African Journal of Biological Sciences

Research Paper Open Access

The Influence of Coordination Training and Leg Muscle Explosive Power Training on the Results of the 100M Run

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Article Info

Volume 6, Issue 8, April 2024
Received: 01 Feb 2024
Accepted: 02 March 2024
Published: 07 April 2024

ABSTRACT: Objective of the research to determine the effect of coordination of footsteps training (Running ABC and Ladder drills) and their interaction (coordination of high and low footsteps) on the results of a 100M run, through a 2x2 factorial design. As well as leg power training (plyometrics, maxex training, and resistance bands) and their interaction (High and low leg power) on 100M running results, through a 3x2 factorial design. The research location will be carried out at the Athletics Laboratory and Track (one of the Sports Science Faculties in Jakarta), throughout June-September 2023. Samples students who took athletics lectures. Test instruments; Test your footstep coordination ability using Smart Speed. Leg power test using a Force Plate. Each group will undergo 18 training meetings. The results of the 100M were obtained from measuring the 100M time using a digital stopwatch. Hypothesis testing uses statistical analysis of the Two Way ANOVA, followed by the Tukey test. The result of the study showed that Experimental Study I; Coordination of footsteps training has an effect on increasing the results of the 100M (sig 0,001<0.05). There is an interaction between coordination of footsteps*coordination of footsteps training (sig 0,000<0.05). This means that for sprinters (students) who have coordination of high footsteps both exercises are suitable for improving the results in the 100M. For sprinters (students) who have coordination of low footsteps, Running ABC is more suitable for improving 100M. Experimental Study II; Leg power training have an effect on increasing the results of the 100-meter run (sig 0,000<0.05). There is an interaction between Leg power*Leg power training (sig 0,011<0.05). For sprinters (students) who have high leg power, Maxex training is more suitable for improving results in the 100M. The fourth hypothesis, for sprinters (students) who have low leg power, Plyometric is more suitable for improving results in the 100M. It is hoped that this research can also be a reference in preparing and implementing athletic training and lectures (students) by teaching staff, trainers and athletic coaches out there.

Keywords: Running ABC, Ladder drills, Coordination of footsteps, Leg power, Plyometric, Maxex training, Resistance bands, 100M run

Introduction

Athletic activities or sports are the oldest sports in the world and are even called the Mother of Sports (Kurniawan et al., 2022). The types of athletics are divided into track and field, while running events are held on athletics tracks and roads (Bong-ju & Byoung-goo, 2017; Malik et al., 2022). Currently, more and more people are doing running activities, mainly to maintain a healthy lifestyle and participate in sports activities, so the various factors that exist are important information to continue to study in more depth (Gibson Taylor et al., 2020). One of the running numbers that is considered the most prestigious is running speed, especially the 100M run. Running speed is the product of stride length and stride frequency, therefore higher speeds can be achieved by increasing one or both (Rottier & Allen, 2021; Mattes et al., 2021). For this reason, sprinter training must aim to learn running movements, correct leg settings, body position and hand movements (Viktor et al., 2022). Beginner sprinter training should start with technical training, then physical fitness training, then move on to the need to maintain the sprinter's healthy body by maintaining a healthy diet, rest and other healthy lifestyle patterns (Maleniuk et al., 2020). The application of training programs for adolescent athletes is of course different from the training portion for adult athletes (Kemala et al., 2020). Special training programs for sprinters must be designed to improve performance, through appropriate technical training aimed at mastering motorbike qualities (Pavlenko & Pavlenko, 2020). Based on this, the main dimensions that a sprinter must train are technical ability and physical components.

The next important thing before preparing and implementing a training program for a sprinter, especially for beginners, is to pay attention to the characteristics of each sprinter. Having individual records relating to each sprinter's profile can provide important diagnostic information to help inform skills and guide performance enhancement and injury prevention training strategies (Harper et al., 2023). The performance of body movement mechanisms when running between elite athletes has its own differences, especially when compared between elite athletes, ordinary athletes and non-athletes (Li & Ma, 2020). There are differences between sprinters who have speed and those who don't, or elite and non-elite athletes, mainly in terms of technique (Rottier & Allen, 2021). The performance of several anatomically specific muscles differentiates between elite and sub-elite runners and is strongly related to sprint performance (Miller, 2021).

For this reason, it is important to test the effect of various forms of training based on the characteristics (differences in technique and/or physical components) of each sprinter, especially sprinters who are student athletes taking athletic courses (at the Faculty of Sports Science). Where the majority come from different backgrounds, namely non-athletes and/or athletes in other sports (with different physical abilities and motor activities). As far as the author knows, athletes (students) generally show technical errors in the form of errors in the mechanics of foot movement when running, which means they need to improve foot step coordination, many still tilt to the right or left (zig- zag), another error is when landing the position of the soles of the feet. Still pointing outwards and the push of the support leg when running is still over strides. This reference indicates that the performance of foot step coordination must be improved.In improving foot step coordination which is very important when sprinting, several research results recommend Running ABC (Athletic Basic Coordination) (Susiono & Hernawan, 2020; Sobarna et al., 2020; Setyantoko et al., 2019; Aristiyanto et al., 2021; Agari et al., 2019; Kosmalla et al., 2021; Ng et al., 2017). The next problem is that leg power is still very lacking. This reference indicates that leg power performance must be improved. As for leg power training, training generally uses several (three) training approaches, namely Maxex training (Bloomfield et al., 1994; Lubis, 2016; Krishnamoorthi, & Maniazhagu, 2018; Mohsen et al., 2022). Resistance band training runners (Sedano et al., 2013; Turban et al., 2014; Namkoong, 2017; Jafarnezhadgero et al., 2021; Colado et al., 2020; Le Scouarnec et al., 2022). Plyometric exercises (Berryman et al., 2010; Singh & Singh, 2013; Ramírez-Campillo, 2014; García-Pinillos, 2020; Patoz et al., 2021; Jaén-Carrillo et al., 2021; Šuc et al., 2022; Engeroff et al., 2023). In an effort to discover the application of training that is appropriate to the characteristics of each athlete (student), namely foot step coordination (low and high) and leg explosive power (low and high) when running the 100 meter run. So an experimental study in the form of a factorial design is proposed. The experimental study began

by knowing the effects of Running ABC and Ladder drills. Followed by a factorial design to determine the effect of Maxex training, Resistance band training runners, Plyometric exercises, by paying attention to the high and low explosive power of the athlete's legs (students). The results of our reading show that the research concept is still minimal and rarely proposed. It is hoped that this research can also be a reference in preparing and implementing athletic training and lectures (students) by teaching staff, trainers and athletic coaches out there

Methods

Study Type

This research uses a quantitative approach with an experimental type. The experimental research referred to in this research will be carried out in two experimental studies in the form of a factorial design. The first experimental study had an independent variable; Running ABC and Ladder drills. Moderator variables (attributes); Coordination of high footsteps and coordination of low footsteps. The dependent variable is the result of running 100 meters, through a 2x2 factorial design. The second experimental study has an independent variable; Plyometrics, Maxex training, and Resistance bands. Moderator variables (attributes); High leg power and low leg power. The dependent variable is the result of the 100 meter run, through a 3x2 factorial design.

Subjects

The population in this research is students (one of the Sports Science Faculties in Jakarta) who took 180 athletics lectures from various majors. The sample was selected using a random sampling method. In the first experimental study, 40 students were randomly selected and divided into two training groups, 20 students took part in Running ABC and 20 others took part in Ladder drills. Before undergoing training, each training group (20 students) will undergo a footstep coordination test to obtain 10 students who have high footstep coordination and 10 students who have low footstep coordination. In the second experimental study, 60 students who had been randomly selected were then divided into three exercise groups, 20 students took part in Plyometrics, 20 students took part in Maxex training, and 20 others took part in Resistance band. Before undergoing training, each training group (20 students) will undergo a leg power test to obtain 10 students who have high leg power and 10 students who have low leg power. The research location will be carried out at the Athletics Laboratory and Track (one of the Sports Science Faculties in Jakarta), throughout June-September 2023

Tests and Procedures

Test instruments; Test your footstep coordination ability using Smart Speed (see figure 1). Leg power test using a Force Plate (see figure 2). The results of the 100 meter run were obtained from measuring the 100 meter running time using a digital stopwatch (see figure 3). Each group will undergo 18 training meetings (Micro 1 (Day one, Day two, Day three) volume: 80%-90%, intensity: 40%-60%, Repetition: 3 set x 10 rep. Micro 2 (Day one, Day two, Day three) volume: 80%-90%, intensity: 50%-70%, Repetition: 3 set x 10 rep. Micro 3 (Day one, Day two, Day three) volume: 70%-80%, intensity: 60%-80%, Repetition: 2 set x 6 rep. Micro 4 (Day one, Day two, Day three) volume: 60%-70%, intensity: 70%-90%, Repetition: 2 set x 6 rep. Micro 5 (Day one, Day two, Day three) volume: 60%-70%, intensity: 70%-90%, Repetition: 2 set x 6 rep. Micro 6 (Day one, Day two, Day three) volume: 40%-50%, intensity: 80%-90%, Repetition: 1 set x 6 rep).

Figure 1. Implementation of the Smart Speed test and equipment

Figure 2. Implementation of the Force Plate test and equipment

Figure 3. Implementation of the 100M run test

Statistical Analysis

The data analysis technique used begins with a statistical assumption test including a normality test (using the Kolmogorov-Smirnov Test) of data and a homogeneity test (using the Levene statistic). Hypothesis testing uses statistical analysis of the Factorial ANOVA (Two Way ANOVA), followed by the Tukey test. All data analysis will use SPSS 26.

Results and Discussion

Descriptive analysis results

The descriptive data obtained in this research begins with the results of descriptive analysis of moderator variables (attributes) through coordination of footstepstest using Smart Speed and leg power test using a Force Plate, in table 1 below:

Table 1. Results of descriptive analysis of Moderator Variables (attributes)

Moderator Variables (attributes)	N	Mean	Median	Std. Deviation	Minimum	Maximum	Range	Skewness
Coordination of footsteps (Coordination x/30 sec)	40	13,40	13,00	1,297	11	16	5	0,009
Leg power (Jump Ht.cm)	60	42,432	42,200	6,1316	30,6	58,5	27,9	0,387

Based on table 1, the data shows that for 40 samples the moderator variable (attribute) coordination of footsteps has a mean value13,40; median 13,00; std 1,297; minimum 11; maximum 16; range 5; skewness 0,009. As for leg power for 60 samples has a mean value 42,432; median 42,200; std 6,1316; minimum 30,6; maximum 58,5; range 27,9; skewness 0,387. Furthermore, Data from posttest descriptive analysis results for experimental study I in table 2, as follows:

Table 2. Posttest descriptive analysis results of Experimental Study I

Moderate	Independent	Mean	Std. Deviation	N
Coordination of high footsteps	Running ABC	13.3260	0.46739	10
	Ladder Drills	13.2530	0.56077	10
	Total	13.2895	0.50382	20
Coordination of low footsteps	Running ABC	13.0350	0.47432	10
	Ladder Drills	14.2440	0.48667	10
	Total	13.6395	0.77680	20
Total	Running ABC	13.1805	0.48201	20
	Ladder Drills	13.7485	0.72083	20
	Total	13.4645	0.67011	40

Based on table 2, it shows that the posttest data for the Running ABC group (Coordination of high footsteps) for 10 samples has a mean value 13.3260 and std 0.46739. Running ABC group posttest data (Coordination of low footsteps) for 10 samples has a mean value 13.0350 and std 0.47432. Data Ladder drills group posttest (Coordination of high footsteps) for 10 samples has a mean value 13.2530 and std 0.56077. As for data Ladder drills group posttest (Coordination of low footsteps) for 10 samples has a mean value 14.2440 and std 0.48667. The total of the coordination of high footsteps categories for both training groups is 20 sampleshas a mean value 13.2895 and std 0.50382. As forcategoriesin Coordination of low footsteps on 20 samples has a mean value 13.6395 and std 0.77680. Thus, total Running ABC on 20 samples has a mean value 13.1805 and 0.48201. As for Ladder drills on 20 samples has a mean value 13.7485 and 0.72083. So, the total is for 40 samples has a mean value 13.4645 and 0.67011. Furthermore, data from descriptive analysis of the dependent variable, which is the results of the 100 meter run for Experimental Study II in table 3 below:

Table 3. Posttest descriptive analysis results of Experimental Study II

Moderate	Independent	Mean	Std. Deviation	N
High leg power	Plyometrics	13.5030	0.34836	10
	Maxex training	13.2190	0.30686	10
	Resistance bands	13.8290	0.31211	10
	Total	13.5170	0.40171	30
Low leg power	Plyometrics	13.0770	0.20271	10
	Maxex training	13.3540	0.31035	10
	Resistance bands	13.6680	0.18713	10
	Total	13.3663	0.33736	30
Total	Plyometrics	13.2900	0.35314	20

	Maxex training	13.2865	0.30826	20
	Resistance bands	13.7485	0.26372	20
	Total	13.4417	0.37554	60

Normality Test Results

Based on table 3, it shows that data Plyometric training group posttest (High leg power) for 10 samples has a mean value 13.5030 and std 0.34836. Data Plyometric training group posttest (Low leg power) for 10 samples has a mean value 13.0770 and std 0.20271. Data Maxex training group posttest (High leg power) for 10 samples has a mean value 13.2190 and std 0.30686. Data Maxex training group posttest (Low leg power) for 10 samples has a mean value 13.3540 and std 0.31035. Data Resistance band group posttest (High leg power) for 10 samples has a mean value 13.8290 and std 0.31211. As for data Resistance band group posttest (Low leg power) for 10 samples has a mean value 13.7485 and std 0.26372. Overall total of the High leg power category for the three training groups in 30 sampleshas a mean value 13.5170 and std 0.40171. As forcategory in Low leg power on 30 samples has a mean value 13.3663 and std 0.33736. So total Plyometric training on 20 samples has a mean value 13.2900 and 0.35314. Maxex training on 20 samples has a mean value 13.2865 and 0.30826. As for Resistance bands on 20 samples has a mean value 13.7485 and 0.26372. So the total is for 60 samples has a mean value 13.4417 and 0.37554. Next, the prerequisite test is the normality test for Experimental Study I, using the Kormogrov-Smirnov Z test (Significance greater than the α value of 0.05), in table 4.

Table 4. Normality Test Results Experimental Study I

Practice Groups	Kolmogorov-Smirnov		
	Statistics	Df	Sig.
Posttest Running ABC group (Coordination of high footsteps)	0.186	10	0.200*
Posttest Running ABC group (Coordination of low footsteps)	0.188	10	0.200*
Ladder Drills group posttest (Coordination of high footsteps)	0.138	10	0.200*
Ladder Drills group posttest (Coordination of low footsteps)	0.120	10	0.200*

Based on table 4, it shows that the Posttest of the Running ABC group (Coordination of high footsteps) has significance value 0.200* > α 0.05. Posttest Running ABC group (Coordination of low footsteps) has significance value 0.200* > α 0.05. Ladder Drills group posttest (Coordination of high footsteps) has significance value 0.200* > α 0.05. Ladder Drills group posttest (Coordination of low footsteps) has significance value 0.200* > α 0.05. Thus, the entire training group for Experimental Study I was normally distributed. Next, the prerequisite test is the normality test for Experimental Study II, in table 5.

Table 5. Normality Test Results Experimental Study II

Practice Groups	Kolmogorov-Smirnov		
	Statistics	Df	Sig.
Plyometric training group posttest (High leg power)	0.176	10	0.200*
Plyometric training group posttest (Low leg power)	0.250	10	0.075
Maxex training group posttest (High leg power)	0.191	10	0.200*
Maxex training group posttest (Low leg power)	0.186	10	0.200*
Resistance band group posttest (High leg power)	0.126	10	0.200*
Resistance band group posttest (Low leg power)	0.220	10	0.188

Based on table 5, it shows that the posttest of the Plyometric training group (High leg power) has significance value 0.200* > α 0.05. Plyometric training group posttest (Low leg power) has significance value 0.075 > α 0.05. Maxex training group posttest (High leg power) has significance value 0.200* > α 0.05. Maxex training group posttest (Low leg power) has significance value 0.200* > α 0.05. Resistance band group posttest (High leg power) has significance value 0.200* > α 0.05. The posttest for the

Resistance band group (Low leg power) has significance value 0.188 > α 0.05. Thus, the entire training group for Experimental Study II was normally distributed.

Homogeneity Test Results

The prerequisite test in the form of a homogeneity test is to test the equality of variance between training groups using levene statistics (Significance greater than the α value of 0.05), in table 6.

Table 6. Homogeneity Test Results Experimental Study I

Practice Groups	levene statistics	Dfl	dfl2	Sig
(1) Groups Running ABC (Coordination of high footsteps), (2) ABC Running Group (Coordination of low footsteps), (3) Pretest group Ladder Drills group (Coordination of high footsteps), (4) Pretest group Ladder Drills group (Coordination of low footsteps)	0.383	3	36	0.766

Based on table 6, it shows that Homogeneity Test Results Experimental Study I have significant value 0.766 > α 0.05. It can be concluded that the data variance is the same or homogeneous. Homogeneity Test Results Experimental Study II, in table 7.

Table 7. Homogeneity Test Results Experimental Study II

Practice Groups	levene statistics	Dfl	dfl2	Sig
(1) Groups Plyometric training (High leg power), (2) Plyometric training group (Low leg power), (3) Maxex training group (High leg power), (4) Maxex training group (Low leg power), (5) Resistance band group (High leg power), (6) Resistance band group (Low leg power).	2,247	5	54	0.063

Based on table 7, it shows that Homogeneity Test Experimental Study I has a significant value 0.063 > α 0.05. It can be concluded that the data variance is the same or homogeneous. Hypothesis Test Results Experimental Study I, in table 8.

Hypothesis Test Results

Table 8. Hypothesis Test Results Experimental Study I

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	8,560a	3	2,853	11,474	,000
Intercept	7251,710	1	7251,710	29159,964	,000
Coordination of footsteps	1,225	1	1,225	4,926	,033
Running ABCs and Ladder Drills	3,226	1	3,226	12,973	,001
Coordination of footsteps*Running ABC and Ladder Drills	4,109	1	4,109	16,522	,000
Error	8,953	36	,249		
Total	7269,223	40			
Corrected Total	17,513	39			

Based on table 8, it shows that the results of the Factorial ANOVA (Two Way ANOVA) analysis for Experimental Study I. It can be concluded that the first hypothesis, as a whole (Running ABC and Ladder drills) has an effect on increasing the results of the 100 meter run, marked by a smaller significance value of 0,001 < 0.05. The second hypothesis, there is an interaction between Coordination of

footsteps*Running ABC and Ladder Drills, marked with a significance value smaller than 0,000 < 0.05. The conclusion of this second hypothesis is also strengthened in Figure 4 (histogram estimated marginal means Experimental Study I) which shows a sign of a cross between training (Running ABC and Ladder Drills) andCoordination of footsteps.

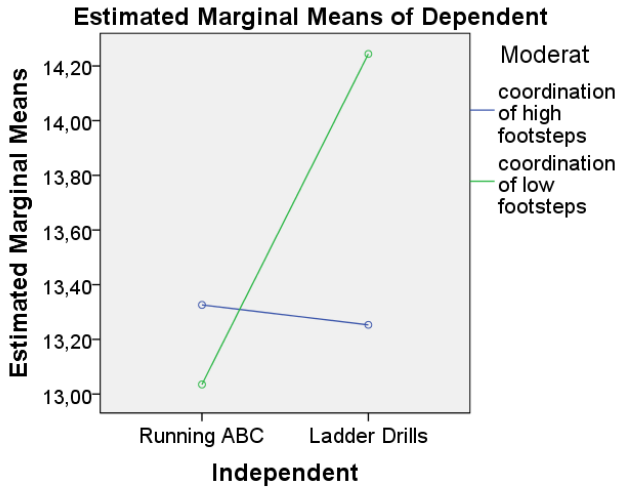

Figure 4. Histogram of estimated marginal means Experimental Study I

To determine the differences in influence between groups in Experimental Study I, use the Tukey Test, in table 9.

Table 9. Further test using the Tukey Test for Experimental Study I

(I) PH	(J) PH	Mean Difference (IJ)	Sig.
Running ABC*Coordination of high footsteps	Ladder Drills*Coordination of high footsteps	,0730	,988
Ladder Drills*Coordination of low footsteps	Running ABC*Coordination of low footsteps	1.2090*	,000

The third hypothesis, for sprinters (students) who have coordination of high footsteps There is no significant difference between Ladder Drills and Running ABC, as evidenced by the sig value of 0.988 > 0.05. Also on valueMean Difference (IJ) is 0.0730. This means that for sprinters (students) who havecoordination of high footstepsboth exercises are suitable for improving the results in the 100 meter run.

The fourth hypothesis, for sprinters (students) who have coordination of low footsteps, Running ABC is significantly better than Ladder drills, proven by a sig value of 0.000 < 0.05. Also on value Mean Difference (IJ) is 1.2090*. This means that for sprinters (students) who have coordination of low footsteps, Running ABC is more suitable for improving 100 meter running results compared to Ladder drills. Next Hypothesis Test Results Experimental Study II, in table 10.

Table 10. Hypothesis Test Results Experimental Study II

Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Corrected Model	3,953a	5	,791	9,773	,000
Intercept	10840,704	1	10840,704	134013,558	,000
Leg power	,341	1	,341	4,209	,045

Plyometric training, Maxex training and Resistance bands	2,825	2	1,412	17,458	,000
Leg power*Plyometric training, Maxex training and Resistance bands	,788	2	,394	4,868	,011
Error	4,368	54	,081		
Total	10849.025	60			
Corrected Total	8,321	59			

Based on table 9, it shows that the results of the Factorial ANOVA (Two Way ANOVA) analysis for Experimental Study II. It can be concluded that the first hypothesis, as a whole (Plyometric training, Maxex training and Resistance band) has an effect on increasing the results of the 100 meter run, marked by a smaller significance value of 0,000 < 0.05. The second hypothesis, there is an interaction between Leg power*Plyometric training, Maxex training and Resistance bands, are marked with a smaller significance value of 0,011 < 0.05. The conclusion of this second hypothesis is also strengthened in Figure 5 (histogram estimated marginal means Experimental Study II) which shows a sign of a cross between training (Plyometric training and Maxex training) andLeg power.

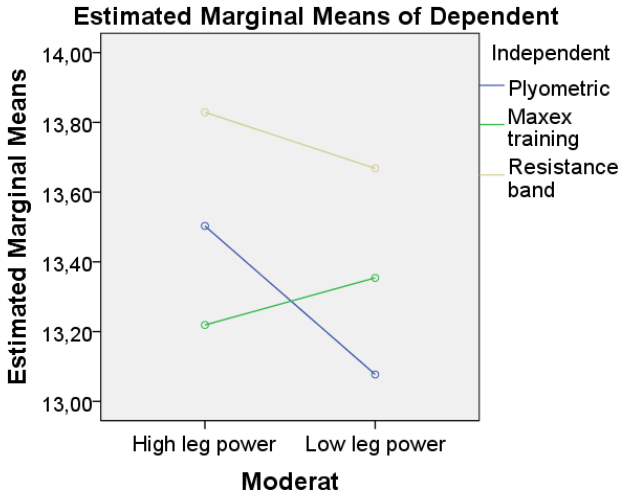

Figure 5. Histogram of estimated marginal means Experimental Study II

To determine the differences in influence between groups in Experimental Study II, use the Tukey Test, in table 11.

Table 11. Further test using the Tukey Test for Experimental Study II

(I) PH	(J) PH	Mean Difference (IJ)	Sig.
Maxex training*High leg power	Plyometric training*High leg power	-,2840	,240
	Resistance bands*High leg power	-,6100*	,000
Plyometric training*Low leg power	Maxex training*Low leg power	-,2770	,265
	Resistance bands*Low leg power	-,5910*	,000
Resistance bands*High leg power	Plyometric training*High leg power	,3260	,124
	Maxex training*High leg power	.6100*	,000
Resistance bands*Low leg power	Plyometric training*Low leg power	.5910*	,000
	Maxex training*Low leg power	,3140	,152

The third hypothesis, for sprinters (students) who havehigh leg power, Maxex training is significantly better than resistance bands, proven by a sig value of 0.000 < 0.05. Also on value Mean Difference (IJ) is -0.6100*. There is no significant difference between Maxex training and Plyometric training, as evidenced

by the sig value of 0.240 > 0.05. But Maxex training still better compared to Plyometric training, proven by grades Mean Difference (IJ) is -0.2840. It is also understood that for sprinters (students) who have high leg power, Resistance bands and Plyometric training do not have a significant difference, as evidenced by the sig value of 0.124 > 0.05. As for Resistance bands is not better than Plyometric training, proven by grades Mean Difference (IJ) is 0.3260. This means that for sprinters (students) who have high leg power Maxex training is more suitable for improving results in the 100 meter run, compared to Plyometric training and Resistance bands.

The fourth hypothesis, for sprinters (students) who have low leg power, Plyometric training is significantly better than resistance bands, proven by a sig value of 0.000 < 0.05. Also on value Mean Difference (IJ) is -0.5910*. Plyometric training compared to Maxex training does not have a significant difference, as evidenced by the sig value of 0.240 > 0.05. However Plyometric training still better compared to Maxex training, proven by value Mean Difference (IJ) is -0.2770. It is also understood that for sprinters (students) who have low leg power, Resistance bands and Maxex training do not have a significant difference, as evidenced by the sig value of 0.152 > 0.05. As for Resistance bands is no better than Maxex training, proven by value Mean Difference (IJ) is 0.3140. This means that for sprinters (students) who have low leg power, Plyometric training is more suitable for improving results in the 100 meter run, compared to Maxex training and resistance bands.

Results of Experimental Study I

The first hypothesis, as a whole (Running ABC and Ladder drills) has an effect on increasing the results of the 100 meter run. The results of our research are in line with the findings that increasing understanding of the basic movements of Running ABC which are good, efficient, harmonious, is able to correct basic movement errors that students often make when running (Susiono & Hernawan, 2020). Learning through ABC Run training has a significant influence compared to learning without ABC Run training on fast running ability (Sobarna et al., 2020). Testing 30 meter speed parameters involving 40 athletes aged 6-12 years, it can be concluded that the ABC running training model (developed) is effective for increasing 30 meter running speed (Setyantoko et al., 2019). Ladder drills have the advantage of increasing the ability to change body position quickly and efficiently while maintaining control of speed and direction (agility) (Kosmalla et al., 2021). Apart from that, this exercise also improves dynamic balance abilities (Ng et al., 2017). Both are part of the components in coordination of footsteps. Ladder drills can be used to guide improvements in footsteps, especially in sports that have basic movements such as sprinting and shuffling (Scoles et al., 2023). The use of ladder drills (based on virtual reality) can improve footstep coordination (Resch, 2023). We also did not find research results that contradicted this.

The second hypothesis, there is an interaction between coordination of footsteps*Running ABC and Ladder drills. We have not found research that is identical and relevant to our findings. However, what is certain is that both (Running ABC and Ladder drills) have an effect on the results of the 100M run. On the other hand coordination of footsteps is related to the runner's step frequency (Furukawa et al., 2023). This could be a sign of an interaction effect between coordination of footsteps*Running ABC and Ladder Drills against 100M results. In the future, this segmentation could be used as the focus of research studies.

The third hypothesis, for sprinters (students) who have coordination of high footsteps there is no significant difference between Ladder drills and Running ABC. This means that for sprinters (students) who have coordination of high footsteps both exercises are suitable for improving the results in the 100 meter run. The fourth hypothesis, for sprinters (students) who have coordination of low footsteps, Running ABC is significantly better than Ladder drills. This means that for sprinters (students) who have coordination of low footsteps, Running ABC is more suitable for improving 100 meter running results compared to Ladder drills. We have not found research results that are identical and relevant to the findings of the third and fourth hypotheses. However, for sprinters (students) who have coordination of low footsteps, or can be said to be very novice and/or very beginner with running speed activities. It is very suitable for ABC Running training, considering that experts say that when introducing athletics,

running should primarily be introduced Running ABC (Susiono & Hernawan, 2020; Sobarna et al., 2020; Setyantoko et al., 2019; Aristiyanto et al., 2021; Agari et al., 2019).

Results of Experimental Study II

The first hypothesis, as a whole (Plyometric training, Maxex training and Resistance band) has an effect on improving the results of the 100M run. Our findings are in line with several relevant research results. Maxex training contributes to the development of explosive skills related to the nervous and muscular systems (soccer player skills) (Mohsen et al., 2022). Resistance band training improves the strength endurance performance of trained (elite) runners (Sedano, et al., 2013). Plyometric training is effective for improving running results, because this training causes a decrease in the energy cost of running (Berryman et al., 2010). Plyometric training can effectively help a sprinter's performance (Singh & Singh, 2013). We also did not find research results that contradicted this.

The second hypothesis, there is an interaction between Leg power*Plyometric training, Maxex training and Resistance bands. We also have not found research that is identical and relevant to our findings, namely the interaction between Leg power*Plyometric training, Maxex training and Resistance bands. However, what is certain is that the three (Plyometric training, Maxex training and Resistance band) have an effect on the results of the 100M run. On the other hand Leg power is related on 100M running results. There is an influence between leg muscle strength, leg muscle explosive power, and both simultaneously on 100 m running performance for runners (students) (Paturusi, 2023). Established a relationship between leg strength, joint stiffness and limb stiffness in a range of running speeds (Jin & Hahn, 2022). This could be a sign of an interaction effect between Leg power*Plyometric training, Maxex training and Resistance band on 100M running results. In the future, this segmentation could be used as the focus of research studies.

The third hypothesis, for sprinters (students) who have high leg power, Maxex training is significantly better than Resistance bands, while Maxex training compared to Plyometric training does not have a significant difference, but Maxex training still better compared to Plyometric training. This means that for sprinters (students) who have high leg power Maxex training is more suitable for improving results in the 100M run, compared to Plyometric training and Resistance bands. We have not found research results that are identical and relevant to our findings. A possible initial identification can be put forward that the sprinter (student) has high leg power, Maxex training is significantly better than other exercises. That by Bompa (2005), Maxex training consists of a combination of high resistance training followed by fast explosive actions. This new method, which combines maximum strength with training for explosive power means maxex training (Krishnamoorthi & Maniazhagu, 2018). The presence of elements of complexity and combination of exercises can be used as a marker that this exercise is relevant for sprinters (students) high leg power.

Like Maxex training with elements of complexity and combination of exercises. We also found research results regarding the success of Resistance band training which has been proven to increase the strength endurance performance of trained (elite) runners (Sedano et al., 2013). For this reason, it can be an initial reference, the fourth hypothesis, for sprinters (students) who havelow leg power, Plyometric training is significantly better than Resistance bands, while Plyometric training compared to Maxex training does not have a significant difference, but Plyometric training still better compared to Maxex training. This means that for sprinters (students) who have low leg power, Plyometric training is more suitable for improving results in the 100 meter run, compared to Maxex training and Resistance bands

Conclusion

Results of Experimental Study I; The first hypothesis, as a whole (Running ABC and Ladder drills) has an effect on increasing the results of the 100M run. The second hypothesis, there is an interaction between Coordination of footsteps*Running ABC and Ladder Drills. The third hypothesis, for sprinters (students) who have the coordination of high footsteps, there is no significant difference between Ladder drills and Running ABC. The fourth hypothesis, for sprinters (students) who have low footsteps coordination, Running ABC is significantly better than Ladder drills.

Results of Experimental Study II; The first hypothesis, as a whole (Plyometric training, Maxex training and Resistance band) has an effect on improving the results of the 100 meter run. The second hypothesis, there is an interaction between Leg power*Plyometric training, Maxex training and Resistance band. The third hypothesis, for sprinters (students) who have high leg power, Maxex training is significantly better than Resistance bands, while Plyometric training does not have a significant difference, but Maxex training is still better. The fourth hypothesis, for sprinters (students) who have low leg power, Plyometric training is significantly better than Resistance bands, while Plyometric training compared to Maxex training does not have a significant difference, but Plyometric training is still better than Maxex training.

Limitations of the Study

Our study is susceptible to specific constraints that might restrict the broad applicability of the findings. Of course, this paper requires many improvements, one of which is significant is the lack of resources in finding and comparing research results that are relevant and identical to our findings. Apart from that, we also predict that there are still many exercises that are suitable to improve the performance of a sprinter's foot step coordination and leg power, however the various training that we propose are forms of training that are generally used in research environment conditions (campuses and athletic clubs). Based on that it is suggested that the future reaearch involving more significance, relevance and various variables in order to add more power on the research result and the conclusion of the relevance theme.

Disclosure Statement

The authors declare that they have no competing interests.

Acknowledgments

The author would like to convey gratitude to the participants involved in this study, espeslcially the promotor Prof. DR. Firmansyah Dlis, M.Pd and Co-Promotor Prof. Dr. Johansyah Lubis, M.Pd. and Physical Education Study Program of University Islam 45 Bekasi. Special thanks to RISTEKDIKTI and LPPM Jakarta State University for funding this work with a contract number: 138/E5/PG.02.00.PL/VI/2023

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