

# Inter and Intra Positional Differences in Ball Kicking Between U-16 Croatian Soccer Players

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## ABSTRACT

*The main goal of this research was to determine inter and intra positional differences in ball kicking speed between U-16 Croatian soccer players. 44 young soccer players (15.7 ± 1.5 years) were tested with 8 specific soccer field tests that evaluate kicking velocity by using Pocket radar that was reading the ball velocity in km/h. The tests took place two days in a row; beginning at 8 A.M. Prior to the tests, players warmed up and stretched for 20 minutes (13 minutes of running with and without the ball, 7 minutes of dynamic stretching). Inter positional differences were significant ( $p \leq 0.05$ ) between midfielders and defenders in all tests and in one test midfielders scored better than strikers. The fastest kicks were instep kicks when stationary and non-stationary ball was kicked. Shots were taken by midfielders with 106.94±7.07 and 101.61±7.88 km/h respectively. Similar to dominant leg, midfielders also achieved the fastest instep kicks with non-dominant leg (91.44±9.56 km/h). Intra positional differences revealed that soccer kick velocity is one of possible selection tools, because more efficient players in all playing lines shoot faster kicks than less efficient players.*

**Key words:** *Instep kick, Side-foot kick, Kicking velocity.*

## Introduction

Soccer consists of various types of movements and actions like tackling, jumping, sprinting and kicking (Reilly et al., 2000; Amiri-Khorasani, Osman and Yusof, 2009). Soccer kicking is the major asset when team is attacking an opponent's goal. Team that shoot more shots on an opponent's goal, over the course of match are likely to be successful or win more games than the opponent (Wong, Chamari and Wisløff, 2010; Lago-Peñas and Lago-Ballesteros, 2011). Although there are several types of soccer kicks, instep and side-foot kicks are the most commonly used kicks in soccer. Side-foot kick is widely and mostly used for passing, shooting from shorter distances or shooting when shot accuracy is more important than shot velocity. Instep kick on the other hand is frequently used for shooting from greater distances and in situations where shot power is more important than precision (Nunome et al. 2002; Arpinar-Avsar and Soyly, 2010). Furthermore, as it is important to kick ball with great velocity, it is also very important to kick it powerfully with both feet (McLean and Tumilty, 1993). The goal scoring opportunities are very rare in top-level soccer and opponents are getting more and more aggressive, so players who can use both feet adequately, depending on the giving situation, have higher chance to score a goal or to be more successful.

Modern soccer developed into a very fast and dynamic game. Top-level players change direction and activities every 4 – 6 seconds, which is between 1200 – 1400 times per game (Reilly et al., 2000), most of which occurs while opposing defenders are very close and are trying to take possession of the ball. In order to maintain possession of a ball or make a shot on an opponent's goal, it is extremely important to have a good kicking technique and kicking velocity while dribbling and running with the ball, also using both feet in the process.

Previous studies concentrated mostly on relations between strength and kicking velocity, or effects of different training loads

or stretching types on kicking speed (Manolopoulos, Papadopoulos and Kellis, 2006; Anthrakidis et al., 2008; Billot et al., 2010; Amiri-Khorasani, Osman and Yusof, 2011a; Amiri-Khorasani et al., 2012; García-Pinillos et al., 2014) while other studies focused on biomechanics and kinematics of soccer kicks (Lees and Nolan, 1998; Asai et al., 2002; Barfield, Kirkendall and Yu, 2002; Dørge et al., 2002; Ozaki and Aoki, 2008; Lees et al., 2009; Amiri-Khorasani, Osman and Yusof, 2011b; Shan and Zhang, 2011). There are only a few research articles about ball kicking and kicking speed regarding differences between playing positions (Amiri-Khorasani, Osman and Yusof, 2009) or differences between various skill levels of soccer players (Arpinar-Avsar and Soyly, 2010; Cometti et al., 2001; Ford et al., 2006). Some authors measured kicking speed for both feet but didn't separate results on dominant and non-dominant leg. Instead, they separated results on left and right leg which left certain things unexplained considering a number of players that could have left leg as a dominant. To author's knowledge, there are no scientific papers that explored intra positional differences in soccer regarding speed of the kicked ball. It is important to detect differences between better and worse players of the same playing position, especially in kicking speed. Better players often score more goals as well as more accurate long passes throughout the match and the season, due to higher kicking power.

In addition, majority of papers measured kicking speed when stationary ball was kicked (Billot et al., 2010; García-Pinillos et al., 2014; Dørge et al., 2002; Cometti et al., 2001; Katis et al., 2013) which is in contrast to actual game situations where stationary ball is kicked only when free kick or corner kick is taken. Involvement of different kicking techniques such as kicking a non-stationary ball (Bacvarevic et al., 2012) is required for more complex and precise evaluation of soccer kicking and its implications on success.

Giving the complexity of the game and relatively unexplored differences between different playing positions and skill

levels, it would be of considerable importance to evaluate differences between players of different playing positions in shooting tests. Thus, the main goal of this research was to determine inter and intra positional differences in ball kicking speed between U-16 Croatian soccer players.

**Methods**

*Participants*

Research was conducted on a sample of 44 young soccer players (15.7 ± 1.5 years) members of NK „Adriatic“ and HNK „Krilnik“ from Split, Croatia. Both teams trained 4 times and played one competitive match per week. This study was approved by Faculty of Kinesiology and its Ethic Committee. In addition, parental and players’ consent was obtained.

*Experimental design*

In this cross-sectional research, dependent variable was a first team status of the players. Players were divided as starters or non-starters, while the independent variables were soccer-specific shooting tests. All players were tested with 8 soccer-specific field tests that evaluate kicking velocity using both feet with standing ball and after dribbling, both with instep and side-foot kicks. Respondents were tested in July at the end of the competitive season 2012/2013. The tests took place two days in a row; beginning at 8 A.M. Prior to the tests, players warmed up and stretched for 20 minutes (running with and without the ball – 13 minutes, dynamic stretching – 7 minutes). Players were divided in pairs and each pair had their own ball for warm up. They did passing while moving and standing, increasing range between them and kicking speed. Finally, they did shots to one another using both legs and kicking stationary and non-stationary ball. After that, they had 8 warming shots, one for each shooting style they would shoot afterwards. All tests were conducted on a natural grass surface in dry, consistent weather conditions. Players wore their own soccer boots during the test. Balls used in these tests were official Adidas Europass balls used in 2008 Euro cup. Balls were FIFA approved 69 – 69.25 cm in circumference, weighted between 441 and 444 grams.

After performing the shot, all respondents waited for others

to shoot. That way all players had enough time to recover for the next shot. The same order was kept for each player across all tests. Players’ aim for all 8 soccer-specific field tests was a center of the goal and they were kicking ball from 16 meters as powerful as they can. During the tests examiner was standing with Pocket radar behind the goal vertical to the shooting trajectory, and was reading the ball velocity in km/h.

*Soccer-specific shooting tests*

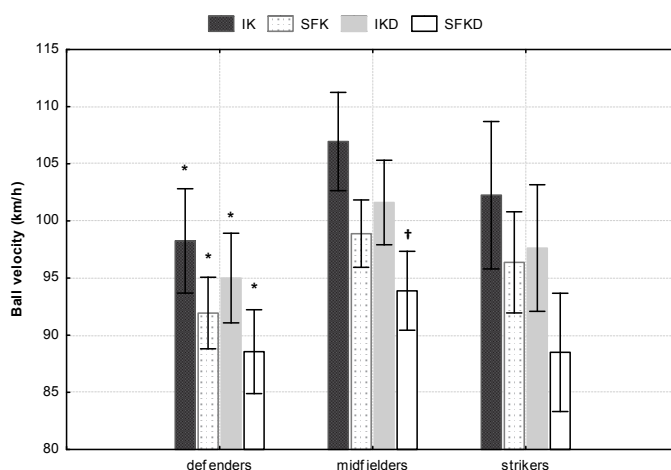
In four tests ball was stationary on 16 meter line: (IKDL – instep kick with dominant leg, IKNDL – instep kick with non dominant leg, SFKDL – side foot kick with dominant leg, SFKNDL – side foot kick with non-dominant leg). In other four tests the task was to dribble and run with the ball from 25 meters distance and shoot from 16 meter line after using arbitrary technique and touching the ball at least 3 times (IKDLD – instep kick with dominant leg after dribbling, IKNDLD – instep kick with non-dominant leg after dribbling, SFKDLD – side-foot kick with dominant leg after dribbling, SFKNDLD – side-foot kick with non-dominant leg after dribbling). All metric characteristics for the given variables were good and evaluated previously (Grgantov et al., 2013).

*Statistical analysis*

Basic descriptive statistics were calculated; means (AS), standard deviation (SD), minimum and maximum results (Min., Max.) and normality analysis (KS-test). Two factors 3x2 ANOVA with Fisher LSD post-hoc analysis were used to determine interaction effects between starters and nonstarters.

**Results**

Figure 1 shows differences in ball velocity between different playing lines when shooting with preferred leg. Overall, midfielders have demonstrated the best kicking power. There were significant differences (p ≤ 0.05) between midfielders and defenders in all tests and in one test (side foot kick after dribbling) midfielders scored better than strikers. The fastest kicks were instep kicks when stationary and non-stationary ball was kicked. Shots were taken by midfielders with 106.94±7.07 and 101.61±7.88 km/h respectively.

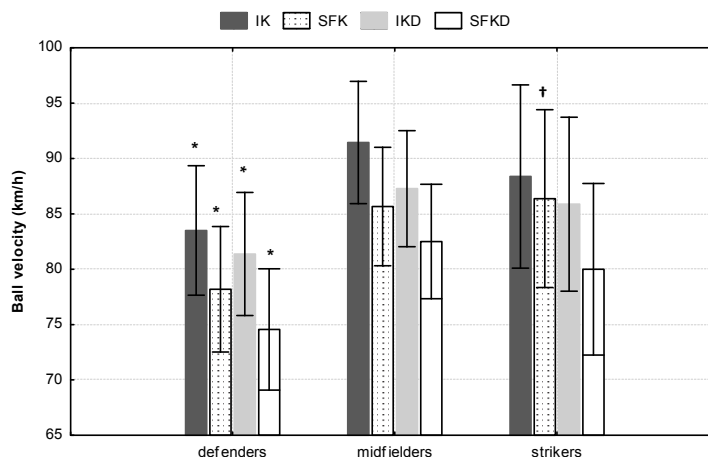


Legend: IK – instep kick; SFK – side foot kick; IKD – instep kick (after dribbling); SFKD – side foot kick (after dribbling); Fischer LSD post-hoc tests, p ≤ 0.05: \* – significant differences in relation to midfielders; † – significant differences in relation to strikers.

**Figure 1.** Inter-positional differences of young male soccer players (N=44) in kicking velocity with dominant leg

Figure 2 shows differences in ball velocity between different playing lines when shooting with non-preferred leg. Similar to figure 1 midfielders had the best kicking velocities, and in all four tests with non-dominant leg were significantly ( $p \leq 0.05$ )

better than defenders. Strikers scored better than defenders when shooting side-foot kicks on stationary ball. Highest ball speed was measured during instep kicks by midfielders with  $91.44 \pm 9.56$  km/h.



Legend: IK – instep kick; SFK – side foot kick; IKD – instep kick (after dribbling); SFKD – side foot kick (after dribbling); Fischer LSD post-hoc tests,  $p \leq 0.05$ : \* – significant differences in relation to midfielders; † – significant differences in relation to defenders.

**Figure 2.** Inter-positional differences of young male soccer players (N=44) in kicking velocity with non-dominant leg

Table 1 presents intra-positional differences for 8 soccer-specific shooting tests. In all measured tests for ball kicking speed more skillful (MS) players were better and kicked ball faster than less skillful (LS) players. Additionally, differences

between different skill levels were significant ( $p \leq 0.05$ ) in 5 out of 8 tests for defenders, and in 7 out of 8 shooting tests for midfielders and strikers.

**Table 1.** Intra-positional differences of young male soccer players (N=44) in ball velocity

Variables	Criterion of quality	Defenders	Midfielders	Strikers
		(LS=10, MS=6)	(LS=7, MS=11)	(LS=5, MS=5)
		Mean±SD	Mean±SD	Mean±SD
IKDL	LS	96.54±9.24	100.14±2.12	93.00±11.52
	MS	105.67±0.58 *	111.27±5.42 *	111.50±1.91 *
IKNDL	LS	80.85±13.27	83.29±7.59	81.75±14.38
	MS	95.00±4.36 *	96.64±6.68 *	95.00±4.40 *
SFKDL	LS	91.00±5.82	95.14±5.01	91.00±6.68
	MS	96.34±2.65	101.27±5.57 *	101.75±2.99 *
SFKNDL	LS	75.46±15.14	81.29±6.58	80.00±7.26
	MS	90.08±5.20 *	88.45±6.83 *	92.75±7.32 *
IKDLD	LS	94.31±7.50	94.86±6.36	91.50±8.74
	MS	98.00±4.36	105.91±5.39 *	103.75±1.89 *
IKNDLD	LS	78.69±11.86	78.86±5.79	77.00±12.36
	MS	93.08±3.61 *	92.64±6.07 *	94.75±3.20 *
SFKDLD	LS	88.08±6.08	87.71±4.61	85.50±7.33
	MS	90.67±4.73	97.82±6.81 *	91.50±9.68
SFKNDLD	LS	71.77±14.83	80.14±7.63	73.75±7.27
	MS	86.67±6.11 *	84.00±4.38	86.25±9.11 *

Legend: IKDL – instep kick dominant leg; IKNDL – instep kick non dominant leg; SFKDL – side foot kick dominant leg; SFKNDL – side foot kick non dominant leg; IKDLD – instep kick dominant leg (after dribbling); IKNDLD – instep kick non dominant leg (after dribbling); SFKDLD – side foot kick dominant leg (after dribbling); SFKNDLD – side foot kick non dominant leg (after dribbling); \* – statistically significant intra-positional differences between less successful and more successful young male soccer players in the analyzed variables, independent t-test,  $p \leq 0.05$ .

**Discussion**

The main goal of this research was to determine inter and intra positional differences in ball kicking speed between U-16

Croatian soccer players. In this research, players that are more efficient kicked faster shots than less efficient players, and midfielders were players who kicked the fastest shots. Results obtained were hard to compare considering the fact that almost all

previous studies concentrated on all respondents regardless of their playing position. Furthermore, in majority of other papers ball speed results were gained after performing instep kicks. Taking that, and also taking results from this research into consideration, it can be seen that average ball velocities (IKDL – instep kick with dominant leg) from shots taken by midfielders are higher than the ones gathered in previous studies (Nunome et al., 2002; Dørge et al., 2002; Bacvarevic et al., 2012), revealing significantly lower ball velocities. However, it should be noted that their recordings were gathered with cameras and only several meters from the ball kicking spot while the ball still hasn't reach its full speed. Respondents in a few previous studies (Amiri-Khorasani, Osman and Yusof, 2009; Nunome et al., 2006) achieved higher ball velocities than the ones in this research. These studies had a much smaller sample of participants who were highly skilled and professional (Olympic and U-17 international) selected soccer players so the results of this kind were expected. According to the present study's findings, more efficient defenders, midfielders and attackers had higher kick velocities than less efficient players of the same playing position. These intra positional differences were not fully explored and the results indicate the importance of a ball shooting speed in soccer. In all variables, differences were numerically present and in summary starters were significantly better in 19 out of 24 possible variables in comparison with non-starters. As an integral part of the game, ball kicking is one of the major assets for success and therefore we can assume it is one of the distinctions between more efficient and less efficient soccer player. These results are in a way contrary to findings of Cometi et. al. (2001) who detected no significant differences in ball kicking velocities between division 1 players, division 2 players and amateurs ( $D1=106.37\pm 12.89$  km/h,  $D2=106.94\pm 7.52$  km/h,  $AM=107.77\pm 5.71$  km/h). Since their findings are, as most previous ones, gathered on whole sample of respondents, not taking into consideration different playing lines, there is additional space for much detailed classification of players and interpretation of results. According to this study, the biggest difference between starting and non-starting defenders is in a shooting speed with a non-dominant foot. Apparently, fast and dynamic soccer game requires a good shooting power and kicking technique with both dominant and non-dominant leg. Similar differences were obtained between starting and non-starting midfielders and attackers, although to a lesser extent. Results obtained in this study showed inter positional differences in kicking velocities of 8 soccer-specific shooting tests. As expected, midfielders had the highest ball velocities. Midfielders and attackers were significantly better than defenders what is similar to other findings (Amiri-Khorasani, Osman and Yusof, 2009). Midfielders dictate the tempo of the game; their passes

and shots must be precise and fast in order to obtain possession or to score a goal from larger distances. In addition, during the talent identification process trainers often select the midfielders by their knowledge of ball kicking. Contrary to midfielders, defenders are often selected based on their ability to disrupt opposition attacks and their physical dominance rather than their kicking technique. Defenders in this research had slower shots than midfielders in all 8 measuring variables, and slower SFKNL (side-foot kick with non-dominant leg) than attackers. Most coaches practice simple passing game with defenders who are supposed to deliver the ball to midfield. Also, game roles of defenders are rarely related to shooting, and they use weaker (non-dominant) leg less than attackers who are supposed to shoot and score with both feet, so this study findings are somewhat expected. Midfielders were more successful than strikers in side-foot kicking with dominant leg after dribbling. This type of shooting is similar for both midfielders and attackers, but midfielders use it more often. Throughout the game attackers can often find themselves in goal scoring chances without nearby defenders, in so-called “face to face” encounters with goalkeepers after quality passes from midfielders. On the other hand, midfielders find themselves quite rarely in these situations, most of the time they need to dribble past the opponent in order to shoot on an opponent's goal.

## Conclusion

Soccer kicking speed is a very important factor of the game and should be evaluated thoroughly. Inter and intra positional differences in ball kicking speed can provide coaches with much needed information, especially throughout the selection process. This research showed that kicking velocity could be one of the factors for talent identification in soccer, because more successful players in all playing lines kicked faster shots than less successful players. Furthermore, midfielders are the ones that shoot faster kicks than the other playing lines. With one of the used, simple shooting tests, youth soccer coaches can get additional, very useful information for position specialization of the soccer players. Soccer is such a fast and dynamic game and the ability to kick faster shots than the opponent is of great importance. That way team and players generate shots that are harder to defend and even the ball possession is better because opponents have less time to intercept the passes. It could be a crucial difference between winning and losing a soccer match. Soccer kicking is one of the major aspects of the game. Therefore, evaluation of the kicks should be included in the youth soccer academy both as a talent identification marker and as a tool for the selection process.

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