MEDICAL RECORDS-International Medical Journal

Research Article

Effects of Walking on Mobility, Balance and Anthropometric Measurements in Individuals with Mechanical Low Back Pain

Onur Secgin Nisanci[1], Ridvan Yildiz[2], Meral Karakoc[3]

[1]Artvin Çoruh University, Vocational School of Health Services, Department of Physiotherapy, Artvin, Türkiye
[2]Dicle University, Vocational School of Health Services, Department of Orthopedic Prosthetics and Orthotics, Diyarbakır, Türkiye
[3]Dicle University, Vocational School of Health Services, Department of Physiotherapy, Diyarbakır, Türkiye

Abstract

Aim: This study aims to investigate the effects of walking on mobility, balance and anthropometric measurements.
Material and Method: Our study included individuals with mechanical low back pain, who were randomly assigned to experimental and control groups. After the waist and hip circumference measurements of the participants who completed the personal information form, a 40-meter fast walking test was performed together with the Timed Up and Go test. The experimental group practiced treadmill walking while the control group continued to take normal care. Evaluations were performed before and after treatment. The results were evaluated in SPSS 22 software program.
Results: No significant differences were observed regarding the demographic characteristics of the participants in our study. However, a notable improvement was identified in the outcomes of the mobility evaluation test (p<0.05). Statistically significant differences were also observed in anthropometric measurements in the low back and hip region (p<0.05).
Conclusion: As a result of our study, it was shown that walking exercise produced significant changes in mobility, balance and anthropometric measurements of individuals.

Keywords: Mechanical low back pain, walking, mobility

INTRODUCTION

Low back pain that is not caused by any known specific pathology, usually originating from in the lumbosacral region or other soft tissues around these discs, is called mechanical low back pain (1,2). Mechanical low back pain is very widespread and ranks among the major causes of disability globally. It is also the second most frequent complaint reported in primary health care settings (3). Furthermore, mechanical low back pain has been reported to affect 23% of the global population, with a recurrence rate ranging from 24% to 80% within a year (4,5). Low back pain is a multifactorial condition influenced by environmental, occupational, personal, and physical factors. According to the literature, risk factors include age, gender, occupation, socio-cultural status, stress, smoking, and obesity (6,7).

A comprehensive evaluation is essential for developing an effective treatment plan for mechanical low back pain. In this evaluation, patient history, physical examination, imaging and laboratory methods should be used together (8-10). Both pharmacologic and non-pharmacologic methods are used to treat mechanical low back pain. Bed rest, heat treatments, electrotherapy, ultrasound, mobilization, and manipulation are examples of non-pharmacological methods (11-13). In recent years, activities such as walking and cycling have been included in non-pharmacological treatment programs. In the literature, there are studies investigating the effects of walking on individuals with mechanical low back pain (14). These studies generally focus on the effects of walking on pain, functionality and depression (15,16).

The purpose of this research was to explore the influence of walking activity on balance, mobility, and anthropometric measurements in individuals with mechanical low back pain.

CITATION
Nisanci OS, Yildiz R, Karakoc M. Effects of Walking on Mobility, Balance and Anthropometric Measurements in Individuals with Mechanical Low Back Pain. Med Records. 2025;7(2):377-83. DOI:1037990/medr.1630125

Received: 03.02.2025 **Accepted:** 06.03.2025 **Published:** 08.05.2025
Corresponding Author: Onur Secgin Nisanci, Artvin Çoruh University, Vocational School of Health Services, Department of Physiotherapy, Artvin, Türkiye
E-mail: onurnisanci@artvin.edu.tr

MATERIAL AND METHOD

The Scientific Research and Publication Ethics Committee of Artvin Çoruh University approved our work. The approval letter, dated 16.04.2024, with the number "E-18457941-050.99-132258" on it, was issued.

The participants in our research were students from the Department of Physiotherapy at Artvin Çoruh University. Participants who consented to participate were included after being informed about the study.

Inclusion criteria;

- Agreeing to participate in the research,
- Signing the consent form created for the research,
- Over 18 years of age,
- Having been diagnosed with mechanical low back pain as a result of clinical evaluation by a physician,
- Not having any history of surgery.

Exclusion criteria;

- Being under 18 years of age,
- Not signing the consent form,
- Previous surgical operation,
- Exposure to low back pain due to a known cause,
- Having physiotherapy and rehabilitation treatment within the last six months,
- Having medical treatment for low back pain within the last six months.

Students diagnosed with mechanical low back pain through clinical evaluation conducted by the university infirmary physician were included in the study. All individuals who agreed to participate in the study and signed the consent form were asked to fill out a personal information form. The participants were then randomly divided into experimental and control groups.

Anthropometric measurements were performed by trained researchers in accordance with standard procedures. A stadiometer was used for height measurement. Participants were asked to stand upright and barefoot, and the headpiece was lowered to the highest point of the head. The first measurement was taken in this way, and after a few seconds of rest, the participants' height was measured again in the same position. The average of the obtained results was then calculated. A calibrated Seca 813 digital scale was used for weight measurement. Participants were weighed in light clothing and without shoes for the first measurement. After stepping off the scale and resting for a few seconds, they were asked to step back on for a second measurement. The average of the two obtained values was calculated. All measurement procedures were conducted in accordance with the standards specified by the World Health Organization (WHO) and relevant literatüre (17). The measurement parameters included height, body weight, waist circumference, hip circumference, and body mass index (BMI). All measurements were conducted in an environment where participants were in an appropriate position and in a relaxed state.

The participants waist circumference was measured at the umbilicus level, while hip circumference was measured at the most prominent point of the gluteal region, ensuring the tape was parallel to the ground. The BMI of the participants was calculated by dividing body weight in kilograms by the square of height in meters. The Timed Up and Go Test was used to measure participants' mobility, while the 40-Meter Fast-Paced Walk Test was applied to evaluate short-distance walking speed and direction-changing activities. Before the assessment, the tests were explained to the individuals, and a trial test was conducted before starting the actual evaluation. After the first assessment, participants in the experimental group began a moderate-paced 20-minute walk on a Voit treadmill at a speed of 5 km/h. The walking sessions were performed five times per week (once per day) for three weeks. Individuals in the control group followed physiotherapists' recommendations by maintaining proper posture, engaging in light physical activities, and avoiding situations that could trigger pain (such as strenuous movements) while continuing their daily routines.

The data collection instruments included a descriptive information form, the Timed Up and Go Test, the 40-Meter Fast-Paced Walk Test, and anthropometric measurements.

The Descriptive Information Form was created by researchers based on a literature review. It consists of six questions covering participants' age, height, weight, BMI, smoking status, and family income level.

The Timed Up and Go Test was used for this assessment, in which participants were seated in a chair with a 3-meter walking distance marked ahead, instructed to stand up, walk to the marked endpoint, return, and sit back down, while the time taken to complete the task was recorded (18).

In the 40-Meter Fast-Paced Walk Test, a hard-surfaced area is marked with a 10-meter distance between the start and finish points. Traffic cones are placed 2 meters behind the start line and 2 meters beyond the finish line. Participants are instructed to walk between the start and finish lines while turning around the cones. The time taken for every 10-meter segment is recorded (19).

In anthropometric measurements, participants' waist circumference was measured at the umbilicus level, while hip circumference was measured at the most prominent point of the gluteal region, ensuring the tape was parallel to the ground. Measurements were repeated before and after the test. To minimize error, each measurement was taken twice, and the average of the obtained values was used for calculations (20).

The timed get-up-and-walk test required the participant to leave the chair, walk to the end of the room, return, and sit in the chair. The amount of time that passed was noted (18).

40-meter fast tempo walking test; In the test, an area of 10 meters is determined between the start and end points on a hard surface. Then traffic cones are placed 2 meters behind the start line and 2 meters ahead of the finish line. The participant is instructed to walk between the start and finish lines while maneuvering around the cones. While the participant is doing this, the elapsed time for every 10 meters is recorded (19).

The sample size in this study was determined based on data from a previous study examining the temporal and kinematic parameters of individuals with chronic low back pain. The effect size was calculated using the mean and standard deviation values of Timed Up and Go Test scores (18). In this study, the effect size for the groups was 1.5653. Using the G*Power 3.1.9.4 software with effect size=1.5653, alpha=0.05, and power=0.95, the total sample size was calculated as 24.

Statistical Analysis

The data obtained in the study were analyzed using SPSS 22.0 software. A significance level of p<0.05 was considered for all statistical analyses. The Kolmogorov-Smirnov test was used to assess the normality of the data distribution. Descriptive statistics were presented as mean±standard deviation for normally distributed continuous variables, median and interquartile range for non-normally distributed variables, and frequency and percentage (%) for categorical variables. Group comparisons were conducted using the One-Way ANOVA and Kruskal-Wallis H test.

RESULTS

No significant difference was seen when comparing the demographic information of the study and control groups (p>0.05) (Table 1).

Table 1. Analysis of demographic information of the participants

		Experimental group (n=39)		Control group (n=39)		p-value
Age	Mean±SD	20.00±1.25		20.00±2.00		F=1.127
	Median (Min-Max)	20.5 (18-25)		21 (18-26)		p=.533
BMI	Mean±SD	21.94±4.99		20.83±3.65		x^2=1.565
	Median (Min-Max)	21.8 (17.8-25.8)		22.2 (18.3-26.1)		p=.353
		Number (n)	Percent (%)	Number (n)	Percent (%)	
Gender	Male	15	38.46	15	42.30	x^2=.384
	Female	24	61.54	24	57.70	p=.825
Smoking	Yes	7	19.23	9	23.07	x^2=.118
	No	32	80.77	30	76.93	p=943

F: One Way ANOVA Test, x^2: Chi-Square test

When the pre-test results of the experimental and control groups were compared, no statistically significant difference was found, whereas a statistically significant difference was detected in the post-test results between the groups (p=0.004, p<0.05). When the pre-test and post-test results were compared in the control group, there was no statistically significant difference (p=0.230, p>0.05). When the pre-test and post-test results were compared in the experimental group, there was a statistically significant difference (p=0.004), p<0.05 (Table 2).

Table 2. Comparison of the experimental and control groups in the timed up and go test pre-test and post-test

			Experimental group (n=39)	Control group (n=39)	t value	p value
Timed up and go test (s)	Pre test	Mean±SD	8.8068±1.81	8.9072±1.40	0.98	0.330
		Median (Min-Max)	8.75 (7.90-9.80)	8.75 (7.55-9.90)		
	End test	Mean±SD	7.5088±1.40	8.9571±2.30	-2.97	0.004*
		Median (Min-Max)	7.45 (6.90-8.20)	8.80 (7.60-9.95)		
Within-group comparison (pre and post)			t=-3.025	t=1.503	-	-
p-value			0.004*	0.230	-	-

t (Independent): Independent samples t-test, t (Dependent): Dependent samples t-test, *p<0.05

When the experimental and control groups were compared, no significant difference was observed between the pre-test and post-test (p>0.05). Similarly, no statistical difference was found between pre-test and post-test measurements in the control group (p=0.511, p>0.05). However, a statistically significant difference was identified between pre-test and post-test measurements in the experimental group (p=0.034, p<0.05) (Table 3).

Table 3. Comparison of the experimental and control groups in the 40 meter rapid tempo walking test pre-test and post-test

			Experimental group (n=39)	Control group (n=39)	t test	p test
40 meter rapid tempo walking test (m/s)	Pre test	Mean±SD	2.3917±0.25	3.2072±0.10	-1.29	0.244
		Median (Min-Max)	2.995 (2.66-3.33)	3.240 (2.85-3.24)		
	End test	Mean±SD	3.4207±0.18	3.1090±0.12	1.85	0.114
		Median (Min-Max)	3.35 (3.10-3.80)	3.09(2.85-3.33)		
Within-group comparison (pre and post)			t=-3.73	t=0.74	-	-
p-value			0.034*	0.511	-	-

t (Independent): Independent samples t-test, t (Dependent): Dependent samples t-test, *p<0.05

Participants in the study and control groups low back circumference anthropometric measurements did not differ statistically significantly before walking (p>0.05), but after walking, a significant difference was discovered in favor of the study group (p<0.05) (Table 4).

When comparing the pre-test hip circumference anthropometric measurements of the experimental and control groups, no statistically significant difference was found (p=0.924, p>0.05). Similarly, there was no significant difference between the groups in the post-test measurements (p=0.461, p>0.05). Within-group analysis revealed a statistically significant difference between the pre-test and post-test measurements in the experimental group (p=0.006, p<0.05). When the pre-test and post-test results were compared within the groups, walking was observed to produce a statistically significant change in hip circumference measurements (Table 4).

Table 4. Comparison of anthropometric measurements of experimental and control groups at pre-test and post-test

			Experimental group (n=39)	Control group (n=39)	t test	p test
Anthropometric measurement of low back circumference (cm)	Pre test	Mean±SD	101.604±2.75	102.450±2.06	0.515	0.625
		Median (Min-Max)	95.2 (89-101)	91 (82-100)		
	End test	Mean±SD	100.48±2.55	102.220±2.28	0.271	0.796
		Median (Min-Max)	93 (88-98)	90.5 (82-99)		
Within-group comparison (Pre vs. Post)			t=3.865	t=2.012	-	-
p-value			0.031*	0.138	-	-
Anthropometric measurement of hip circumference (cm)	Pre test	Mean±SD	107.604±2.75	107.450±2.06	0.100	0.924
		Median (Min-Max)	109 (103-115)	109.5 (104-115)		
	End test	Mean±SD	102.48±2.55	107.220±2.58	-0.432	0.667
		Median (Min-Max)	105 (100-109)	109.32 (104-115)		
Within-group comparison (Pre vs. Post)			t=6.926	t=1.532	-	-
p-value			0.006*	0.010*	-	-

t (Independent): Independent samples t-test, t (Dependent): Dependent samples t-test, *p<0.05

DISCUSSION

Walking is a widely recommended physical activity to improve health and support activities of daily living (21). In this study, the effects of walking activity on mobility, balance and anthropometric measurements were examined. Our study aims to provide important information on how walking can be used more effectively in clinical practice and to contribute to the literature.

In a study conducted by Suh et al., (2019), the effectiveness of lumbar stabilization exercises and walking activity on low back pain was examined. They included 48 participants in their study and divided the participants into 4 groups by randomization method. They applied flexibility exercises to the first group, walking to the second group, stabilization exercises to the third group and walking activity with stabilization exercises to the fourth group. In their study, they used the VAS scale to measure pain at rest and during physical activity as the primary outcome measure and the frequency of medication use, Oswestry disability index, beck depression questionnaire and lumbar muscle strength as secondary outcome measures. According to the results of their study, the reduction of back pain and increase in muscle strength were more significant in the stabilization and walking groups compared to the other group. The authors also recommended walking and stabilization exercises for chronic low back pain (22).

A study by Arkesteijn et al. (2022) examined how walking and static work programs affected older women's posture, stimulation of muscles, and acute low back pain. The study involved 14 elderly women. A improved silent standing task and a 30-minute walking task were used to evaluate changes in trunk contractions, lower and higher spine angles, postural influence, and back discomfort. The results, although not statistically significant, indicate a decline in acute back pain and an increase in the upper spine flexion angle (23).

In a study conducted by Seay et al. (2011), the effects of low back pain on the pelvis and trunk during walking and running were examined. Runners participated in the study. The runners were asked to walk on a treadmill with increments of 0.8 m/s. Pelvis and trunk data were collected during the last 20 seconds of each phase. Coordination analysis measured the portion of the walking cycle spent on trunk movement only, pelvis movement only, in-phase, and antiphase relationships for each group. In the group with low back pain, a reduction in coordinated movement between the pelvis and trunk was found, despite low disability levels (24). In our study, it was observed that walking activity provided significant improvements in the experimental group on the timed up-and-go and 40-meter walk tests. Our study also showed that walking had significant effects on mobility and performance.

In a study conducted by Tekin et al., (2020), the effectiveness of an aerobic exercise program in patients with non-specific low back pain was investigated. The participants included in their study were divided into experimental and control groups by randomization method and the participants in the experimental group were given home exercises in addition to aerobic exercise while the control groups were only given home exercise program. The participants were assessed for pain level, spinal flexibility, lumbar muscle endurance, depressive symptom presence and severity, disability, and quality of life before treatment, after treatment, and three months after treatment. According to the results of the study, significant improvement was found in all evaluations in the study group, while significant improvement was found in pain, spinal flexibility and physical component of quality of life in the control group. Compared to the control group, the positive change in the evaluation parameters over time was significantly higher in the experimental group (25).

In a study conducted by Li et al. (2020), the effects of walking activity on body mass index, low back circumference, and other health indicators in the working population were explored. The study evaluated participants' walking behavior, height, weight, and low back circumference measurements before and after the intervention. The results indicated that walking exercises were effective in reducing both body mass index and low back circumference (26). In our study, it was found that walking had a positive effect on reducing low back circumference in the study group.

In a study conducted by Melam et al. (2016) examined the effects of aerobic exercise and brisk walking on body mass index, anthropometric measurements and blood pressure in overweight. The participants in the study were assigned to three groups using a randomization method. The primary group was selected as aerobic exercises and diet; the second group as brisk walking and diet; and the third group as the control group. The interventions were continued for 10 weeks and a re-evaluation was performed at the end of 10 weeks. As a result of the study, it was found that the participants in the aerobic exercise and diet group saw more positive effects than those in the brisk walking and diet group. In addition, changes in all variables were significant in the brisk walking and diet group, yet the control group showed no significant differences (27).

A study by Guessogo et al. (2016) examined the effect of a 24-week repetitive short-term walking-based training program on the physical fitness of black Cameroonian obese women. Participants in the study were divided into three groups: premenopausal women, postmenopausal women, and the control group. A 90-minute rehabilitation protocol was performed for all groups except the control group. The first 20 minutes of this program consisted of warm-up exercises, while the remaining time consisted of main exercises and cooling exercises. Metabolic, cardiorespiratory and anthropometric measurements were performed by the researchers at the beginning and end of the study. As a result of the study, there were no significant differences in the measurements of the participants in the control group, while significant differences were found in metabolic, cardiorespiratory and anthropometric values for the other two groups (28). In our study, the participants in the experimental group were made to walk at a moderate pace and anthropometric measurements were performed. As a result of our study, significant differences were found in anthropometric variables in consistent with the literature. Although our study found significant results of walking on mobility, balance and anthropometrics, further studies are needed to contribute to the literature on this subject.

Despite these positive findings, our study has limitations. The short study duration prevented long-term evaluations. The fact that the participants were young adults makes it unclear whether the findings are applicable to older individuals or other populations. Further research involving longer follow-up periods and different age groups is needed.

CONCLUSION

Walking exercises may be an effective method for improving mobility, balance, and anthropometric measurements in individuals with mechanical low back pain. Additionally, moderate-paced walking was found to significantly reduce waist and hip circumference. Future studies should investigate the long-term effects of walking interventions on low back pain management.

Financial disclosures: *The authors declared that this study has received no financial support.*

Conflict of interest: *The authors have no conflicts of interest to declare.*

Ethical approval: *The Scientific Research and Publication Ethics Committee of Artvin Çoruh University approved our work. The approval letter, dated 16.04.2024, with the number "E-18457941-050.99-132258" on it, was issued.*

REFERENCES

1. Akeda K, Yamada J, Linn E, et al. Platelet-rich plasma in the management of chronic low back pain: a critical review. J Pain Res. 2019;12:753-67.
2. El-Sayed A, Hadley C, Tessema F, et al. Back and neck pain and psychopathology in rural sub-Saharan Africa: evidence from the Gilgel Gibe Growth and Development Study, Ethiopia. Spine. (Phila Pa 1976). 2010;35:684-9.
3. Traeger A, Buchbinder R, Harris I, Maher C. Diagnosis and management of low-back pain in primary care. CMAJ. 2017;189:E1386-95.
4. Andersson GB. Epidemiological features of chronic low-back pain. Lancet. 1999;354:581-5.
5. Will JS, Bury DC, Miller JA. Mechanical low back pain. Am Fam Physician. 2018;98:421-8.
6. Hoy D, Brooks P, Blyth F, Buchbinder R. The epidemiology of low back pain. Best Pract Res Clin Rheumatol. 2010;24:769-81.
7. Ünde Ayvat P, Aydın ON, Oğurlu M. Risk factors associated with lower back pain in the Polyclinic of Algology. AĞRI 2012;24:165-70.
8. Hutchins TA, Peckham M, Shah LM, et al. ACR appropriateness criteria® low back pain: 2021 update. J Am Coll Radiol. 2021;18:S361-79.
9. Parfenov V, Golovacheva V. Diagnosis and treatment of acute low back pain. Ter Arkh. 2019;91:155-9.
10. Casser H-R, Seddigh S, Rauschmann M. Acute lumbar back pain: investigation, differential diagnosis, and treatment. Dtsch Arztebl Int. 2016;113:223-34.
11. Myrtos CD. Low back disorders. Evidence-based prevention and rehabilitation. J Can Chiropr Assoc. 2012;56:76.
12. Polat M, Karaoğlan B. Approach to lumbar pain: recognition treatment. Klinik Tıp Aile Hekimliği. 2017;9:13-21.
13. Yaraşır E, Pirinçci E, Deveci SE. Complementary and alternative treatment in low back pain. Archives Medical Review Journal. 2018;27:93-108.
14. Pocovi N, de Campos T, Christine Lin C, et al. Walking, cycling, and swimming for nonspecific low back pain: a systematic review with meta-analysis. J Orthop Sports Phys Ther. 2022;52:85-99.
15. Ünal A, Yelda K, Gülsüm T, et al. Factors affecting pain intensity and disability level in patients with low back pain: a cross-sectional study. Gevher Nesibe Journal of Medical & Health Sciences. 2023;8:75-83.
16. Kim H, Min TJ, Kang SH, et al. Association between walking and low back pain in the Korean population: a cross-sectional study. Ann Rehabil Med. 2017;41:786-92.
17. de Onis M, Habicht JP. Anthropometric reference data for international use: recommendations from a World Health Organization Expert Committee. Am J Clin Nutr. 1996;64:650-8.
18. Buraschi R, Pollet J, Villafañe JH, et al. Temporal and kinematic analyses of timed up and go test in chronic low back pain patients. Gait Posture. 2022;96:137-42.
19. Aily JB, da Silva AC, de Noronha M, et al. Concurrent validity and reliability of video-based approach to assess physical function in adults with knee osteoarthritis. Phys Ther. 2024;104:pzae039.
20. Turan E, Savut B, Kulaksızoğlu M, et al. Diyabetli hastalarda bel, boyun ve ayak bileği çevresinin kesim nokta değerleri. Selçuk Tıp Derg. 2015;31:24-6.
21. Ungvari Z, Fazekas-Pongor V, Csiszar A, Kunutsor SK. The multifaceted benefits of walking for healthy aging: from blue zones to molecular mechanisms. Geroscience. 2023;45:3211-39.
22. Suh JH, Kim H, Jung GP, et al. The effect of lumbar stabilization and walking exercises on chronic low back pain: a randomized controlled trial. Medicine (Baltimore). 2019;98:e16173.
23. Arkesteijn M, Jones R, Low DC. The effect of walking and stationary work on the acute back pain, muscle activation, posture and postural control of older women. Ergonomics. 2022;65:866-76.
24. Seay JF, Van Emmerik RE, Hamill J. Influence of low back pain status on pelvis-trunk coordination during walking and running. Spine (Phila Pa 1976). 2011;36:E1070-9.

25. Tekin V, Akçay Ş, Şengül İ, et al. Effect of aerobic exercise program in patients with non-specific chronic low back pain. Cukurova Med J. 2020;45:1372-83.

26. Li YC, Zhao YF, Yang XZ, et al. Effects of short-term intervention of walking on body mass index, waist circumference, and related indicators of working population. Zhonghua Yu Fang Yi Xue Za Zhi. 2019;53:212-7.

27. Melam GR, Alhusaini AA, Buragadda S, et al. Impact of brisk walking and aerobics in overweight women. J Phys Ther Sci. 2016;28:293-7.

28. Guessogo WR, Temfemo A, Mandengue SH, et al. Effect of 24-week repeated short-time walking based training program on physical fitness of black Cameroonian obese women. J Exerc Rehabil. 2016;12:90-8.