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ORIGINAL RESEARCH ARTICLE

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The effect of 8-week warm-ups, static and dynamic stretching of hip flexors on flexibility, agility, and dynamic balance in junior field hockey players: a randomized controlled trial

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Abstract

Background Hockey players mostly lack flexibility in the hips due to prolonged flexion during competition and over-use of hip extensors and external rotators. The lack of flexibility or dysfunction in the hips can negatively impact the dynamic balance and biomechanics of the lower extremities.

Objective This study aimed to investigate the effect of adding dynamic stretching to the standard warm-ups and static stretching of hip flexors in junior field hockey players' balance, flexibility, and agility.

Methods In this randomized controlled trial, 30 junior field hockey players were randomly assigned into experimental ($n=15$) and control groups ($n=15$). The control group performed warm-ups, static stretching, and placebo-like stretching exercises. The experimental group performed the same warm-ups, static stretching exercises plus dynamic stretching to hip flexors. The exercise program was performed by alternating between the right and left lower limbs in both groups. The modified Thomas test, Illinois Agility Test, and modified star excursion balance test were used to measure hip muscle flexibility, agility, and dynamic balance after 8 weeks of interventions in both groups.

Results In comparison with the post-test score of both the groups, the experimental group shows a highly statistically significant value in all three measurements of the modified Thomas test (right limb: Cohen's $d=2.1$, $P<0.001$, left limb: Cohen's $d=1.5$, $P<0.001$) Illinois Agility Test (Cohen's $d=2.3$, $P<0.001$) modified star excursion balance test (composite score: right limb Cohen's $d=1.3$, $P<0.001$, left limb Cohen's $d=1.53$, $P<0.001$) respectively.

Conclusion The findings of this study revealed that adding dynamic stretching of hip flexors in routine warm-ups and static stretching has significantly increased hip extension range of motion, agility, and dynamic balance in both the right and left limbs among junior field hockey players.

Keywords Static stretching, Warm-up exercise, Dynamic stretching, Flexibility

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Introduction

Changing directions and maneuvering quickly around other players is a critical skill in field hockey, so the players must be flexible and agile. Hockey is mostly played in a semi-crouched position while dribbling, defending, and handling the ball at most times [1]. The prolonged hip flexion facilitates the anterior pelvic tilt, which produces an asymmetrical force between hip flexors and the gluteal muscles. The hip extensor and external rotator muscles play a critical role in running, sprinting, shooting a ball, and making rapid direction changes. They often face overuse due to the substantial demands placed on them during these dynamic movements [2]. Limited hip flexibility is a common problem among hockey players due to prolonged flexion during competition and overuse of hip extensor and external rotator muscles [2]. The lack of flexibility or dysfunction will negatively impact the dynamic balance and biomechanics of the lower extremities [3].

The National Collegiate Athletic Association (NCAA) reported an injury rate of 6.3/1000 athlete exposures in field hockey. Hockey players have a high prevalence and incidence of injuries, especially in the lower limb. Lower limbs represent 12.7% of all hockey injuries [4]. Junior players have a higher incidence of overuse complaints, resulting in repeated exposure to a greater risk of injuries than adults [5]. In a game, a junior hockey player (average 25 times) gets more chance of getting injured (96.1 per 1000 player-game hours) than in practice (3.9 per 1000 player-practice hours) [6].

Stretching is an essential component of an athlete's warm-up, and it is usually incorporated in pre-exercise to improve flexibility, prevent injury, and enhance physical performance [7].

Static stretching is performed by placing the joint or joints in a position so that the muscles and connective tissues are stretched while held in a static position with the tissues at their greatest length. Stretches should be held for 15 to 30 s [8]. In contrast, dynamic stretching involves moving the limb from its neutral position to the end range, where the muscles are at their greatest length, and then moving the limb back to its original position. This dynamic action is carried out in a smooth, controlled manner and is repeated for a specified time period [9]. However, recent studies have reported static stretching decreases maximal force production and has a negative effect on balance and agility compared to dynamic stretching [10]. The increased range of motion (ROM) attained by static stretching was maintained when dynamic stretching activities were performed after static stretching [9, 10]. Coaches, trainers, and athletes have recently preferred dynamic stretching [11]. Researchers have shown that performing dynamic stretching after static stretching will reduce or remove the detrimental performance effects of static stretching [12]. The current research is based on the above references [9–12].

There are only a few comparison studies between static and dynamic stretching; among those, studies on field hockey players have been very scarce. The purpose of this study was to investigate the effects of adding the dynamic stretching of hip flexors with routine warm-ups and static stretching on junior field hockey players' balance, flexibility, and agility.

Materials and methods

Study design

Randomized controlled trial.

Participants

Thirty junior field hockey players were recruited for this study, and the study was conducted at Sardar Vallabhai Patel International Hockey Stadium in Raipur, Chhattisgarh, India, from December 2018 to February 2019. The inclusion criteria encompassed individuals aged between 12 to 18 years, both males and females, who played field hockey for the past year without any recent history of pain or a lower limb injury. Junior hockey players were excluded from the study if they had connective tissue, systemic, or neurological disorders and were unwilling to consent.

Randomization, allocation, and blinding

Seventy-seven field hockey players were assessed for eligibility. Forty-seven were excluded due to 45 needing to meet the inclusion criteria, and 2 declined to participate in the study. After the initial assessment for compliance with eligibility criteria, 30 junior hockey players who met the inclusion criteria were randomly allocated into 2 groups control (warm-up exercise + static stretching + placebo-like stretching) and an experimental group (warm-up exercise + static stretching + dynamic stretching group). Randomization was done using a sealed envelope containing random numbers at a ratio of 1:1. The participants were asked to pick up one enclosed envelope from a box containing numbers from 1 to 30. Depending on their chosen number, they were allocated to the experimental ($n = 15$) and control group ($n = 15$). The principal investigator did randomization, and all the data were kept confidential till the end of the study. Participant-based blinding was done for those who performed dynamic stretching in the experimental group. No dropping out of subjects from the study was reported after the randomization. The process for participant selection is explained in the flow diagram (Fig. 1).

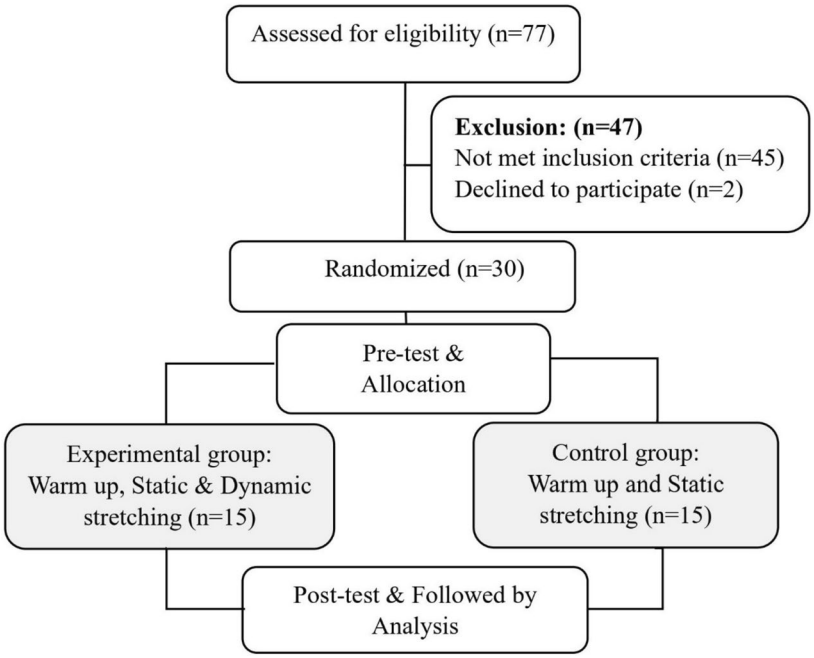

Fig. 1 Selection of study participants

Sample size

The effect size for the sample size calculation was obtained from the previous studies on hip extension range of motion using dynamic stretching [13]. Based on the data from that study, the mean and standard deviation of the active stretching group was 3.17 ± 4.64, and that of the control group was − 2.48 ± 5.19 after the stretching. The G-power was used to compare the independent samples of the two groups. Finally, it was estimated that, with effect size = 1, power = 0.8, and alpha value = 0.05, the sample size is 30 participants.

Procedure

All participants and their parents/legal guardians provided written informed consent before the commencement of the study. The experimental and control groups participated in warm-up and static stretching exercises for 30 min. Then, in the subsequent 15 min, the control group performed a placebo-like stretching exercise while participants in the experimental group engaged in dynamic stretching. Both groups performed the exercise program by alternating between the right and left lower limbs. The experimental group performed dynamic stretching in a separate playground corner to ensure blinding. Additionally, participants were briefed on the study's objectives and instructed to refrain from discussing their stretching protocols. Both groups performed the exercises for 45 min daily in the evening session for up to 8 weeks. The principal investigator, a physical therapist with more than 10 years of experience in orthopedic rehabilitation, supervised the training program for all the sessions, and he evaluated flexibility, agility, and dynamic balance in both groups before and after the 8 weeks of intervention. To ensure adherence to the intervention, the principal investigator closely monitors participants' engagement by inquiring with their parents and coaches about participant's commitment to the intervention. Additionally, the investigator provides regular motivation to the participants.

Outcome measures

Among the various tests utilized to measure balance, flexibility, and agility, the most valid and reliable used in this study are (i) the modified Thomas test, used to evaluate the presence of hip flexion contracture and measure hip extensibility. (ii) The Illinois Agility Test, utilized for assessing agility; (iii) The modified star excursion balance test, used to assess the dynamic postural stability in athletes.

Hip joint flexibility evaluation: the Modified Thomas test

The Modified Thomas test is a widely used passive range of motion (PROM) test to assess hip flexor contracture [14]. Participants were instructed to sit on the edge of the examination table, bring one knee towards their chest, and then roll back onto the table, leaving the other lower limb extended off the table. If the extended limb thigh is raised from the table, it indicates tightness of the hip

flexor muscles [15]. A goniometer was used to measure the hip flexion angle on both sides of the lower limbs [16]. The modified Thomas test has good inter-rater reliability [17, 18].

Agility evaluation: Illinois Agility Test (IAT)

This test aimed to assess the players' ability to make turns in different directions at different angles and speeds. Before commencing the test, participants were briefed on the procedure. The length of the course is 10 m long by 5 m wide. Four cones were placed, with two at starting and finishing points and two at turning points. Another four cones were placed at the center at an equal distance apart. Participants assumed a prone position with their chin touching the starting line. Once the researcher gave a command to "Go," the stopwatch was started, and the participant got up as quickly as possible and ran around the course in the direction indicated by the researcher. The stopwatch was stopped after crossing the finish line. Players were instructed to perform at least two attempts at each exercise, with at least 2 min of rest between tests and trials. The faster completion time between the two points was recorded in seconds [19]. The Illinois Agility Test (IAT) is a standard agility test used for training and assessment of able-bodied athletes for many years [20]. It was introduced to measure different sports' multidirectional agility [20, 21].

Dynamic balance evaluation: the Modified Star Excursion Balance test (mSEBT)

This test was conducted to evaluate dynamic stability. It consists of three tape measures arranged on the ground in the shape of a Y, with angles of 135° between the posterior-lateral (PL) and posteromedial (PM) compared to the anterior (A) and 90° between the posterior lateral and posterior medial reach distances. Participants were instructed to remove their shoes, place their hands on their waist, and position themselves at the intersection of the three lines on the floor. Participants must touch the line as far as possible using the distal part of the big toe, and the leg is returned to the center. A maximum of three reaches in each direction were recorded, and the best out of three for each leg in the eight directions was used for the final analysis [22]. The modified star excursion balance test (mSEBT) is a reliable and valid assessment tool for evaluating dynamic balance [22, 23].

Interventions

Before commencing the study, participants were instructed to follow the stretching program's procedures and practice immediately after the warm-up exercise. This stretching program was administered under the supervision of a physiotherapist. The details of treatment protocols are outlined below, and the contents for each group are summarised in Table 1.

Warm-up exercise

All participants were engaged in low-intensity running on an 800-m track, followed by joint mobility exercises before performing the stretching exercises.

Static stretching

Static stretching was conducted in a standing position, targeting the iliopsoas, hamstring, and quadriceps muscles. Each stretch was held for 30 s at a point of mild discomfort. After 10–15 s, the contralateral leg was stretched, and this process was repeated five times for each stretch in both legs.

Dynamic stretching

Forward and backward leg swings

Participants stood upright with their feet positioned hip-width apart and used a wall for support during this stretch. One leg remained stationary while the other was slowly swung forward and backward [24]. Each stretch was sustained for 30 s, with a rate of 1 stretch cycle every 2 s. This stretch was repeated five times at a slow pace and ten times as quickly as possible, all performed in a controlled manner and without bouncing.

High kicks/reach

Participants walk with flexion of hips and full extension of the leg and thigh, with the opposite hand reaching to

Table 1 Details of the treatment protocol

Control group	Experimental group
(Warm-up exercise + static stretching + placebo-like stretching)	(Warm-up exercise + static stretching + dynamic stretching group)
Warm-up exercise (15 min)	Warm-up exercise (15 min)
- 800 m running	- 800 m running
- Joint mobility exercises	- Joint mobility exercises
Static stretching (15 min)	Static Stretching (15 min)
-Stretching to iliopsoas, hamstring, quadriceps muscles	-Stretching to iliopsoas, hamstring, quadriceps muscles
Placebo-like stretching (15 min)	Dynamic stretching (15 min)
- Gentle whole-body stretch	- Forward and backward leg swings
	- High kick/reach
	- Spiderman
	- Quadriceps hold and touch the floor
	- Twenty-yard backpedal

touch the toe [25]. This stretch was done the length of 20 yards.

Spiderman

A floor crawl where an athlete mimics climbing up a wall using exaggerated hip flexion and extension [25]. This stretch was done the length of 20 yards.

Quadriceps hold and touch the floor

The participant performed this stretch by holding their dominant foot to their buttocks and reaching the ground with their opposite hand [24]. This stretch was performed for 20 yards, stepping between each hold.

Twenty-yard backpedal.

The participant was asked to get down in a squat position and reach back with each leg [24].

Placebo-like stretching

A gentle whole-body stretching exercises were done for 15 min daily.

Statistical analysis

The data collected were entered and analyzed in the statistical package for the social sciences (SPSS v.17) (IBM SPSS, 2007, Chicago, IL). Descriptive analysis was performed and presented as the mean and standard deviation for all the variables. Normality was tested using the Shapiro–Wilk test to test the variables' normal distribution and variance homogeneity. Wilcoxon signed-rank test was used to measure the significant difference in hip flexion angle, Illinois Agility Test, and mSEBT reach distance for the pre and post-test of both the control and experimental groups. Mann–Whitney *U* tests were used to measure the significant difference in hip flexion angle, mSEBT reach distance, and Illinois Agility Test between the post-test of control and experimental groups. The probability of a p value less than 0.05 was considered significant. We calculated Cohen's d by taking the difference between two means and dividing it by the data's standard deviation.

Results

General information of participants

For this randomized trial, 77 junior hockey players were screened. Forty-seven were excluded due to 45 players not meet the inclusion criteria and two refused to participate in this study. We have enrolled 30 junior hockey players, with 15 in each group (20 male and 10 females, the mean age is 14.3 ± 2.3 years, height is 146.7 ± 10.7 cm, and weight is 38.5 ± 9 kg). The demographic and anthropometric data are shown in Table 2.

The pre-test and post-test scores for hip extension, agility, and the mean limb length reach distances within the groups were presented in Tables 3 and 4, respectively. When comparing the effects of the intervention, statistically significant differences were observed in hip extension, agility, limb length reach distances, and composite reach scores within the control group ($P < 0.01$) and experimental group ($P < 0.001$), respectively. In comparison with the post-test scores between the groups Table 5, the experimental group exhibits highly statistically significant values in all three measurements of the modified Thomas test (right limb: Cohen's $d = 2.1$, $P < 0.001$; left limb: Cohen's $d = 1.5$, $P < 0.001$), the Illinois Agility Test (Cohen's $d = 2.3$, $P < 0.001$) and the modified star excursion balance test (composite score: right limb Cohen's $d = 1.3$, $P < 0.001$; left limb Cohen's $d = 1.53$, $P < 0.001$), respectively.

Discussion

Muscle flexibility is critical in injury prevention and enhancing athletic performance. Consequently, stretching is pivotal in sports-related activities and rehabilitation programs [26]. In contemporary sports, warm-up before exercise is essential to every sport nowadays; stretching

Table 2 Participant demographic and anthropometric information

Variables	Control group ($n = 15$)		Experimental group ($n = 15$)		*P* value
	Mean ± SD (95% CI)		Mean ± SD (95% CI)		
Age (years)	14.3	± 2.3 (13.1–15.6)	15.6	± 1.8 (14.6–16.6)	0.103
Gender (*n*)	10 males, 5 females		10 males, 5 females		
Height (cm)	146.7	± 10.7 (140.8–152.7)	146.9	± 8.0 (142.5–151.4)	0.954
Weight (kg)	38.5	± 9.8 (33.1–44.0)	41.7	± 8.2 (37.1–46.2)	0.353
Body mass index	17.7	± 3.1 (16.0–19.4)	19.4	± 3.9 (17.2–21.5)	0.209
Leg length (cm)					
Right leg	87.1	± 4.9 (84.4–89.8)	88.0	± 5.2 (85.1–90.9)	0.641
Left leg	87.1	± 4.9 84.4–89.8)	88.0	± 5.2 (85.1–90.9)	0.641

Table 3 Performance of modified Thomas test, Illinois agility test, and mSEBT for the control group ($n = 15$)

	Pre test		Post test		*t* value	df	Wilcoxon *Z* value	*P* value	Cohen's *d*
	Mean ± SD		Mean ± SD						
	I. Modified Thomas test (°)								
Hip									
Right hip	4	± 6.4	11.2	± 2.8	− 6.65	14	− 3.422	0.00**	1.5
Left hip	4.2	± 5.3	11.7	± 3.1	− 8.96	14	− 3.423	0.00**	1.7
	II. Illinois Agility Test (in seconds)								
Agility test	22.9	± 1.6	20.1	± 1.7	10.08	14	− 3.408	0.00**	1.7
	III. mSEBT (cm)								
	1. Anterior direction								
Right limb	87.6	± 2.6	88.6	± 2.7	− 4.62	14	− 3.296	0.00**	0.4
Left limb	87	± 4.9	88.3	± 5.2	− 2.83	14	− 2.556	0.01*	0.3
	2. Poster medial direction								
Right limb	93.6	± 2.9	92.3	± 3.6	3.37	14	− 2.613	0.00**	0.4
Left limb	94.6	± 5.5	95.4	± 5.2	− 2.28	14	− 2.794	0.04*	0.2
	3. Poster lateral direction								
Right limb	91.7	± 3.6	92.3	± 3.6	− 3.21	14	− 1.874	0.01*	0.2
Left limb	92.8	± 4.7	94.1	± 4.5	− 2.43	14	− 2.642	0.03*	0.3
	4. Composite score								
Right limb	91	± 2.9	91.7	± 2.9	− 7.91	14	− 3.408	0.00**	0.2
Left limb	91.4	± 4.9	92.6	± 4.7	− 2.87	14	− 3.408	0.01*	0.2

*P value < 0.05

** P value < 0.01

Table 4 Performance of modified Thomas test, Illinois Agility Test, and mSEBT for the experimental group ($n = 15$)

	Pre-test		Post-test		*t* value	df	Wilcoxon *Z* value	*P* value	Cohen's *d*
	Mean ± SD		Mean ± SD						
	I. Modified Thomas test (°)								
Hip									
Right hip	4.9	± 4.1	15.9	± 1.4	− 14.41	14	− 3.424	0.00**	3.6
Left hip	4.6	± 4.1	15.5	± 1.7	− 14.53	14	− 3.450	0.00**	3.5
	II. Illinois Agility Test (in seconds)								
Agility test	22.6	± 1.2	16.7	± 1.2	15.87	14	− 3.408	0.00**	4.9
	III.mSEBT (cm)								
	1. Anterior direction								
Right limb	87.4	± 6.6	95.9	± 5.3	− 13.02	14	− 3.408	0.00**	1.4
Left limb	88.4	± 6.3	97.1	± 6.5	− 12.73	14	− 3.408	0.00**	1.4
	2. Poster medial direction								
Right limb	91.8	± 6.6	98	± 5.8	− 7.01	14	− 3.408	0.00**	1.0
Left limb	93.3	± 5.5	102	± 6.2	− 26.69	14	− 3.408	0.00**	1.5
	3. Poster lateral direction								
Right limb	90.1	± 6.0	98	± 5.8	− 10.89	14	− 3.408	0.00**	1.3
Left limb	91.5	± 5.7	99.3	± 5.8	− 20.11	14	− 3.408	0.00**	1.4
	4. Composite score								
Right limb	89.8	± 5.9	97.3	± 5.3	− 15.19	14	− 3.408	0.00**	1.3
Left limb	91.1	± 5.5	99.5	± 6.0	− 26.54	14	− 3.408	0.00**	1.5

*P value < 0.05

** P value < 0.01

Table 5 Performance of Modified Thomas test, Illinois Agility Test, and mSEBT after the intervention between the control and experimental group

	Control group ($n=15$)		Experimental group ($n=15$)		*t* value	Df	Mann–Whitney *U* test	*P* value	Cohen's *d*
	Mean ± SD		Mean ± SD						
	I. Modified Thomas test (°)								
	Hip								
Right limb	11.2	± 2.8	15.9	± 1.4	− 5.8	28	11.500	0.00**	2.1
Left limb	11.7	± 3.1	15.5	± 1.7	− 4.26	28	29.500	0.00**	1.5
	II. Illinois Agility Test (in seconds)								
Agility test	20.1	± 1.7	16.7	± 1.2	6.14	28	6.000	0.00**	2.3
	III. Modified SEBT (cm)								
1. Anterior direction									
Right limb	88.6	± 2.7	95.9	± 5.3	− 4.83	28	25.000	0.00**	1.7
Left limb	88.3	± 5.2	97.1	± 6.5	− 4.08	28	38.000	0.00**	1.5
2. Poster medial direction									
Right limb	94.2	± 2.8	97.9	± 5.8	− 2.25	28	69.000	0.03*	0.8
Left limb	95.4	± 5.2	102	± 6.2	− 3.15	28	46.500	0.00**	1.2
3. Poster lateral direction									
Right limb	92.3	± 3.6	98	± 5.8	− 3.27	28	44.500	0.00**	1.2
Left limb	94.1	± 4.5	99.3	± 5.8	− 2.76	28	53.500	0.01*	1.0
4. Composite score									
Right limb	91.7	± 2.9	97.3	± 5.3	− 3.59	28	40.000	0.00**	1.3
Left limb	92.6	± 4.7	99.5	± 6.0	− 3.49	28	43.000	0.00**	1.3

*P value < 0.05

** P value < 0.01

can improve athletic performance [27]. Junior players should stretch their major lower body muscle groups before and after sports to attain maximum benefit. To improve performance and avoid injury, hockey players need to do flexibility exercises that mainly focus on the hip flexors. A limited number of studies compared the effects of warm-ups static and dynamic stretching on junior field hockey players' flexibility [28]. This study aims to evaluate the impact of an 8-week training program of warm-ups and static and dynamic stretching of hip flexors compared to routine activities of warm-ups and static stretching by junior field hockey players.

In this study, hip extensibility was assessed using the modified Thomas test. In the post-test, an increase in hip extension was observed in both groups. However, the experimental group demonstrated a higher hip extension in both the right and left legs (15.9 and 15.5°) than the control group (11.2 and 11.7°). In line with our findings, recent studies have demonstrated that players who incorporate warm-ups, static stretching, and dynamic stretching experience increased flexibility, improved performance, and a reduced risk of injury [11, 28]. Earlier studies have indicated that dynamic stretching incorporates active contraction of the antagonist's muscles, potentially providing benefits for muscles that may not respond as effectively to static stretching [29].

Field hockey players need to change directions quickly without losing balance and speed for a successful performance [30]. The present study revealed a significant reduction in agility time (16.7 ± 1.2 s) within the experimental group after employing warm-ups, static, and dynamic stretching, compared to the control group's warm-up, static stretching regimen, and placebo-like stretching (20.1 ± 1.7 s). These findings underscore the enhanced effectiveness of dynamic stretching in combination with warm-up and static stretching for improving agility performance. This finding aligns with the research of Amiri-Khorasani et al. (2011), who reported that warm-up protocols incorporating static stretching followed by dynamic stretching might be more beneficial than static stretching alone in soccer players engaged in agility activities [28]. Studies showed that static stretching should be followed by dynamic stretching during warm-up to nullify any performance deficits caused by static stretching [31]. In a study, Sarika et al. (2019) reported similar results among cricket players; they found that combined static and dynamic static have more

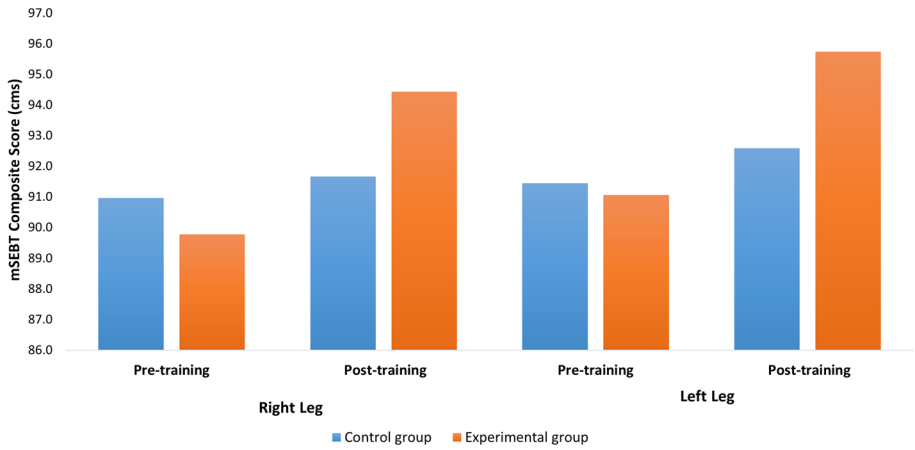

Fig. 2 Comparison in a composite score of star excursion balance test

beneficial effects on flexibility, speed, and agility than routine stretching during warm-up sessions [32].

In this study, the mSEBT was primarily employed to assess the postural balance in junior field hockey players. The experimental group showed a significant improvement in composite scores of the star excursion balance test for both the right and left legs ($P<0.001$) compared to the control group (as shown in Fig. 2). Notably, the experimental group demonstrated more significant improvements in all three reach directions: anterior, posterior-medial, and posterior-lateral. This aligns with Filipa A. et al. (2010) findings, who observed similar improvements among young female athletes after an 8-week neuromuscular training program [33]. Two studies investigated the effect of dynamic stretching on female high school athletes and untrained, healthy college students. Both studies illustrated that dynamic stretching resulted in better balance, agility, and overall performance than static stretching [10, 34]. Another study involving professional football players found that combining aerobic running with dynamic stretching significantly improved flexibility when compared to aerobic running alone ($p \leq 0.05$) [11].

Our study underscores the importance of incorporating dynamic stretching, static stretching, and warm-up exercises for enhancing hip joint flexibility. This multifaceted approach significantly contributes to lumbar spine stability and improves the range of motion for hip extension. The current study was limited to a small sample size and a short follow-up period.

Conclusion

This study's results demonstrated that 8 weeks of combined dynamic stretching with routine activities of warm-up and static stretching exercises performed by the experimental group showed a significant improvement in dynamic balance, flexibility, and agility compared to the control group, which practiced only their routine activities warm-up, static stretching, and placebo-based stretching exercises.

Abbreviations

mSEBT	Modified Star Excursion Balance Test
PROM	Passive range of motion
IAT	Illinois Agility Test
PL	Posterior-lateral
PM	Posterior-medial
A	Anterior
S	Seconds
Kg	Kilograms
Cm	Centimetres

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Authors' contributions

SKR was involved in study conceptualization and design, obtaining permission for the study, conducting the interviews, data management, and manuscript writing. JF was involved in monitoring the study and commenting on the manuscript. PG was involved in study design, data analysis, and interpretation, and in drafting the manuscript. SP was involved in organizing the data, drafting, and commenting on the manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

The dataset used or analyzed during the current study will be available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

This study was approved by the Institutional Review Board with approved no: 023/2018 from Thanthai Roever College of Physiotherapy, Perambalur,

Tamilnadu, and obtained permission for conducting the study from the Director of Youth and Welfare of Sports, Chhattisgarh. Prior to the start of the study, each procedure was explained to the participant, and their parents/legal guardians' written consent was taken for the same.

Competing interests
The authors declare that they have no competing interests.

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