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The effect of a core training program applied to folk dancer children aged 9-11 on their physical performance variables

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The effect of a core training program applied to folk dancer children aged 9-11 on their physical performance variables

Abstract

This study aimed to investigate the effects of core exercises applied to child folk dancers aged 9-11, both male and female, on physical performance variables. Before the study, participants were randomly divided into a core group (15 males-15 females) and a control group (15 males-16 females). The core group underwent core exercises for 2 days a week for 8 weeks in addition to their regular folk dance training. The control group continued their regular training for 2 days a week for 8 weeks. Before the study and at the end of the 4th and 8th weeks, anthropometric and basic motor measurements of the participants were taken. The analysis of the data was performed using the SPSS 25 software package (SPSS Inc., Chicago, IL, USA). The Shapiro-Wilk test for normality was conducted to determine the distribution of the data, and normal distribution was observed. Consequently, repeated measures ANOVA was applied for the analysis of intra-group variables regarding the training effect. When the findings of the study are examined, in the men and women in the experimental group, statistically significant improvements were observed in all parameters (except the flexibility test in women) between the 1st, 2nd and 3rd measurements ($p<0.05$). In the control group, it was determined that the percentage of development and the number of variables with significant differences were lower than in the core group. As a result, it can be said that basic core exercises, which are regularly applied to 9-11 age group folk dancer children 2 days a week for 8 weeks, contribute to the physical performance development of children.

Keywords: Folk dances, Core exercises, Physical performance tests

9-11 yaş grubu halk oyuncu çocuklara uygulanan core antrenman programının çocukların fiziksel performans değişkenleri üzerine olan etkisinin incelenmesi

Özet

Bu çalışmada, 9-11 yaş grubu erkek ve kadın halk oyuncu çocuklara uygulanan core egzersizlerinin fiziksel performans değişkenleri üzerine etkilerinin araştırılması amaçlanmıştır. Çalışma öncesinde katılımcılar rastgele core grubu (15 erkek-15 kadın) ve kontrol grubu (15 erkek-16 kadın) olarak gruplara ayrılmışlardır. Core grubuna kendi halk oyunları antrenmanlarına ek olarak, 8 hafta boyunca haftada 2 gün core egzersizleri uygulanmıştır. Kontrol grubu ise, 8 hafta boyunca haftada 2 gün kendi antrenmanlarına devam etmişlerdir. Çalışmanın öncesinde, 4. ve 8. haftanın sonunda katılımcıların antropometrik ve temel motorik ölçümleri alınmıştır. Verilerin analizlerinde SPSS 25 paket programı (SPSS Inc., Chicago, IL, USA) kullanılmıştır. Verilerin dağılımlarını belirlerken Shapiro-Wilk normallik testi yapılmış ve normal dağılım gösterdiği saptanmıştır. Bunun sonucunda antrenman etkisine ilişkin grup içi değişkenlerin analizi için repeated measures ANOVA testi uygulanmıştır. Çalışmanın bulguları incelendiğinde; deney grubundaki erkekler ve kadınlarda, 1. 2. ve 3. ölçümler arasında tüm parametrelerde (kadınlarda esneklik testi hariç) istatistiksel olarak anlamlı gelişmeler gözlenmiştir ($p<0.05$). Kontrol grubunda ise; yüzdelik gelişimlerinin ve anlamlı farklılık gösteren değişken sayısının core grubundan daha düşük düzeyde olduğu belirlenmiştir. Sonuç olarak, 8 hafta boyunca haftada 2 gün 9-11 yaş grubu halk oyuncu çocuklara düzenli uygulanan temel core egzersizlerinin çocukların fiziksel performans gelişimlerine katkı sağladığı söylenebilir.

Anahtar Kelimeler: Halk oyunları, Çocuklar, Core egzersizleri, Fiziksel performans testleri

Introduction

Core refers to the muscle groups located in the central region of the body, including the abdominal, lumbar, hip, and pelvic floor areas. These muscle groups play a fundamental role in ensuring trunk stability, maintaining posture, and performing movements effectively (Akuthota & Nadler, 2004). Core training not only enhances performance in athletes but is also applied to facilitate daily activities, reduce injury risks, and support overall physical health (Kibler et al., 2006). Due to the benefits of core training, its application frequency has significantly increased. Its popularity has grown not only in the healthcare sector but also in the sports and fitness industries, leading to its incorporation into training programs by strength and conditioning coaches, fitness professionals, and trainers (Reed et al., 2012; Saeterbakken et al., 2011). Core training consists of a series of exercises designed to improve elements such as balance, coordination, strength, and endurance. These workouts are particularly recognized as an effective method for enhancing athletic performance and preventing injuries in athletes (Willardson, 2007). Research has shown that a strong core structure enhances sports performance, improves postural control, and supports biomechanical efficiency (Behm et al., 2010). The muscle groups and joints in the core region are not only responsible for maintaining balance and transferring generated force. In addition to these roles, the muscles in this area also play a crucial role in performing various physical activities such as walking, running, jumping, playing football, and playing basketball. For this reason, activities that develop the core region provide benefits both in enhancing physical performance and preventing sports injuries. Strengthening the core region also holds significant importance in the treatment of sports injuries (Kibler et al., 2006). In recent years, there has been an increase in studies examining the positive effects of core training on individuals of different age groups and physical levels. These studies highlight that core training plays a significant role not only in athletic performance but also in rehabilitation processes and the enhancement of functional movement capabilities (Reed et al., 2012).

Core stabilization makes a significant contribution to proper posture and balance. In the performance of folk dances, core stabilization also plays a crucial role. Core stabilization is essential for individuals to maintain balance and execute movements effectively. Folk dance practices contribute to the strengthening of muscles located in the core region (Bağaçlı, 2019). The turns, jumps, and sudden directional changes performed during folk dances require a strong core. Strong core muscles enable dancers to perform these movements more controlled and balanced (Kirdiş, 2010). Strengthening core muscles enhances dancers' overall performance.

These muscles facilitate force transfer between the upper and lower body, increasing the efficiency of movements. Additionally, by improving endurance, they help delay fatigue during prolonged performances. Strong core muscles stabilize the spine and pelvic region, preventing excessive strain. This, in turn, reduces the risk of injuries in the lower back and hip areas (Mis, 2011). The inclusion of folk dances in the field of sports is relatively new. Due to their lack of a long-standing history in the sports context, there is a limited number of studies examining their effects on health or athletic performance. Studies investigating the connection between folk dances and the core region are particularly rare (Bağaçlı, 2019). This study will address the fundamental principles of core training, its application methods, and its effects on physical performance variables, evaluated in light of the existing findings in the literature.

Method

Research Model

An experimental research model was used in this study, which aims to examine the effect of the core training program applied to 9-11 age group folk dancer children on children's physical performance variables.

Study Group

A total of 61 active children (30 boys and 31 girls) receiving training at the Yozgat Provincial Directorate of Youth and Sports voluntarily participated in the study. Necessary permissions were obtained from the children’s families. Before the study, participants were randomly divided into two groups: the core (experimental) group and the control group. The boys were divided into an experimental group (n=15) and a control group (n=15), while the girls were divided into an experimental group (n=15) and a control group (n=16).

In this study, conducted during the 2023-24 period (April-May), the core group performed core exercises twice a week for eight weeks in addition to their folk dance training. Meanwhile, the control group continued their regular folk dance training twice a week for eight weeks. All participants underwent the following tests before the study, at the end of the 4th week, and at the end of the 8th week: standing long jump test, vertical jump test, squat jump test, handgrip strength test, sit-and-reach flexibility test, 20-meter sprint test, flamingo balance test, shuttle test, plank test, and push-up test. Subsequently, the groups were compared within themselves over time.

Core Group Training Program

Participants in the experimental group followed a core training program under the supervision of expert trainers twice a week for eight weeks. These exercises were conducted immediately after the warm-up phase at the beginning of the main session. Care was taken to ensure the exercises were performed with correct technique. After completing the core exercises, the children continued with their folk dance training.

Table 1. Core group training program*

		1. Movement	2. Movement	3. Movement	4. Movement	5. Movement	6. Movement
Week-1	**Study 1**	Plank (fixed)	Side plank	Cobra stance (half)	Crunch (looking up)	Bridge (fixed)	Foot lift (fixed)
	Study 2	Single leg plank	Side plank (overhand)	Cobra stance (full)	Crunch	Bridge (movable)	Foot lift (movable)
Week-2	**Study 1**	Plank (hand extension)	Side plank (leg spread)	Superman (fixed)	Crunch (knees in the air)	Bench position (donkey kick)	Foot lift (knees to chest)
	Study 2	Plank (heel to hip)	Side plank (x-fixed)	Superman (cross)	V seating (knee pull)	Bank position (circle with knee)	Dead insect (simple)
Week-3	**Study 1**	Plank (leg up)	Side plank (front kick)	Superman (w)	Heel contact	Single foot bridge (movable)	Foot extension on the ground (fixed)
	Study 2	Plank (forward-backward)	Side plank (leg+knee)	Push-up position (foot open-close)	Laptop reclining back	Bridge with back extension	Dead insect (normal)
Week-4	**Study 1**	Plank (jump open-close)	Side plank (lift the lower leg)	Push-up position (knees close)	Crunch (elbow to knee)	Bridge on the heel (movable)	Supine walking
	Study 2	Plank (hip lift)	Side plank (hip lift)	Spider-man (with jump)	Russian twist	Single foot bridge (fixed)	Scissor foot
Week-5	**Study 1**	Plank (side knee)	Side plank (leg swing)	Hunting dog	Crunch (forward reach)	Single leg bridge (leg lift)	Drawing an adjacent foot circle
	Study 2	Plank (right-left step)	Side plank (overhand x)	Push-up position (foot crossed)	Crossed hands and feet on the floor	Knee pull on the bridge	Circle drawing with split foot
Week-6	**Study 1**	Hip rotation in plank	Side plank (elbow to knee)	Mountain climber	Side position double leg lift	Foot extension from the bridge	Crossing legs on the floor
	Study 2	Back to cross in plank	Side plank (elbow to knee)	Push-up position (hip rotation)	Side crunch (knee pull)	Overhand bridge (movable)	Bicycle (with foot extension)
Week-7	**Study 1**	Transition from plank to push-up	Armpit extension in side plank	Push-up position (forward-backward jump)	Crunch (feet in the air)	Elbow on the bridge (knee pull and extension)	Banana pose
	Study 2	Step in plank (back and forth)	Overhand side plank (armpit recline)	Push-up position (one hand rotation)	Crunch (reach for the feet)	Overhand bridge (extend knee pull)	Stretch your knees on the floor
Week-8	**Study 1**	Crossed hand foot extension in plank	Transition from vinyl to side records	Push-up position (wire hand foot reach)	Candle pose (hand fixed on the floor)	Elbow on the bridge (cross hand foot)	Roof (single leg)
	Study 2	Cross in plank (hand foot fixed)	Overhand side plank	Push-up position (cross lift)	Candle pose (moving)	Cross on overhand bridge (fixed)	Pocket knife (double leg)

* Eren (2019)

Implementation of the Training Program

The training program applied in this study was designed using 96 different core exercises, each featuring distinct movement variations. The exercises were arranged in order of difficulty, progressing from easier to harder, and performed in a circuit format.

For the experimental group, core exercise sessions were conducted twice a week for eight weeks, following the warm-up phase. Each session lasted approximately 25 minutes and consisted of six bodyweight exercises. Each exercise was performed for 30 seconds, followed by 30 seconds of rest, and repeated for three sets.

After completing each exercise, participants rested for 30 seconds before moving to the next. Upon completing all six exercises in the series, a 2-minute rest period was given. Including rest periods between sets, the total session duration was approximately 25 minutes over three sets.

No additional training model was applied to the control group, which continued only with their routine folk dance training (Eren, 2019).

Control Group Training Program

The control group continued with the folk dance training program determined by their team coach, practicing twice a week for eight weeks.

Measurement

Before the study, participants and their families were provided with detailed information about the measurements and potential risks. Participants were instructed not to engage in training the day before the testing. They were also advised to avoid consuming stimulatory foods and beverages, such as caffeine, before the test day. Additionally, participants were informed to ensure adequate sleep, arrive well-rested, and wear appropriate sports attire for the tests.

Before the measurements, it was confirmed that the children had no health conditions that would prevent them from participating in the tests. The pre-test, mid-test, and post-test measurements of the study were conducted at the same times of the day in the indoor sports hall of Yozgat city center, located at an altitude of approximately 1200 meters above sea level. On the testing day, anthropometric tests were administered first, followed by physical performance tests after providing sufficient rest intervals. Each test was performed twice, and the highest value was recorded.

Data Collection Instruments

Height: The height of the children was measured with a stadiometer (Holtain Ltd, England) fixed to the wall, using measurement equipment with an accuracy of 0.1 cm.

Body Weight: The participants' weight was measured while they were barefoot, wearing a t-shirt and shorts, and in an anatomical standing position. The measurement equipment used was an Arzum brand electronic scale with a precision of ±0.1 kg, and the obtained data were recorded in kilograms for evaluation.

Vertical Jump Test (cm): The Countermovement Jump test was conducted using the My Jump 2 iOS app. The participants' jump videos were recorded using the 240 Hz high-speed video recording feature of the iPhone 7 (Karaman et al., 2019). Athletes' hands are on their waists from the beginning to the end of the test; they are encouraged to jump at the highest level (Gelen et al., 2008).

Squat Jump Test (cm): The camera recording was started using the My Jump 2 mobile application, and athletes were instructed to position their hands on their hips, bend their knees at a 90-degree angle, and, when ready, jump upward with maximum force without any preparatory movement. The recorded video was analyzed to determine the points where the athletes lost contact with the ground and re-established contact after the jump. The values were then calculated using the mobile application (Arazoğlu, 2022).

Hand Grip Strength Test (kg): The hand grip strength of the child folk dancers was measured using a Takkei (Japan) brand hand dynamometer. Both hand strength measurements (right and left hands) were taken while the participants were standing. During the measurement, the children were instructed not to bend the arm being tested or bring it close to the body (Zorba & Saygın, 2009).

Sit-and-Reach Flexibility Test (cm): To measure the participants' flexibility, a sit-and-reach bench with a height of 32 cm and a length of 35 cm was used. The children were instructed to remove their shoes, sit on the floor, and place the soles of their feet flat against the test bench. During the test, participants were asked to reach forward as far as possible without bending their knees, slowly pushing the ruler forward, and holding the final position for up to 2 seconds (Hazar & Taşmektepligil, 2008).

20-Meter Sprint Test (sec): The students participating in the study were instructed to run the previously determined 20-meter (m) distance with a high start and maximal speed. The running time in seconds (sec) was determined using the My Sprint iOS app.

Standing Long Jump Test (cm): The measurements were taken using the My Jump 2 iOS app. The children were instructed to position their toes just behind the take-off line and to jump forward with both feet from a squat position. The distance between the point they reached during the jump and the starting line, measured from their heels, was recorded in centimeters (Haynes et al., 2019).

Flamingo Balance Test: For this test, a wooden beam measuring 50 cm in length, 4 cm in height, and 3 cm in width was used. Additionally, two supports, each 15 cm long and 2 cm wide, were attached at the bottom and top of the beam to ensure stability. Participants were asked to balance on the beam using their non-dominant foot for as long as possible within 1 minute. They bent their free leg backward and held it with the hand on the same side, attempting to maintain a flamingo-like posture. The free arm was used for balance. Participants used the assistant's forearm to get into the correct balance position. The test began the moment they released the assistant's arm. The number of errors made within 1 minute was recorded. The test was performed twice, and the best result was recorded (Erikoğlu et al., 2009).

Shuttle Test: A handheld stopwatch with a precision of 1/1000 was used for the 30-second shuttle test. Athletes performed shuttle tests for 30 seconds, starting in a supine position with knees bent, hands behind the neck, and feet flat on the ground. Upon the "start" command, they were instructed to complete as many shuttle tests as possible within the allotted time. To ensure their feet remained in contact with the ground, their feet were held in place. Before the test, each participant was allowed one trial attempt. It was ensured that their shoulders touched the ground during the descent and their elbows touched their knees during the ascent. The number of shuttle tests completed within 30 seconds was recorded (Pekel, 2007).

Plank Test: This is one of the fundamental static tests used to measure core endurance. Participants were asked to assume a prone position, supporting their body on their forearms and elbows at shoulder-width apart, and on their toes. They were instructed to lift their pelvis and maintain a straight line with their neck, shoulders, back, hips, and legs parallel to the ground (plank position). The time was recorded in seconds, starting from when the participant assumed the position until they became fatigued or broke form (Reiman & Manske, 2009).

Push-Up Test: A handheld stopwatch with a precision of 1/1000 was used for the 30-second push-up test. Participants were instructed to perform push-ups for 30 seconds upon the "start" command. Starting in a prone position facing the ground, with their legs extended, body weight supported on their toes and arms, and knees not touching the ground, participants raised and

lowered their bodies. The total number of push-ups completed within 30 seconds was recorded (Pekel, 2007).

Data Analysis

The data were analyzed using the SPSS 25 software package (SPSS Inc., Chicago, IL, USA). Descriptive statistics were presented as mean and standard deviation. To determine whether the data followed a normal distribution, the Shapiro-Wilk normality test was conducted, and it was found that the data were normally distributed. Consequently, repeated measures ANOVA was applied to analyze within-group variables related to the effects of training. If a difference is found between groups, a post hoc Bonferroni test is conducted to determine which group the difference originates from. The level of statistical significance was set at $p<0.05$. The findings were presented in tables and subsequently interpreted in the results section.

Results

In this section, the anthropometric characteristics of the participants, as well as their pre-test, mid-test, and post-test values, are presented in the form of tables and statistical analyses.

Table 2. Descriptive statistics of the participants

Variables	Experimental group male (n=15) X±Sd	Control group male (n=15) X±Sd	Experimental group female (n=15) X±Sd	Control group female (n=16) X±Sd
Age (years)	10±0.76	9.33±0.59	10.4±0.63	9.94±0.44
Weight (kg)	39.06±11.05	34.32±7.60	38.79±9.77	34.11±9.08
Height (cm)	140.87±10.60	133.13±5.84	141.13±8.60	136.44±7.38

It was determined that the average age, weight, and height of male participants in the experimental group were 10±0.76, 39.06±11.05, and 140.87±10.60, respectively, while the average age, weight, and height of male participants in the control group were 9.33±0.59, 34.32±7.60, and 133.13±5.84, respectively. Similarly, the average age, weight, and height of female participants in the experimental group were found to be 10.4±0.63, 38.79±9.77, and 141.13±8.60, respectively, while those of female participants in the control group were determined to be 9.94±0.44, 34.11±9.08, and 136.44±7.38, respectively.

Table 3. The paired measures ANOVA statistical analysis values for the pre-test, mid-test, and post-test comparisons of the male participants in the experimental group

Experimental Group Male (*n* = 15)							
Parameters	**Pre-test**	**Mid-test**	**Post-test**	**%**		**p value**	**Bonferroni**
				Pre-Mid	**Pre-Post**		
Standing long jump (cm)	84.77±25.17	86.93±24.62	89.25±23.99	2.55%	5.28%	0.00*	3>1,2 2>1
Vertical jump test (cm)	16.82±3.99	17.63±4.00	18.31±3.97	4.82%	8.86%	0.00*	3>1,2 2>1

Squat jump test (cm)	19.19±4.74	19.87±4.63	20.40±4.42	3.54%	6.31%	0.00*	3>1,2 2>1
Right-hand grip strength (kg)	15.51±3.96	16.31±3.59	17.27±3.72	5.16%	11.35%	0.00*	3>1,2 2>1
Left-hand grip strength (kg)	14.91±3.63	16.07±3.37	17.03±3.65	7.78%	14.22%	0.00*	3>1,2 2>1
20-meter sprint test (sec)	4.70±0.44	4.66±0.42	4.62±0.41	-0.85%	-1.70%	0.00*	1>2,3 2>3
Flamingo balance test (n)	17.20±4.84	16.20±3.84	14.80±3.30	-5.81%	-13.95%	0.00*	1,2>3
Shuttle test (n)	10.13±2.47	13.13±3.48	16.93±3.20	29.62%	67.13%	0.00*	3>1,2 2>1
Plank test (sec)	49.47±33.22	67.99±28.50	94.53±41.09	37.44%	91.09%	0.00*	3>1,2 2>1
Push-Up test (n)	6.27±2.63	7.13±2.80	9.07±3.28	13.72%	44.66%	0.00*	3>1,2 2>1
Flexibility test (cm)	22.37±5.70	23.53±5.65	25.10±5.01	5.19%	12.20%	0.00*	3>1,2 2>1

1: pre-test, 2: mid-test, 3: post-test. % Percentage of change. *p<0.05 indicates significant changes.

As a result of core training applied twice a week for 8 weeks to the participants in the experimental group, a statistically significant improvement was observed in all variables of the participants.

Table 4. The paired measures ANOVA statistical analysis values for the pre-test, mid-test, and post-test comparisons of the male participants in the control group

Control Group Male (*n* = 15)							
Parameters	**Pre-test**	**Mid-test**	**Post-test**	**%**		**p value**	**Bonferroni**
				Pre-Mid	**Pre-Post**		
Standing long jump (cm)	75.05±7.03	75.03±6.42	75.70±6.41	-0.03%	0.87%	0.09	-
Vertical jump Test (cm)	14.54±1.79	14.50±1.84	15.05±1.97	-0.28%	3.51%	0.00*	3>2
Squat jump test (cm)	15.49±1.74	15.60±1.71	15.52±3.25	0.71%	0.19%	0.89	-
Right-hand grip strength (kg)	13.57±2.27	13.64±2.24	13.97±2.21	0.52%	2.95%	0.17	-
Left-hand grip strength (kg)	13.70±2.35	13.89±2.41	13.98±2.44	1.39%	2.04%	0.39	-
20-meter sprint test (sec)	4.93±0.21	4.91±0.20	4.92±0.18	-0.41%	-0.20%	0.43	-
Flamingo balance test (n)	19.47±6.17	16.20±3.73	15.87±4.58	-16.80%	-18.49%	0.01*	1>2,3
Shuttle test (n)	9.80±3.47	10.13±2.85	11.60±2.90	3.37%	18.37%	0.00*	3>1,2
Plank test (sec)	55.87±15.18	59.60±11.85	65.93±12.44	6.68%	18.01%	0.00*	3>1,2 2>1
Push-Up test (n)	4.47±2.17	5.40±2.13	5.13±2.53	20.81%	14.77%	0.00*	2>1
Flexibility test (cm)	26.07±4.39	26.47±3.78	26.77±3.28	1.53%	2.69%	0.10	-

1: pre-test, 2: mid-test, 3: post-test. % Percentage of change. *p<0.05 indicates significant changes.

When examining the results of the male participants in the control group, a statistically significant improvement was observed in the vertical jump test (3>2), flamingo balance test (1>2,3), shuttle test (3>1,2), plank test (3>1,2 - 2>1), and push-up test (2>1). No statistically significant differences were found between the groups in other variables.

Table 5. The paired measures ANOVA statistical analysis values for the pre-test, mid-test, and post-test comparisons of the female participants in the experimental group

Experimental Group Female (*n* = 15)							
Parameters	**Pre-test**	**Mid-test**	**Post-test**	**%**		**p value**	**Bonferroni**
				Pre-Mid	**Pre-Post**		
Standing long jump (cm)	89.45±19.90	93.07±18.73	96.16±18.49	4.05%	7.50%	0.00*	3>1,2 2>1
Vertical jump Test (cm)	16.93±2.56	17.86±2.54	18.62±2.62	5.49%	9.98%	0.00*	3>1,2 2>1
Squat jump test (cm)	18.87±3.03	19.57±2.87	20.45±2.87	3.71%	8.37%	0.00*	3>1,2 2>1
Right-hand grip strength (kg)	16.52±4.23	17.51±4.21	18.40±4.71	5.99%	11.38%	0.00*	3>1,2 2>1
Left-hand grip strength (kg)	15.90±4.35	16.74±4.46	18.76±5.03	5.28%	17.99%	0.00*	3>1,2 2>1
20-meter sprint test (sec)	4.46±0.30	4.41±0.27	4.36±0.25	-1.12%	-2.24%	0.00*	1,2>3
Flamingo balance test (n)	17.47±7.86	14.47±4.24	12.53±4.16	-17.17%	-28.28%	0.00*	1,2>3 1>2
Shuttle test (n)	14.20±4.48	16.27±4.08	20.53±4.61	14.58%	44.58%	0.00*	3>1,2 2>1
Plank test (sec)	94.97±33.06	110.71±26.00	127.80±27.37	16.57%	34.57%	0.00*	3>1,2 2>1
Push-Up test (n)	8.47±3.85	10.20±3.57	11.33±3.89	20.43%	33.77%	0.00*	2,3>1
Flexibility test (cm)	26.73±8.51	27.97±8.01	27.73±10.20	4.64%	3.74%	0.53	-

1: pre-test, 2: mid-test, 3: post-test. % Percentage of change. *p<0.05 indicates significant changes.

As a result of core training applied twice a week for 8 weeks to the female participants in the experimental group, a statistically significant improvement was observed in all variables, except for the flexibility test. It was found that the participants showed improvement in the mid-test measurements compared to the pre-test measurements. Additionally, a greater percentage of improvement was observed in the post-test measurements compared to the pre-test measurements.

Table 6. The paired measures ANOVA statistical analysis values for the pre-test, mid-test, and post-test comparisons of the female participants in the control group

Control Group Female (*n* = 16)							
Parameters	**Pre-test**	**Mid-test**	**Post-test**	**%**		**p value**	**Bonferroni**
				Pre-Mid	**Pre-Post**		
Standing long jump (cm)	80.20±12.76	80.25±13.35	79.92±12.28	0.06%	-0.35%	0.84	-
Vertical jump Test (cm)	15.42±2.44	15.61±2.56	15.89±2.37	1.23%	3.05%	0.02*	3>1,2
Squat jump test (cm)	17.21±2.89	17.74±2.87	17.63±2.60	3.08%	2.44%	0.01*	2>1
Right-hand grip strength (kg)	13.58±3.66	14.02±3.38	14.61±3.32	3.24%	7.58%	0.00*	3>1,2
Left-hand grip strength (kg)	12.86±3.25	13.83±3.01	14.13±2.91	7.54%	9.88%	0.00*	2,3>1
20-meter sprint test (sec)	4.85±0.30	4.84±0.35	4.84±0.32	-0.21%	-0.21%	0.72	-
Flamingo balance test (n)	20.31±6.36	18.69±5.55	16.00±4.56	-7.98%	-21.22%	0.00*	1,2>3
Shuttle test (n)	11.19±6.07	11.06±5.58	10.38±3.96	-1.16%	-7.24%	0.36	-

Plank test (sec)	54.53±27.71	60.56±25.04	66.25±19.82	11.06%	21.49%	0.00*	3>1,2 2>1
Push-Up test (n)	5.63±4.13	6.50±3.61	6.44±2.63	15.45%	14.39%	0.11	-
Flexibility test (cm)	26.56±5.53	26.66±5.06	26.88±4.78	0.38%	1.20%	0.39	-

1: pre-test, 2: mid-test, 3: post-test. % Percentage of change. *p<0.05 indicates significant changes.

When examining the results of the female participants in the control group, a significant improvement was observed in the vertical jump test (3>1,2), squat jump test (2>1), right hand grip strength test (3>1,2), left hand grip strength test (2,3>1), flamingo balance test (1,2>3), and plank test (3>1,2 - 2>1). It was found that the percentage of improvement in the pre-test and mid-test, as well as the pre-test and post-test values of the female participants in the control group, was lower than the percentage of improvement observed in the female participants in the experimental group. The reason for the lower improvement rates in the control group compared to the experimental group can be attributed to the absence of core training for the participants in the control group.

Discussion and Conclusion

This study was conducted to investigate the effects of an 8-week core training program applied to folk dancer children. Within the scope of the research, male (experimental and control) and female (experimental and control) participants were compared within their respective groups. The effects of core training were examined by comparing the pre-test, mid-test, and post-test values of the participants.

When analyzing the results of the male children in the experimental group, significant improvements were observed both statistically ($p<0.05$) and in percentage terms in the standing long jump test, vertical jump test, squat jump test, right-hand grip strength test, left-hand grip strength test, 20-meter sprint test, flamingo balance test, shuttle test, plank test, push-up test, and flexibility test. A linear improvement was observed in the pre-test, mid-test, and post-test values of the participants. In all variables, an improvement was detected in the post-test compared to the mid-test and in the mid-test compared to the pre-test (Table 2). When analyzing the results of the male participants in the control group, statistically significant ($p<0.05$) improvements were found in the vertical jump test (3>2), flamingo balance test (1>2,3), shuttle test (3>1,2), plank test (3>1,2 - 2>1), and push-up test (2>1). In the remaining parameters, no statistically significant differences were found ($p>0.05$) (Table 3). When comparing all variables of the control group participants with those of the experimental group, it was determined that individuals in the core training group showed greater improvements in all parameters, both statistically and in percentage terms. This finding indicates that the

development rates of the athletes in the experimental group, who underwent core training for 8 weeks, were higher than those of the control group athletes.

In the literature, the number of studies on core training applied to folk dancers is quite limited. Therefore, the discussion section was supported by referencing both studies related to folk dancing and similar studies in other sports disciplines. In a study conducted on 40 male children aged 12-14 who participated in folk dance training, it was found that the trunk stabilization, balance, and flexibility values of the experimental group performing folk dances were better than those of children leading a sedentary lifestyle (Bağaçlı, 2019). In the same parameters, no statistically significant differences were found in the control group. In a study conducted on young folk dancers (Yol et al., 2019), it was determined that regular folk dance training had a significant effect on improving static and dynamic balance performance. The findings from similar studies in the literature are consistent with our results. In another study conducted on male soccer players aged 11-13 (Boyacı & Bıyıklı, 2018), core exercises were applied twice a week for 10 weeks using a pretest and post-test design. Statistically significant improvements ($p<0.05$) were found in the standing long jump test, vertical jump test, and 20-meter sprint test in the experimental group. However, no statistically significant differences were found in these variables between the pre-test and post-test values in the control group ($p>0.05$). In a study conducted on young soccer players (Mahmoud, 2018), core exercises were applied twice a week for 10 weeks. At the end of the 10 weeks, statistically significant improvements ($p<0.05$) were observed in vertical jump, standing long jump, medicine ball throw, 30-meter sprint, and shuttle run agility tests. In another study conducted on soccer players aged 12-14 (Bayrakdar et al., 2020), core exercises were applied twice a week for 9 weeks, and significant improvements were observed in the 30-meter sprint, standing long jump, vertical jump, and agility tests. In a study conducted on male volleyball players (Bora & Dağlıoğlu, 2022), core exercises were applied three times a week for six weeks in the experimental group. After the core training program, significant improvements ($p<0.05$) were detected in the participants' speed, anaerobic power, and static balance values. In a study conducted on 12 male university basketball players (Li, 2022), the experimental group performed core training for six weeks. At the end of the six-week period, statistically significant improvements were found in technical parameters (passing, shooting, dribbling) in the experimental group. However, no improvements were detected in the control group. Additionally, in various studies conducted on males in different sports disciplines (Arı & Çolakoğlu, 2021; Atlı, 2021; Borkar, 2022; Feng et al., 2024; Guan et al., 2024; Messina et al., 2024; Ramasamy et al., 2022; Yılmaz & Ateş, 2024; Yildirim, 2022),

the importance of core training has been emphasized. These studies have highlighted that core training positively impacts athletes' motor development, fundamental biomotor, and auxiliary biomotor characteristics.

In our study, when analyzing the results of the female participants in the experimental group, improvements were observed in all variables except for the flexibility test, both statistically ($p<0.05$) and in percentage terms. A linear improvement was observed in the pre-test, mid-test, and post-test values of the participants. In all variables, an improvement was detected in the post-test compared to the mid-test and in the mid-test compared to the pre-test. As a result of the 8-week core training applied to the female participants in the experimental group, it was determined that it had a positive effect on their physical performance variables (Table 4). When analyzing the results of the female participants in the control group, statistically significant differences ($p<0.05$) were found among the groups in the vertical jump test (3>1,2), squat jump test (2>1), right-hand grip strength test (3>1,2), left-hand grip strength test (3>1,2 - 2>1), flamingo balance test (1,2>3), and plank test (3>1,2 - 2>1). However, no statistically significant differences ($p>0.05$) were found among the groups in the standing long jump test, 20-meter sprint test, shuttle test, push-up test, and flexibility test (Table 5). The presence of improvements in certain variables in the control group does not necessarily make them superior to the experimental group. This is because, in the experimental group, statistically significant improvements were observed in all variables except for the flexibility test. Additionally, in all variables, the percentage improvement rate in the pre-test, mid-test, and post-test of the experimental group was higher than that of the control group.

When examining similar studies in the literature, a study conducted on university students who participated in folk dance training for 12 weeks, three times per week (Korkmaz et al., 2018), found that both male and female folk dancers in the experimental group experienced reductions in body fat percentage and body weight, as well as increases in flexibility, agility, speed, and strength parameters. However, no statistically significant differences were found in these variables in the control group.

In another study conducted on young folk dancers (Yol et al., 2019), it was determined that regular folk dance training had a significant effect on improving static and dynamic balance performance. In a different study conducted on young women (Ocak & Tortop, 2012), participants in the experimental group engaged in folk dance training for 12 weeks, three times per week, while the control group did not perform any exercises and continued their daily routines. As a result, statistically significant improvements were found in the experimental

group's body weight, body mass index, body fat percentage, flexibility, right and left-hand grip strength, anaerobic power, and aerobic power values. In a study conducted on 64 female folk dancers (32 in the experimental group and 32 in the control group) (Taşkin, 2020), the experimental group participated in folk dance training for 8 weeks, twice per week, while the control group did not engage in any exercise. At the end of 8 weeks, statistically significant improvements were found in the 30-meter sprint values of the experimental group participants. Additionally, in various studies conducted on women in different sports disciplines (Altundağ et al., 2021; Cabrejas et al., 2022; Esteban-García et al., 2021; Tahaei & Fouladi, 2021; Wang et al., 2022), the importance of core training has been highlighted. These studies have shown that core training positively contributes to the motor development of female athletes and enhances their sport-specific skills. Furthermore, more studies are needed, particularly on female athletes, regarding the effects of folk dance and core exercises.

Suggestions

In conclusion, it has been determined that basic core exercises, regularly applied twice a week for 8 weeks to 9-11-year-old folk dancers, contribute to the improvement of children's physical performance. It is believed that coaches should prioritize core exercises and allocate additional time for them in training sessions to enhance children's motor skills development. Additionally, it is recommended that more core training be conducted in the field of folk dancing and that further contributions be made to this area.

Author Contribution

Theoretical Framework, Data Analysis: OG; Data Collection: MRE, BE; Conceptualisation, Theoretical Framework: OMY; Conceptualisation: ASD.

Conflict of Interest

The authors declare no conflicts of interest.

Ethical Statement

The ethical approval for this study was obtained from the Ethics Committee of Yozgat Bozok University during the meeting held on 20/03/2024, with the reference number 210506 and decision number 12/70.

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