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SHORT TERM AGILITY AND SPEED TRAINING PROGRAMME EFFECTS ON SPEED, AGILITY AND DRIBBLING IN YOUNG FOOTBALL PLAYERS

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Original research:

Abstract:
The research aimed to determine the training effects on speed potential of young football players by designed training program. Twelve (12) variables were measured, of which three (3) refer to the morphological part, while nine (9) refer to speed and agility tests. It was also assumed that there would be progress in the speed potential and agility of young footballers in favor of the EG, as well as progress in the specific technique. Sample included 33 young football players (Mean ± SD: 8.59 ± 0.69 years of age; body weight 32.12 ± 4.74 kg; height 135.29 ± 5.34 cm; and BMI 17.32 ± 1.76) divided in experimental group (EG) n=18 and control group (CG) n= 15. Greater statistical differences were noticeable in the EG, i.e. progress in the sprint variables at 5 and 10 meters ($p<0.05$), while in the CG there was none evident deterioration of the results compared to the initial values. Likewise, all variables, except for the 20-meter sprint and the 505 right leg agility test, had some improvement from baseline, but without statistical significance. Short term additional training programme lasting 4 weeks led to increase in speed quality improvement at 5 and 10 m in young football players. Results were in line with previous results.

Key words: training, programme, soccer, skills, talent identification

Introduction

In contemporary football, experts scout players from the youngest age categories who, according to their assessments, have the potential to develop into players suited for their respective clubs. Increasing attention is directed towards evaluating the motor qualities of young players, encompassing attributes such as speed, agility, coordination, and soccer intelligence. Concurrently, within the framework of their academies and the individual soccer philosophies of each club, players' technical skills, tactics, and the psychology of the game are cultivated through structured training programs.

This study, and the master's thesis topic, delve into one of the most desirable and sought-after abilities in every football player: speed potential. It explores various facets of speed, including initial acceleration, maximum speed, speed endurance, and agility. This ability holds special significance and importance in contemporary football, with all football experts considering it a priority for young players. Due to the topicality of the subject matter and the field it belongs to, the author has chosen to investigate specific aspects of speed potential in young football players.

For players training at local clubs, it is needless to expound extensively on the topicality of this subject. The daily spectacle of players in the foremost football competitions in Europe and around the world, who predominantly stand out due to their exceptional speed, renders words superfluous.

Study by Milanović et al. (2013) suggested that SAQ (Speed, Agility, and Quickness) training represents an effective method for enhancing agility, both with and without the ball, among young footballers. SAQ training has proven its effectiveness in improving agility, with or without the ball, in young footballers. Football coaches can incorporate this form of training into preseason and in-season training regimens. In comparison to pre-training times, statistically significant progress was observed in all agility tests, except for one, both with and without the ball, following SAQ training. Similar results have been obtained in studies by other authors (Čović et al., 2011; Karim et al., 2018; Born et al., 2016; Alves et al., 2010; Bartels et al., 2016). The aim of this study was to determine the effects of the planned training program on the

speed potential of young soccer players. In addition to the primary objective of this study, there are also two secondary objectives: 1) Determine the effects of the short term planned training program on the speed potential and agility of young soccer players, 2) Determine the effects of the planned training program on the specific technique of young soccer players. We hypnotized that statistically significant differences in the speed, agility and technic between experimental and control group are anticipated because of the additional training program.

Methods

Sample

The research was conducted on 33 young football players who were participants of the local football school (Mean ± SD: 8.59 ± 0.69 years of age; body weight 32.12 ± 4.74 kg; height 135.29 ± 5.34 cm; and BMI 17.32 ± 1.76). All players were familiar with the testing and measurement procedures and were consistent in their training process.

Experimental procedure

Study was conducted as randomized controlled trial (RCT). Subject were randomized in two groups using closed envelope procedure. Experimental group (EG) (n=18) performed beside regular football additional training program as part of the extended warm up procedure. Control group (CG) (n= 15) was not involved in additional training and performed only their regular football activities. The program was carried out at the beginning of the new competitive season. The young soccer players underwent regular training under the guidance of their daily coaches, and the program was implemented with the assistance of two additional coaches/sports professors. The program was designed to be implementable with the same age group, without major difficulties. A total of 10 training sessions were conducted, originally planned for 12 sessions according to the program. Each training session where the program was applied included 10 to 20 minutes of the introductory preparatory phase of the training. The entire program was focused on the speed, agility, and technique of young soccer players,

Table 1. Additional 4 weeks training programme

		Volume			Recovery	
Training N0	Exercise	N0 reps	N0 sets	Intensity	Duration	Type
1.	5 meters with the ball - sprint	2	3	Max	Complete rest	Passive
	10 meters with the ball - sprint	2	3	Max	Complete rest	Passive
	20 meters with the ball - sprint	2	3	Max	Complete rest	Passive
	4x5 m with the ball	2	3	Max	Complete rest	Passive
2.	505 test with the ball	2	3	Max	Complete rest	Passive
	4x5 meters with the ball	2	3	Max	Complete rest	Passive
	90-degree turn with the ball	2	3	Max	Complete rest	Passive
	Slalom 10 meters with the ball	2	3	Max	Complete rest	Passive
3.	5 meters with the ball - sprint	2	3	Max	Complete rest	Passive
	20 meters with the ball - sprint	2	3	Max	Complete rest	Passive
	90-degree turn with the ball	2	3	Max	Complete rest	Passive
	10 meters with the ball - sprint	2	3	Max	Complete rest	Passive
4.	5 meters with the ball in front of the player	3	4	Max	Complete rest	Passive
	10 meters with the ball in front of the player	3	4	Max	Complete rest	Passive
	20 meters with the ball in front of the player	3	4	Max	Complete rest	Passive
5.	Agility ladders plus 4x5 meters with the ball	2	3	Max	Complete rest	Passive
	Agility ladders 90° turn with the ball	2	3	Max	Complete rest	Passive
	Agility ladders plus slalom 10 meters	2	3	Max	Complete rest	Passive
6.	Slalom 10 meters on 4 sides	3 min	2	Max	Complete rest	Passive
	"505" competition	1	4	Max	Complete rest	Passive
7.	Combination of turns and slalom	3 min	2	Max	Complete rest	Passive
	Agility ladders + 5 meters sprint with the ball	2	2	Max	Complete rest	Passive
8.	Capture slalom	3 min	2	Max	Complete rest	Passive
	Agility ladders + 10 meters sprint with the ball	2	2	Max	Complete rest	Passive
9.	Competition - 505 + 10 meters slalom	2	3	Max	Complete rest	Passive
	4x5 meters with the ball	2	1	Max	Complete rest	Passive
10.	Double slalom	3 min	2	Max	Complete rest	Passive
	Competition - 10 meters with the ball	2	2	Max	Complete rest	Passive

exclusively with the ball. The level of intensity in the program was maximal, as all exercises used for speed development had to be performed at maximum effort to achieve the desired effect, but with optimal rest intervals to avoid training speed endurance, which was not the goal. The rest intervals were complete and passive to ensure that the young soccer players were adequately prepared for each subsequent speed exertion. In total variety of 20 exercises were performed during 4 weeks of additional training (table 1).
The entire testing process was approved by the parents signing written contest and was also endorsed by the club, which approved the entire procedure.

Measuring procedure

Anthropometric measures

Following the measurement of their height, each participant proceeded to stand on the TANITA scale, which was used to determine body weight and calculate the body mass index (BMI). Participants were required to be attired in undergarments and barefoot to utilize the TANITA scale effectively. Upon request, the following data were input into the scale: height, gender, participant type (athletic or recreational), and age. Subsequently, TANITA generated individualized values on paper. One of the assessors then transcribed these results into a data sheet for record-keeping, while participants were directed to proceed with dressing. Furthermore, it is crucial to emphasize that anthropometric measurements, specifically height, were conducted using a portable anthropometer (Holtain 610, Crymych, United Kingdom) with an accuracy of 0.5 cm. Body weight and the body mass index (BMI) for young soccer players were measured using the digital TANITA BC-420MA scale (TANITA Europe GmbH, Sindelfingen, Germany) with an error margin of 0.1 kg. Each test performed in this assessment was conducted twice, meaning that each participant completed each test on two occasions. The mean value of the two repetitions was used as the representative result.

Sprint running 5m, 10m and 20m

The participants take starting position in a high stance. When ready, participants initiate a straight-line run covering 20 meters with time points set on 5 and 10 meters, thereby completing the task. After completing the task participants were resting for at least 120 sec, and subsequently repeat the task three times consecutively. Results were measured using photocells (Microgate, Bolzano Italy) at nearest of 0.01s. Time started when the participant initiates the movement and passes through timing gates (photocells), with the results being digitally displayed. Best times of three measures were used as result.

505 agility test dominant and nondominant side

The participant starts from high starting position. Participants arbitarly commences a straight-line run of 10 meters, with the timing starting when the body crosses the tenth meter mark. Following this, the participant continues running straight for an additional 5 meters before executing a 180-degree turn. After completing the turn, the participant returns with a straight-line run of 5 meters, thereby completing the task. Photocells are placed at the tenth meter, and after the task is completed, one of the timers records the result. Participants first completed 3 consecutive runs making a turn with dominant limb followed by nondominant limb. If the participant does m, not cross the line at 15m result was not considered as valid. Microgate photocells were used to measure the timing to nearest of 0.01 seconds and best results from three runs was used as best result.

4x5m test

The participant begins a straight-line run of 5 meters, followed by a 90-degree turn to the right. They continue running to the next cone, which is 5 meters away, where they execute another 90-degree turn, this time to the left. Subsequently, the participant runs straight to another cone also situated 5 meters away, after which they perform a 180-degree turn and complete a 5-meter run. The task is considered completed upon the passage of the body through photocells. This task is based on continuous changes in the direction of movement and was performed three times consecutively. After each completed attempt, the result to the nearest of 0.01 seconds was recorded in the results sheet. One pair of photocells was placed at the starting point where the participant begins, while the other pair of photocells is positioned at the finish line, where the task ends.

Sprint with 90° turn without and with ball dribbling

This task, which requires a constant change in the direction of movement, represents an additional agility assessment test for football players. When ready the participants begin a straight-line run of 2 meters, followed by a 90-degree turn to the right. They continue running for 3 meters, where a second cone is placed, and they execute a 90-degree turn to the left around. The participant continues to run for 3 meters, after which they perform another 90-degree turn to the left behind the cone. They continue for 5-meter run, followed by a 90-degree turn to the right and continue

for 3 meters making 90-degree turn to the right. Finally, they run 3 meters and execute a 90-degree turn to the left before completing the task with a 2-meter run. Following each successful attempt, the result, rounded to the nearest 0.01 seconds, was recorded in the results sheet. One set of photocells was positioned at starting point, while another set of photocells was placed at the end of the task. Participants firstly performed test without ball followed by three consecutive executions with ball and dribbling with both feet.

Slalom 10m with ball dribbling

The participant commences by dribbling the soccer ball through a series of cones. The first cone, starting from the initial point, is positioned at 1 meter, with subsequent cones spaced 2 meters apart. The participant navigates the ball through the cones, executes a 180-degree turn at the final cone, and returns along the same path to the starting point to complete the task. Photocells were placed at the starting point, with beam interruption occurring twice at a single location. The computer records the time taken for test completion, and the examiner logs this data in a results spreadsheet. Each participant performs the test three times.

Statistical analysis

The data were processed using the statistical software package (SPSS Inc., Chicago, IL, USA). Descriptive statistics were computed for the variables utilized in this study, including the calculation of the mean (M) and standard deviation (SD). Normality of data was checked using Kolmogorov – Smirnov test. A paired-samples t-test was utilized to examine differences between the initial and final testing within both the experimental (EG) and control groups (CG). Additionally, an independent-samples t-test was employed to determine differences between the experimental and control groups at both the initial and final testing stages. To assess the impact of the designed program, an analysis of variance (ANOVA) was conducted, specifically a mixed-design ANOVA (group x time). Results were presented using tables and figures. Five participants were not tested at the final measurement, and the Intention to Treat (ITT) method was employed to ensure the validity of the results. Statistical significance was set at $p<0.05$.

Results

T-test for dependent and independent samples, as well as ANOVA, revealed a significant interaction in the differences of results, arising from additional training (Table 2). This interaction was evident for the variables sprint 5m ($F=15.814$; $p<0.001$) and sprint 10m ($F=8.086$; $p=0.006$) (figure 1 and 2). Upon reviewing the test results, a statistically significant improvement ($p<0.05$) was observed in the EG for the variables sprint 5m and 10m, with statistically significant poorer results in the CG. Based on Partial Eta Square, it can be inferred that the effects of the program are substantial (for the sprint 5m variable; $\eta^2=0.203$) and moderate (for the sprint 10m variable; $\eta^2=0.115$).

Sprint 20m did not change significantly and result differences were not identified, nor differences at baseline and after 4 weeks for EG and CG. Similarly, 505 test dominant leg did not showed differences between the groups, nor were significant differences found at baseline and after 4 weeks within the EG and CG. The 505 test with nondominant leg, the following findings were noted: a) the presence of a statistically significant difference in results between the experimental and control groups at baseline ($p<0.05$); b) the presence of a statistically significant difference in results between the experimental and control groups at the final testing stage.

In the case of the 4x5 m test, the analysis revealed: a) the presence of a statistically significant difference ($p<0.05$) in results between the EG and CG at baseline; b) statistically significant difference ($p<0.05$) in results between the EG and CG after 4 weeks.

For the variable Sprint with 90° turn without a ball, it was determined: a) statistically significant difference ($p<0.05$) in results between the EG and CG at baseline and after 4 weeks; b) statistically significant differences ($p<0.05$) after 4 weeks for EG and CG compared to baseline results.

Regarding the variable Sprint with 90° turn with a ball, the analysis revealed: a) statistically significant difference ($p<0.05$) in results between the EG and CG at baseline and 4 weeks; b) statistically significant differences ($p<0.05$) in results from baseline to 4 weeks within the EG.

For the variable Slalom test 10m, it was observed: a) statistically significant difference ($p<0.05$) in results between the EG and CG at baseline; b) statistically significant difference ($p<0.05$) in results between the EG and CG after 4 weeks.

Discussion

The research conducted aimed to access ascertain the training effects on the motor abilities, specifically the speed potential, of young soccer players under the influence of a designed training program. The sample consisted of 33 young soccer players from the U-10

Table 2. Differences of results for 5m, 10m, 20m, 505 test dominant and nondominant leg at baseline and after 4 weeks of additional training program for the experimental (EG; n=18) and control group (CG; n=15)

	EG (n=18)		CG (n=15)		ANOVA (group X time)		
	Baseline	4 weeks	Baseline	4 weeks			
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	F	p	η^2
Sprint 5m (s)	1.61±0.20*	1.45±0.13$	1.31±0.08*	1.42±0.09¥	15.814	0.000	0.203
Sprint 10m (s)	2.60±0.26*	2.46±0.15$	2.25±0.11*	2.36±0.12¥	8.086	0.006	0.115
Sprint 20m (s)	4.15±0.31	4.26±0.3	4.02±0.18	4.12±0.16	0.003	0.954	0.000
505 (DL) (s)	3.03±0.24	3.00±0.22	2.87±0.10	2.88±0.13	0.155	0.695	0.003
505 (NL) (s)	3.06±0.23*	3.07±0.21#	2.90±0.13*	2.83±0.09#	0.919	0.341	0.015
4X5m (s)	7.54±0.45*	7.38±0.51#	7.19±0.33*	6.97±0.34#	0.085	0.772	0.001
Sprint with 90° turn (s)	8.74±0.95*	7.81±0.76#$	8.03±0.44*	7.24±0.48#¥	0.163	0.687	0.003
Sprint with 90° turn + ball (s)	14.26±1.88*	12.99±1.77#$	12.45±1.18*	11.55±1.07#	0.249	0.620	0.004
Slalom 10m + ball (s)	16.11±1.53*	16.18±1.6#	14.01±1.39*	14.17±1.47#	0.140	0.908	0.000

SD – standard deviation; F – F value; p – Statistical significance; η2 – Partial Eta Squared; DL – dominant leg; NL- nondominant leg;
** - p<0.05 between EG and CG at baseline*
 # - p<0.05 between EG and CG at 4 weeks
$ - p<0.05 between baseline and 4 weeks for EG
¥ - p<0.05 between baseline and 4 weeks for CG

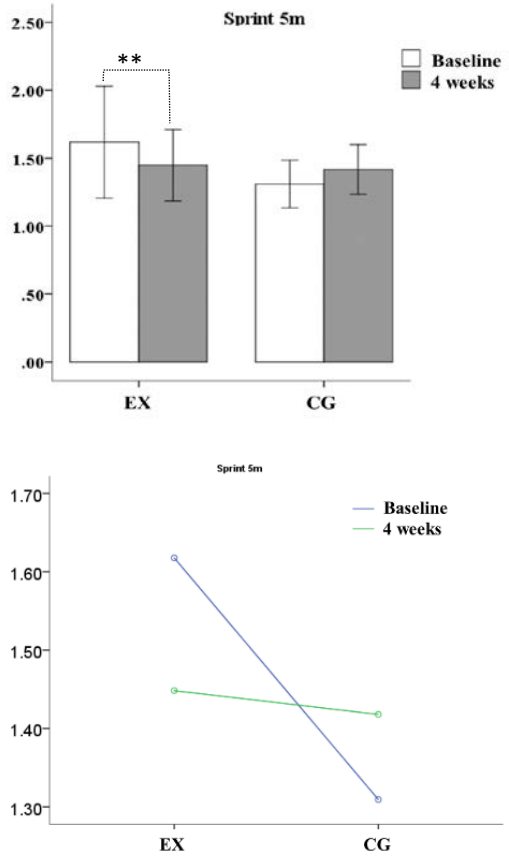

Figure 1. Graphical representation of results for EG (n=18) and CG (n=15) at baseline and after 4 weeks of additional training programme the variable sprint 5m

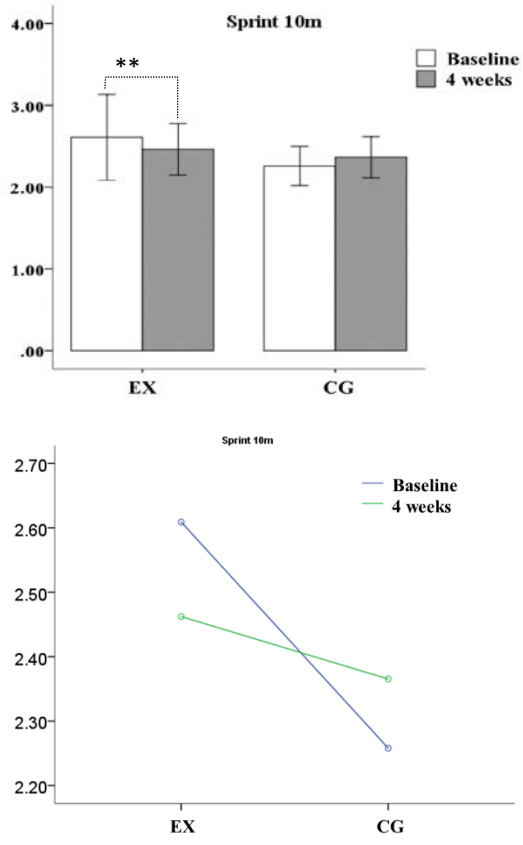

Figure 2. Graphical representation of results for EG (n=18) and CG (n=15) at baseline and after 4 weeks of additional training programme the variable sprint 10m

selection of F.K. "Željezničar" in Sarajevo. All participants obtained parental consent for testing and program implementation through signed consent forms. Additionally, the club provided authorization for the execution of these activities within the youth department of this prominent football club. Following

the obtained results, significant statistical differences were observed in the experimental group, indicating progress in the variables of the 5 and 10-meter sprints. In contrast, the control group showed evident deterioration in results compared to their initial values. Furthermore, all variables, except for the 20-meter sprint and the 505-agility test for the dominant leg, displayed some improvement compared to their initial values but without statistical significance. Upon establishing and analyzing the results of the program's effects, the hypotheses formulated at the beginning of this study could be either accepted or rejected.

Following the implementation of the designed training program for young soccer players, both the experimental and control groups exhibited certain changes between initial and final measurements. Bangsbo (1994) stated that sprints of 5 to 15 meters, both with and without a ball, represent 90% of the total value of fast running – sprinting in a soccer match. This research demonstrates the most significant improvement in the experimental group's sprint performance at 5 meters and 10 meters. Conversely, the control group displayed markedly poorer results in their final measurements. In all other variables, except for the 20-meter sprint and the non-dominant leg agility test (505 test), some improvements were observed, albeit not statistically significant for this study. The two mentioned variables did not exhibit any noticeable progress compared to the initial testing.

Concerning the 5 and 10-meter sprints, numerous studies have explored these variables in young soccer players (Alves et al., 2010; Reilly et al., 2000). The results in these studies were slightly better than those observed in present research, possibly due to the older age of the participants in those studies compared to the participants in this research.

The significant progress observed in the variables (5 and 10-meter sprints) can be partly attributed to the designed program. The training components previously programmed by the coach also exerted a considerable influence on the progress. Additionally, at the outset of testing, most of the boys in the control group were one year older than those in the experimental group. This age difference may have contributed to the progress observed in the experimental group in these variables, potentially indicating a greater effect on younger boys. Ideal conditions would involve both the experimental and control groups being of the same age to yield more precise information.

Regarding other variables where no statistically significant progress was observed between groups, it is possible that the program's duration was relatively short (10 training sessions over one month) and extending the program could produce positive effects. Similarly, in the study conducted by Milanović et al. (2013), variables such as the 4x5-meter sprint, 90-degree turns with and without a ball showed statistically significant improvement, but their program spanned 12 weeks, and the participants were slightly older than those in this study. Furthermore, a limitation of this program, and indeed the overall training program, is that it needs to incorporate more ball manipulation by young soccer players under various conditions and scenarios. By doing so, technique can be enhanced, leading to improvements in variables closely associated with soccer skills.

The application of this program, as conducted in this study, can be extended to older participants, potentially yielding more positive effects in all variables. This is attributed to a more serious approach and greater experience in the training process.

Conclusion

The designed program has yielded certain positive effects favouring the final measurements, thus introducing a novel dimension to the realm of sports training and the coaching process, which can be readily applied in the practical domain of soccer coaching. Moreover, this study contains components that can be implemented differently to enhance its effectiveness. Specifically, considerations include the duration of program implementation, the inclusion of a more extensive array of exercises involving ball manipulation in various scenarios by young soccer players, and the target age group for program execution. A notable attribute of this entire program lies in its core exercises, which find practical applicability on soccer fields, especially within the context of younger age categories.

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