CANONICAL RELATIONS BETWEEN COORDINATION AND TECHNICAL SKILLS IN YOUNG FOOTBALL PLAYERS

Filip Majić[1], Mladen Hraste[2], Igor Jelaska[1]

[1]Faculty of Kinesiology, University of Split, Croatia
[2]Faculty of Science, University of Split, Croatia

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Abstract

The aim of this study is to identify and explain relations between coordination and technical skills in young football players. Consequently, 13 football players (aged: 14.23±0.75yrs; training experience: 5.75±1.46) were recruited and measured. The first battery of test was constituted of four tests for the coordination assessment while the second battery was consisted of five newly constructed tests for the evaluation of the football-specific technical performance. Prior to the analysis, reliability and validity indicators were examined and were identified as appropriate. Canonical correlation analysis revealed high but not significant correlation between motor abilities and technical skills (CanR=0.98; $CanR^2$=0.95; p=0.07) what is probably due to the fact the coordination and technical skills are intertwined through common biomechanical movement patterns. Results from this study can provide fundamental information for expert coaches during planning, programming and controlling of the training process in young football players.

Key words: *young football players, motor abilities, technical skills*

Introduction

Coordination is a complex motor ability closely related to speed, strength, endurance and flexibility and is of crucial importance for achieving and improvement of technique and tactic. Furthermore, it is commonly known that coordination is mostly genetically conditioned and along with speed and explosive strength, it is the most important predisposition in motor abilities for achieving outstanding performance in team sport games (Balague, et al., 2013). The role of coordination was significantly related to participation in football in boys, aged between 6 and 10 years (Smyth, & Anderson, 2001). Football players' coordination is of high importance for achieving top performance of total execution (De Souza, et al., 2010) and preciseness (Bjelica, 2007; Bjelica, 2008). It was identified that coordination has a significant impact on formation of the player's technique with young football players aging 13 to 14 years (Boichuk, Iermakov, & Podrigalo, 2018). Football technique can be defined as a collection of biomechanic correct activities which comply with the game rules and situations and one of the most important elements in studying the football game. The quality of technical performance of football shoots is highly correlated with the football's quality (Kapilevich, Buravel, & Koshelskaya, 2012) and the analysed profiles of technical performances suggest that the football player's quality level is reflected on the level of technical efficiency in term of shooting, passes and ball possession (Sgrò, & Liporma, 2016). Even though coordination and football technique are fundamental for the optimal performance, there are no studies that connect them. In accordance with the previously stated, the aim of this study is to establish and explain the level of correlation between coordination and technical skills in young football players.

Methods

The sample of participants

The sample of participants was constituted of 13 football players, (age: 14.23±0.75; training experience: 5.75±1.46). All subjects were healthy during the testing sessions. One participant was excluded from the study due to the recent musculoskeletal injury. All participants' parents were informed on purpose of the study and signed a written consent. Participants were informed that they can quit any time they want, without any kind of penalty. All procedures were performed in accordance with declaration of Helsinki and local Ethical Committee provide consent on realisation of the study.

The sample of variables

The sample of variables was constituted of two separate battery of tests. The first battery of tests was constituted of four tests for the evaluation of coordination and the second battery of tests consisted five tests for the evaluation of the football technical skills. Four tests for the evaluation of

coordination were: (1) *Slalom running without the ball between the markers (SR)*; (2) *Slalom running with the ball between the markers (SRB)*; (3) *Sidesteps (SIS)*; (4) *Agility in the air (AIA)*. Five tests for the evaluation of the football technical skills were: (1) *Ball handover (BHO)*; (2) *Rolling dribbling (RDB)*; (3) *Zigzag dribbling (ZDB)*; (4) *Dribbling (DB)*; (5) *Shooting with the dominant leg (SOT)*.

Test description

Slalom running without the ball between the markers (SR). Six markers were set at a distance of 2 meters between each marker. The test is performed in a way that a player is standing near the first marker with the closer leg and starts zigzag running and passes all markers in the shortest time possible to arrive to the initial position. The time stops when the player passes the last marker with his whole body. *Slalom running with the ball between the markers (SRB).* Six markers were set at a distance of 2 meters between each marker. The player's initial position is close to the first marker holding the ball in the leg which is closer to the marker. He starts the zigzag dribbling on a sign, passes all markers in the shortest time possible, turns around the last one and arrives to the initial position. It is necessary to emphasize that the player chooses the technique of dribbling. *Sidesteps (SS).* There are two cones in the same line set at a distance of 4m. The player is standing in the initial position with both legs outside the area of 4m, uses the step and close techniques to master the distance eight times. The player starts the test only after the techniques requirements off the element execution have been met. It is necessary to be careful not to make mistakes like running, hurdle step or reverse lunge. In case of a mistake, testing is repeated. *Agility in the air (AIA).* The player is sitting on four medicine balls set next to each other, with his hands lifted in the air. On a sign, he does a back flip, lifts his body up and goes flying into the front flip over medicine balls, lifts his body up and touches the closest medicine ball with his hand. The drill should be executed in the shortest time possible. Due to safety reasons, the drill should be executed on the exercise mats. *Ball handover (BHO).* The player is standing in the square marked with four cones in the area 2×2 m. The team mate for the ball handover is standing at the 4 m distance. The task is to catch the ball inside the square and transfer it aside around the cones, with the ball outside the square. The player is doing 4 repetitions of the ball transfer and handover in the default schedule, one repetition with the internal foot, left and right leg, and afterwards ball transfer using external foot part using both left and right leg. *Rolling dribbling (RDB).* The one-meter long sticks are placed on the ground at a distance of 1m. The player must pass the four sticks in ball rolling using left and right leg with the obligatory two touches between the sticks. *Zigzag dribbling (ZDB).* Dribbling between the six cones placed on a zigzag distance 4 meters apart from the other. The player has the task to change the direction using internal

foot, while dribbling aside towards the next cone with the external foot part. *Dribbling (DB).* The following element the player must overcome is dribbling feint ''bicycle''. Two cones are places at a distance of 12m, so that the player has the space and the time at high speed to prepare for the feint execution. The task is to execute two dribblings, using both dominant and non-dominant leg. *Shooting with the dominant leg (SOT).* This test is actually a sequel of the dribbling test. After the player does the last dribbling, there is a final task where he executes the shoot at the goal with full foot ridge using the dominant leg.

Figure 1: The technique tests in the circular polygon
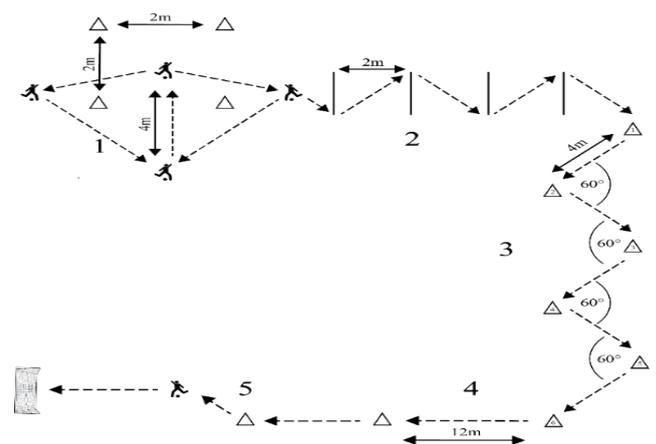
Legends: 1. *Ball handover (BHO)*; 2. *Rolling dribbling (RDB)*; 3. *Zigzag dribbling (ZDB)*; 4. *Dribbling (DB)*; 5. *Shooting with the dominant leg (SOT)*

Experimental procedure

All testings were performed during 09:00-11:00 in the morning in 3 consecutive days. Before the testing sessions, 15 min of dynamic warm-up was done. Temperature was approximately 25° with constant humidity. Each participant had 1 test trial and was verbally encouraged to provide the best result. Each trial was repeated three times and the best result was taken as final. The technique tests were conducted in the circular polygon inside which the players had specific and defined tasks. After the successfully finished part of the polygon, and in the shortest time possible, the player would pass on the following part. The polygon was finished by shooting at the goal. Execution of each individual technical element was evaluated on the Likert scale of 1 to 5, and three judges were involved in the evaluation. Before each testing, the participants had a trial attempt of each element separately. Participants had to strictly follow the default rules during the test execution, and if the mistakes during the default technique execution occurred, the points were deducted according to the previously stated Likert scale.

Data processing methods

For the needs of this study the following parameters of descriptive statistic were calculated: Means (Mean±SD), standard deviations (SD), 95%

intervals of the means (95% CI), coefficients of variation (CV%), minimal (Min) and maximal result (Max). All variables were examined on reliability using one way repeated measures ANOVA and ICC. Normality of the data distribution was calculated using Kolmogorov–Smirnov test. Relations between the variables for the evaluation of the motor abilities and variables for the evaluation of the technical performance have been calculated using canonical correlation analysis. In the frames of the canonical correlation analysis, the coefficient of the canonical correlation analysis (CanR), coefficient of the canonical determination (CanR^2), the value of the Bartlett's x^2 test, level of statistical significance (p) and coefficients of the factor correlation for each variable from the variable sets were calculated (Root 1 and Root 2). Type I error was set at α=5%. All calculations were performed using data analysis software system Statistica ver. 13. (TIBCO Software Inc., 2018).

Results and discussion

Prior to the analysis, reliability was examined using one way repeated measures ANOVA and ICC. ANOVA did not identified significant differences between measurement (p>0.05) while ICC was found to be excellent ranged from 0.85-0.97. Additionally, Kolmogorov Smirnov test revealed normality of the all observed data (p>0.20). Table 1 provides descriptive statistical parameters of measured data.

Table 1. Means and standard deviations (M ± SD), 95% interval of mean (95% CI), coefficients variation (CV%), minimal result (Min), maximal result (Max), Kolmogorov-Smirnov test (K-S test)

	M±SD	95% CI	CV[%]	Min	Max
BHO	4,00±0,71	3,57-4,43	17,68	3,0	5,0
RDB	4,38±0,77	3,92-4,85	17,51	3,0	5,0
ZDB	3,23±1,09	2,57-3,89	33,80	1,0	5,0
DB	3,69±0,63	3,31-4,07	17,07	3,0	5,0
SOT	3,23±0,83	2,73-3,73	25,75	2,0	5,0
SR	5,40±0,168	5,30-5,50	3,04	5,1	5,7
SRB	8,86±0,38	8,63-9,09	4,27	8,4	9,7
SIS	10,89±0,38	10,66-11,12	3,50	10,4	11,7
AIA	3,31±0,30	3,13-3,49	9,02	2,6	3,7

Legends: BHO-ball handover, RDB-rolling dribbling, ZDB-zigzag dribbling, DB-dribbling, SOT-shooting with the dominant leg, SR-slalom running without the ball between the markers, SRB-slalom running with the ball between the markers, SIS-sidesteps, AIA-agility in the air

Observing data from table 1, it can be concluded that used sample of participants is homogenous, due to relatively small data variations. Furthermore, Table 2 provides results of canonical correlation analysis.

Table 2. Canonical correlation analysis

	Root 1			Root 1
BHO	0.63	SR		-0.40
RDB	0.84	SRB		-0.70
ZDB	0.77	SIS		0.16
DB	0.47	AIA		-0.75
SOT	0.76			
CanR=0.98; CanR^2=0.95; x^2(20)=30.30; p=0.07				

Legends: BHO-ball handover, RDB-rolling dribbling, ZDB-zigzag dribbling, DB-dribbling, SOT-shooting with the dominant leg, SR-slalom running without the ball between the markers, SRB-slalom running with the ball between the markers, SIS-sidesteps, AIA-agility in the air

Table 2 shows very high coefficient of canonical correlation (CanR=0.98), small deviation from the statistical significance (p=0.07) and relatively high correlation coefficients in factor structures in six variables.

Very high coefficient of canonical correlation could refers to the conclusion that the coordination and technical skill belong to the same anthropological area which impact the success of young football players. Small deviations from the statistical significance can be very likely assigned to the small number of participants which is also the limitation of this study. High correlation coefficients of the two motor factors (running with the ball and agility in the air) and four factors of technical skills can probably be assigned to the closeness of the two stated factors with the technical skills and performances of football players which was also indicated in the previous studies (Bjelica, 2007; Bjelica, 2008; De Souza et al., 2010; Boichuket et al., 2018).

Conclusion

This study established and clarified relations between motor abilities and technical skills in young football players. One can conclude that the high technical quality of young football players depends on the motor abilities, which are closer to the football performance in this structure. There should be a larger number of participants in the following studies, and it should include more motor and technical variables. Information from this study could be useful as the support for coaches during planning, programming and control of the training process.

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Corresponding information: