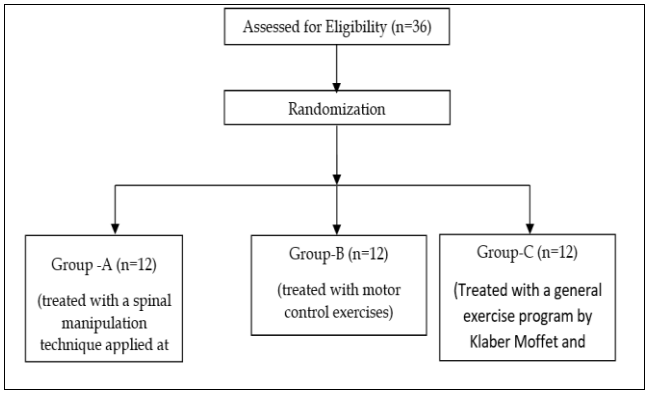

Figure-1: Patient Flow Diagram (n=36)

Group-B was treated with motor control exercises .[12] That improve the function of specific trunk muscles to control the inter-segmental movement of the spine, including transversus abdominis, multifidus, the diaphragm and pelvic floor muscles. Initially, participants were educated to contract the transversus abdominis and multifidus muscle groups in isolation from the superficial trunk muscles. However, alongside the pelvic floor muscular tissues, When treating members in each exercise group, physical therapists did follow the principles of cognitive-behavioural therapy.[13] The cognitive-behavioural approach encourages skill acquisition through modelling, pacing, setting modern desires, self-tracking progress, and positive reinforcement of progress. Group-C was treated with a general exercise program by Klaber Moffet and Frost.[14] The exercises aim to strengthen the body's key muscle groups, including the trunk and abs, stretch the key muscle groups, and increase cardiovascular wellness with low-impact aerobic exercises. The primary point of the program was to progress the physical capacity and trust in utilizing the spine and to show members how to handle their back issues. Pain and functional status were the primary outcomes measured with a numerical pain rating scale and patient-specific functional scale. At the same time, disability was the secondary outcome measured with the Oswestry disability index.[15] Pre and post-treatment values

Statistical Package for Social Sciences (SPSS) version 23.0 was used for the data analysis. Quantitative variables were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. Repeated measure ANOVA was applied to gauge the mean differences among the groups. The *p*-value of 0.05 or less was taken as significant.

RESULTS

Participants in the Manipulation Therapy-Group had the mean BMI of 23.01±3.51kg/m^2, Motor Control-Group had 21.11 ± 6.23kg/m^2 and General Group had mean BMI of 22.79±2.53kg/m^2. Table-I shows the treatment outcomes comparing the Motor control, spinal manipulation, and General exercise groups.

Table-I: Demographic Details of the Study Groups (n=36)

Study Groups		Mean ± Std. Deviation
Manipulative Therapy (n=12)	Age (years)	27.67±5.59
	height in cm	165.42±8.63
	weight in kg	63.417±12.1
	BMI (kg/m^2)	23.017±3.51
Motor Control Exercises (n=12)	Age (years)	28.00±5.08
	height in cm	168.75±7.11
	weight in kg	64.917±8.14
	BMI (kg/m^2)	21.117±6.23
General Exercises (n=12)	Age (years)	27.75±4.33
	height in cm	162.83±5.40
	weight in kg	60.833±8.38
	BMI(kg/m^2)	22.792±2.53

The comparison of pre-treatment and post-treatment NPRS, PSFS and ODI values across three groups was done by repeated measure ANOVA. Analysis revealed a statistically significant difference in the three groups (*p*-value < 0.05). In the Manipulative Therapy Group, the mean difference for NPRS pre-treatment was 7.00±1.47 and post-treatment values were 2.92±1.16 for the Motor Control Group, pre-treatment was 7.25±1.42, and post-treatment was 1.42±0.66, and for General Exercise Group pre-treatment was 6.67±1.49, and post-treatment was 4.17±1.40. Results showed statistically significant differences in the three groups (*p*-value <0.05), with a

greater difference in the Motor Control Group, as shown in Table-II. Post-HOC analysis is shown in the Table-III.

Table- II: Pre and Post Values of Scales in the Study Groups (n=36)

Scales		Manipulative Therapy (n=12)	Motor Control Exercises (n=12)	General Exercises (n=12)	*p*-value
Numerical Pain Rating Scale	Pre	7.00±1.47	7.25±1.42	6.67±1.49	<0.01
	Post	2.92±1.16	1.42±0.66	4.17±1.40	
Patient Specific Functional Scale	Pre	2.58±0.87	2.95±1.16	3.23±1.21	<0.01
	Post	6.75±1.21	8.98±1.35	6.53±1.07	
Oswestry Disability Index	Pre	56.83±14.56	65.42±11.38	68.50±8.87	<0.01
	Post	21.67±5.63	10.08±4.68	33.58±8.14	

Table-III: Inter-Group Comparison (Post Hoc analysis)

Scales	Group Comparisons		*p*-value
Numerical Pain Rating Scale	Motor Control Exercises	Manipulative therapy	0.007
	Motor control Exercises	General exercises	<0.01
	General exercises	Manipulative therapy	0.027
Patient Specific Functional Scale	Motor Control Exercises	Manipulative therapy	0.004
	Motor Control Exercises	General exercises	<0.001
	General exercises	Manipulative therapy	0.894
Oswestry Disability Index	Motor Control Exercises	Manipulative therapy	<0.001
	Motor Control Exercises	General exercises	<0.001
	General exercises	Manipulative therapy	<0.001

DISCUSSION

In our study, the motor control exercises, general exercises, and spinal manipulations were given as a treatment, and the motor control exercises group had a maximum decrease in pain within and across the group on the numerical pain rating scale when measured. A randomized clinical trial was conducted in 2018 in which motor control exercise, patient education and motor control exercise and patient education groups were compared to manage chronic low back aches. The pairwise assessment shows that the (MCE+ PE) group was greater than the patient education group for pain and the motor control group for disability.[15] Similarly, a systematic review was conducted to assess the efficiency of motor control exercise in patients with non-specific low backaches that concluded that MCE is more efficient than other treatments for decreasing pain, as the biological justification for motor control exercise was generally founded on the idea that the stability and control of the spine are changed in people with low backache.[16] Physiological investigations have shown that patients with low back aches may display a delayed onset of activity of the deep trunk muscles (e.g., transversus abdominis, multifidus) when the spine's stability is tested in dynamic tasks.[17]

Motor control exercises increase the stability and dynamic control of the spine as they help strengthen the deep trunk muscles. Therefore, the motor control group had the maximum decrease in pain compared to other groups.[18,19]

The physical function of the patients in the Motor Control Group was also improved the most compared to the other groups, as the pain was not allowing the patients to participate in the daily activities and instrumental activities of daily life, and due to the fear of pain, the patients did not function properly. It is obvious that when the pain factor is decreased, the patient actively starts doing their daily activities. Disability factor was also checked in all groups. After the results, the Motor Control Group showed the maximum decrease in disability when compared to the other groups.

Our study concluded that pain level within the Manipulative Therapy Group was decreased; on the other hand, compared with the motor control group, it was less decreased, and compared with the General Exercise Group, it was more decreased. Similarly, physical function within the Manipulative Group was increased; on the other hand, when compared with the Motor Control Group, it was less increased, and as compared to the General Exercise Group, it was more increased. Therefore, Motor Control Exercises are more effective in increasing the functional status of the patients.

The General Exercises Group showed a significant decrease in pain within the group, but when compared with motor control exercises, the motor control group showed a decrease in pain. Similarly, when compared to the Manipulative Therapy Group, the manipulative therapy group showed a decrease in pain. Similarly, the General Exercises Group showed significant

differences within the group in terms of pain, function and disability, but when compared with the Motor Control and Spinal Manipulation Group, it showed less increase in function and less decrease in disability as compared to the Manipulative and Motor Control Group.

Further studies are essential to see the long-term effects of these treatment options, as they effectively refine the quality of life in the long term. As in our study, follow-up needed to be included; this study only focuses on the short-term and immediate effects of the treatment.

LIMITATIONS OF STUDY

This study focuses only on the short-term effects of this treatment. The sample size for this research was small, and the study was conducted quickly.

CONCLUSION

The results of this study show a significant difference in pain, functional status, and disability in all the groups. The motor control exercise group shows a maximum decrease in pain and a maximum gain in function and disability. Therefore, motor control exercises treat chronic low back pain more effectively.

Conflict of Interest: None

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

AK & NA: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

ST & KK: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

AZ & SM: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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