The Effect of Giving Three Exercises on Reducing Pain for Low Back Pain Sufferers in Online Motorcycle Taxi Drivers

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ABSTRACTS

Purpose	Prolonged static sitting for ≥6 hours among online motorcycle taxi drivers increases lumbar load, reduces flexibility, and contributes to non-specific low back pain. This study aimed to determine the effectiveness of the Three Exercises program in reducing pain intensity in this population.
Materials and Methods	This study used a randomized controlled trial (RCT) design involving 30 online motorcycle taxi drivers aged 22–60 years who met the inclusion criteria. Participants were randomly assigned to an intervention group receiving *Three Exercises* (knee to chest, pelvic tilting, and child pose) or to a control group. The intervention was performed 3 times per week for 12 weeks, with two sets of 10 repetitions per session, maintaining each position for 7 seconds with 3 seconds of rest. Pain intensity was measured using the Visual Analogue Scale (VAS) before and after the intervention. Statistical analysis used Wilcoxon paired tests and Mann–Whitney tests for between-group comparison.
Result	The intervention group (n=15) showed a significant reduction in VAS scores from pretest (3.93 ± 1.48) to posttest (p = 0.001). The control group (n=15) also showed a more minor but significant reduction in VAS from 4.46 ± 1.06 (p = 0.025). The between-group comparison revealed a significant difference in posttest VAS values (p = 0.001), demonstrating superior improvement in the intervention group. Participant characteristics, including age, BMI distribution, work duration, and educational background, were comparable between groups.
Conclusion	The Three Exercises program significantly reduces pain intensity compared with standard care in online motorcycle taxi drivers with low back pain. Its simple structure and feasibility support its use as an effective therapeutic exercise to improve lumbar comfort and functional capacity.
Keywords	Low back pain; Three exercises; Online motorcycle taxi.

INTRODUCTION

The rapid development of digital technology has transformed mobility patterns in modern society, increasing the demand for app-based transportation services. Online motorcycle taxi drivers play a crucial role in this system. However, their occupational demands expose them to prolonged static

sitting, suboptimal ergonomics, and repetitive loading of the lumbar region for 8–12 hours per day. Sustained spinal flexion and limited postural variation create cumulative mechanical stress, contributing to the high prevalence of low back pain in this population (Djuartina et al., 2020; Sunarya et al., 2024). Globally, low back pain affects 50–80% of adults and is a significant cause of reduced work productivity and functional limitation (Fatoye et al., 2019; Ferreira et al., 2023; Zhang et al., 2025).

Static sitting for prolonged durations increases intradiscal pressure, reduces paraspinal muscle activation, and triggers compensatory muscle spasms as the body attempts to maintain postural alignment (Hong et al., 2015; Tu et al., 2016). Over time, these mechanisms decrease lumbar mobility, particularly in flexion and rotation, and gradually diminish joint flexibility, an essential component for functional movement and injury prevention (Numasawa T et al., 2012; Simonsen et al., 2010; Behm et al., 2015). Flexibility plays an important role in facilitating comfortable and functional body movements, thereby reducing the risk of injury and improving posture (Behm et al., 2015; Phillips et al., 2010). Addressing flexibility deficits is therefore an important therapeutic target for drivers with low back pain.

William's flexion exercise is one of the most widely used physiotherapy interventions for reducing lumbar pain and improving flexibility (Maher et al., 2017). However, despite its popularity, this method presents several limitations that reduce its suitability for workers, such as online motorcycle taxi drivers. The William program includes nine movements, some of which emphasize muscle strengthening rather than flexibility alone. Strengthening movements involving lumbar loading may provoke discomfort or exacerbate symptoms in individuals with acute or recurrent low back pain. Prior studies also indicate that its complexity and higher physical demands may reduce adherence among patients with occupational time constraints.

In response to these limitations, the *Three Exercises* approach was developed as a simplified, safer, and more targeted alternative. Comprising knee-to-chest, pelvic tilting, and child's pose, these exercises focus specifically on enhancing flexibility and promoting muscle relaxation through mechanisms such as reciprocal inhibition and post-isometric relaxation. Their low mechanical load and ease of use make them appropriate for individuals who spend long hours in static sitting and require a gentle, consistent intervention.

Therefore, this study aims to determine the effectiveness of three exercises in reducing pain and increasing lumbar flexibility in online motorcycle taxi drivers with low back pain. This study hypothesizes that the three exercises will result in a significantly greater reduction in pain intensity than the control group.

METHODS

Study Participants

This study employed a randomized controlled trial (RCT) design involving 30 online motorcycle taxi drivers who met the predefined inclusion and exclusion criteria and provided written informed consent. Inclusion criteria were: (1) age 25–60 years, (2) baseline VAS ≥4, (3) daily working duration ≥6 hours, and (4) willingness to follow the exercise protocol for 12 weeks. Exclusion criteria included: history of vascular disorders such as vertigo, previous or current vertebral column or upper-limb injuries that limit physical activity, history of spinal or upper-limb surgery, inflammatory diseases, spinal tumors, and congenital postural disorders. Participants were withdrawn if they attended fewer than three training sessions or failed to complete the posttest. A total sample of 30 participants (15 per Group) was deemed adequate based on

precedents from similar low back pain exercise trials using flexibility-focused interventions, which typically recommend sample sizes of 20–30 participants to detect moderate effect sizes. Although no formal power analysis was performed, the sample size aligns with previous RCTs examining exercise-based interventions for musculoskeletal pain.

Study Organization

Random allocation was conducted using a simple lottery method: participants who drew odd numbers entered the intervention group, while those who drew even numbers were assigned to the control group. Allocation was performed by an independent administrator not involved in assessment or data analysis to ensure allocation concealment. Outcome assessors were blinded to group assignment during both pretest and posttest VAS measurements to minimize assessment bias.

Training Program

Figure 1. One of the participants is doing the three exercise movements

The intervention group received the *Three Exercises* program, consisting of knee-to-chest, pelvic tilting, and child pose movements. Exercises were performed three times per week for 12 weeks, with each session consisting of 2 sets of 10 repetitions, maintaining each movement for 7 seconds with a 3-second rest interval. A physiotherapy practitioner supervised all exercise sessions to ensure correct technique, safety, and adherence to protocol. Attendance was recorded at every session, and adherence was quantified through attendance logs and weekly monitoring. The control group did not receive any exercise intervention during the study period.

Measurement

Pain intensity was assessed using the Visual Analogue Scale (VAS). Baseline measurements were taken before the intervention began. Posttest measurements were conducted immediately after completing of the 12-week intervention, following a brief standardized rest period of 5–10 minutes to minimize acute fatigue effects.

Statistical Analysis

Non-parametric tests were used because the data did not meet normality assumptions. Within-group comparisons were analyzed using the Wilcoxon signed-rank test, while between-group differences were assessed using the Mann-Whitney U test. Effect sizes (r) were calculated to evaluate the magnitude of treatment effects, and 95% confidence intervals (CIs) were reported to enhance the interpretability and robustness of the findings. A p-value <0.05 was considered statistically significant. Data were analyzed using SPSS version 26.0.

RESULT

The characteristics of the 30 participants are summarized in Table 1. Both groups were comparable in age, anthropometric variables, body mass index categories, education level, and daily work duration. Baseline pain intensity (VAS) also showed no clinically meaningful difference between groups.

Table 1. Characteristics of research subjects

Characteristics	Group I (n=15)	Group II (n=15)
Age(years)*	38,86±13,44	41,06±11,67
height (cm)*	164,43±8,59	162,46±7,98
body weight(kg)*	68,26±12,40	61,60±11,72
BMI Categories		
Underweight	0	0
Normal	4(26,7%)	2(13,3%)
Overweight	4(26,7%)	4(26,7%)
Obesitas I	5(33,3%)	4(26,7%)
Obesitas II	2(13,3%)	5(33,3%)
Education Level		
Elementary school	1(6,7%)	0
Junior high school	2(13,3%)	1(6,7%)
Senior high school	10(66,7%)	11(73,3%)
Bachelor	2(13,3%)	3(20,0%)
Duration of work *	9,66±0,89	9,26±1.03
Baseline VAS (0–10)*	3,93±1,48	4,46±1,06

* Values listed mean ± standard deviation
* VAS (Visual Analogue Scale)

A total of 30 participants met the inclusion criteria and were randomized in equal numbers to Group I (intervention) and Group II (control). The mean age of Group I was 38.86 ± 13.44 years, while Group II had a mean age of 41.06 ± 11.67 years. Both groups showed comparable anthropometric characteristics, with mean heights of 164.43 ± 8.59 cm in Group I and 162.46 ± 7.98 cm in Group II, and mean body weights of 68.26 ± 12.40 kg and 61.60 ± 11.72 kg, respectively.

BMI distribution, educational level, and daily work duration were similar across groups. BMI categories ranged from normal to obesity class II, and both groups demonstrated comparable proportions within each category. Most participants in both groups had a high school education. Average work duration per day was 9.66 ± 0.89 hours in Group I and 9.26 ± 1.03 hours in Group II.

Pain intensity, measured using VAS, decreased significantly in the intervention group, from 3.93 ± 1.48 at baseline to lower posttest values (p = 0.001). The control group also experienced a more minor but statistically significant decrease from 4.46 ± 1.06 (p = 0.025). Between-group analysis demonstrated a significant difference in posttest VAS scores (p = 0.001), indicating greater improvement in participants receiving the Three Exercises protocol.
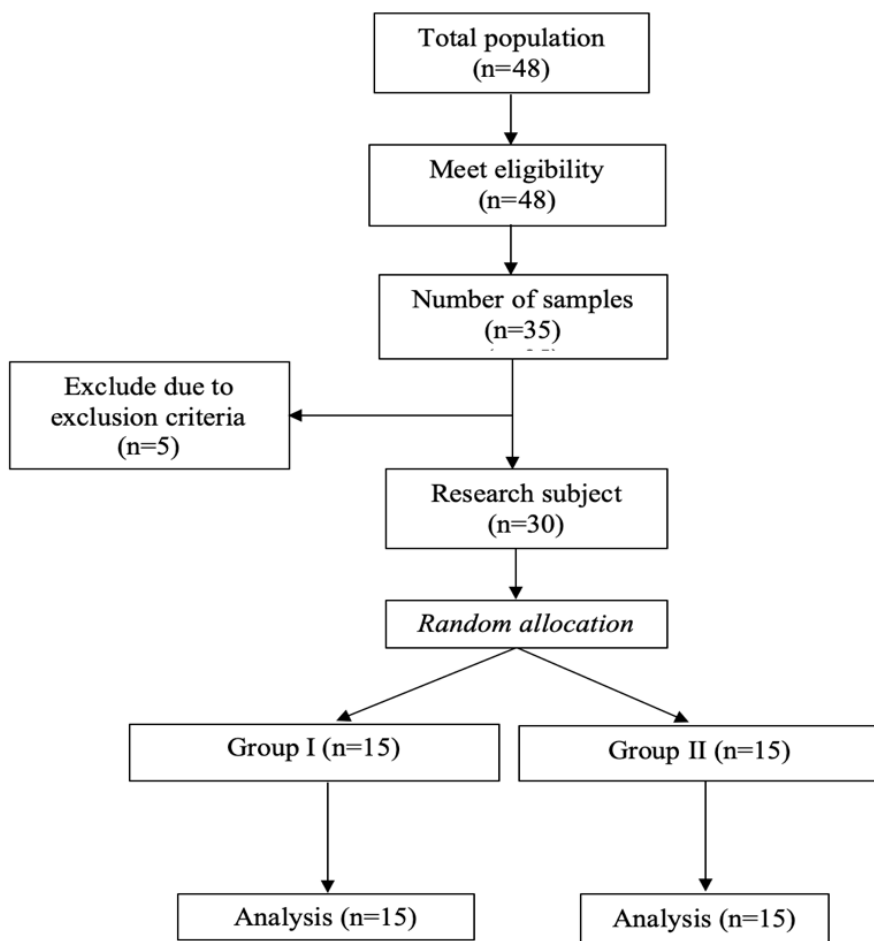
Figure 2. Research flow diagram

The study population consisted of 48 online motorcycle taxis. A research sample of 35 was then selected from the pretest results. After selecting research subjects based on inclusion and exclusion criteria, 30 were enrolled. Next, the research subjects in Group I, totaling 15 online motorcycle taxis, received three exercises for 12 weeks, and Group II, totaling 15 online motorcycle taxis, served as the control group. Then, in the twelfth week, a posttest was conducted.

Furthermore, the data was tested through a hypothesis test to validate the accuracy of the previously established hypothesis. Hypothesis testing in this study was carried out using three tests: pretest-posttest difference tests in groups I and II, and a posttest difference test between groups I and II using a non-parametric test. Table 2 presents the results of within-group and between-group analyses. VAS scores are expressed as mean ± SD, although non-parametric testing was applied.

Table 2. Hypothesis testing

Variables	Group I (n=15)	Group II (n=15)	Comparison between Group I and Group II
	Pre- post test (p-value)	*Pre- post test (p-value)*	*Post-post test (p-value)*
VAS	0,001**	0,025**	0,001**

** Values listed mean ± standard deviation
** Significant at p < 0.05

The Wilcoxon paired t-test was used to assess differences between the pretest and posttest results, thereby evaluating the impact of the intervention within each Group. In Group I, with 15 research subjects, the pretest-posttest difference was significant (p = 0.001). The results of the Wilcoxon test for Group I showed a p-value < 0.05, indicating a significant difference. Meanwhile, the results of the pretest-posttest differences in Group II, with 15 research subjects, showed a p-value of 0.025. The Wilcoxon test for Group II showed a p-value of <0.05, indicating a statistically significant difference. Between-group comparison using the Mann–Whitney U test revealed a significant difference in posttest VAS scores between Group I and Group II (p = 0.001), indicating that the Three Exercises intervention was more effective at reducing pain intensity than the control condition.

DISCUSSION

Based on the results of this study, 30 out of 48 online motorcycle taxi drivers were identified as having low back pain and showed differences in the characteristics of the research subjects between groups I and II, as shown in Table 1. The ages in Group I (mean 38.86) and Group II (mean 41.06) indicate that motorcycle taxi drivers who operate online are more likely to experience lower back pain. Online motorcycle taxi drivers with lower back pain are mostly over 30 years old. Individuals aged 30 begin to experience bone degeneration. Processes such as tissue injury, tissue repair, and fluid reduction can reduce bone and muscle stability. As individuals age, the risk of decreased bone elasticity increases, which can trigger the onset of low back pain symptoms (Rider et al., 2018).

In addition, the difference in BMI characteristics between study participants in Group I and Group II is that obesity is more common in Group I. In contrast, obesity II is more common in Group II. The BMI of study subjects in the obesity category is associated with a shift in the center of gravity (COG) in the bodies of online motorcycle taxi drivers. When the COG shifts, body weight tends to shift forward due to gravity (Sugianto et al., 2020), leading to excessive contraction of the lower back muscles to maintain an upright posture.

The characteristics of the subjects of this study, based on the level of education in groups I and II, are dominated by high school education. The most recent educational background of workers indicates their understanding of proper work posture. The relationship between education level and low back pain aims to describe how cognitive assessments, namely pain and healthy living behaviors, impact feelings, body sensations, and behavior. A reciprocal process that often causes individuals to be trapped in a vicious circle and maladaptive pain behavior. In this case, psychoeducation in the model of pain as a dynamic system influenced by cognition, emotion, and behavior, combined with group exercises in problem-solving skills and means to restore engagement in daily activities (Main & George, 2011; Vlaeyen & Linton, 2000).

Next, the characteristics of the subjects are based on the duration of work in Group I (mean = 9.66) and Group II (mean = 9.26). Based on the results of this study, three exercises have an impact or influence in reducing pain levels for individuals who experience lower back pain, especially among online motorcycle taxi drivers, as evidenced by a decrease in pain scores using VAS in Group I; the results were statistically significant (p = 0.000); however, in Group II it was not significant with the test results (p> 0.05). The significant decrease in pain scores in Group I, which received three exercise interventions, was intended to activate the trunk's intrinsic muscles. The knee-to-chest movement in three exercises helps reduce pressure on the trunk, increase lumbar stability, and reduce lower back pain. Next, pelvic tilting helps activate local muscles that improve

alignment of the lumbar trunk segment. The next child pose movement focuses on activating the trunk and thigh muscles to increase overall flexibility.

The coordinated activity of the muscles generates strong signals in the muscle spindles and the Golgi tendon organs, both of which monitor and detect tension during muscle contraction. Muscle spindles function to preserve muscle length by providing feedback regarding changes in contraction. They help inhibit neural impulses directed toward the opposing muscle, thereby preventing excessive stretching. This mechanism leads to relaxation of the antagonist muscle, a process known as reciprocal inhibition.

In contrast, sensory impulses from the Golgi tendon organs are transmitted to the dorsal spinal cord, where they interact with inhibitory motor neurons. This process suppresses further contraction of the agonist muscle, reducing muscle tone and promoting its relaxation, a phenomenon known as post-isometric relaxation (Proske & Gandevia, 2012). In this study, the dose for the three exercises in Group I was 10 repetitions in 2 sets, with each repetition held for 7 seconds and a 3-second rest period before returning to the starting position. The total exercise was carried out three times a week for 12 weeks.

According to research, cyclical stretching, which involves repetitive stretching forces performed several times during a therapy session and holding each movement for 5–10 seconds, can improve muscle flexibility (Çelik, 2017; Chaabene et al., 2019). Also, if a stretching-based training program is performed at least 2 times a week, it can increase joint mobility (Konrad et al., 2023; Støve et al., 2024).

Three exercises can reduce pain and can be achieved if done consistently according to the specified exercise dose, online motorcycle taxi driver activities, and the goal of exercise motivation. To continuously provide long-term benefits, including increased lower back flexibility, it can provide a relaxing effect on the body, improving the functional ability of individuals affected by conditions or suffering from low back pain.

CONCLUSION

The findings of this study indicate that the three exercise programs administered for 12 weeks (48 sessions) effectively reduced pain in online motorcycle taxi drivers with low back pain. The intervention group showed a greater decrease in pain intensity compared with the control group, demonstrating that this structured exercise approach has a meaningful therapeutic impact on workers exposed to prolonged sitting and vibration. This study has several limitations, including a relatively small sample size and the absence of long-term follow-up to assess the persistence of clinical improvements. Future studies are encouraged to involve larger, more representative samples, incorporate long-term monitoring, and explore combined intervention strategies, such as integrating stretching with strengthening exercises or adding ergonomic education programs, to optimize the prevention and management of low back pain in occupational settings.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this matter.

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