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Comparison of the Effects of 10 Weeks of Fitness and Kettlebell Workouts on Some Physical Parameters of Sedentary Individuals*

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Abstract

In this study, it is aimed to scientifically reveal the changes that may occur in sedentary individuals with fitness and kettlebell training for 10 weeks and to compare these two different training practices. The research group of the study consists of sedentary individuals residing in Bayburt province. The participants included in the study first had anthropometric measurements (height, body weight, skinfold thickness, circumference measurements), diameter measurements, digital back-leg dynamometer measurement, vertical jump performance measurement, maximal 1 repetition "squat" performance measurement, and maximal 1 repetition "deadlift" performance measurement. The participants were randomly divided into two groups and included in the kettlebell and fitness training groups. As a result of the fitness training performed regularly for 10 weeks, it was observed that there were statistically significant differences between the pretest-posttest scores of the participants in shoulder diameter, chest diameter, arm diameter, squat, deadlift, sled, countermovement jump (CMJ) and squat jump (SJ). As a result of the kettlebell training performed regularly for 10 weeks, it was observed that there were statistically significant differences between the pretest-posttest scores of the participants in shoulder diameter, thigh diameter, squat, deadlift, sled, CMJ, SJ and back-leg strength. As a result, it can be said that fitness and kettlebell training are effective training types on the change of physical parameters of sedentary individuals.
Keywords: Fitness, Kettlebell, Weight training, Sedentary

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INTRODUCTION

A sedentary lifestyle refers to a way of living characterized by minimal physical activity and a predominantly inactive routine. Sedentary lifestyles, characterized by a lack of physical activity, have become increasingly prevalent over time, particularly as societal and technological advancements continue to progress (Lee et al., 2021). This way of living is linked to various negative health effects, such as a reduced lifespan, elevated blood pressure, and a higher risk of diabetes. Studies indicate that physical inactivity is responsible for one in ten premature deaths worldwide, and reducing sedentary behavior by 25% could prevent over 1.3 million deaths annually (Lee et al., 2012). Obesity is one of the most important problems that arise in relation to a sedentary lifestyle. Obesity is a complex, multifactorial disease defined by the World Health Organization as a condition characterized by excessive fat accumulation, which poses a risk to health (WHO, 2022). Sedentary behavior and lack of physical activity may elevate the risk of obesity (Silveira et al., 2022). Obesity has emerged as one of the most urgent public health issues of contemporary times. In addition to contributing to the development of various diseases, it significantly reduces quality of life and increases mortality rates. Moreover, obesity is not only a global public health issue but also imposes significant economic burdens on national healthcare systems (Daniels, 2005). Obesity has been linked to numerous cardiovascular risk factors (Flegal et al., 2005; Willett et al., 1995) and metabolic disorders (Field et al., 2001). Currently, obesity-related deaths are increasing at an alarming rate worldwide, making it the second leading cause of preventable mortality after smoking (Daniels, 2005). Consequently, individuals increasingly turn to regular physical exercise as a means of combating obesity. Physical activity and exercise training programs are essential components of a comprehensive approach to obesity management (Oppert et al., 2023).

Health is essential for human survival and development (Li et al., 2021). Exercise is a fundamental component of a healthy lifestyle, promoting overall well-being by enhancing musculoskeletal fitness and reducing the risk of various diseases (Kell et al., 2001). It is a critical factor in mitigating obesity-related risks for both adults and young individuals (USDHHS, 2008). Scientific research has demonstrated that regular exercise can effectively facilitate weight loss. Individuals who consistently engage in structured physical activity not only mitigate health complications associated with excessive fat accumulation but also enhance their overall physiological functions and physical capabilities. To maintain and improve health, people participate in various sports, among which fitness training is one of the most preferred. Fitness is a broad discipline that encompasses numerous movement patterns essential for overall physical health. It is defined as a set of structured physical activities designed to induce physiological adaptations, enhance physical performance, and promote overall well-being. Regular fitness training is associated with numerous health benefits, including improved bone strength, maintenance of a healthy body weight, increased muscle strength, enhanced flexibility, and better mental health. Additionally, it has been linked to a reduced risk of various types of cancer (CDCP, 2010). It is suggested that regular exercise is associated with lower levels of depression (Kim, 2022), anxiety (Patterson et al., 2021), and neuroticism (De Moor et al., 2006; Desai et al., 2023). Similarly, Zhu and Cheng (2022) argue that fitness training can be an effective strategy for managing anxiety.

Kettlebell training, although widely utilized in Russia for many years, has only recently gained global recognition as a functional strength-training tool (McGill, 2011). Kettlebell training has emerged as one of the most popular fitness trends in the United States in recent years (Kim et al., 2024). Due to its emphasis on dynamic, full-body movements, kettlebell training is commonly incorporated into CrossFit workouts to develop muscular strength and endurance (Holmberg, 2009; Öztürk & Taş, 2020). As a training method, CrossFit integrates kettlebell exercises into its holistic approach to fitness. Kettlebell exercises are ideal for functional training, as they simulate real-life movements and challenges encountered in daily activities (McGill, 2011). Kettlebell training has been shown to be an effective strategy for improving strength, power, and endurance in both men and women (Santos Jr. et al., 2024). Some of the most popular kettlebell exercises include the kettlebell swing, goblet squat, clean and press, snatch, and Turkish get-up. One notable advantage of kettlebell swings is their ability to mimic everyday joint actions. For example, the hip hinge movement used in kettlebell swings activates lower extremity muscle patterns similar to those observed during running (Kartages et al., 2019). Kettlebell exercises (e.g., swings, cleans, snatches, push-presses, and high-pulls) are typically performed in a ballistic manner, characterized by a rapid concentric contraction following an eccentric counter-movement, effectively utilizing the stretch-shortening cycle (Lake & Lauder, 2012; McGill & Marshall, 2012). Kettlebell training provides multiple health benefits, including the generation of power (Levine et al., 2022). Furthermore, kettlebell training induces significant cardiovascular stress while simultaneously providing resistance training benefits, such as increased respiratory rate, heart rate, and oxygen consumption (Budnar et al., 2014; Falatic et al., 2015; Farrar et al., 2010). Given these factors, kettlebell training is considered a high-energy-demand activity that promotes significant physical development (Jay et al., 2011). Additionally, kettlebell training has been shown to improve postural control and may potentially alleviate certain musculoskeletal pain conditions (Girard & Hussain, 2015). Kettlebell training can be considered an effective strategy for enhancing strength, power, and endurance (Levine et al., 2022). Research further suggests that kettlebell exercises increase levels of cortisol, testosterone, and immunoreactive growth hormone, thereby positively influencing muscle adaptation and hypertrophy (Budnar et al., 2014; Raymond et al., 2018). Moreover, kettlebell training has been found to enhance glucose tolerance, contributing to improved metabolic health (Greenwald et al., 2016). It has been suggested that the kettlebell swing exercise may improve cardiorespiratory fitness (Tsatsouline, 2006). Also, kettlebell swing exercises have been proposed as a method for improving strength, power, endurance, and aerobic capacity (Vuk & Pajtak, 2023).

This study aims to examine and compare the physical and physiological changes that occur in sedentary individuals residing in Bayburt, Turkey, following a 10-week fitness and kettlebell training program. By analyzing these changes scientifically, the study seeks to highlight the importance of structured exercise interventions for individuals with insufficient physical activity levels. Additionally, the study aims to provide participants with fundamental knowledge about fitness and kettlebell training, guiding them through a structured exercise regimen to facilitate physical and physiological development while promoting overall well-being.

METHOD

Research Model
This study employed a pretest-posttest experimental design without a control group to investigate the effects of fitness and kettlebell training programs on selected physical parameters of sedentary individuals.

Research Groups
The study population consisted of sedentary individuals residing in Bayburt, Turkey. The sample comprised 24 sedentary individuals living in this province. Participants were randomly assigned into two groups: 12 in the fitness training group and 12 in the kettlebell training group. All participants were male.

Data Collection Tools
During the training phase, the following equipment was utilized: a squat rack, a bench press station, two dumbbells of each weight, four Olympic bars, one weight sled, and three plyometric jump boxes (two large and one small). Additionally, kettlebells weights were used in pairs. Body weight measurements were obtained using a digital scale, and body dimensions were assessed with a measuring tape. Hand-grip strength was measured using a hand dynamometer, while vertical jump performance was evaluated using a pulley-system jump meter. Furthermore, back-leg strength was assessed with a digital back-leg dynamometer.

Technical training sessions were conducted in the sports hall of the Faculty of Sports Sciences at Bayburt University. The intensity of the training programs was systematically increased over a total period of 10 weeks, with participants exercising three times per week. During the first two weeks, each exercise was performed for one set of 12 repetitions to focus on technical instruction and anatomical adaptation. In the subsequent four weeks, participants completed two sets of 12 repetitions for each exercise. In the final four weeks, they performed three sets of 12 repetitions per exercise. Each training session lasted approximately 70 minutes, consisting of a dynamic warm-up (10 minutes), the main workout session (50 minutes), and a cool-down and stretching phase (10 minutes). Data for the study were obtained between September 23 and November 30, 2024.

The training programs implemented over the 10-week period were as follows:
10-Week Training Program

Fitness Training Program
Monday: Warm-up (10 min), equipment introduction, workout session (Barbell Row, Barbell Deadlift, Barbell Upright Row, Barbell Squat, Dumbbell Shoulder Press, Standing Dumbbell Curl, Barbell Bench Press) (50 min), stretching and cooling-down exercises after completing the training (10 min).

Wednesday: Warm-up (10 min), workout session (same exercises as Monday) (50 min), stretching and cooling-down exercises after completing the training (10 min).

Friday: Warm-up (10 min), workout session (same exercises as Monday) (50 min), stretching and cooling-down exercises after completing the training (10 min).

Kettlebell Training Program

Monday: Warm-up (10 min), equipment introduction, workout session (Kettlebell Row, Kettlebell Deadlift, Kettlebell Upright Row, Kettlebell Squat, Kettlebell Shoulder Press, Kettlebell Biceps Curl, Kettlebell Bench Press) (50 min), stretching and cooling-down exercises after completing the training (10 min).

Wednesday: Warm-up (10 min), workout session (same exercises as Monday) (50 min), stretching and cooling-down exercises after completing the training (10 min).

Friday: Warm-up (10 min), workout session (same exercises as Monday) (50 min), stretching and cooling-down exercises after completing the training (10 min).

Ethics Approval

Ethical approval for this study was obtained from the Ethics Committee of Bayburt University (08.11.2023, session number: 2023/19, decision number: 363).

Collection of Data

Prior to participation, all individuals were provided with detailed information about the study, including potential risks and adverse effects, and were required to sign an informed consent form. Individuals who did not sign the consent form were excluded from the study. Participants were instructed to refrain from engaging in any physical activity within 24 hours before undergoing the tests. At the beginning of the study, participants underwent a series of baseline measurements, including anthropometric assessments (height, body weight, skinfold thickness, circumference measurements), diameter measurements, digital back-leg dynamometer tests, hand-grip strength assessments, vertical jump performance tests, and maximal one-repetition tests for both squat and deadlift exercises. Additionally, a sled push test was conducted. After completing the 10-week training program, all these measurements were repeated as post-tests.

Analysis of Data

The collected data were analyzed using SPSS 25.0. To assess the normality of the data distribution, the Kolmogorov-Smirnov and Shapiro-Wilk tests were performed. The findings revealed that the data did not conform to a normal distribution. Consequently, the Wilcoxon Signed-Rank Test was employed to compare the pre-test and post-test scores in order to examine within-group differences. As a result of the G*Power analysis, the test power was calculated as 0.60. This value indicates that the test is moderately powerful, meaning that there is a 60% chance that it will detect true effects. In general, a test power of 0.80 and above is preferred, but a value of 0.60 offers a moderate level of reliability.

FINDINGS

Table 1. Pretest anthropometric measurements of fitness participants

Participant	Age (Year)	Height (m)	Weight (kg)	Shoulder (cm)	Chest (cm)	Arm (cm)	Waist (cm)	Thigh (cm)
FK1	23	1,74	94,5	114	103	32	100	64
FK2	25	1,83	97,5	111	101	33	103	58
FK3	25	1,9	97	118	101	34	103	58
FK4	38	1,91	120,6	122	115	32	115	52
FK5	39	1,75	73,1	105	90	28	87	50
FK6	22	1,81	89,4	124	105	33	90	58
FK7	22	1,84	76,5	108	96	28	89	56
FK8	22	1,69	80,1	107	97	31	93	61
FK9	21	1,76	73,6	104	91	26	92	50
FK10	22	1,74	80	118	95	32	94	53
FK11	34	1,76	72,4	106	97	27	90	50
FK12	22	1,76	72,6	102	90	26	85	52

FK refers to participants in the fitness workout group.

The ages of the participants were recorded in years, their heights in meters, their weights in kilograms, and their diameter and circumference measurements in centimeters.

Table 1 presents the pretest anatomical measurements of participants who underwent the fitness training program.

Table 2. Posttest anatomical measurements of fitness participants

Participant	Age (Year)	Height (m)	Weight (kg)	Shoulder (cm)	Chest (cm)	Arm (cm)	Waist (cm)	Thigh (cm)
FK1	23	1,74	101,7	130	107	36	98	65
FK2	25	1,83	97	110	100	33	102	55
FK3	25	1,9	96	119	103	37,5	109	50
FK4	38	1,91	117,2	126	122	38	115	59
FK5	39	1,75	73,7	109	91	30	89	52
FK6	22	1,81	92,5	128	108	36	92	57
FK7	22	1,84	76	110	97	30	86	56
FK8	22	1,69	79	117	98	36	89	62
FK9	21	1,76	75,3	109	92	30	88	57
FK10	22	1,74	77,1	113	95	34	87	53
FK11	34	1,76	75,8	117	102	31	89	57
FK12	22	1,76	72,6	111	93	29	88	57

FK refers to participants in the fitness workout group.

The ages of the participants were recorded in years, their heights in meters, their weights in kilograms, and their diameter and circumference measurements in centimeters. FK refers to participants in the fitness workout group.

Table 2 presents the posttest anatomical measurements of participants who underwent the fitness training program.

Table 3. Pretest weight measurements of fitness participants

Participant	Squat (kg)	Deadlift (kg)	Sled Push (s)	CMJ (cm)	SJ (cm)	Hand-Grip (N)	Back-Leg Strength (N)
FK1	115	130	8,68	52	47	39,7	145,5
FK2	65	100	24,4	49	43	58,8	165
FK3	65	100	11,5	35	31	59,9	142
FK4	55	130	8,01	37	36	43,9	181
FK5	75	80	9,44	38	35	44,5	157
FK6	105	150	14,68	51	40	57	251,7
FK7	95	120	7,9	44	44	49,4	148,5
FK8	95	120	14,15	45	42	51,2	179
FK9	75	80	8,71	41	41	44,5	135
FK10	95	110	7,61	41	41	51,6	199,5
FK11	75	90	10,65	35	33	52,6	159,5
FK12	65	100	6,22	46	44	47,2	155

FK refers to participants in the fitness workout group.

The squat and deadlift strength of the participants was calculated based on the total weight, including the bar weight and the plates used (kg). Sled push performance was measured in seconds by recording the time taken to complete a 15-meter distance. CMJ (Countermovement Jump) and SJ (Static Jump) tests were measured in centimeters (cm). Handgrip strength and back-leg strength were measured in newtons (N) using a dynamometer.

Table 3 presents the pretest weight measurements of participants who underwent the fitness training program.

Table 4. Posttest weight measurements of fitness participants

Participant	Squat (kg)	Deadlift (kg)	Sled Push (s)	CMJ (cm)	SJ (cm)	Hand-Grip (N)	Back-Leg Strength (N)
FK1	135	170	5,13	58,5	55,5	52	166
FK2	120	110	8,2	47	44	57,3	172
FK3	90	130	7,91	39	35	62,2	182
FK4	95	150	6,62	56	56	58,4	202,5
FK5	95	100	6,71	48	42	43	114
FK6	160	165	5,18	48	48	63	242
FK7	140	135	4,78	46	47	41,5	129
FK8	135	150	6,6	42	39	57	144,5
FK9	135	140	7,15	40	39	45,7	140
FK10	85	140	4,96	46	50	55,5	183,5
FK11	105	110	6,95	51	48	54,2	181
FK12	105	130	6,83	59	59	45,7	215

FK refers to participants in the fitness workout group.

The squat and deadlift strength of the participants was calculated based on the total weight, including the bar weight and the plates used (kg). Sled push performance was measured in seconds by recording the time taken to complete a 15-meter distance. CMJ (Countermovement

Jump) and SJ (Static Jump) tests were measured in centimeters (cm). Handgrip strength and back-leg strength were measured in newtons (N) using a dynamometer.

Table 4 presents the posttest weight measurements of participants who underwent the fitness training program.

Table 5. Pretest anatomical measurements of kettlebell participants

Participant	Age (Year)	Height (m)	Weight (kg)	Shoulder (cm)	Chest (cm)	Arm (cm)	Waist (cm)	Thigh (cm)
KK1	44	1,74	77,9	108	100	28	102	56
KK2	45	1,81	113,6	121	113	32	114	62
KK3	36	1,66	71,4	107	92	27	92	50
KK4	45	1,72	101,2	117	113	32	118	63
KK5	19	1,72	62,7	110	87	26	77	46
KK6	22	1,92	77,8	109	98	29	85	52
KK7	22	1,79	87	113	102	35	100	55
KK8	39	1,81	93,3	112	106	31	100	54
KK9	21	1,77	106	124	115	35	106	59
KK10	19	1,76	81,6	109	100	29	93	50
KK11	18	1,66	83,5	112	103	31	97	56
KK12	23	1,79	71,9	115	95	29	95	52

KK refers to participants in the kettlebell workout group.

The ages of the participants were recorded in years, their heights in meters, their weights in kilograms, and their diameter and circumference measurements in centimeters.

Table 5 presents the pretest anatomical measurements of participants who underwent the kettlebell training program.

Table 6. Posttest anatomical measurements of kettlebell participants

Participant	Age (Year)	Height (m)	Weight (kg)	Shoulder (cm)	Chest (cm)	Arm (cm)	Waist (cm)	Thigh (cm)
KK1	44	1,74	78,9	115	100	31	101	58
KK2	45	1,81	104	123	113	32	110	60
KK3	36	1,66	71,6	112	94	32	91	57
KK4	45	1,72	99	123	114	34	107	57
KK5	19	1,72	68	112	93	31	78	54
KK6	22	1,92	79	113	95	28	79	55
KK7	22	1,79	85,6	119	102	34	91	62
KK8	39	1,81	94,8	125	105	32	101	60
KK9	21	1,77	99	124	117	35	101	62
KK10	19	1,76	85,5	114	100	32	94	59
KK11	18	1,66	86	122	105	32	98	62
KK12	23	1,79	70	121	102	32	96	55

KK refers to participants in the kettlebell workout group.

The ages of the participants were recorded in years, their heights in meters, their weights in kilograms, and their diameter and circumference measurements in centimeters.

Table 6 presents the posttest anatomical measurements of participants who underwent the kettlebell training program.

Table 7. Pretest weight measurements of kettlebell participants

Participant	Squat (kg)	Deadlift (kg)	Sled Push (s)	CMJ (cm)	SJ (cm)	Hand-Grip (N)	Back-Leg Strength (N)
KK1	65	95	18,46	26	28	37,8	111,5
KK2	75	115	9,6	26	27	37,9	117
KK3	65	90	9,29	38	40	41,2	123
KK4	45	90	9,71	22	21	44,5	117,5
KK5	95	110	10,2	41	39	56,2	272,5
KK6	95	140	6,26	72	60	68	277,5
KK7	115	120	7,61	41	38	56,4	164
KK8	95	140	8,88	39	45	64	171,5
KK9	125	130	9,68	37	37	52,8	174
KK10	75	100	8,03	49	46	48,8	141
KK11	65	80	8,55	37	34	37,2	124,5
KK12	50	75	7,84	59	57	42,6	153

KK refers to participants in the kettlebell workout group.

The squat and deadlift strength of the participants was calculated based on the total weight, including the bar weight and the plates used (kg). Sled push performance was measured in seconds by recording the time taken to complete a 15-meter distance. CMJ (Countermovement Jump) and SJ (Static Jump) tests were measured in centimeters (cm). Handgrip strength and back-leg strength were measured in newtons (N) using a dynamometer.

Table 7 presents the pretest weight measurements of participants who underwent the kettlebell training program.

Table 8. Posttest weight measurements of kettlebell participants

Participant	Squat (kg)	Deadlift (kg)	Sled Push (s)	CMJ (cm)	SJ (cm)	Hand-Grip (N)	Back-Leg Strength (N)
KK1	105	110	7,98	40	31	41,6	117,5
KK2	130	135	6,51	47	46	42,8	127,5
KK3	105	100	7,66	49	47	44	131
KK4	95	110	6,15	45	43	41	133
KK5	150	130	6,65	50	49	47,1	275
KK6	125	140	5,33	72	70	65	246
KK7	110	150	5,77	52	45	54,2	175
KK8	115	160	6,86	52	53	58,6	177
KK9	130	140	6,1	50	46	48	226
KK10	100	140	5,81	59	51	52,5	147,5
KK11	125	130	6,15	39	33	39,6	127
KK12	75	120	5,93	65	64	53	199

KK refers to participants in the kettlebell workout group.

The squat and deadlift strength of the participants was calculated based on the total weight, including the bar weight and the plates used. Sled push performance was measured in seconds by recording the time taken to complete a 15-meter distance. CMJ (Countermovement Jump) and SJ (Static Jump) tests were measured in centimeters. Handgrip strength and back-leg strength were measured in newtons using a dynamometer.

Table 8 presents the posttest weight measurements of participants who underwent the kettlebell training program.

Table 9. Wilcoxon signed-rank test results for pretest and posttest scores of weight, body circumference measurements, and strength performance in the fitness group

Experimental Group Pretest-Posttest Values			N	Mean Rank	Sum of Rank	Z	p
Weight	**Posttest – Pretest**	Negative Rank	7	5,07	35,50	-,223	0,824
		Positive Rank	4	7,63	30,50		
		Ties (Equal)	1				
Shoulder	**Posttest – Pretest**	Negative Rank	2	4,50	9,00	-2,359	**0,018**
		Positive Rank	10	6,90	69,00		
		Ties (Equal)	0				
Chest	**Posttest – Pretest**	Negative Rank	1	3,00	3,00	-2,695	**0,007**
		Positive Rank	10	6,30	63,00		
		Ties (Equal)	1				
Arm	**Posttest – Pretest**	Negative Rank	0	0,00	0,00	-2,947	**0,003**
		Positive Rank	11	6,00	66,00		
		Ties (Equal)	1				
Waist	**Posttest – Pretest**	Negative Rank	7	5,93	41,50	-,758	0,448
		Positive Rank	4	6,13	24,50		
		Ties (Equal)	1				
Thigh	**Posttest – Pretest**	Negative Rank	3	5,67	17,00	-1,076	0,282
		Positive Rank	7	5,43	38,00		
		Ties (Equal)	2				
Squat	**Posttest – Pretest**	Negative Rank	1	1,00	1,00	-2,988	**0,003**
		Positive Rank	11	7,00	77,00		
		Ties (Equal)	0				
Deadlift	**Posttest – Pretest**	Negative Rank	0	0,00	0,00	-3,077	**0,002**
		Positive Rank	12	6,50	78,00		
		Ties (Equal)	0				
Sled Push	**Posttest – Pretest**	Negative Rank	11	7,00	77,00	-2,981	**0,003**
		Positive Rank	1	1,00	1,00		
		Ties (Equal)	0				
CMJ	**Posttest – Pretest**	Negative Rank	4	3,13	12,50	-2,080	**0,037**
		Positive Rank	8	8,19	65,50		
		Ties (Equal)	0				
SJ	**Posttest – Pretest**	Negative Rank	2	2,75	5,50	-2,630	**0,009**
		Positive Rank	10	7,25	72,50		
		Ties (Equal)	0				
Handgrip	**Posttest – Pretest**	Negative Rank	4	4,75	19,00	-1,571	0,116
		Positive Rank	8	7,38	59,00		
		Ties (Equal)	0				
Back-Leg Strength	**Posttest – Pretest**	Negative Rank	5	6,40	32,00	-,549	0,583
		Positive Rank	7	6,57	46,00		
		Ties (Equal)	0				

In Table 9, the Wilcoxon Signed-Rank Test was applied to determine whether there were statistically significant differences between the pretest and posttest scores of weight, body circumference measurements, and strength performance in the fitness training group. The analysis revealed statistically significant differences in shoulder diameter ($z= -2.359$; $p<0.05$), chest diameter ($z= -2.695$; $p<0.05$), arm diameter ($z= -2.947$; $p<0.05$), squat ($z= -2.988$; $p<0.05$), deadlift ($z= -3.077$; $p<0.05$), sled push ($z= -2.981$; $p<0.05$), CMJ (Countermovement Jump) ($z= -2.080$; $p<0.05$), and SJ (Static Jump) ($z= -2.630$; $p<0.05$) between pretest and posttest scores. No statistically significant differences were observed in the remaining variables.

Table 10. Wilcoxon signed-rank test results for pretest and posttest scores of weight, body circumference measurements, and strength performance in the kettlebell group

Experimental Group Pretest-Posttest Values			N	Mean Rank	Sum of Rank	Z	p
Weight	**Posttest – Pretest**	Negative Rank	5	8	40	-,078	,937
		Positive Rank	7	5,43	38		
		Ties (Equal)	0				
Shoulder	**Posttest – Pretest**	Negative Rank	0	11	0	-2,943	**,003**
		Positive Rank	11	6	66		
		Ties (Equal)	1				
Chest	**Posttest – Pretest**	Negative Rank	2	3,75	7,50	-1,479	,139
		Positive Rank	6	4,75	28,50		
		Ties (Equal)	4				
Arm	**Posttest – Pretest**	Negative Rank	2	2,50	5,00	-2,316	**,021**
		Positive Rank	8	6,25	50,00		
		Ties (Equal)	2				
Waist	**Posttest – Pretest**	Negative Rank	7	8,29	58,00	-1,524	,128
		Positive Rank	5	4,00	20,00		
		Ties (Equal)	0				
Thigh	**Posttest – Pretest**	Negative Rank	2	4,25	8,50	-2,402	**,016**
		Positive Rank	10	6,95	69,50		
		Ties (Equal)	0				
Squat	**Posttest – Pretest**	Negative Rank	1	1,50	1,50	-2,946	**,003**
		Positive Rank	11	6,95	76,50		
		Ties (Equal)	0				
Deadlift	**Posttest – Pretest**	Negative Rank	0	0,00	0,00	-2,950	**,003**
		Positive Rank	11	6,00	66,00		
		Ties (Equal)	1				
Sled Push	**Posttest – Pretest**	Negative Rank	12	6,50	78,00	-3,059	**,002**
		Positive Rank	0	0,00	0,00		
		Ties (Equal)	0				
CMJ	**Posttest – Pretest**	Negative Rank	0	0,00	0,00	-2,937	**,003**
		Positive Rank	11	6,00	66,00		
		Ties (Equal)	1				
SJ	**Posttest – Pretest**	Negative Rank	1	1,00	1,00	-2,987	**,003**
		Positive Rank	11	7,00	77,00		
		Ties (Equal)	0				
Handgrip	**Posttest – Pretest**	Negative Rank	6	6,50	39,00	,000	1,000
		Positive Rank	6	6,50	39,00		
		Ties (Equal)	0				
Back-Leg Strength	**Posttest – Pretest**	Negative Rank	1	10,00	10,00	-2,276	**,023**
		Positive Rank	11	6,18	68,00		
		Ties (Equal)	0				

In Table 10, the Wilcoxon Signed-Rank Test was applied to determine whether there were statistically significant differences between the pretest and posttest scores of weight, body circumference measurements, and strength performance parameters in the kettlebell training group. The analysis revealed statistically significant differences in shoulder diameter (z= -2.943; p<0.05), thigh diameter (z= -2.402; p<0.05), squat (z= -2.946; p<0.05), deadlift (z= -

2.950; p<0.05), sled push (z= -3.059; p<0.05), CMJ (Countermovement Jump) (z= -2.937; p<0.05), SJ (Static Jump) (z= -2.987; p<0.05), and back-leg strength (z= -2.276; p<0.05) between pretest and posttest scores. No statistically significant differences were observed in the remaining variables.

DISCUSSION and CONCLUSION

Following the implementation of the training programs, significant differences were observed in the pretest and posttest values of shoulder, chest, and arm diameters in participants who engaged in fitness training. Similarly, significant differences were found in shoulder and thigh diameters among participants in the kettlebell training group. Consistent with these findings, Akkoç (2013) reported significant differences in the shoulder, chest, arm, and forearm regions among individuals engaged in bodybuilding. Similarly, Ertören (2020) found significant changes in the biceps, shoulder, chest, abdominal, quadriceps, and calf regions. In another study, Geri et al. (2015) demonstrated that a 12-week fitness training program led to statistically significant differences in the biceps, chest, shoulder, abdominal, and thigh regions. Akgül (2016) found significant differences in shoulder, arm extension, arm contraction, waist, abdomen, hip, and thigh measurements in a study conducted on sedentary women. Additionally, Majerič (2019) reported that an eight-week fitness program effectively reduced abdominal and hip circumference. Similarly, Mendonça et al. (2022) reported that a 12-week training program was effective in enhancing muscle mass and reducing body fat percentage in individuals. Govindasamy et al. (2024) suggest that kettlebell training improves body composition and fitness by reducing body fat percentage. Research indicates that skeletal muscle hypertrophy can occur in response to prolonged resistance training involving various loading paradigms (Roberts et al., 2023) and that repeated resistance exercises contribute to muscle hypertrophy (Bhasin et al., 1996). Furthermore, regular exercise is associated with fat loss. Based on these findings, it can be concluded that both training modalities influence physical parameters, with kettlebell training leading to greater reductions in thigh circumference compared to fitness training.

Moreover, significant differences were identified in pretest and posttest scores for squat, deadlift, sled push, CMJ (Countermovement Jump), and SJ (Static Jump) among participants in the fitness training group. Similarly, participants in the kettlebell training group exhibited significant improvements in squat, deadlift, sled push, CMJ, SJ, and back-leg strength. Previous studies have also demonstrated the effectiveness of kettlebell training in improving physical performance parameters. Öztürk (2020) reported significant improvements in vertical jump performance following kettlebell training, while Yıldırım (2024) found significant enhancements in both vertical jump and back-leg strength. Additionally, research suggests that kettlebell training contributes to increased muscle mass (Baker, 2008; Jay et al., 2012; Levine et al., 2022; Palmieri-Smith, 2013; Stagi et al., 2023). Beltz (2012) emphasized that an eight-week kettlebell training program is an effective method for enhancing muscular strength. From a broader perspective, Hackett et al. (2016) found that weightlifting exercises, including squats and deadlifts, commonly incorporated in Olympic weightlifting programs, significantly increased vertical jump height. Similarly, the study conducted by Kul et al. (2021) found that regular weightlifting training increased individuals' vertical jump performance. Other studies have also indicated that these exercises positively influence specific strength parameters (Carvalho et al., 2014; Hermassi et al., 2017; Ikebukuro et al., 2011; İnce, 2018; Jaiswal et al., 2024; Levine et al., 2023; Musa et al., 2009; Stagi et al., 2023; Talpey et al., 2016). Strength training interventions are often assessed based on maximal isometric and dynamic muscle strength, power, speed, agility, and jump performance (ACSM, 2009). The squat exercise is considered a fundamental movement that mimics daily activities and sports-related movements, involving flexion and extension of the hip, knee, and ankle joints. It is widely regarded as one of the most effective exercises for enhancing lower extremity strength and power (Clark et al., 2012). Studies have reported that squat training positively affects jump height (Fukutani et al., 2014; García-Valverde et la., 2022; Gourgoulis et al., 2003; Kilduff et al., 2008; Rixon et al., 2007; Weber et al., 2008). Similarly, the deadlift is a multi-joint, closed kinetic chain exercise that engages numerous lower extremity muscles by extending the hips and knees while lifting a barbell from the ground (Bezerra et al., 2013; Bird & Barrington-Higgs, 2010; Earle & Baechle, 2008). Research suggests that deadlift training may contribute to improvements in jump performance (Chen et al., 2024; Montano et al., 2021; Santos Jr. et al., 2022; Thompson et al., 2015). Based on these studies, it can be inferred that the inclusion of squat and deadlift exercises in both fitness and kettlebell training protocols played a key role in the observed performance enhancements. Overall, both training modalities appear to positively influence strength-related parameters in sedentary individuals.

Over the course of 10 weeks, participants in the fitness training group exhibited significant improvements in shoulder diameter, chest diameter, arm diameter, squat, deadlift, sled push, CMJ, and SJ pretest-posttest scores. Similarly, participants in the kettlebell training group demonstrated significant improvements in shoulder diameter, thigh diameter, squat, deadlift, sled push, CMJ, SJ, and back-leg strength. These findings suggest that kettlebell training is more effective than traditional fitness exercises in reducing thigh circumference. Additionally, kettlebell training resulted in a statistically significant increase in back-leg strength compared to fitness training. Both training groups exhibited statistically significant improvements in vertical jump performance; however, the increase was more pronounced in the kettlebell training group. Conversely, no statistically significant differences were observed in grip strength among participants in either training group.

In conclusion, both fitness and kettlebell training programs have been shown to provide significant improvements in key physical parameters such as muscle strength and body composition in sedentary individuals. Moreover, these programs stand out as effective methods for enhancing strength levels and improving overall physical health, thereby contributing to a better quality of life. This study primarily focused on comparing fitness and kettlebell exercises. Future research should explore comparisons between different types of sports and training modalities.

The study sample consisted exclusively of male participants. Future studies should examine potential differences between male and female participants to determine whether training responses vary based on gender. The duration of this study was limited to 10 weeks. Extending the training period could yield more comprehensive results. Future studies could incorporate additional exercises to compare their effectiveness in targeting specific muscle groups and improving performance outcomes. The present study did not include a control group. Future research should incorporate a control group to strengthen the validity of findings.

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