COMPARING THE EFFECTS OF PILATES (PELVIC TILT) AND MCKENZIE BACK EXTENSION EXERCISES IN POWER LOOM WORKERS HAVING NON-SPECIFIC CHRONIC LOW BACK PAIN

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ABSTRACT

Background: Non-specific low back pain, which excludes identifiable conditions like infections, tumors, or fractures, is a leading cause of disability worldwide.

Objectives: The objective of this study was to analyze and contrast the impacts of two exercises – the Mackenzie back extension exercise and the Pilates pelvic tilt exercise – on pain, disability, and anterior pelvic tilt angle in power loom workers suffering from nonspecific chronic low back pain.

Methodology: It was a randomized clinical trial (RCT). In this study 138 subjects were screened for selection process. Selection was done according to the defined inclusion & exclusion criteria. The sample size of Forty-six loom workers was included in the study. Subjects were divided randomly by lottery method into two groups, group A (McKenzie back extension exercise) and group B (Pilates pelvic tilt exercise), 23 participants in each group. The data was collected with help of three investigations, QUEBEC back pain disability scale for disability and numeric pain rating scale for pain intensity goniometer for anterior pelvic tilt angle. Data analysis was done through SPSS version 26.

Results: Out of 46 participants, 45.7% were of age between 35-40 years, 54.3%)were between the age of 41-46 years. A statistical significant difference was found in QBPDS, NPRS and pelvic pre and post treatment ($P \leq 0.05$) in both groups A and B. Between-group analysis of NPRS, QBPDS and Pelvic angle showed a statistical significant difference ($p \leq 0.05$) between group A and B after treatment of 4 weeks.

Conclusion: This study found that both Mackenzie back extension exercise and Pilates pelvic tilt exercise were effective but Pilates pelvic tilt exercise was more effective in

improving pain, disability, and anterior pelvic tilt angle in power-loom workers with nonspecific chronic low back pain.

Keywords: McKenzie back extension exercise, Nonspecific chronic low back pain, Pilates, pelvic tilt exercise, QUEBEC back pain disability scale

Trial ID: This RCT was registered in ClinicalTrials.gov, Ref No NCT05473416 (https://clinicaltrials.gov/show/NCT05473416)

INTRODUCTION

Low back pain is a prevalent reason for medical consultations, ranking sixth in frequency, with approximately 80% of individuals experiencing it during their lifetime. When this discomfort persists for over three months, it is categorized as chronic low back pain (LBP) (1). However, a universally agreed-upon definition for LBP remains elusive. The yearly incidence is believed to vary between 15% and 45%, with a lifetime rate of approximately 23%, contributing too many healthcare and socio-economic challenges. Chronic LBP can arise from a diverse range of factors, with a precise cause identified in only around 10% of cases (2). Clinical examinations often fall short in determining the root cause of chronic LBP. It is estimated that roughly 700,000 adults in the US suffer from limited mobility attributable to chronic low back pain. In healthy adults, the lumbar intervertebral disc receives nerve supply, mainly focused in the external layers of the annulus fibrosus. However, as disc degeneration progresses, nociceptive fibers (sensory neurons responding to painful stimuli) and vascular granulation tissue extend deeper into the annulus fibrosus (3, 4).

Pain in the lower back that isn't attributed to recognizable conditions such as infections, bone degeneration, spine fractures, anatomical irregularities, inflammation, nerve-related issues, or

cauda equina syndrome is termed as non-specific low back pain. This sort of low back pain can affect people of all ages, with adults experiencing a greater impact on their quality of life than children (5). Non-specific chronic low back pain (NSCLBP) is a common illness that is linked to disability and absence at work on a worldwide scale. Recent prognostic studies have showed that around 40% of those suffering from acute low back pain do not heal within three months, and only 40% recover over the next 12 months. It's critical to recognise that the expenses of low back pain and disability are extremely high, putting a huge financial strain on individuals, governments, and healthcare providers (6, 7).

Exercises for lumbar extension and lumbar flexion are the foundation of the McKenzie-specific program. These are neither predetermined nor scheduled, but rather follow the progressivity principle with the aims of centralising discomfort, alleviating pain, and restoring functioning. When an inflammation (a swelling that might irradiate a segment of the sciatic nerve or the entire sciatic nerve) arises at the roots of the sciatic nerve and the pain becomes severe and persistent, it is contraindicated. The paravertebral muscles contracting either unilaterally or bilaterally is another factor that rules out this technique. Applying this technique has no effect on the muscle contractures. Additionally, even if the pain does not get worse, this method should not be used if there is numbness on various muscle groups in the affected lower limb (8). McKenzie back extension exercise consist of following steps; 1st step, First, keep lying on your stomach. Keep lying on your stomach with your arms at your sides or under your shoulders. Head lowered or twisted to one side. Inhale deeply, then unwind. Hold for five seconds. Second step is to keep lying on a pillow. Keep lying on your stomach with your arms by your side and a pillow under your chest. Head lowered or twisted to one side. Inhale deeply then unwind. Hold for 5 seconds. 3rd step prone lying on elbows to

rest on your forearms, lie on your stomach and tuck your elbows under your shoulders. Inhale deeply then relax. 4th step prone position press-ups put your hands under your shoulders as you lay on your stomach. Slowly straighten your elbows while relaxing your lower body and raising your back as high as pain will allow. Hold 10 sec, repeat 10 times (9).

Herdiana I et al. (2021) demonstrated that McKenzie exercises, conducted twice weekly for a month, significantly reduced pain in patients with chronic low back pain (10). In a study of 4-week program comparing the Back School to McKenzie exercises, participants in the McKenzie group displayed more improvement in disability but not in pain. The back extension method was slightly more effective for disability but not immediate post-treatment pain in chronic low back pain sufferers (11).

In the early 20th century, Joseph H. Pilates crafted the Pilates method, blending both physical and mental disciplines. Drawing from diverse influences like yoga, martial arts, Zen meditation, ballet, and Greco-Roman fitness techniques, Pilates developed this unique approach. It first saw application during World War I in a prison camp hospital where Pilates assisted in rehabilitating patients, marking their initial exposure to its benefits. Later, in the 1920s, he opened a studio in the United States to apply his philosophy to the rehabilitation of wounded dancers (12, 13). Joseph Hubertus Pilates developed the six key principles of the Pilates technique, which are breathing, centering, focus, control, accuracy, and fluidity. The exercises are paired with "powerhouse" isometric muscular contractions for centering. The transversus abdominis, external and internal obliques, rectus abdominis, multifidus, gluteus maximus, hamstring, posterior part of the hip adductor, iliopsoas, rectus femoris, sartorius, tensor fasciae latae, and anterior part of the hip adductor, as well as the pelvic-floor muscles, are all involved. The powerhouse is in charge of sustaining the body's dynamic stability

during activities and stabilising the spine and pelvis in the static posture (14). A study reported that both passive exercise therapy and Pilates are effective for chronic low back pain, with Pilates showing more significant pain reduction than passive exercise therapy (15). Another study revealed both Pilates and friction massage therapy reduced pain in chronic low back pain patients, but Pilates proved more effective than friction massage therapy in pain reduction (16). In a randomized trial with 60 chronic non-specific LBP patients, those who combined NSAID use with Pilates showed significant improvements in pain, function, and quality-of-life over those using only NSAIDs. Pilates effectively enhanced outcomes without adverse effects. (17).

The aim of this study was to determine the effect of McKenzie back extension exercise and Pilates pelvic tilt exercise on pain, anterior pelvic tilt angle and disability in power loom workers with nonspecific chronic low back pain. Usually, power loom workers suffering nonspecific chronic low back pain problem due to the continuous work. Our study based on the solution of the above mentioning problem, that comprises upon the two methods McKenzie back extension exercise and Pilates pelvic tilt exercise. Impact of this study will help to reduce the burden on the health caretakers and improve the quality of life of the power loom workers in sense of improving efficiency in the work and improving qualities of life. So this study will help physiotherapist to choose better treatment options for improvement in pain, disability, and anterior pelvic tilt angle in patients with nonspecific chronic low back pain, because if these pathologies remain untreated then this leads to permanent disability along with worst pain.

MATERIALS AND METHODS

3.1 Study design and population

The study used a randomized clinical trial research design. Participants in this single-blind trial were blinded. After receiving the data collection latter from the university, permission was granted from the concern person. The study was conducted on power loom workers, and data were collected from the power looms of Faizabad, Faisalabad. Study period was 8 months from june 2021 to Jan 2022. The participants in this study were power loom operators, who were meeting the inclusion criteria i-e suffer from non-specific chronic low back pain without any underlying pathology or disease. The diagnosis of chronic low backache was reached after ruling out severe spinal pathology such as tumours, fractures, inflammatory diseases, prior spinal surgery, nerve root impairment in the lumbar area, spinal stenosis, neurological dysfunction, and systemic disorders. Purposive sampling was utilised in this study, and individuals were divided into two groups using simple randomization using the lottery technique. The sample size for this investigation was obtained by comparing means using Epitool software (18). There were 23 participants in each of two groups.

3.2 Selection Criteria

The inclusion criteria for this study encompassed participants aged between 35 and 45 years, exclusively male workers diagnosed with nonspecific chronic low back pain, engaged in power loom operations for a minimum of 12 hours daily, experiencing low back pain

persisting for over three months, reporting mild to moderate pain intensity on the Numeric Pain Rating Scale (NPRS), and exhibiting an anterior pelvic tilt angle beyond the normal range, ranging from $13^{o} \pm 4.9^{o}$ to anterior tilting between 18^{o} and 25^{o}. Exclusion criteria for this study comprised individuals with significant spinal pathologies, including tumors, those with inflammatory diseases, a history of prior spinal surgery, known neurological disorders, and individuals with low back pain stemming from systemic diseases, all of whom were ineligible for participation.

3.3 Data collection procedure

The duly signed ethical approval was given by The University of Faisalabad prior to collecting the data and then power loom workers were explained orally the details of this research study and then all participants signed a consent form. The study was started by allocating the recruited participants in to two groups, group A (McKenzie back extension exercise) and group B (Pilates pelvic tilt exercise). After the allocation, the respective treatment and follow up plan was given to the participants. The measurement of QBPDS, NPRS, and goniometer were taken at the baseline prior to the first treatment session and after 2^{nd} week and last reading was taken after 12^{th} session at 4^{th} week. The data of QBPDS, NPRS, and goniometer were taken at baseline, mid, and post treatment. Data was collected from power looms of Faizabad Faisalabad. This clinical study was a single-blinded, randomized experiment.

In this research study 138 subjects were selected for screening process. Screening was done according to the defined inclusion & exclusion criteria. Following pathologies were ruled out. Lumber stenosis; lumber stenosis was evaluated by using the lumbar extension-loading

test, which has the ability to precisely identify the affected spinal level. In this test, individuals must stand as long as they can while maintaining a modest degree of lumbar extension (between 10° and 30°). Changes in subjective symptoms and objective neurological results were assessed after the individuals underwent this test (19). To rule out SIJ dysfunction the FIBER test was performed. To rule out sciatica SLR test was performed. History of all the participants were taken to rule out any specific disease that mentioned in the exclusion criteria. 92 subjects were excluded according to exclusion criteria and 46 subjects were included according to defined inclusion criteria. To take agreement for study, consent forms were taken from all subjects. All participants were randomly divided into two equal groups the group A and group B. Group A was received McKenzie Back extension exercise and group B was received Pilates pelvic tilt exercise.

Postural guidelines + stretch break + rest were provided and guided as baseline treatment to both groups.

Figure 1 near here

McKenzie back extension exercise and baseline treatment was given to the participants of group A. The McKenzie back extension exercise involves beginning in a prone position on a mat with abdomen facing down. Position the legs in alignment with the hips, pointing the toes, and initiate the movement by taking a deep breath. Gradually, bend the elbows and lift upper body off the floor, extending the back until feels the stretch. It's important to avoid locking the elbows while supporting weight with your hands and wrists, maintaining this position for 10 seconds while continuing to breathe deeply. Three sets of 10 repetition were

performed by the participant in a session. Total 12 sessions was given to the participant within 4 weeks (20).

Figure 2 near hear

Participants in group B received Pilates pelvic tilt exercise in addition to the baseline treatment. The Pilates pelvic tilt exercise involves lying on back on the floor with the legs bent and toes pointing forward, maintaining a neutral position. Begin by drawing the belly button inward towards the spine, simultaneously lifting the pelvis towards ceiling. While doing so, engage the gluteus and hip muscles, creating a forward tilt of the pelvis, and hold this position for 10 seconds. Three sets of 10 repetition were performed by the participant in a session. Total 12 sessions were given to the participants within 4 weeks. Patients were performed these activities under the supervision of physiotherapist (20).

Figure 3 near here

3.4 Data collection tools

The Numeric Pain Rating Scale (NPRS) was used to quantify the individuals' pain severity, which provides a numerical value from 0 to 10, with 0 representing no pain and 10 indicating the greatest possible agony. Scores of 1 to 3 correlate to mild pain, 4 to 6 to moderate pain, and 7 to 10 to severe pain on this scale. Patients conveyed their pain levels numerically, enabling classification (e.g., a score of 4 indicating moderate pain) (21). To evaluate the degree of disability among patients, the Quebec Back Pain Disability Scale, comprising 20 items, was employed. This validated scale is specifically designed to measure functional disability in individuals experiencing low back pain and is utilized to gauge patient progress during treatment or rehabilitation programs (22). Additionally, anterior pelvic tilt angles of

power loom workers were measured using a goniometer, which comprises three components: the body, a stationary arm, and a mobile arm. To assess the anterior pelvic tilt angle, the goniometer's body was placed horizontally on the anterior superior iliac spine, while the mobile arm was positioned on the posterior superior iliac spine, with the reading on the goniometer indicating the angle of anterior pelvic tilt.

Pain, disability and anterior pelvic tilt was measured at baseline, after 2 weeks and 4 weeks intervention

Figure 4 near here

Figure 5 near here

Figure 6 near here

3.5 Ethical Consideration

The study received approval from institutional review board of "The University of Faisalabad". No harm was subjected to any participant of the research. Dignity of the participants was prioritized. Informed consent form was taken from the participants prior to the study. This RCT was registered in ClinicalTrials.gov, Ref No NCT05473416 (https://clinicaltrials.gov/show/NCT05473416).

3.6 Statistical Analysis

The collected data was analyzed by using SPSS version 26. Mean and standard deviation was calculated by using descriptive statistics. Out data set were less than 100 that are why we were focused on Shapiro wilk test. P-values of NPRS and Pelvic Angle were .000 which

showed that data was not follow to normality so nonparametric tests were applied on these two scales and QBPDS scales p-values was .435 which explained data follow to normality we applied parametric test for this scale. Following tests were used for parametric values; Paired Samples Statistics was used to determine the inter group comparison between baseline to 2nd week, baseline to 4th week, 2nd week to 4th week. Repeated Measure ANOVA was used to determine the inter group comparison between baseline, post intervention data. Independent t test was used to determine the comparison between two groups, following test were used for nonparametric values; Wilcoxon Signed Ranks Test was used to determine the inter group comparison between baseline to 2nd week, baseline to 4th week, 2nd week to 4th week. Friedman Test was used to determine the inter group comparison between baseline, post intervention data. Mann-Whitney Test was used to determine the comparison between two groups.

Figure 7 near here

RESULTS

4.1 Demographic statistics

Figure 8 shows that, out of 46 participants, 21(45.7%) were of age between 35-40 years, 25(54.3%) were between the age of 41-46 years.

Figure 8 near here

4.2 Within-group analysis of QBPDS

Table 1 presents the within-group analysis of QBPDS. Repeated measure ANOVA shows that in intervention group A. mean±S.D was 46.7826±5.35093 on baseline. Mean ± S.D was

29.4348±4.56096 on 2nd week. Mean ± S.D was 6.0870±2.53902 on 4th week. A statistical significant difference was found in QBPDS pre and post treatment (P≤0.05) in group A. In group B. mean±S.D was 44.3913±3.62741 on baseline. Mean ± S.D was 34.5652±6.02892 on 2nd week. Mean ± S.D was 3.3043±1.91726 on 4th week. A statistical significant difference was found in QBPDS pre and post treatment (P≤0.05) in group B.

Table 1 near here

Within-group analysis of NPRS and Pelvic angle

Table 2 presents the within-group analysis of NPRS and Pelvic angle. In group A mean±S.D of NPRS was 4.5217±0.51075 at baseline. mean±S.D was 2.0000±.67420 at 2nd week. At 4th week mean±S.D of NPRS was 1.2609 ±0.54082. A statistical significant difference was found in NPRS pre and post treatment (P≤0.05) in group A. At baseline mean±S.D of pelvic angle was 24.0435±.82453. At 2nd week it was 22.2609±.81002. At 4th week it was 19.1739±0.71682. A statistical significant difference was found in pelvic angle pre and post treatment (P≤0.05) in group A. In group B Mean ± S.D of NPRS at baseline was 4.3913±.65638. At 2nd and 4th week it was 2.7391±.68870 and 0.6522±.64728 respectively. A statistical significant difference was found in NPRS pre and post treatment (P≤0.05) in group B. At baseline mean±S.D of pelvic angle was 23.9565±0.87792 in group B. At 2nd week it was 21.8696±0.91970 and at 4th week it was 18.0000±.85280. A statistical significant difference was found in pelvic angle pre and post treatment (P≤0.05) in group B.

Table 2 near here

4.3 Between group analysis of QBPDS

Table 3 illustrates the between-group analysis of the Quebec Back Pain Disability Scale (QBPDS). A statistically significant difference ($p \leq 0.05$) emerged between group A and group B following the 4-week treatment period. Notably, Pilates pelvic tilt exercise exhibited greater effectiveness in ameliorating disability among power loom workers experiencing nonspecific chronic low back pain.

Table 3 near here

4.4 Between-group analysis for NPRS and Pelvic angle

In Table 4, the between-group analysis of the Numeric Pain Rating Scale (NPRS) and pelvic angle is depicted. A statistically significant difference ($p \leq 0.05$) was observed between group A and group B following the 4-week treatment period. It is noteworthy that Pilates pelvic tilt exercise demonstrated greater effectiveness in alleviating pain and improving the anterior pelvic tilt angle among power loom workers afflicted with nonspecific chronic low back pain.

Table 4 near here

DISCUSSION

Non-specific low back pain, a prevalent condition that does not stem from identifiable factors such as infections, tumors, or fractures, constitutes a significant global contributor to disability (5). This study aimed to investigate the impact of two specific exercises, the McKenzie back extension exercise and the Pilates pelvic tilt exercise, on individuals suffering from non-specific chronic low back pain. The study focused on assessing the effects of these exercises on pain levels, disability, and the anterior pelvic tilt angle.

Results of the present study showed that out of 46 participants, 21(45.7%) were of age between 35-40 years, 25(54.3%) were between the age of 41-46 years. Repeated measure ANOVA for within-group analysis of QBPDS showed that in intervention group A, mean±S.D was 46.7826±5.35093 on baseline. Mean ± S.D was 29.4348±4.56096 on 2nd week which improved to 6.0870±2.53902 on 4th week. In group B. mean±S.D was 44.3913±3.62741 on baseline. Mean ± S.D was 34.5652±6.02892 on 2nd week which improved to 3.3043±1.91726 on 4th week. A statistical significant difference was found in QBPDS pre and post treatment (P≤0.05) in both groups A and B. Friedman Test for within-group analysis showed a statistical significant difference in pain and pelvic angle pre and post treatment (P≤0.05) in group A and B. Between-group analysis of NPRS, QBPDS and Pelvic angle showed a statistical significant difference (p≤0.05) between group A and B after treatment of 4 weeks. Pilates pelvic tilt exercise was found to be more effective in improving pain, disability and anterior pelvic tilt angle in power loom workers with nonspecific chronic low back pain.

Queiroz BC et al., in 2010, conducted a study on Muscle Activation During Four Pilates Core Stability Exercises in Quadruped Position. All muscle activity was noticeably reduced in the neutral pelvic position. In all activities, the rectus abdominis muscle was activated similarly and was unaffected by the pelvic or trunk position in maintaining body posture (23). The results of the current study showed that Pilates pelvic tilt exercise had beneficial effects on chronic low back pain in loom workers. A study reported that both passive exercise therapy and Pilates are effective for chronic low back pain, with Pilates showing more significant pain reduction than passive exercise therapy (15). Another study revealed both Pilates and friction massage therapy reduced pain in chronic low back pain patients, but Pilates proved

more effective than friction massage therapy in pain reduction (16). In line with these, results of in current study showed that Pilates had superior effects then Mackenzie exercises in improving pain, disability and anterior pelvic tilt angle in power loom workers with nonspecific chronic low back pain.

Herdiana I et al. (2021) demonstrated that McKenzie exercises, conducted twice weekly for a month, significantly reduced pain in patients with chronic low back pain (10). Kumar A in 2022 resulted that in participants with nonspecific low back pain, the global postural reeducation (GPR) group had more improvement in functional status, disability, and pain intensity than the Mackenzie group (MCE). But both therapies had significant results ($p \leq 0.05$) (24). In present study, Both Mackenzie and Pilates pelvic tilt exercise was found to be effective in patients of non-specific low back pain but Pilates had superior effects then Mackenzie exercises in improving pain, disability and anterior pelvic tilt angle in power loom workers with nonspecific chronic low back pain.

Conclusion

In conclusion, four weeks plan of Pilates and Mackenzie exercises can improve anterior pelvic tilt angle, disability and sense of pain. Although there is a considerable impact on nonspecific low back pain from these two types of training programs. But gains in group receiving Pilates pelvic tilt exercises were noticeable and considerable. Pilates training was found to have better at boosting physical health than McKenzie exercises.

Limitations

The sample size consisted of only 46 loom workers, which might not be representative of the broader population with non-specific chronic low back pain.

The age range of the participants was limited between 35-46 years, which might not capture the effects of the exercises on younger or older individuals.

The intervention was conducted over a period of 4 weeks. Longer-term effects of the exercises were not evaluated.

The study compared two interventions without a placebo or control group, making it difficult to gauge the true efficacy of the interventions against natural recovery or other factors.

Recommendations

Future studies could benefit from a more extensive and diverse sample, possibly including individuals from different occupational backgrounds and age groups.

To better evaluate the real effectiveness of the exercises, future research should include a control group.

Researchers should consider tracking participants for longer durations to determine the long-term benefits and potential relapse rates of each exercise regimen.

While subjective measures like pain scales are important, incorporating more objective measures can help provide a comprehensive understanding of the treatment's effectiveness.

Given the prevalence of non-specific low back pain, researching a wider variety of treatments can help identify the most effective strategies.

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Table 1: Repeated measure ANOVA with-in group analysis

		Mean	**Std. Deviation**	**N**	**P-value**
Group A (McKenzie)	Baseline QBPDS Group A	46.7826	5.35093	23	0.000
	2nd week QBPDS Group A	29.4348	4.56096	23	

	4thweek QBPDS group A	6.0870	2.53902	23	
Group B (Pilates)	Baseline QBPDS	44.3913	3.62741	23	0.000
	2nd week QBPDS	34.5652	6.02892	23	
	4thweek QBPDS	3.3043	1.91726	23	

Table 2: Friedman Test for within-group analysis of NPRS and pelvic angle

Groups		N	Mean	Std. Deviation	P-value
Group A (McKenzie)	Baseline NPRS	23	4.5217	.51075	0.000
	NPRS 2nd week	23	2.0000	.67420	
	NPRS 4th week	23	1.2609	.54082	
	Baseline Pelvic angle	23	24.0435	.82453	0.000
	Pelvic angle 2nd	23	22.2609	.81002	
	Pelvic angle 4th	23	19.1739	.71682	
Group B (Pilates)	Baseline NPRS	23	4.3913	.65638	0.000
	NPRS 2nd week	23	2.7391	.68870	
	NPRS 4th week	23	23.9565	.87792	
	Baseline Pelvic angle	23	21.8696	.91970	0.000

	Pelvic angle 2nd	23	18.0000	.85280	
	Pelvic angle 4th	23	23.9565	.87792	

Table 3: Independent t test for group A and B

	Groups	**N**	**Mean**	**Std. Deviation**	**Sig. (2-tailed)**
Baseline QBPDS	McKenzie	23	46.7826	5.35093	.083
	Pilates	23	44.3913	3.62741	
2nd week QBPDS	McKenzie	23	34.4348	4.56096	.002
	Pilates	23	29.5652	6.02892	
4th weeks QBPDS	McKenzie	23	6.0870	2.53902	.000
	Pilates	23	3.3043	1.91726	

Table 4: Mann-Whitney U Test Statistics

	Mann-Whitney U	Z	Asymp. Sig. (2-tailed)
Baseline NPRS	251	-.128	0.510
2nd week NPRS	131.000	-3.186	0.001
4th week NPRS	137.500	-3.122	0.002
Baseline Pelvic angle	328	-1.019	0.351
2nd week Pelvic angle	195.000	-1.614	0.017
4th week Pelvic angle	86.500	-4.079	0.000

Figure 1: Baseline treatment for both group A & B

Figure 2: McKenzie back extension exercise (Group A)

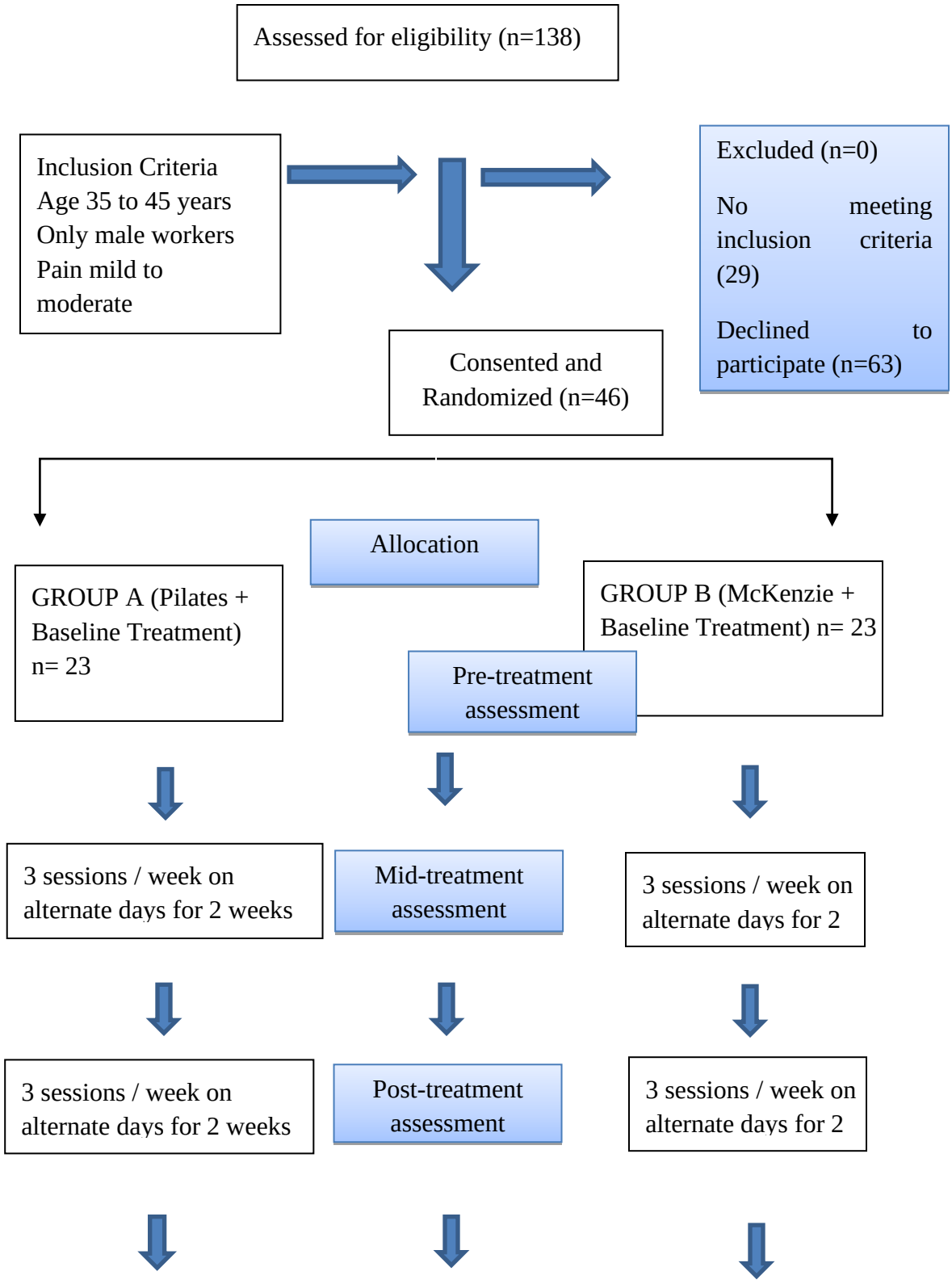
Figure 3: Pilates pelvic tilt exercise (Group B)

Figure 4: Quebec back pain disability scale measurement.

Figure 5: Numeric pain rating scale measurement

Figure 6: Anterior pelvic tilt angle measurement

CONSORT DIAGRAM



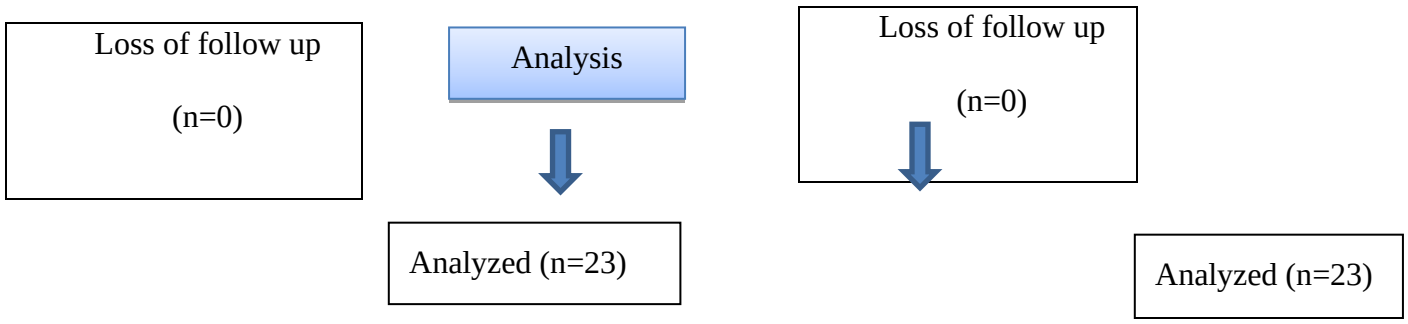


Figure 7: Flow chart showing the progress of subjects from trial to follow-up

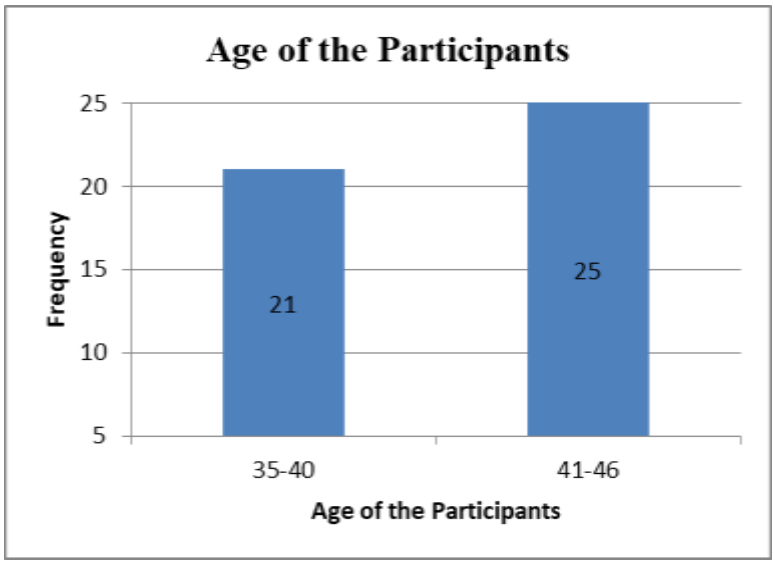


Figure 8: Age of the participants