

Comparison of Standard Programs with and without Programmed Proper Body Mechanics on Pain and Functional Function in Obese Patient with Mechanical Low Back Pain

Putri Paramita Sakti, Tirza Z. Tamin, Jull Kurniarobbi

*Department of Physical Medicine and Rehabilitation, Faculty of Medicine,
University of Indonesia, Cipto Mangunkusumo Hospital, Jakarta, Indonesia*

Abstract

Introduction: Mechanical Low Back Pain (mLBP) is a common issue linked to obesity. This study evaluates the effectiveness of Proper Body Mechanics Program in managing pain and enhancing functional ability in obese patients with mLBP.

Method: Single-blind, randomized controlled trial conducted three times a week for six weeks. Thirty eligible participants at Cipto Mangunkusumo Hospital were divided into two groups: the intervention group (14 subjects) received the Proper Body Mechanics Program in addition to a standard treatment plan including diet education, aerobic exercise, transcutaneous electrical nerve stimulation (TENS) and William flexion exercise, while the control group (16 subjects) only received a standard treatment plan.

Result: Results showed a significant reduction in pain levels as measured by the Visual Analog Scale (VAS) ($p=0.011$) after six weeks; however, no significant difference was found in functional ability scores ($p=0.976$).

Conclusion: While pain and functional ability improved in each group, the study indicates that the Proper Body Mechanics Program significantly reduces pain when added to standard Williams Flexion Exercises. Although the improvement in functional ability was not statistically significant, the intervention group showed higher overall functional improvement after six weeks.

Keywords: Aerobic exercise, Mechanical low back pain, Obesity, Proper body mechanics, Standard program, William flexion exercise

Perbandingan Program Standar dengan dan tanpa Program Mekanika Tubuh yang Tepat terhadap Nyeri dan Status Fungsional pada Pasien Obesitas dengan Nyeri Punggung Bawah Mekanik

Putri Paramita Sakti, Tirza Z. Tamin, Jull Kurniarobbi

Departemen Ilmu Kedokteran Fisik dan Rehabilitasi, Fakultas Kedokteran,
Universitas Indonesia, Rumah Sakit Cipto Mangunkusumo, Jakarta, Indonesia

Abstrak

Pendahuluan: Salah satu masalah yang sering dijumpai pada obesitas adalah nyeri pinggang mekanik. Penelitian ini bertujuan untuk mengetahui efektifitas program standar dengan Proper Body Mechanics terprogram terhadap nyeri dan fungsi pada pasien obesitas dengan nyeri pinggang mekanik.

Metode: Studi single blind, randomized controlled trial ini dilakukan tiga kali seminggu selama enam minggu. Total 30 subjek dibagi menjadi dua kelompok, 14 subjek di kelompok perlakuan yang mendapat edukasi diet, aerobic exercise, transcutaneous electrical nerve simulation (TENS), dan William flexion exercise dengan Proper Body Mechanics terprogram, sementara 16 subjek di kelompok kontrol tanpa Proper Body Mechanics terprogram.

Hasil: Terdapat perbaikan dan secara statistik bermakna pada delta skor VAS antar kelompok ($p = 0,011$) setelah intervensi selama enam minggu. Tidak ditemukan perbedaan bermakna fungsi fungsional antar kelompok ($p = 0,976$).

Kesimpulan: Kombinasi Program Standar dengan penambahan Proper Body Mechanics terprogram dapat mengurangi nyeri secara signifikan setelah intervensi selama enam minggu. Meskipun perbaikan fungsi fungsional tidak signifikan antara kedua kelompok, namun perubahan perbaikan fungsi fungsional lebih besar pada kelompok Proper Body Mechanics terprogram setelah intervensi selama enam minggu pada pasien obesitas dengan nyeri pinggang mekanik.

Kata Kunci: Obesitas, Proper body mechanics, Aerobic exercise, William flexuion exercise, Nyeri punggung bawah

Introduction

Mechanical Low Back Pain (mLBP) is a common issue among obese patients and is often linked to disability.¹ Research indicates that 36.4% of obese individuals aged 18 and older experience mLBP.² In the obese population, women report experiencing lower back pain at a higher rate than men, with 21.5% of housewives affected by mLBP.³ Additionally, the recurrence rate for patients with lower back pain is 69% within 12 months, with 81% of these cases attributed to poor posture.⁴

The higher prevalence of mild lower back pain (mLBP) in women can be attributed to housework. Housewives often engage in repetitive bending and twisting motions throughout the day, which can pressure the spine and increase susceptibility to lower back pain (LBP).⁵ This pain can lead to limitations in daily activities, particularly those related to

household tasks. Consequently, these limitations may reduce individuals' participation in work and everyday life. A community-based study in India found that 53.1% of women aged 45-65 who had LBP, had LBP-associated disabilities.⁶⁻⁸ Among them, 21% had severe disabilities, while 79% had moderate disabilities.⁶⁻⁸

The programmed proper body mechanics approach, combined with standard Williams Flexion Exercises, aims to reduce pain, improve functionality, decrease disability, and enhance the quality of life for patients. The goal is to restore anatomical posture by applying correct body mechanics during daily activities and work.⁶⁻⁸ This study aims to compare the outcomes of patients who receive the standard therapy program with those who receive Programmed Proper Body Mechanics treatment, focusing on pain levels and functional capabilities.

Materials and Methods

This study is a single-blind Randomized Controlled Trial involving obese patients with chronic low back pain (mLBP). Participants were grouped into two groups: each group received standard treatment which consist of dietary guidance, Transcutaneous Electrical Nerve Stimulation (TENS), aerobic exercise, and William Flexion Exercises. In addition to standard treatment the first group (Group A) received Proper Body Mechanics for the intervention. Due to the study design, the research assistant was unaware of group allocations while the researcher and participants knew their assignments. This research has received ethical clearance from the Ethical Committee of the Faculty of Medicine in

University of Indonesia / Cipto Mangunkusumo Hospital with the protocol number 21-08-0888 on the 6th of December, 2021.

Subjects were recruited at the Cipto Mangunkusumo Hospital, and the study went on from January to October 2022. Sampling was done through consecutive sampling, and randomization was executed using a computer-based simple technique. Participants signed an informed consent form to take part in the study. The sample size was determined to be a minimum of 28 subjects using the difference of two means formula. Participants were included in the study if they fulfilled these criteria: female aged 35-65 years, obese (BMI ≥ 25 kg/m²), diagnosed with chronic mLBP with a Visual Analog Scale (VAS) score of 4-7, housewives with no household assistants,

Table 1. Subject Characteristics

Characteristics		Group		Total	p value
		Intervention (A), n (%)	Control (B), n (%)		
Age (year)	(x $\pm$ SD)	62 $\pm$ 4	61 $\pm$ 3	62 $\pm$ 4	0.309 ^a
BMI (kg/m ²)					
Grade I obesity	n (%)	10 (71.4%)	6 (37.5%)	16 (52.3%)	0.120 ^b
Grade II obesity		4 (28.6%)	10 (62.5%)	14 (46.7%)	
Educational Level	n (%)				0.694 ^c
Basic (Elementary, Middle school)		3 (21.4%)	2 (12.5%)	5 (16.7%)	
Middle (high school)		6 (42.9%)	10 (62.5%)	16 (53.3%)	
Advanced (Diploma, Undergraduate, Postgraduate)		5 (36.7%)	4 (25%)	9 (30%)	
Race	n (%)				0.204 ^c
Bataknese		5 (35.7%)	2 (12.5%)	7 (23.3%)	
Sundanese		1 (7.1%)	4 (25%)	5 (16.7%)	
Minangese		1 (7.1%)	2 (12.5%)	3 (10%)	
Betawi		2 (14.3%)	4 (25%)	6 (20%)	
Javanese		3 (21.4%)	4 (25%)	7 (23.3%)	
Chinese- Indonesian		2 (14.3%)	0 (0%)	2 (6.7%)	
Passive Physical Activity	n (%)	14 (46.7%)	16 (53.3%)	30 (100%)	
Comorbidities	n (%)				1.000 ^d
Hypertension		9 (37.5%)	5 (20.8%)	14 (29.1%)	
Diabetes mellitus		2 (8.3%)	1 (4.1%)	3 (6.2%)	
Knee Osteoarthritis		11 (45.8%)	13 (54.1%)	24 (50%)	
Dyslipidemia		2 (8.3%)	5 (20.8%)	7 (14.5%)	
Initial VAS score	(x $\pm$ SD)	5.36 $\pm$ 1.082	5.19 $\pm$ 1.047	5.37 $\pm$ 1.24	0.746 ^d
Schober test	(x $\pm$ SD)	19.46 $\pm$ 1.6	19.2 $\pm$ 2.68	19.32 $\pm$ 2.21	0.756 ^a
Initial ODI score	(x $\pm$ SD)	29.43 $\pm$ 11.07	33.75 $\pm$ 12.49	31.73 $\pm$ 11.85	0.328 ^a

a: Independent T-test, b: Chi-Square, c: Fisher Exact, d: Mann-Whitney * of statistical significance $p < 0.05$
Abbreviations: BMI: body mass index; VAS: visual analogue scale; ODI: Oswestry Disability Index

lived a sedentary lifestyle and had no history of anti-pain medication usage two weeks before the study.

Participants who were pregnant at the time of the research, had cognitive or communication disorders, cardiovascular issues, sensory disorders, history of tumor or cancer, or were diagnosed with Low Back Pain (LBP) due to congenital abnormalities, scoliosis, or spondylitis TB were excluded from the study. Of the 115 subjects selected based on inclusion and exclusion criteria, 32 were eligible. Two participants dropped out due to unrelated health issues (COVID-19), leaving 30 to complete the study.

Subjects were randomized into an intervention group (Group A) and a control group (Group B). Programmed proper body mechanics were implemented for the intervention group, and standard Williams Flexion Exercises were used for the control group. Data was collected and measured using the Visual Analog Scale (VAS) and Oswestry Disability Index (ODI). VAS scores were collected be-

fore the study and every week until the sixth week. ODI scores were taken before the study and in the third and sixth weeks.

Data were analyzed using IBM SPSS software, version 26.0. An initial Shapiro-Wilk test assessed the equivalence of baseline characteristics, considering $p > 0.05$ as equivalent. A parametric unpaired T-test was used for normally distributed data, while a Mann-Whitney U test was applied for non-normally distributed data. Statistical significance was set at $p < 0.05$.

Result

We assessed the similarities in both groups before comparing the effectiveness of Programmed Proper Body Mechanics and standard LBP treatment. There were no significant differences in age, body mass index (BMI), education level, ethnicity, physical activity, initial Visual Analog Scale (VAS) scores, or initial Oswestry Disability Index (ODI) scores, as presented in Table 1.

Table 2. VAS Score Changes in The Control Group and Intervention Group

Time	Intervention group (cm)	p value	Control group (cm)	p value
	Median (Min-Max)		Median (Min-Max)	
Start of treatment	5 (4 – 7)		5 (4 – 7)	
Week 1	5 (2 – 6)	0.03 ^{a*}	5 (3 – 7)	0.027 ^{a*}
Week 2	4 (2 – 5)	0.011 ^{a*}	4 (2 – 7)	0.001 ^{a*}
Week 3	3 (2 – 5)	0.001 ^{a*}	4 (2 – 7)	0.001 ^{a*}
Week 4	3 (1 – 5)	0.001 ^{a*}	3.5 (1 – 6)	0.001 ^{a*}
Week 5	3 (1 – 4)	0.001 ^{a*}	3 (1 – 5)	0.001 ^{a*}
Week 6	2 (0 – 3)	0.001 ^{a*}	3 (1 – 4)	0.001 ^{a*}

Wilcoxon * statistically significant, $p < 0.05$

Table 3. VAS Score Differences Between the Two Groups

Δ VAS score	Intervention group	Control group	p Value
Week 1	0.5 (-1 – 2)	0 (0 – 3)	0.551 ^a
Week 2	1 (0 – 3)	1 (0 – 3)	0.793 ^a
Week 3	2 (0 – 5)	1 (-2 – 4)	0.172 ^a
Week 4	2 (0 – 5)	1.5 (0 – 4)	0.177 ^a
Week 5	3 (1 – 5)	2 (-1 – 4)	0.204 ^a
Week 6	4 (2 – 6)	2 (0 – 5)	0.015 ^{a*}
Δ initial VAS score – Week 6	4 (2-6)	2 (0-5)	0.011 ^{a*}

^a Mann-Whitney * statistically significant, $p < 0.05$

The VAS scores of the intervention and control groups were monitored each week. We found a significant decrease in VAS scores for each group ($p < 0.05$ using the Wilcoxon test), outlined in Table 2.

Table 3 compares the speed of VAS reduction between the two groups. After 6 weeks, the intervention group had a median VAS reduction of 4, compared to 2 in the control group, indicating a significant difference in favor of the intervention.

To summarize the changes in functional outcomes in the intervention and control group, Table 4 shows a significant difference in Oswestry Disability Index (ODI) scores be-

Table 4. Oswestry Disability Index Score Changes in Intervention and Control Group

Time	Intervention group (cm)	p value	Control group (cm)	p value
	Median (Min-Max)		Median (Min-Max)	
Start of treatment	30 (16 – 48)		34 (14 – 54)	
Week 3	19 (4 – 32)	0.001 ^{a*}	27 (0 – 40)	0.001 ^{a*}
Week 6	14 (4 – 26)	0.001 ^{a*}	20 (10 – 28)	0.001 ^{a*}

a : T Dependent *: statistically significant, $p < 0.05$ **Table 5. Comparison of Oswestry Disability Index score Δ between the Two Groups**

Δ ODI	Intervention group	Control group	p Value
Week 3	9.86 $\pm$ 6.949	8.63 $\pm$ 6.761	0.627 ^a
Week 6	14.86 $\pm$ 8.328	14.5 $\pm$ 7.563	0.903 ^a
Δ initial ODI scores – Week 6 ODI scores	14.86 $\pm$ 8.328	14.5 $\pm$ 7.563	0.976 ^a

a: T Dependent *:statistically significant, $p < 0.05$

tween the initial measurement and the scores taken in the third week. The declining trend continues until the sixth week in both groups.

Table 5 compares ODI scores in the intervention group with the control group. Starting from the first week, the decrease in ODI in the intervention group was greater than in the control group. However, statistical tests did not show a significant difference between the decline in the two groups ($P > 0.05$).

Discussion

This study aimed to compare the pain levels and functionality of patients who receive the standard therapy program with those who receive programmed proper body mechanics treatment. The minimal clinically important difference (MCID) for chronic low back pain (LBP) is 2 cm. The intervention group saw noticeable relief from the third week, while the control group only reported a reduction by the fifth week.

The outcome of this study indicates that both the standard program and programmed proper body mechanics significantly reduce pain intensity in obese patients with mLBP. However, patients who receive programmed proper body mechanics show a more significant pain reduction after six weeks. This can be attributed to improved back muscle flexibility and better integration of proper body mechanics into daily activities.

This result is supported by a study by Hasmar⁹ and Rosdiana¹⁰ that reported a significant decrease in pain and increased flexibility in obese patients who received William Back Exercise and programmed proper body mechanics. Another study by El-Rasol¹¹ also highlighted significant improvements in disability level and overall quality of life of patients who receive Programmed Proper Body Mechanics.

An improvement of Oswestry Disability Index (ODI) score shows a notable improvement after six weeks of treatment. The treatment group experienced a significant decrease in ODI scores from 29.43 ± 11.07 (moderate disability) to 14.57 ± 6.48 (minimal disability). The ODI score of the control group also shows a decrease, from 33.75 ± 12.49 (moderate disability) to 19.25 ± 6.77 (minimal disability). The minimum clinically important difference (MCID) was a 30% reduction from the initial score, with the treatment group showing a 50% decrease compared to the control group's 42%. However, there were no statistically significant differences between the groups.

This ODI score improvement is in line with another study by Olalla, et al.¹¹ who highlighted that severe LBP has caused a great disability and has affected their activity of daily living (ADL). Another study by Fusz, et al.¹² supported this claim, finding that the use of proper body mechanics principles can improve functional capacity along with increasing ODI scores. With proper body mechanics training, LBP-related disability level has shown to decrease and quality of life has shown to increase significantly, as shown in a study by El-Rasol.¹⁰

This is the first study evaluating the effectiveness of a programmed proper body mechanics intervention alongside standard treatment for mechanical non-specific low back pain in obese housewives. The strength of this research lies in its sample size, which demonstrates 80% power with a sufficient sample size, and compliance with the exercise pro-

Table 6. Level of Adherence in Both Groups

Group	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Avg. total	p value
Intervention (A)	95,24%	92,86%	90,48%	88,10%	90,48%	95,24%	92,06%	0.299 ^a
Control (B)	95,83%	89,58%	81,25%	91,67%	89,58%	89,58%	89,58%	

a: T Independent; *: statistically significant, $p < 0.05$

gram exceeded 80% (Table 6). Most subjects had at least a high school education, which facilitated their understanding of the material and commitment to the exercises. This is an important factor, considering that education on Proper Body Mechanics has been shown to reduce pain intensity, improve function, and reduce short-term disability in subjects with chronic LBP.^{13,14}

However, this study has yet to examine subject's willingness to maintain proper body mechanics in their daily activities, which will prevent mLBP recurrence. This study also did not factor in objective measurements related to psychosocial factors, like aversion to movement to avoid pain (kinesiophobia), depression, or stress level. Review studies have shown that these factors are related to poor outcomes in patients with LBP. Psychosocial factors like catastrophic thoughts regarding pain and depression must be identified due to their relation to increasing chronic pain and long-term disability.¹⁵

This research focuses on patient safety principles and involves supervised training in the Medical Rehabilitation Department. Patients are instructed to stop exercising if their pain increases and no serious side effects are reported. At the end of the study, all participants felt they benefited from exercise and proper body mechanics, expressing a desire to continue practicing them regularly. Further research on the continuity of this programmed exercise is essential to assess mLBP recurrence in the treatment group after three months of intervention.

Emphasize the new and important aspects of the study. Discuss solutions and recommendations in dealing with issues or controversies. Relate the results to literature data (other than described in the introduction) and highlight the innovative and significant aspects of the study. Verify hypotheses. It should also contain a section related to the limitations of the work and directions for future research should be described

Conclusion

The study found that the group using programmed proper body mechanics expe-

rienced a significant reduction in pain after six weeks compared to the control group. Although the improvement in functional capability wasn't statistically significant, the programmed proper body mechanics group saw greater functional improvement. These findings can help improve rehabilitation services for obese patients with mechanical low back pain (mLBP) and serve as a guide in prescribing home exercise programs. This result can also aid in patient education about proper body mechanics in daily life activities that can reduce pain, increase functional ability, and prevent recurrence of mLBP.

Conflicts of Interest

This study was conducted with no potential conflict of interest.

Acknowledgment

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

References

1. Hashimoto Y, Matsudaira K, Sawada SS, Gando Y, Kawakami R, Sloan RA, et al. Association between objectively measured physical activity and body mass index with low back pain: a large-scale cross-sectional study of Japanese men. *BMC Public Health*. 2018;18(1):341. Published 2018 Mar 9. doi:10.1186/s12889-018-5253-8.
2. Peng T, Pérez A, Pettee Gabriel K. The Association Among Overweight, Obesity, and Low Back Pain in U.S. Adults: A Cross-Sectional Study of the 2015 National Health Interview Survey. *J Manipulative Physiol Ther*. 2018;41(4):294-303. doi:10.1016/j.jmpt.2017.10.005
3. Kaur C, Kaur G, Bindra S. Prevalence and Risk Factors of Musculoskeletal Disorders among Housewives: A Survey Study. *International Journal of Science and Healthcare Research*. 2024 Jul 1;9(2):391-9.
4. da Silva T, Mills K, Brown BT, Pocovi N, de Campos T, Maher C, et al. Recur-

- rence of low back pain is common: a prospective inception cohort study. *J Physiother*. 2019;65(3):159-65. doi:10.1016/j.jphys.2019.04.010
5. GBD 2021 Low Back Pain Collaborators. Global, regional, and national burden of low back pain, 1990-2020, its attributable risk factors, and projections to 2050: a systematic analysis of the Global Burden of Disease Study 2021. *Lancet Rheumatol*. 2023 May 22;5(6):e316-e329. doi: 10.1016/S2665-9913(23)00098-X.
 6. Barr KP, Harrast MA. Chapter 40 Low Back Pain. In: Cifu DX., Eapen BC. Braddom's physical medicine and rehabilitation. Philadelphia: Elsevier; 2021.
 7. Nazar NMA, Menon JC, Karta N. Prevalence of low back pain and associated disability among women between 45-65 in Ernakulam district Kerala: a community-based cross-sectional study. *Int J Community Med Public Health* 2025;12:267-74.
 8. Watanabe S, Takahashi T, Takeba J, Miura H. Factors associated with the prevalence of back pain and work absence in shipyard workers. *BMC Musculoskelet Disord*. 2018;19(1):12. Published 2018 Jan 11. doi:10.1186/s12891-018-1931-z
 9. Hasmar W, Junaidei AS. Educational Exercise William Flexion Exercise To Reduce Lower Back Pain. *Asian Journal of Community Services* [Internet]. 2022 Jul 23 [cited 2025 Nov 10];1(1):33-6. Available from: https://www.researchgate.net/publication/362571501_Educational_Exercise_William_Flexion_Exercise_To_Reduce_Lower_Back_Pain
 10. Rosdiana I, Wirastuti K. Edukasi Proper Body Mechanics Untuk Mengurangi Nyeri Pinggang. *Indonesian Journal of Community Services*. 2024 May 31;6(1):16.
 11. El-Rasol Z, Mabrouk R, Rahman A El. Effect Of Implementing Body Mechanics And Ergonomics Training Program On Nurses' Low Back Pain And Quality Of Nursing Work Life. *IOSR J Nurs Health Sci*. 2018;7(3):20-35. doi: 10.9790/1959-0703102035
 12. Olalla M, Naranjo G, López S, Muñoz M, Bayas-Morejón F. Body Mechanics and Complications in the Nursing Personnel of the Emergency Service of Luis Vernaza General Hospital (Guayaquil-Ecuador). *Electron J Gen Med*. 2020;17(2). doi: <https://doi.org/10.29333/ejgm/7809>
 13. Olalla M, Naranjo G, López S, Muñoz M, Bayas-Morejón F. Body Mechanics and Complications in the Nursing Personnel of the Emergency Service of Luis Vernaza General Hospital (Guayaquil-Ecuador). *Electron J Gen Med*. 2020;17(2). doi: <https://doi.org/10.29333/ejgm/7809>
 14. Hernandez-Lucas P, Leirós-Rodríguez R, Mota J, García-Soidán JL. Effects of a back school-based intervention on non-specific low back pain in adults: a randomized controlled trial. *BMC Complement Med Ther* [Internet]. 2023 [cited 2025 Nov 10];23:229. Available from: <http://creativecommons.org/licenses/by/4.0/>.TheCreativeCommonsPublicDomainDedicationwaiver
 15. World Health Organization. Obesity and Overweight [Internet]. 2018. Available from: <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>

