Title: The Effect of Core Stability Exercises on Functional Movement Screen Scores, balance, and performance in Elite Basketball Players

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Abstract

Background: A strong core is a crucial prerequisite for practicing in many sports. This study aimed to investigate the effect of core stability exercises on functional movement screen scores, balance, and performance in elite basketball players.

Methods: Thirty-four adult male elite basketball players were divided into core exercise and control groups, with the core exercise group performing an eight-week core stability exercise protocol. Balance, movement pattern, and performance were evaluated using the Y-Balance Test, the Functional Movement Screen (FMS), the Single-Leg Hop Test, the Zigzag Triple-Hop Test, the Davies Test, and the Square Hop Test, respectively. Data were analyzed through descriptive analysis of Covariance (ANCOVA) for parametric and Quade's test for non-parametric data.

Results: The findings indicated a significant difference between the core exercise and control groups in total FMS score (P=0.001), single-leg hop test (P=0.001), zigzag triple hop test (P=0.001), dominant upper limb balance scores (P=0.001), non-dominant upper limb balance scores (P=0.001), the square hop test (P=0.001), and the Davies Closed Kinetic Chain test (P=0.001).

Conclusion: The current study's results showed that after eight weeks of core stability exercises, elite basketball players experienced significant improvements in FMS scores, balance, and performance. These findings highlight the positive effect of core-focused exercises on enhancing movement efficiency and athletic performance, which may have important implications for reducing injury risk in elite athletes.

Keywords: Core stability, Performance, Balance, Basketball

Plain Language Summary

According to this study, core stability exercises can considerably enhance elite male basketball players' movement quality, balance, and athletic performance. The players' performance on movement tests like deep squats, lunges, shoulder mobility, and balancing activities improved after completing an eight-week core training program. Compared to individuals who did not practice the core exercises, they also demonstrated better results on performance-based assessments. These findings demonstrate the advantages of core-focused training for athletes looking to improve their performance and lower their risk of injury.

Highlights

- Core stability training improved FMS scores in elite basketball players.
- Improved movement efficiency may contribute to reduced injury risk.
- Balance improved in both dominant and non-dominant limbs after core stability exercises.

Introduction

Today, with the increasing importance of sports at all levels of society, attention to the issue of injury has become more prominent (1). Injury is inevitable in every sport, and each sport has specific injuries. Basketball, which was created more than a century ago by James Naismith in the United States, has become one of the most popular sports in the world (2). Basketball is a complex, high-impact sport, with 11% of the world's population playing basketball (3). With the increasing number of basketball players, the rate of injury has also increased, with a significant percentage of reported injuries occurring in the lower extremities (between 13% and 44%) (3, 4). A review study that examined 12,000 reported injuries in basketball showed that, regardless of gender, more injuries occur in the lower extremities (63.7% of injuries), and the prevalence of injuries in elite athletes was reported to be 64.7% (5). In addition, injuries to the upper extremities and trunk may also occur in basketball, as this sport involves repeated body contact and use of the upper extremities (6). Injury prevention and risk reduction are more important than treatment, and screening before participation in an activity can address an important part of this issue (7). Researchers have developed methods and tools to evaluate movement patterns for injury prevention, one of which is the functional movement screen (FMS), which can demonstrate the quality of functional movement patterns and identify individuals at risk (8, 9). A study revealed that deep squat and hurdle step scores may be associated with injuries in basketball players (10).

Core stability is the ability of core muscles to maintain spinal and pelvic stability during dynamic movements (11). A strong core is a crucial prerequisite for practicing sports such as track and field, basketball, and football (12). The core of basketball players during activities such as dribbling, boxing out, and rebounding, which involve sudden and specific movements, is responsible for creating stability and biomechanical linkage between the upper and lower limbs (13). The power generated in basketball-specific movements, such as shooting and layups, passes through the core of the body (14). The core muscles minimize the disturbances created during upper limb movements, which enables maintaining balance during dynamic activities, thus increasing the performance of the shooter without creating an additional burden on the upper limbs (15). Weakness or lack of sufficient coordination in the core stability muscles can lead to disruption of movement patterns, compensatory movement patterns, overuse, and ultimately injury (16). Therefore, it can be concluded that weakness in stabilizing core muscles can have a negative effect on movement patterns (17). In addition to having a strong core, improving balance control is an important goal in sports and exercise, as good balance has a strong correlation with improving athletes' performance and a negative correlation with upper and lower limb injuries (18). In a review study by Luo et al. (2022), it has been shown that core training has the potential to improve performance in athletes across various sports, including football, handball, basketball, and golf (19).

Several studies have separately investigated the effect of core stability exercises on FMS scores, balance, and upper and lower limb performance in basketball players (20-26). Also, most existing literature has either focused on recreational or youth athletes or employed generalized fitness protocols that may not capture the unique physical demands of high-level basketball, such as rapid changes of direction, explosive jumping, and sustained isometric control during competitions. Given the growing emphasis on evidence-based training approaches in elite sports, there is a pressing need to investigate how core stability training protocols influence FMS scores, balance, and performance in elite athletes. Addressing this gap will enhance training and rehabilitation strategies, improving injury reduction and performance optimization in competitive basketball players.

Materials and Methods

This study included 34 elite basketball players who were selected using convenience sampling and divided into core exercises (N=17) and control groups (N=17). Using G*Power Ver 3.1 software, considering an effect size of 0.50, a significance level of 0.05, and a statistical power of 0.80, the sample size was calculated to be 17 in each group. Inclusion criteria comprised having an age range of 18-30, a minimum of three years of professional basketball, an absence of musculoskeletal injuries in the upper and lower limbs within the past six months (27), no history of surgery in the upper and lower limbs in the past six months, absence of significant musculoskeletal abnormalities, no simultaneous participation in other research or exercise programs, and no history of neuropathy or use of medication affecting the body's nervous and motor systems. Exclusion criteria included injury during the research, irregular participation in training sessions, withdrawal from the study, failure to complete the research process, and absence from two consecutive and three intermittent training sessions. Initially, in accordance with the Declaration of Helsinki, participants were fully informed about all aspects of the study, and written consent was obtained. They were also assured that the examiner would take appropriate measures in case any issues arose during the testing process. All assessments were conducted by certified corrective exercise specialists with extensive experience in evaluating functional movement and athletic performance. Each test was clearly explained to the participants beforehand. A comprehensive overview of the procedures was presented before the tests. All measurements were conducted three times, and the average of these measurements was utilized as the final data for analysis.

FMS Test

The FMS kit was utilized to assess FMS scores. The FMS consists of seven movement tests: Deep Squat (DS), Hurdle Step (HS), In-Line Lunge (ILL), Shoulder Mobility (SM), Active Straight Leg Raise (ASLR), Trunk Stability Push-Up (TSPU), and Rotary Stability (RS) (28, 29). Each movement test is scored on a scale of zero to three, with higher scores indicating better performance. The scoring criteria are as follows: a score of 3 is awarded for a complete and correct movement; a score of 2 indicates compensation during the movement; a score of 1 is given when the movement cannot be completed; and a score of 0 is assigned if pain is experienced during the test (30, 31). To calculate the total FMS score, the individual scores of all tests were summed. The total score can range from 0, indicating pain in all movement tests, to 21, representing perfect performance across all tests. Studies have reported moderate intra-rater and inter-rater reliability for FMS tests (32, 33). Additionally, Chorba et al. (2010) demonstrated sufficient capability of the FMS to predict injury (34). To ensure accurate scoring, the examiner must observe and evaluate the participant from all anterior, posterior, and lateral views during the tests.

Single-leg hop Test

This assessment uses a 3-meter-long narrow measuring tape placed on the floor. The participant stands on their dominant leg with the toes aligned just behind the starting line. The procedure involves executing a maximal forward hop on one leg, landing on the same foot, and maintaining balance for a minimum of two seconds. Arm movements are permitted to help balance if needed. After 2–3 practice trials, the participant performs a full single-leg hop using the dominant leg, and the distance jumped is measured. Previous studies have reported high reliability for this test, with intraclass correlation coefficients (ICC) exceeding 0.85 (35).

Davies Closed Kinetic Chain Test

In the Davies Closed Kinetic Chain (CKC) Upper Extremity Stability Test, two parallel tape lines were positioned on the floor, separated by a distance of three feet. Participants assumed a push-up position and were directed to rapidly alternate their hand movements between the lines, making contact with each line in succession. They were advised to maintain a straight trunk and minimize movement of the head and torso. After a warm-up trial, three 15-second maximum-effort trials were performed, each separated by a 45-second rest period. The average number of touches across the three trials was calculated for analysis (36). The test has demonstrated high test-retest reliability, reported at 0.92 (37).

Y-balance Test (YBT)

The Y-Balance Test (YBT) is a standardized method for objectively evaluating dynamic balance during functional movement. Participants placed themselves at the center of the YBT kit and are instructed to reach as far as possible in three directions—anterior, posterolateral, and posteromedial—while keeping the stance foot aligned with the designated markers. After each reach, they return to the starting position. The test is performed on both legs. The furthest point of contact, typically the toe, on the measuring stick indicates the maximum reach. Trials in which balance is lost, the stance foot shifts, or the reach indicator is struck are considered invalid. A composite score is calculated by summing the reach distances in all three directions, dividing by three times the leg length, and multiplying by 100 to obtain a percentage. Leg length is assessed with the participant in a supine position, measuring from the anterior superior iliac spine to the most distal point of the medial malleolus, utilizing a measuring tape (38). The evaluation of a person's preferred leg for kicking a ball serves to identify the dominant lower limb. YBT demonstrates strong inter-rater and test-retest reliability (39).

Zigzag Triple Hop Test

In this test, the participant stood on the testing leg and performed three consecutive zigzag hops over a line with a width of 15 cm. The movement was executed in a zigzag pattern, and the maximum total distance covered across the three hops was recorded as the performance score. The trial was considered invalid and repeated if the participant touched the ground with the non-testing leg or failed to completely clear the width of the tape line during any of the hops (40). The test has demonstrated high intra-rater reliability, reported at 0.97 (41).

Square Hop Test

In this test, the participant performed clockwise hops on a single leg outside the perimeter of a 40 × 40 cm square for 30 seconds. The subject moved continuously clockwise, hopping over each side of the square. Each time a full revolution was completed, the participant announced it aloud while the examiner discreetly noted any instances where the leg landed on the line during the test. At the end of 30 seconds, the participant stopped, and the final score was calculated by subtracting the number of incorrect hops (incomplete clearance of the line) from the total number of correct hops (complete clearance over the line) (42).

Intervention

The experimental group performed an eight-week core stability exercise program based on the FITT principle (Frequency, Intensity, Time, and Type), three days a week (each session lasting 45 minutes), alongside regular basketball training. The training focused on the abdominal, back, and hip muscles (Table 1), whereas the control group engaged in regular basketball training, emphasizing basketball-specific skills such as shooting, passing, dribbling, defensive and offensive drills, and agility. Finally, the post-test phase was conducted after completing the core stability exercise protocol.

Table 1. Eight-Week Protocol of Core Stability Exercises.

Weak	Days	Exercises	Sets	Repetitions (r) or time in Seconds (s)	Rest in Seconds
1	Sunday Tuesday Thursday	Pelvic curl	3	20 s	20 s
		Chest lift	3	12 r	30 s
		Leg lift side	3	10 r	20 s
		Spine twist supine	3	14 r	30 s
2	Sunday Tuesday Thursday	Pelvic curl	4	30 s	15 s
		Chest lift	4	15 r	20 s
		Leg lift side	4	10 r	15 s
		Spine twist supine	4	20 r	20 s
3	Sunday Tuesday Thursday	Shoulder bridge	3	15 s	15 s
		Chest lift with rotation	3	12 r	30 s
		Back extension prone	3	10 r	20 s
		Hundred	3	10 r	30 s
4	Sunday Tuesday Thursday	Shoulder bridge	4	20 s	10 s
		Chest lift with rotation	4	14 r	20 s
		Back extension prone	4	15 r	15 s
		Hundred	4	15 r	20 s
5	Sunday Tuesday Thursday	Double leg stretch	3	20 s	20 s
		Criss cross	3	20 r	30 s
		Leg pull front	3	10 r	20 s
		Side kick	2	10 r	20 s
6	Sunday Tuesday Thursday	Double leg stretch	4	30 s	15 s
		Criss cross	4	30 r	20 s
		Leg pull front	4	15 r	15 s
		Side kick	3	12 r	10 s
7	Sunday Tuesday Thursday	Teaser	3	20 s	20 s
		Hip twist with stretched arms	3	12 r	15 s
		Swimming	3	10 r	15 s
		Side bend	3	20 s	20 s
8	Sunday Tuesday Thursday	Teaser	4	30 s	15 s
		Hip twist with stretched arms	4	30 s	10 s
		Swimming	4	15 r	10 s
		Side bend	4	30 s	10 s

Data analysis

This study employed descriptive statistics to characterize the variables and utilized inferential statistics for data analysis. The normality of the data distribution was assessed using the Shapiro-Wilk test. If the data were normally distributed, the Covariance (ANCOVA) was used for inferential statistics. Also, the Quade's test was utilized for non-parametric data. Statistical analysis was performed using SPSS version 27, with significance determined at the 95% confidence level and an alpha level less than or equal to ≤ 0.05.

Results

Table 2 presents the demographic characteristics of participants across both groups. No significant differences were observed in the demographic data across the study groups.

Table 2. Demographic characteristics of participants

Variable	Core exercises Mean ± SD	Control group Mean ± SD	p-value
Age (year)	21.70±3.27	20.11±1.86	0.144
Weight (kg)	88.76±8.25	87.64±8.48	0.700
Height (cm)	188.23±9.88	190.17±5.46	0.484
BMI (Kg/m^2)	22.47±0.71	22.29±0.68	0.392
History of sports activity (years)	6.05±1.08	5.70±0.91	0.413
Weekly activity level (hours)	6.17±1.13	6.29±1.10	0.734
Dominant upper limb length (cm)	93.85±4.82	95.38±3.52	0.299

BMI Body Mass Index

Table 3. Quade's test results

Variable	Stage	Core exercises Mean ± SD	Control group Mean ± SD	F	Mean square	P-value
Deep Squat	Pre-test	2.17±0.39	1.82±0.80	5.850	190.934	0.021*
	Post-test	2.58±0.50	1.88±0.78			
Hurdle Step	Pre-test	2±0.70	1.88±0.48	8.604	400.309	0.006*
	Post-test	2.47±0.51	1.94±0.55			
In-Line Lunge	Pre-test	1.94±0.82	2±0.50	17.201	788.450	0.001*
	Post-test	2.52±0.51	1.88±0.48			
Shoulder Mobility	Pre-test	2.05±1.08	2.29±0.77	14.073	700.216	0.001*
	Post-test	2.64±0.49	2.05±0.55			
Active Straight Leg Raise	Pre-test	1.88±0.78	2.29±0.46	13.098	609.503	0.001*
	Post-test	2.35±0.49	1.76±0.43			
Trunk Stability Push-Up	Pre-test	1.94±1.14	1.88±0.60	27.671	1223.723	0.001*
	Post-test	2.70±0.46	1.76±0.56			
Rotary Stability	Pre-test	1.88±0.60	1.94±0.55	21.749	937.868	0.001*
	Post-test	2.47±0.51	1.70±0.58			
Total FMS Score	Pre-test	13.88±2.97	14.11±1.72	86.360	2246.153	0.001*
	Post-test	17.76±1.09	14.41±1.22			
Single-leg hop	Pre-test	176.29±14.81	174.76±13.44	30.661	247.872	0.001*
	Post-test	185.29±14.99	174.58±13.85			
Zigzag Triple Hop Test	Pre-test	466.64±70.85	463.70±31.09	17.011	226.383	0.001*
	Post-test	517.05±137.56	464.76±31.46			

*** a significant change from pre-test to post-test**

Table 3 indicated a difference between the core exercise and control groups in the deep squat (P=0.021), hurdle step (P=0.006), in-line lunge (P=0.001), shoulder mobility (P=0.001), active straight leg raise (P=0.001), trunk stability push-up (P=0.001), rotary stability (P=0.001), total FMS score (P=0.001), single-leg hop test (P=0.001), and zigzag triple hop test (P=0.001). These results show that the core stability exercises significantly affected FMS.

Table 4. Covariance (ANCOVA) test results

Variable	Stage	Core exercises Mean ± SD	Control group Mean ± SD	F	Eta squared	P-value
Dominant upper limb balance scores	Pre-test	99.83±13.10	98.78±6.08	71.632	0.698	0.001*
	Post-test	108.19±11.54	99.10±6.01			
Non-dominant upper limb balance scores	Pre-test	93.34±5.76	92.59±6.72	268.858	0.897	0.001*
	Post-test	100.53±5.10	92.90±6.64			
Square Hop Test	Pre-test	39.70±9.25	40.88±8.76	96.865	0.758	0.001*
	Post-test	45.64±9.51	41.05±9.12			
Davies Closed Kinetic Chain Test	Pre-test	30.88±6.47	32.82±5.31	90.444	0.745	0.001*
	Post-test	39.41±5.78	33.11±5.25			

*** a significant change from pre-test to post-test**

Table 4 indicated a significant difference between the core exercise and control groups in the dominant upper limb balance scores (P=0.001), non-dominant upper limb balance scores (P=0.001), the square hop test (P=0.001), and the Davies Closed Kinetic Chain test (P=0.001). These results show that the core stability exercises significantly affected balance and performance.

Discussion

Although core stability exercises are commonly used in rehabilitation and sports, there is limited research on their effects on FMS scores, balance, and performance in elite athletes. To our knowledge, this is the first study to investigate the effects of core stability exercises on these variables in elite basketball players. The core plays a crucial role in stabilizing the torso, which is essential for effectively generating, controlling, and transferring forces to both the upper and lower limbs during functional movements (43). It is believed that optimal core stability enhances productivity and movement efficiency and contributes to improved athletic performance (17).

The results of the current study regarding the effect of core stability exercises on the FMS test are consistent with some studies. In the study by Hessam et al. (2023), the effect of McGill's core stability exercises on movement patterns, shooting accuracy, and performance of basketball players (40 individuals) was examined, which showed that core stability exercises were effective in increasing FMS scores of male basketball players (23). Kurt et al. (2023) stated that swimmers who performed core stability exercises improved their performance, and their scores in the FMS test improved (44). Majewska et al. (2022) also showed that core stability exercises could increase the overall FMS score in tennis players from 14.44 to 16.91 (45). Additionally, the results of Rahimi et al.'s studies (2023, 2021) support the positive effect of core stability exercises on FMS scores of elite karate and wrestling athletes aged 9 to 12 years (46, 47). The study by Daneshjoo et al. (2020) found that core stability exercises significantly improve static and dynamic balance and increase adolescent football players' FMS scores (48). Lago-Fuentes et al. (2018) also reported significant improvements in FMS and agility in futsal players after core stability interventions (24). It is evident from various studies conducted in different sports disciplines that core stability exercises positively affect athletes' movement patterns. Core region instability during running results in poor technique and ineffective force application (49). In various studies, the correlation between weak core muscles and an increased occurrence of upper and lower limb injuries in athletes has been reported. In this regard, Šiupšinskas et al. (2019) stated that dysfunctional movement patterns and weak biomechanics during landing in pre-season screening tests correlate with an increased risk of lower limb injuries in female basketball players during the season (50). Core stability exercises are widely used in rehabilitation programs and are essential for optimal performance in most activities (15). Exercises that improve both strength and coordination of the core muscles may affect participants' ability to activate muscles in a coordinated manner and lead to increased force production (51). Changes in coordination, increased force production, or both, may improve movement control in sports. A study by Sedaghati et al. (2018) found a positive correlation between trunk flexor endurance and balance with FMS scores in basketball players. Individuals with greater muscular endurance perform better in the FMS test and have higher balance scores (52). It should be noted that these exercises lead to indirect improvements in alignment in the kinetic chain, acceleration, and balance, resulting in desirable performance. By co-contracting the abdominal muscles with the lumbar stabilizers, core stability exercises may prevent lateral displacement of the torso during the FMS test and provide the necessary stability for lower limb movement in three planes of motion, leading to improved performance (53).

Concerning the results of the performance of the upper and lower limbs, our study was consistent with some studies. Luo et al. (2023) reported that incorporating core training, especially on unstable surfaces, and integrating static and dynamic core exercises enhanced athletic performance and skill execution in basketball players (54). Another study by Li (2022) showed higher fast dribbling passes and shots among basketball players after a six-week core stability exercise (55). In addition, a study investigating the efficacy of core stability training on upper extremity performance in collegiate athletes showed that the functional throwing performance index was enhanced after core stability training (56). In overhead and throwing sports, the force and energy generated by the body are ultimately transferred to the ball. The execution of such skills involves a coordinated sequence of movements, where each component has the potential to influence the entire kinetic chain. For effective execution of throwing skills and efficient energy transfer along the kinetic chain, all body segments and joints must possess adequate stability, strength, endurance, mobility, and neuromuscular control (57). Among these segments, the core region plays a critical role, serving as a biomechanical bridge between the upper and lower limbs. Any disruption in force generation within one segment can increase the mechanical load on adjacent segments in the kinetic chain, potentially leading to injury in distal joints and segments that may be structurally weaker (57). Concerning the performance of the lower limb, a study by Saki et al. (2021) reported that after an eight-week core program, single-leg hop and triple hop were improved (58). Another study by Ebrahimi et al. (2024) indicated that the performance of taekwondo practitioners increased after six weeks of core stability training (59). Additionally, a study investigating the effects of the core training program applied for eight weeks to basketball players aged 16-18 showed that core training has positive effects on vertical jump performance (60). Enhancing core strength improves the stability of the pelvic girdle, spine, and hip joints, providing a stable base of support for lower limb movements. This, in turn, facilitates more coordinated motion and better postural control during rapid directional changes (61). Jumping performance is influenced by trunk and pelvic control, as these regions contribute significantly to the stability and force generation required by the lower limb and hip extensor muscles during jumping tasks (24).

Regarding the balance results, our findings align with some studies. Javadaneh et al. (2020) demonstrated that core exercises affect dynamic balance and postural sway in basketball athletes (62). Gong et al. (2024) conducted a study comparing the effects of a ten-week core stability program with traditional strength training (TST) on balance performance in adolescent male basketball players. Their findings indicated that core stability exercises led to notable enhancements in dynamic balance and agility across various movement planes (63). In addition, in a study by Liu (2022), basketball players showed better coordination and balance after a core training program (64). Dogan et el. (2021) also reported that after eight weeks of a core strength training program, basketball players had better balance and general strength (22). Core stability will likely enhance the body's ability to maintain balance during various dynamic movements and contribute to appropriate force production, thereby preventing injury (65). The primary goal of core training is to develop the physical capacity to retain a neutral spinal alignment during daily functional activities. This is achieved by improving the endurance and coordination of spinal stabilizer muscles, including the obliques, transversus abdominis, multifidus, and erector spinae (66).

Furthermore, the core region serves as the location of the body's center of gravity and the origin point of all bodily movements. Thus, strengthening the musculature of this area through core stability training enhances neuromuscular efficiency and promotes optimal joint motion of the lumbar spine, pelvis, and hips throughout the functional kinetic chain. It also supports appropriate acceleration and deceleration, muscular balance, proximal stability, and functional strength (67). High-intensity, multidirectional motions are common among elite basketball players, necessitating fine neuromuscular control, dynamic balance, and ideal force transfer along the kinetic chain. Therefore, incorporating core stability exercises into training regimens can enhance the balance, FMS scores, and overall athletic performance of elite basketball players. Specifically, we emphasize that incorporating structured core stability training into regular practice routines may be a time-efficient and targeted strategy to improve key performance-related outcomes such as movement quality, dynamic balance, and functional power. These improvements are particularly relevant for enhancing on-court performance and may support injury prevention strategies in elite basketball athletes. This study has several limitations: (1) the absence of follow-up to assess the durability of exercise effects on the measured variables; (2) a small sample size; and (3) the lack of muscle length evaluation, which may influence performance outcomes in certain tests. Future research is recommended to include female, amateur, and semi-professional basketball players, and to quantify changes in core muscle activation patterns during basketball-specific skills before and after exercise interventions.

Conclusion

The current study's results showed that after eight weeks of core stability exercises, elite basketball players experienced significant improvements in FMS scores, balance, and performance. These findings highlight the positive effect of core-focused exercises on enhancing movement efficiency and athletic performance, which may have important implications for reducing injury risk in elite athletes.

Ethical Considerations

Compliance with ethical guidelines

All research procedures were conducted in accordance with the ethical guidelines of the Physical Education and Sports Science Research Institute (SSRI.REC-2310-2462). Before the commencement of the study and measurements, individuals were asked to participate in the research by providing informed consent by completing a consent form.

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Authors' Contribution

All authors contributed equally to the conception and design of the study, data collection and analysis, interpretation of results, and drafting of the manuscript. All authors consented to the final version of the manuscript prior to submission.

Conflict of Interest

The authors declared no conflicts of interest.

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