Sports University of Tirana
Faculty of Movement Sciences

SUMMARY OF
DISSERTATION

Impact of biomechanical parameters on speed training for young players

Field of Study

Sport Science

MSc Arjan Hyka (Kand. Dr)

Supervisor: Prof. Dr Agron Cuka

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Abstract

The aim of this study is to monitor and improve the technique (number of steps) and speed of running through a 12 week training program for young players in the city of Elbasan. The 12-week of training intervention was carried out with the main focus on biomechanical running parameters and mainly on the densities of the steps during the training sessions. The participants in this study were 28 younger players 15.1 ± 0.3 years (control group and intrusion group). The speed time and number of steps (50m sprint) was evaluated during the sprint test (50m) and also the anthropometric parameters (weight, height, body fat in percentage) were measured at both study times (first T1 measurements and T2 second measurements). Skin thickness measurements were used to estimate the percentage of the body fat of the child. The triceps and the subcapular thickness were measured at the nearest 0.1mm using a dummy on the right side of the body (Harpenden Skinfold Caliper, Baty International RH15 9 LR). To predict the percentage of body fat the equation described by Slaughter et al. (1988) is used. The analysis between groups for speed test (50m) show that there is a significant difference (p= 0.03) between the improvement of intervention with control group in favor of the improvement of the intervention group. Data from the analysis on this research study by groups show that there is an improvement in mean values for step counts from T1 to T2 as follows; for control group by 1.3 steps (SD 0.8 seconds; t= 4 p=0.01) while for intervention group there is an improvement also by 2.8 steps (SD 1.1 steps; t= 5.7 p=0.005). Finally, statistical analysis show a significant difference in improvements (T1 to T2) between groups for the number of steps (p= 0.03) in favor of the improvement of the intervention group. Training of athletes needs to continue progressively and carefully, it requires ample time and respect for the fundamental stages since childhood.

Keywords; youth, training, intervention, steps

Introduction

Training on speed and fitness not only increases sportiness but also increases confidence in a child. The result is that they are more likely to enjoy sports participation. Sports participation promotes an assessment of coaching, self-assessment and interaction in a team environment. Training speed and recruitment training improves acceleration, slowdown, response time and coordination. It is also important for improving foot speed, speed changes and directional change. Each of these skills enhances sports performance. Athletics is the secret to being constantly improved in a sport. Building a solid foundation of athletic skills and motor skills enables the child to develop the special sports skills in a balanced and healthy way. Once the child creates a foundation, they can enjoy their physical activity and progress in their sport as much as they choose.

Every sports discipline involves physical and mobile actions that are accomplished at a certain speed (specific speed) and the race is won by athletes running or performing faster technical actions. Studies by Gil et al., (2007) and Gravina et al., (2008) revealed that for different playing positions there are specific physiological demands and anthropometrical prerequisites.

Several studies have investigated the association between strength and sprint performances, showing that stronger athletes perform better during sprint performances (Baker and Nance 1999; Comform et al., 2012).

Although various aspects of training can be improved through appropriate training, research has suggested that there may be optimal periods for a player's growth and development when it is most appropriate to apply them. It is possible that if these attributes are not placed in the right importance, a player can not understand his full potential.

Training of athletes should continue progressively and carefully: it requires ample time and respect for the fundamental stages from childhood. In fact, combustion of the self-awareness of young athletes to achieve early results has often led to negative consequences for athletes and their careers. It has already been agreed that the growth period is considered delicate and very important in the preparation of a sportsman . In all sports disciplines, speed is displayed actively and specifically during the description of movements of shifting athletes in short, space and time. Every sports discipline involves physical and mobile actions that are accomplished at a certain speed (specific speed) and the race is won by athletes running or performing faster technical actions. Speed is a specific fitness that is nurtured and perfected in training conditions and especially in the race. Speed is not a matter of fate, gift or genetic gift, but a physical skill that takes place in exercise (Segreve 1996). In interaction and explosive strength, speed plays an important role in acyclic athletic types, especially in the realization of the basic phases of the technique.

Speed capability is particularly noticeable in speeding. It is directly dependent on the primary influence of two important components, which have a certain performance from one age to the other, namely: the size of the steps and the degree of the steps.

Although various aspects of speed training can be improved through appropriate training, research has suggested that there may be optimal periods for a player's growth and development when it is most appropriate to apply them. Among the different physical qualities needed are the ability to perform straight-line sprint and positive and negative acceleration with rapid changes of directions, often referred to as agility (Muijka et al., 2009). Previous studies have shown a difference in running speed between high- level and the non-elite youth players in those qualities (Mujika et al., 2009; Malina et al., 2007; Gissis et al., 2006), and sprint performance has been reported to be among the most important variables in predicting player selection (Vescovi, 2012; Gil et al., 2007).

It is possible that if these attributes are not placed in the right importance, a player can not understand his full potential. Performance in a soccer match depends on a variety of factors such as skills, tactics, and players' physiological, physical and mental capacities (Stolen et al., 2005). Sprint actions only constitute 11% of the total distance covered during a match, they represent crucial parts of the game, directly contributing to possession of the ball, making assists and passes or scoring a goal (Reilly et al., 2000).

The aim of this article was to monitor and improve the technique and speed of running through a 12-hour training program for young players in the city of Elbasan.

Methods

The aim of this article is to monitor and improve the technique and speed of running through a 12-hour training program for young players in the city of Elbasan. The 12-hour training intervention was conducted with the main focus on biomechanical running parameters and mainly on the densities of steps during training sessions. For this purpose, it was randomly selected a football association of young ages from the associations that conduct coaching in the city of Elbasan and the selection of teams within the association was made randomly

The participants in this study were 28 young players (control group and intruder group). The age of the participants was 15.1 ± 0.3 years. The speed time (50m sprint) was evaluated during the sprint test and also anthropometric parameters (weight, height, body fat in percentage) were measured at both study times (first T1 measurements and T2 second measurements). Body height and body weight were measured using a 402 KL Health O Meter scales. The values were recorded at 0.1 cm closest and 100 g respectively. The body mass index is calculated using the usual formula; BMI = body mass (kg) / body height (m 2).

Skin thickness measurements were used to assess the percentage of the body fat of the children. Triceps and scapular thickness were measured in the nearest 0.1mm using a dagger on the right side of the body (Harpenden Skinfold Caliper; Baty International RH15 9LR .Angli). All skin folds are taken three times by the same examiner to ensure consistency in the results with the average of the three values used as the final value. To predict the percentage of body fat the equation described by Slaughter et al. (1988) is used.

Intervention Program (Program protocol)

On some details of the training plan used during the training at the football team "Pepa" Elbasan, during November 2015 - February 2016. This training (addition to team training sessions) consists in interfering with biomechanical running parameters and mainly in the densities of the steps. The intervention in this scientific paper was directed at increasing the rhythm and frequency of the steps during the special running exercises. Mainly through the exercise protocol we focused at the end of the training session. The team we worked with was in football, so we did not get to the part of the various technical elements of football, but the focus was on the technique of running. For about 12 weeks it was worked through a specialized training by interfering with increasing the frequency of motion actions.

Statistical analysis

Descriptive statistics (mean and standard deviation) were calculated for the variables estimated in this study. A specific database was created in the excel file (first T1 measurement results and after T2 intervention) and then converted to the SPSS database. All variables evaluated in this study were tested for normality and ANOVA test for T2 and T1 comparison of variables measured in this study. Values $p \leq 0.05$ was considered statistically significant. All analyzes were performed using the SPSS 17 statistical system.

Results

Data on table 1 show descriptive statistics for mean and standard deviation values for body height and body weight for both groups participated in the study. Data show for T1 measurement mean values of body weight on control group 46. 2kg (7.4 kg) and for intervention group 45.6 kg (5.9 kg) where for control group the minimal and maximal values are 32.5 kg and 59 kg while for intervention group the minimal and maximal values are 33 kg and 53.5 kg. Values for T2 measurement are as follows: body weight on control group 51.6 kg (13.9 kg) and for intervention group 51.7 kg (12.2 kg) where for control group the minimal and maximal values are 32.3 kg and 68.8 kg while for intervention group the minimal and maximal values are 43.8 kg and 69.6 kg.

Data show for T1 measurement mean values of body height on control group 158cm (10 cm) and for intervention group 157.6 cm (4.5 cm) where for control group the minimal and maximal values are 138 cm and 178 cm while for intervention group the minimal and maximal values are 147 cm and 161.5.

Values for T2 measurement are as follows: body height on control group 162.7 cm (11.5 cm) and for intervention group 164.5 cm (14.8 cm) where for control group the minimal and maximal values are 142cm and 172.5 cm while for intervention group the minimal and maximal values are 163.5 cm and 165.6 cm.

Table 1 Descriptive statistics for body height, weight for control and intervention groups

Group		Minimum	Maximum	Mean	Std. Deviation
	Weight kg T1	32.5	59.0	46.238	7.4507
	Weight kg T2	32.3	68.8	51.650	13.9375
Control	Height cm T1	138.0	175.0	158.092	10.0570
	Height cm T2	142.0	172.5	162.667	11.5138
	Weight kg T1	33.0	53.5	45.600	5.9791
	Weight kg T2	43.8	69.6	51.725	12.2058
Intervention	Height cm T1	147.0	161.5	157.633	4.5398
	Height cm T2	163.5	165.6	164.550	1.4849

Descriptive statistics for BMI, body fat, speed and count steps for 50 m are shown in table 2 for both groups of participants. Mean values for control group on T1 : BMI 18.2 kg/m2 (SD 1.8, min 15.5 and max 21.5 kg/m2) and T2: BMI 19.1 kg/m2 (SD 2.9, min 16 and max 23.1 kg/m2) and intervention group T1 : BMI 18.4 kg/m2 (SD 1.9, min 15.3 and max 21.3 kg/m2) and T2: BMI 19.1 kg/m2 (SD 3.5, min 16.5 and max 23.1 kg/m2).

Mean values on body fat for control group on T1 : 10 % (SD 4.7, min 5.4 and max 23.6 %) and T2: 8.9% (SD 3.8, min 5 and max 15.5%) and intervention group T1: 8.9 % (SD 3.4, min 5 and max 16.6%) and T2: 8.8% (SD 3.7, min 4.7 and max 14.2 %).

Also data (Table 2) for mean values on speed (50m) for control group on T1 show: 7.7 seconds (SD 0.6, min 6.9 and max 8.9 s) and T2: 7.3seconds (SD 0.5, min 6.7 and max 8.1 seconds) and intervention group T1: 7.6 seconds (SD 0.2, min 7.1 and max 8 seconds) and T2: 7.3 seconds (SD 0.2, min 7.1 and max 7.5 seconds) while for step counts during performing 50m sprint test show: for control group on T1 show: 31.4 steps (SD 2.6, min 28 and max 36 steps) and T2: 29.2 steps (SD 2, min 27 and max 33 steps) and intervention group T1: 31.5 steps (SD 0.5, min 31 and max 32 steps) and T2: 28.6 steps (SD 1.1, min 27 and max 30 steps)

Table 2 Descriptive statistics for BMI, body fat, speed and steps (50m) for control and intervention groups

Group		Minimum	Maximum	Mean	Std. Deviation
	BMI_T1	15.55	21.50	18.4269	1.84312
	BMI_T2	15.99	23.12	19.1700	2.98089
	Body fat T1	5.4	23.6	9.958	4.7738
	Body fat T2	5.0	15.5	8.945	3.7687
Control	Speed 50m T1	6.9	8.9	7.733	.5990
	Speed 50m T2	6.7	8.1	7.272	.4711
	Steps (counts) 50m T1	28	36	31.42	2.548
	Steps (counts) 50m T2	27	33	29.17	2.041
	BMI_T1	15.27	21.23	18.3919	1.87819
	BMI_T2	16.46	23.12	19.1488	3.51130
Intervention	Body fat T1	5.0	16.6	8.878	3.4675
	Body fat T2	4.7	14.2	8.754	3.6647
	Speed 50m T1	7.1	8.0	7.648	.2497

Speed 50m T2	7.1	7.5	7.278	.1501
Steps (counts) 50m T1	31	32	31.45	.497
Steps (counts) 50m T2	27	30	28.60	1.140

There is a difference in mean (Table 3) while comparing the variables from T2 to T1 of the measurement as follows; for weight from T1 to T2 there is an increase by 5.1 kg (SD 8.5 kg; t= -1.8, p=0.09), for height from T1 to T2 there is an increase by 3.7 cm (SD 0.7 cm; t= -15.1, p=0.00), for BMI there is an increase by 0.7 kg/m2 (SD 3 kg/m2; t= -0.7, p=0.48) and for body fat also an increase in mean values by 1.6 % (SD 1.6%; t= -0.3, p=0.76)

Table 3 Paired differences samples test, for time one T1 and time two T2 of measurement for body weight, height, BMI and body fat

	Paired Differences					
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		
				Lower	t	Sig. (2-tailed)
Weight T1 –Weight T2	-5.0500	8.5041	2.6892	-11.1335	-1.878	.093
Height T1 – Height T2	-3.7000	.6928	.2449	-4.2792	-15.105	.000
BMI T1 - BMIT2	-.72303	2.97950	.99317	-3.01328	-.728	.487
Body fat T1 - T2	-.1408	1.5589	.4500	-1.1313	-.313	.760

There is a difference (Table 4) in mean while comparing the variables from T2 to T1 of the measurement as follows; for speed from T1 to T2 there is an improvement by 0.3 seconds (SD 0.2 seconds; t= 5.3 p=0.00), for step counts an improvement in efficiency from T1 to T2 by 2 steps (SD 1.1 steps; t= 5.6, p=0.00).

Table 4 Paired differences samples test, for time one T1 and time two T2 of measurement for speed and steps count on 50m

	Paired Differences					
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		
				Lower	t	Sig. (2-tailed)
Speed 50mT1 –Speed 50m T2	.2482	.1548	.0467	.1442	5.318	.000
Steps 50mT1 – Steps 50mT2	2.000	1.183	.357	1.205	5.606	.000

Data from the analysis by group participated in the study show that there is an improvement (Table 5) in mean values for speed test from T1 to T2 as follows; for speed on control group from T1 to T2 there is an improvement by 0.2 seconds (SD 0.2 seconds; t= 2.7 p=0.04) while for intervention group there is an improvement by 0.4 seconds (SD 0.1 seconds; t= 8.6 p=0.001)

Table 5 Paired Samples Test by group for speed test

Group		Paired Differences					t	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference			
					Lower	Upper		
Control	Speed 50mT1-Speed 50m T2	0.16	0.15	.0598	.0079	.3154	2.703	0.043
Intervention	Speed 50mT1-Speed 50mT2	0.35	0.09	.0409	.2384	.4656	8.603	0.001

Data on table 6 for step counts also show an improvement in efficiency from T1 to T2 for control group by 1.3 steps (SD 0.8 seconds; t= 4 p=0.01) while for intervention group there is an improvement also by 2.8 steps (SD 1.1 steps; t= 5.7 p=0.005)

Table 6 Paired Samples Test by group for number of steps in speed test

Paired Samples Test

Group		Paired Differences					t	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference			
					Lower	Upper		
Control	Steps 50mT1 – Steps T2	1.333	.816	.333	.476	2.190	4.000	.010
Intervention	Steps 50mT1 – Steps	2.800	1.095	.490	1.440	4.160	5.715	.005

Data on table 7 show the analysis for the improvement between groups; control and intervention for the speed test. There is a significant difference (p= 0.03) between the improvement of intervention with control group in favor of the improvement of the intervention group.

Table 7 Comparison for the difference between groups in speed test

ANOVA

Diff T1_T2

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	**.099**	**1**	**.099**	**6.317**	**.033**
Within Groups	**.141**	**9**	**.016**		
Total	**.240**	**10**			

Data on table 8 show the analysis for the improvement between groups; control and intervention for number of steps in performing speed test. There is a significant difference (p= 0.03) between the improvement of intervention with control group in favor of the improvement of the intervention group.

Table 8 Comparison for the difference between groups for number of steps in speed test

ANOVA

Diff_stepsT1_T2

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	**5.867**	**1**	**5.867**	**6.492**	**.031**
Within Groups	**8.133**	**9**	**.904**		
Total	**14.000**	**10**			

Discussion

The final results of this research study show that there is an improvement in mean values for speed test from T1 to T2 as follows; for speed on control group from T1 to T2 there is an improvement by 0.2 seconds (SD 0.2 seconds; t= 2.7 p=0.04) while for intervention group there is an improvement by 0.4 seconds (SD 0.1 seconds; t= 8.6 p=0.001). The analysis between groups show that there is a significant difference (p= 0.03) between the improvement of intervention with control group in favor of the improvement of the intervention group.

Data from the analysis on this research study by groups show that there is an improvement in mean values for step counts from T1 to T2 as follows; for control group by 1.3 steps (SD 0.8 seconds; t= 4 p=0.01) while for intervention group there is an improvement also by 2.8 steps (SD 1.1 steps; t= 5.7 p=0.005). In total for both groups there is a difference in mean values while comparing the variables from T2 to T1 for step counts by 2 steps (SD 1.1 steps; t= 5.6, p=0.00).
Finally, statistical analysis show a significant difference in improvements (T1 to T2) between groups for the number of steps (p= 0.03) in favor of the improvement of the intervention group.

Training of athletes needs to continue progressively and carefully, it requires ample time and respect for the fundamental stages since childhood. Wong et al. (2009) reported that speed during childhood and adolescence is related to height and body mass. They studied a group of soccer players under the age of 14 and found a significant relationship between body mass and time to run a 30 m sprint (r=-0.54).

This research suggests that it is important to develop speed in youth soccer players to improve their movement and agility. However, we must be careful to take into consideration anthropometric characteristics in relation to growth and maturation when youth soccer players are compared since they correlate well with both speed and muscle strength.

We are aware that soccer involves frequent changes of direction, we say that agility would be highly related to muscle strength. However, they only had a small correlation (r = - 0.29).

For one, this could be due to the maturity stage of young players, which affects coordination, important in agility (Sheppard and Young, 2006), but not strength or power performance. Indeed, a significant gain in strength and power occurs during the later stages of puberty (Malina et al., 2004).

After puberty, players will benefit from a more structured training approach. The speed training for players at this stage of development must be based on the "Smart" principle (ie, structuring in technical training in a way that benefits the player's physical preparation as well as his technical skills). This type of exercise is very effective as it is very effective with reference to exercise time. It is also very specific for football. The speed training should be more specialized when the players reach the stage after puberty. At this stage, players must complete both types of training as "Productivity" and "Performance Conservation". Although we must pay attention also to the training of strength.

Different author from studies have shown a direct relationship between muscle strength and running speed: the strongest athletes achieve the greatest running speed (Chelly et al., 2009; Seitz et al., 2014; Wisloff et al., 2004). In conclusion training of athletes needs to continue progressively and carefully, it requires ample time and respect for the fundamental stages since childhood. The steepness of the steps increases sharply from T1 to T2 due to the training of lower limb, and developmental coordination skills, easily. Finally, we recommend that the athlete's development speed training program (densities and steps) be carefully taken into account. Need to taking into account the stages of their physical and mental development and in accordance with the findings outlined above.

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