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Effect of metabolic based sports specific training with different stretching on selected physical fitness and specific technical skill among school football players

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Abstract
The purpose of this study was to find out the effect of metabolic based sports specific training with different stretching on selected physical fitness and specific technical skill among school football players. The selected subjects (N=45) were divided into three equal groups each consisting of 15 (n-15) football ball players. Experimental group I (N=15) underwent Football training with Dynamic Stretching (MBDST), Experimental group -II (N=15) underwent) Football training with Static Stretching (MBSST), and the Group-III (N=15) acted as control group (CG). All the selected subjects were given proper orientation about the purpose of the study, testing and training procedures. The selected subjects were initially tested on criterion variables used in this study and this was considered as the pre-test data and recorded for analysis. The Experimental groups were given respective training for a period of 12 weeks. After twelve weeks of their training program again the subjects were tested on the same criterion variables as such in the pre-test and considered this as the post-test data for the analysis. Agility was assessed by shuttle run test and the unit of measure was in seconds, dribbling was assessed by Mcdonald soccer skill test and unit of measure was in seconds. Descriptive statistics such as mean and standard deviation are found in order to get the basic idea of the data distribution "t" test was done for finding whether there is any statistically significant pre-test to post-test mean differences in their respective variables of each groups. ANCOVA tests the significance of "adjusted post-test mean" differences between the experimental and control groups for each variable. Whenever the "F" ratio for adjusted post-test was found to be significant, Scheffee's post hoc test was applied to test the significant difference between the paired adjusted means.0.05 level of confidence was fixed for agility and dribbling to test the level of significance.

Keywords: Metabolic based skill training, Dynamic stretching, Static training, football players, skill performance, agility, dribbling

Introduction
Football is one of the most popular and widely played sports in the world, with its influence spanning across continents and cultures. At the school level, football serves as a critical avenue for the physical, social, and psychological development of students. It encourages teamwork, discipline, coordination, and strategic thinking. However, football also places significant physiological demands on players, requiring a blend of strength, speed, endurance, flexibility, and agility. As the sport becomes increasingly competitive at younger levels, it becomes essential to implement structured, scientific training programs that foster holistic athletic development. This need underpins the current study, which explores the effect of metabolic-based sports specific training combined with stretching on the performance parameters of school football players.

Metabolic-based sports-specific training (MBST) is a training approach that focuses on conditioning the specific energy systems predominantly used during the performance of a particular sport. The idea is to design training regimens that simulate the metabolic demands athletes face during competition, thereby optimizing energy system efficiency and improving overall athletic performance.

In sports like football, which require a combination of short bursts of high-intensity activity interspersed with periods of lower intensity, MBST targets the phosphagen system (ATP-PCr), anaerobic glycolysis, and aerobic systems in a balanced and sport-specific manner. Static stretching is one of the most traditional and widely used forms of flexibility training,

especially in athletic and therapeutic settings. It is characterized by elongating a muscle or group of muscles to its farthest point and then maintaining that position for a certain period, typically 10-60 seconds. This method of stretching is aimed at improving muscle flexibility, increasing joint range of motion, and reducing the risk of injury. Despite the emergence of newer techniques such as dynamic or ballistic stretching, static stretching remains a foundational component in many warm-up and cool-down routines. Static stretching involves slowly moving a muscle to its end range and holding that position for a sustained period without movement. According to Alter, static stretching is a safe and effective way to increase flexibility and range of motion, especially when performed regularly. The key feature of static stretching is its passive nature once the target position is reached, the stretch is held using body weight or support from an external object, without bouncing or rapid movement.

Dynamic stretching has become an integral component of modern warm-up routines in sports and physical training, especially in activities requiring explosive power, agility, and speed. Unlike static stretching, which involves holding a muscle in an elongated position, dynamic stretching incorporates movement-based stretches that actively engage the muscles and joints through their full range of motion. This technique is particularly valuable in preparing the body for sport-specific actions and has been widely endorsed by sports scientists and coaches alike (Yamaguchi & Ishii, 2005; Behm & Chaouachi, 2025) [1]. Dynamic stretching refers to a series of controlled, repetitive movements that gradually increase reach and speed of motion. These movements often mimic the sport or activity that is about to be performed, thus providing both a physiological and neurological warm-up effect. According to Faigenbaum *et al*., dynamic stretching involves moving parts of the body and gradually increasing reach, speed of movement, or both. The goal is to elevate muscle temperature, increase blood flow, and activate the central nervous system to prepare athletes for physical exertion.

Dynamic stretching works by engaging both the musculoskeletal system and the nervous system. When the body moves through dynamic stretches, the muscles are activated in a functional manner, enhancing neuromuscular coordination. This type of stretching increases heart rate, respiratory rate, and blood flow to the working muscles, resulting in increased oxygen delivery and muscle elasticity (Behm & Chaouachi, 2025) [1]. Additionally, the repetitive motion stimulates proprioceptors and primes the stretch-shortening cycle, which is essential for activities involving rapid changes in muscle length and force production.

Methodology

The purpose of this study was to find out the effect of metabolic based sports specific training with different stretching on selected physical fitness and specific technical skill among school football players. The selected subjects (N=45) were divided into three equal groups each consisting of 15 (n-15) football ball players. Experimental group I (N=15) underwent Football training with Dynamic Stretching (MBDST), Experimental group -II (N=15) underwent) Football training with Static Stretching (MBSST), and the Group-III (N=15) acted as control group (CG). All the selected subjects were given proper orientation about the purpose of the study, testing and training procedures. The selected subjects were initially tested on criterion variables used in this study and this was considered as the pre-test data and recorded for analysis. The Experimental groups were given respective training for a period of 12 weeks. After twelve weeks of their training program again the subjects were tested on the same criterion variables as such in the pre-test and considered this as the post-test data for the analysis. Agility was assessed by shuttle run test and the unit of measure was in seconds, dribbling was assessed by Mcdonald soccer skill test and unit of measure was in seconds. Descriptive statistics such as mean and standard deviation are found in order to get the basic idea of the data distribution "t" test was done for finding whether there is any statistically significant pre-test to post-test mean differences in their respective variables of each groups. ANCOVA tests the significance of "adjusted post-test mean" differences between the experimental and control groups for each variable. Whenever the "F" ratio for adjusted post-test was found to be significant, Scheffee's post hoc test was applied to test the significant difference between the paired adjusted means.0.05 level of confidence was fixed for agility and dribbling to test the level of significance.

Table 1: Computation of 'T' Ratio on Agility of Experimental and Control Groups (Scores in seconds)

Groups	Pre - test mean	Post - test mean	't' ratio
Dynamic stretching Training Group	12.17	12.02	113.50*
Static stretching Training Group	12.18	12.12	38.50*
Control Group	12.17	12.18	1.38

* Significant at 0.05 level for the degrees of freedom 1 and 14, (2.15)

Table 1 shows that the 't' ratios on Agility of MBDSTG, MBSSTG and CG were 113.50, 38.50 and 1.38 respectively. Since, these values were higher than the required table value of 2.145, it was found to be statistically significant at 0.05 level of confidence for degrees of freedom 1 and 14. From the results it was inferred that, both the training protocols produced a significant improvement in agility among school football players and there was no significant improvement between the pre and post-test of CG

Table 2: Analysis Of Covariance on Pre, Post And Adjusted Post-test Means on Agility Of Experimental and Control Groups (Scores in Seconds)

Test	MBDST	MBSST	CG	Source of variance	Df	Sum of square	Mean square	F-ratio
Pre-test mean	12.17	12.80	12.17	B / S	2	0.001	0.001	.007
				W / S	42	0.112	0.003	
Post-test mean	12.02	12.12	12.80	B / S	2	0.183	0.91	33.93*
				W / S	42	0.113	0.003	
Adjusted post-test mean	12.02	12.12	12.18	B / S	2	0.182	0.091	3114.01*
				W / S	41	0.001	2.89	

* Significant at 0.05 level for the degrees of freedom (2, 42) and (2, 43), 3.21

Table 2 reveals the computation of 'F' ratios on pre-test, post-test and adjusted post-test means of MBDSTG, MBSSTG and CG on agility.

The obtained 'F' ratio for the pre-test means of MBDSTG, MBSSTG and CG on agility. was 0.007 Since, the 'F' value was less than the required table value of 3.21 for the degrees of freedom 2 and 42, it was found to be not significant at 0.05 level of confidence.

Further, the 'F' ratio for post-test means of DSTG, SSTG and CG on agility was 33.93 Since, the 'F' value was higher than the required table value of 3.21 for the degrees of freedom 2 and 42, hence it was found to be statistically significant at 0.05 level of confidence. The obtained 'F' ratio for the adjusted post-test means of MBDSTG, MBSSTG and CG on agility was 3114.01. Since, the 'F' value was higher than the required table value of 3.21 for the degrees of freedom 2 and 41, it was found to be statistically significant at 0.05 level of confidence.

The results revealed that there was a significant difference in post-test means among MBDSTG, MBSSTG and CG in agility among school football players.

Table 3: Scheffe's Post Hoc Test for the Differences Between the paired Adjusted Post-Test Means of Agility.

MBDSTG	MBSST	Control Group	Mean difference	Confidence Interval
12.02	12.12	-	0.16	0.28
12.02	-	12.18	0.06	
-	12.12	12.18	0.4	

* Significant at 0.05 level

Table 3 revealed that the mean differences between the paired adjusted post-test means of all groups.

The mean difference between MBDSTG and MBSSTG, MBDSTG and CG, MBSSTG and CG, were 0.16, 0.06 and 0.4 respectively. The values of mean difference of adjusted post-test means were higher than the required confidence interval value of 0.28 and it was found to be significant at 0.05 level of confidence. From these results, it was inferred that sixteen weeks of MBDSTG produced significant improvement in agility among school football players than MBSSTG and control

group. Mean values of pre, post and adjusted post-test of MBDSTG, MBSSTG and CG on agility are presented in Figure 1.

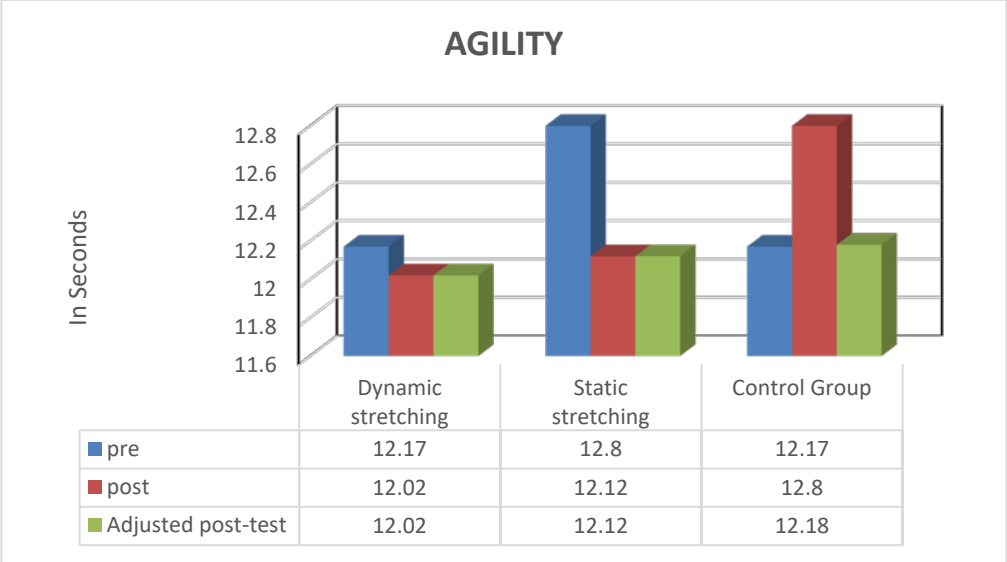

Fig 1: Bar Diagram Showing Pre, Post and Adjusted Post-test Means of Dynamic Stretching Training Group, Static Stretching Training Group and Control Group on Agility (Scores in Seconds)

Table 4: Computation of 'T' Ratio on Dribbling of Experimental and Control Groups (Scores in Seconds)

Groups	Pre - test mean	Post - test mean	't' ratio
Dynamic stretching Training Group	12.25	12.15	51.00*
Static stretching Training Group	12.26	12.21	38.50*
Control Group	12.25	12.25	0.71

* Significant at 0.05 level for the degrees of freedom 1 and 14, (2.15)

Table 4 shows that the 't' ratios on agility of MBDSTG, MBSSTG and CG were 51.00, 38.50 and 0.71 respectively. Since, these values were higher than the required table value of 2.145, it was found to be statistically significant at 0.05 level of confidence for degrees of freedom 1 and 14. From the results it was inferred that, both the training protocols produced a significant improvement in dribbling of school football players and there was no significant improvement between the pre and post-test of CG

Table 5: Analysis of Covariance on Pre, Post and Adjusted Post-test Means on Dribbling of Experimental and Control Groups (Scores in Seconds)

Test	MBDST	MBSST	CG	Source of variance	Df	Sum of square	Mean square	F-ratio
Pre-test mean	12.25	12.26	12.25	B / S	2	0.001	0.001	0.53
				W / S	42	0.030	0.001	
Post-test mean	12.15	12.21	12.25	B / S	44	0.084	0.042	55.75*
				W / S	2	0.032	0.001	
Adjusted post-test mean	12.15	12.20	12.25	B / S	2	0.081	0.041	586.39*
				W / S	41	0.003	6.92	

* Significant at 0.05 level for the degrees of freedom (2, 42) and (2, 43), 3.21

Table 5 reveals the computation of 'F' ratios on pre-test, post-test and adjusted post-test means of MBDSTG, MBSSTG and CG on dribbling.

The obtained 'F' ratio for the pre-test means of MBDSTG, MBSSTG and CG on dribbling. was 0.53 Since, the 'F' value was less than the required table value of 3.21 for the degrees of freedom 2 and 42, it was found to be not significant at 0.05 level of confidence.

Further, the 'F' ratio for post-test means of DSTG, SSTG and CG on dribbling was 55.75 Since, the 'F' value was higher than the required table value of 3.21 for the degrees of freedom 2 and 42, hence it was found to be statistically significant at 0.05 level of confidence.

The obtained 'F' ratio for the adjusted post-test means of MBDSTG, MBSSTG and CG on dribbling was 586.39. Since, the 'F' value was higher than the required table value of 3.21 for the degrees of freedom 2 and 41, it was found to be statistically significant at 0.05 level of confidence. The results revealed that there was a significant difference in post-test means among MBDSTG, MBSSTG and CG in agility of school football players.

Table 6: Scheffe's Post Hoc Test for the Differences Between THE paired Adjusted Post-Test Means of Dribbling

MBDSTG	MBSST	Control Group	Mean difference	Confidence Interval
12.15	12.20	-	0.05	0.35
12.15	-	12.25	0.01	
-	12.20	12.25	0.05	

* Significant at 0.05 level

Table 6 revealed that the mean differences between the paired adjusted post-test means of all groups. The mean difference between MBDSTG and MBSSTG, MBDSTG and CG, MBSSTG and CG, were 0.08, 0.16 and 0.12 respectively. The values of mean difference of adjusted post-test means were higher than the required confidence interval value of 0.35 and it was found to be significant at 0.05 level of confidence.

From these results, it was inferred that sixteen weeks of MBDSTG produced significant improvement in agility among school football players than MBSSTG and control group. Mean values of pre, post and adjusted post-test of MBDSTG, MBSSTG and CG on dribbling are presented in Figure 2.

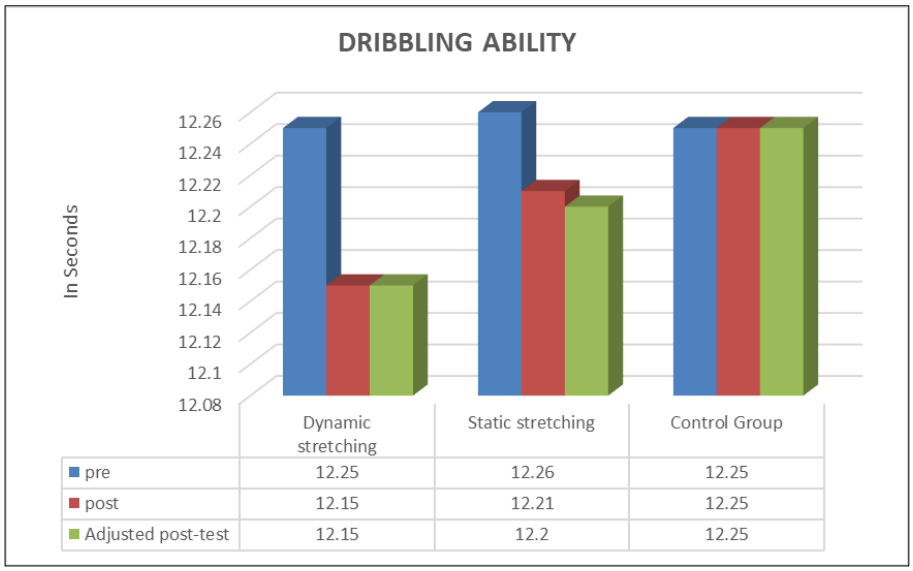

Fig 2: Bar Diagram Showing Pre, Post and Adjusted Post-test Means of Dynamic Stretching Training Group, Static Stretching Training Group and Control Group on Dribbling (Scores in Seconds)

Discussion on Findings

From the findings of this present study, it shows that all the Experimental groups improved physical and specific technical skill such as (Agility and dribbling) by finding significant differences in comparison from base line to post-test. Metabolic based dynamic stretching training shows better performance on selected variables such as agility and dribbling among school football players when compares to Metabolic based Static stretching training group and control group. Where as Metabolic based Static stretching training shows better performance on selected variables such as agility and dribbling among school football players when compares to control group.

According to the study Hammami, *et al*., (2025) [1] NMT but not ST or CG resulted in improved measures of physical fitness and mental well-being in highly-trained pubertal male soccer players. NMT performed during the warm-up is a safe and effective training method as it exerts positive effects on physical fitness and self-confidence as well as the coping of anxiety in highly-trained male pubertal soccer players. Hernandez-Martinez *et al*., (2023) [2] to related to other study compared to standard warm-up, stretching-based warm-up exerts no effect on male youth soccer players jump height, sprint speed and ball kicking speed. According to the study Debas, *et al*., (2020) [3] Aerobic exercise showed a positive effect on cardio respiratory fitness. Coaches of under-17 football project trainees are expected to have a regular schedule on health-related physical fitness components for improving the fitness of trainees. (ITALO *et al*.,2025) [5] Furthermore, it seems to induce a functional improvement in post-activation performance. According to the study Gelen, *et al*., (2012) [6] The results of this study indicate that dynamic and high-volume upper extremity plyometric WU activities are likely beneficial to serve speed of elite junior tennis players. According to the study Teklewold, A. A. (2023) [7] The study concludes that 12 weeks physical exercises training on speed, Agility and Power on Football players on U-17 Male Football project trainees: The case of in Bishoftu Town, Oromia Regional state, Ethiopia. The study recommends that to Coaches so as to Selected physical exercises training in their training program.

Conclusion

1. Within the limitations and on the basis of the findings, it was very clear that 12 weeks of metabolic based dynamic stretching training (MBDST) produces significant changes in the physical fitness variables and specific technical skills such as agility and dribbling among school Football players.
2. It was also very clear that twelve weeks of metabolic based static stretching training (MBSST) produced significant changes over physical fitness variables and specific technical skills such as agility and dribbling among school Football players.
3. Metabolic based Dynamic stretching training (MBDST) provided significant changes over physical fitness variables and specific technical skills such as agility and dribbling among school Football players when compared metabolic based static stretching training (MBSST).
4. It is concluded that the metabolic based sports specific training with stretching needed to be incorporated in the training protocol to enhance the overall performance of team sports.

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