DOI 10.26773/smj.241012

SportMont

ORIGINAL SCIENTIFIC PAPER

Differences in the Speed and Power of Elite U12 and U13 Croatian Soccer Players

Luka Mikić[1,2], Jakov Marasović[1], Ante Rađa[1,2], Marko Erceg[1], Hrvoje Sivrić[3]

[1]University of Split, Faculty of Kinesiology, Split, Croatia, [2]HNK Hajduk Split, Split, Croatia, [3]University of Slavonski Brod, Slavonski Brod, Croatia

Abstract

Identification of talent and continuous evaluation of players' abilities is an indispensable part of the selection process. The main goal of the research was to determine the differences in speed and power of elite U12 and U13 young Croatian soccer players with different roles in the team. Out of the 38 total HNK Hajduk Split players, 18 players were U12 age category while 20 players were U13 age category. Players were divided by the coaches in the groups of higher quality (key players) and lower quality (rotation players). Players were tested with 2 tests to assess explosive power and 3 tests to assess speed. Results obtained with Student's T-test showed that there are no significant differences in the speed and the power between the two observed group of players for each age category. For U12 category key players demonstrated better results than rotation players in the standing long jump and the medicine ball throw (183.89/566.44 vs. 177.22/511.89 cm, respectively). Additionally, key players performed better in 5-, 10- and 20- m sprint (1.11/1.93/3.43 vs. 1.14/1.96/3.52 s). U13 key players performed similar with rotation players in 5-, 10- and 20- m sprint (1.12/1.97/3.44 vs. 1.13/1.97/3.47 s), but interestingly, U13 key players were slightly worse than rotation players in the standing long jump and the medicine ball throw (194.33/587.67 vs. 194.75/606.50 cm). Many variables and abilities may determine soccer success. For the observed participants it seems likely that other abilities could have been more decisive for status differentiation in the team.

Keywords: *young soccer players, key players, rotation players, speed, power*

Introduction

Today's football, which has greatly progressed compared to the football played in the 20th century (Reilly et al., 2000; Wong et al., 2009), differs mainly in terms of the technical-tactical requirements of the game and fitness abilities, which today makes a difference in a large number of cases (Johnson, Farooq & Whiteley, 2017; Morales et al., 2018). Nowadays, football is much faster and more dynamic compared to the football that was played in the past (Cardenas et al., 2019; Vaeyens et al., 2009). Football game is becoming more and more demanding, and players are no longer closely tied to the position they are placed in but are required to participate fully in both the attack and defense phases (Figueiredo et al., 2018; Huertas et al., 2019). Fitness preparation of athletes is a process where various programs are applied to maintain and improve numerous functional and motor abilities, but also morphological characteristics of players (Aquino et al., 2017; Cobley et al., 2009; Costa et al., 2012). It is very important to assess players' abilities continuously during the phases of growth and development and one of the most important things is diagnostics, which plays a big role in planning and programming training, especially for young football players (Cardenas et al., 2019; Wong et al., 2009). Football academies and coaches should regularly conduct player tests in order to be able to identify and select football talents with the most accurate data possible (Philippaerts et al., 2006, Toselli et al., 2022). Today, young football players who are physically more dominant are selected as more successful ones (Duarte et al., 2019; Reilly et al., 2000, Rickesh et al., 2019). Some researchers (Altimari et al., 2021, Duarte et al., 2019) have studied differences in anthropometric characteristics and motor abilities in young soccer players of the same chronological age. The results of their research suggested that first team players performed better when compared to reserve players in motor abilities and were taller and heavier.

Correspondence:

Ante Rađa
University of Split, Faculty of Kinesiology, Teslina 6, Split, Croatia
E-mail: ante.rada@kifst.eu, anteradja7@gmail.com

Bidaurrazaga-Letona et al. (2016) investigated the differences in anthropometric characteristics between young soccer players and their research suggested that players who are taller and heavier are selected as more successful and play in the starting line-up in contrast to physically inferior players. Gissis et al. (2006) found that the players of the first team, given their physical dominance, have better results in tests of explosiveness of the lower extremities. Some researchers suggest (Aquino et al., 2017; Deprez et al., 2015) anthropometric characteristics and motor performance without the ball as the main predictors of success that coaches single out for young soccer players. On the other hand, Costa et al. (2012) suggest that selection should not be made with emphasis on morphological characteristics, but primarily on the skills with the ball. Speed and strength are certainly one of the most important and measured abilities in soccer (Gravina et al., 2008). Also, modern football is unimaginable without strong and fast players. In football, one of the most important things is explosive power, which represents the ability of absolute excitation of muscle fibers in a unit of time (Figueiredo et al., 2018). Players who are selected as more successful have better results in manifestations of explosiveness (Gissis et al., 2006). On the other hand, speed represents the ability to overcome a certain way in the shortest possible time. Today's football implies that the player needs to be fast to more easily adapt to the technical and tactical demands placed in front of him (Duarte et al., 2019). As soccer clubs continue to pursue talent in earlier and earlier stages of players' development, it becomes increasingly important to develop efficient ways to detect talent and differences between elite and sub-elite players. Subsequently, it is of great interest for coaches and clubs to make continuous assessment of young players' abilities in order to maintain an appropriate identification and selection of players. Players within U12 and U13 age group are the ones that experience transition from smaller "half-pitch" size fields to "full size" fields. It would be beneficial to determine what abilities differentiate key and rotation players in elite clubs during this sensitive stage of development.

The main goal of the research was to determine the differences in speed and power of elite U12 and U13 young Croatian soccer players with different roles in the team.

Methods

Participants

Out of the 38 total HNK Hajduk Split players, 18 players were U12 age category while 20 players were U13 age category. Players were divided by the coaches in the groups of higher quality (key players) and lower quality (rotation players). Key players were the ones defined by the coach as players that were the most impactful on the match outcome and can dominate most aspects of the game. Rotation players were all other players who were either substitute players or the ones that impact the game in a lesser degree. Ethical Committee of the Faculty of Kinesiology approved the research (approval number: 2181-205-02-05-23-018 Split, Croatia), according to the ethical standards of the 1964 Helsinki Declaration. Inclusion criteria for participating in this study were: player's participation in more than 85% of the training while playing in competitive matches, without reported injury during the time of the research. Players had valid sport identity card signed and were healthy as well as medically examined by a sport specialist doctor. The participants did not consume any caffeine products 24 hours before the test and did not consume any food for two hours prior to the test.

Design and procedures

The research was conducted in the period from October 13, 2022. – October 20, 2022. First, anthropometric characteristics were measured: body height and body mass. After the anthropometric measurements were taken, the players went out on the field with artificial grass to do a warm-up and prepare the organism for the motor tests. The subjects performed medicine ball throw (3kg), standing long jump, the 5 m sprint, the 10 m sprint and the 20 m sprint. For each test, the measurement was performed three times with a break between each measurement. Polarized retroreflective photoelectric Witty timing system – Microgate (16-bit microprocessor, operating temperature 0-45°C, accuracy ±0.4ms) series was used (Bolzano, Italy).

Statistical analysis

The data obtained from the research were entered into the Microsoft Excel (2018 version, Microsoft Corporation, Redmond, Washington) computer program. Furthermore, the software Statistica ver. 13.0 (Dell Inc., Round Rock, TX USA) was used for data analysis. Descriptive statistics parameters were calculated, and T-test for independent samples was used to determine differences between groups ($p<0.05$).

Results

T-test shows that significant differences were not found in the variables of anthropometry and motor abilities between key and rotation players for U12 category. The results obtained in the descriptive statistics show that, on average, key players (N=9) are slightly taller (152.67 vs. 151.67 cm) compared to rotation players (N=9) and that they have quite similar body

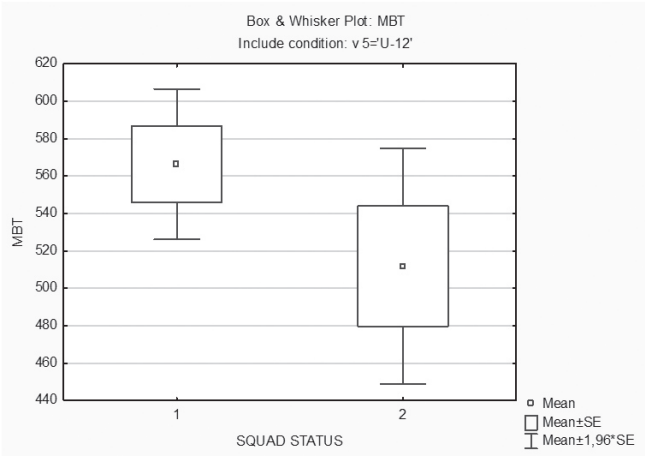
Table 1. T-test of differences between U12 players and range of results.

Variables	M±SD 1	M±SD 2	t-value	p	Range 1	Range 2
BH (cm)	152.67±4.39	151.67±10.74	0.25	0.799	147.00-159.00	41.00-177.00
BM (kg)	38.32±3.51	38.81±7.26	-0.18	0.858	32.00-43.50	30.30-55.80
SLJ (cm)	183.89±9.08	177.22 12.06	1.32	0.204	171.00-197.00	160.00-203.00
MBT (cm)	566.44±61.58	511.89±96.32	1.43	0.171	485.00-670.00	417.00-745.00
S5m (s)	1.11±0.04	1.14±0.06	-1.31	0.208	1.05-1.17	1.07-1.24
S10m (s)	1.93±0.06	1.96±0.07	-1.00	0.331	1.85-2.02	1.82-2.03
S20m (s)	3.43±0.08	3.52±0.12	-1.89	0.077	3.30-3.52	3.23-3.65

Legend: M±SD 1 – mean and standard deviation of key players, M±SD 2- mean and standard deviation of rotation players, t- value, RANGE1- minimum and maximum of key players, RANGE2- minimum and maximum of rotation players, BH - body height, BM- body mass, SLJ - standing long jump, MBT - medicine ball throw, S5m-sprint 5 meters, S10m-sprint 10 meters, S20m-sprint 20 meters.

mass (38.32 vs. 38.81 kg). In the tests for measuring the explosiveness of the lower and upper part of the body (SLJ and MBT) key players achieved better results in contrast to rotation players (183.89/566.44 vs. 177.22/511.89cm). Additionally, key players performed better in S5, S10 and S20 m sprint (Table 1).

In graph 1. it can be seen that average score in medicine ball throw of key players is higher than average score of rotation players that had wider range of results.



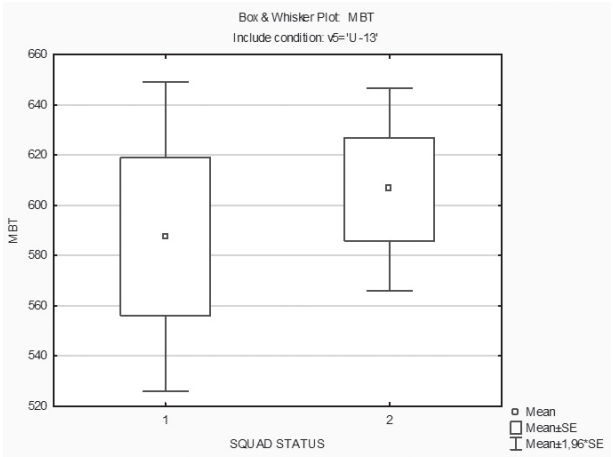
GRAPH 1. Graphic presentation of the results in medicine ball throw for U12 group of subjects

Using the T-test for independent samples, no significant differences were obtained. Rotation players (N=8) are on average taller (159.00 vs. 155.67 cm) and heavier (44.90 vs. 42.48 kg) compared to key players (N=12). Key players and rotation players achieved an almost identical result in the standing long jump (194.33/194.75 cm), while rotation players achieved a better result in the medicine ball throw (606.5 cm) than key players (587.67 cm). U13 key players performed similar with rotation players in S5, S10 and S20 m sprint (Table 2).

Contrast to U12 players, in U13 age category rotation players performed better in variable medicine ball throw while key players had wider range of results.

Table 2. T-test of differences between U13 players and range of results

Variables	M±SD 1	M±SD 2	t-value	p	Range 1	Range 2
BH (cm)	155.67±8.45	159.00±7.35	-0.91	0.380	143.00-172.00	150.00-172.00
BM (kg)	42.48±7.76	44.90±4.63	-0.79	0.440	32.60-58.20	38.50-50.90
SLJ (cm)	194.33±13.37	194.75±17.04	-0.06	0.950	168.00-213.00	168.00-223.00
MBT (cm)	587.67±108.89	606.50±58.22	-0.45	0.660	425.00-795.00	545.00-700.00
S5m (s)	1.12±0.03	1.13±0.04	-0.14	0.890	1.09-1.17	1.08-1.20
S10m (s)	1.97±0.07	1.97±0.08	-0.07	0.940	1.89-2.10	1.88-2.15
S20m (s)	3.44±0.10	3.47±0.12	-0.57	0.570	3.26-3.58	3.31-3.65



GRAPH 1. Graphic presentation of the results in medicine ball throw for U12 group of subjects

Discussion

Results showed that there were no significant differences in the speed and the power between key and rotation players of U12 and U13 age category. For U12 category, key players demonstrated slightly better results than rotation players in the standing long jump and the medicine ball throw (183.89/566.44 vs. 177.22/511.89 cm). U13 key players were slightly worse than rotation players in the standing long jump

and medicine ball throw (194.33/587.67 vs. 194.75/606.50 cm). Such results were somewhat expected because U13 rotation players in this research were taller and heavier compared to key players (Table 2). On the other hand, Silva et al. (2010) found that selected players were heavier (F=30.67, p<0.01) and taller (F=35.07, p<0.01); performed better in explosive power (F=21.25, p<0.01), repeated sprints (F=20.04, p<0.01) than non-selected players. Additionally, Gouvea at al. (2017) showed that more skilled young soccer players showed greater performance in two manifestations of explosiveness such as squat jump and countermovement jump. Gissis et al. (2006) also revealed significant effects between elite and sub-elite young soccer players of the group on maximal isometric force (F=5.490, p<0.01), peak force relative to body mass (F=818.728, p<0.01), explosive force at 100 msec (F=140.225, p<0.05), rate of force development (F=7.982, p<0.001), squat jump height (F=127.827, p<0.05). Bidaurrazaga-Letona et al. (2016) showed that elite players were significantly taller than sub-elite across all ages (d=0.30–1.18). In the Under-11 group, he found that elite players were less heavy than sub-elite players (d=0.30–0.54) but, as age increased, elite players became heavier than players in the rest of the groups (d=0.28–0.87). Also, differences were observed by Toselli et al. (2022) in body composition (height, weight, lengths, widths, circumferences, and skinfold thicknesses) between elite and non-elite players and in all performance tests (Yo-Yo test, repeated sprint ability and countermovement jump). The aforementioned research suggests significant differences in the anthropometric characteristics of young players who were selected as more successful which is in contrast to findings in this research. This was possibly one of the reasons that there were not significant differences in manifestations of explosiveness (Table 1 and Table 2).

Key players of this research performed slightly better in S5, S10 and S20 m sprint (1.11/1.93/3.43 vs. 1.14/1.96/3.52 s) in U12 group. U13 key players performed similar with rotation players in the S5, S10 and S20 m sprint (1.12/1.97/3.44 vs. 1.13/1.97 /3.47 s) but in both groups' differences were not significant (Table 1 and Table 2). Similar results with our research were obtained in Gissis et al. (2006) which showed there were no significant differences in variable of speed (10m) between elite and sub-elite players (1.95 m/s vs. 2.14 m/s). Additionally, Rebelo et al. (2012) found no differences between elite and non-elite players in 5m and 30m sprints (p>0.05). Malina et al. (2007) found no differences between young players of different quality in speed, however, players differed in aerobic endurance (p<0.01). On the other hand, Slimani and Nikolaidis (2017) found better results (p<0.01) in speed (10-30 m) and agility of higher-level compared to lower-level young soccer players. Contradictory results amongst number of researchers highlight the complexity of the problem at hand. Given the specific biologic and soccer stages of development, it remains challenging to determine differences in abilities and characteristics between youth players, both at the elite and lower level. Relatively small number of participants was one of the limitations of the study. Further research with higher number of participants with more players from elite clubs and sub-elite clubs would be advised. Also, for the U12 and U13 players, variables that include other dimensions such as soccer "skill", agility and coordination are required in order to obtain more conclusive data.

Conclusion

There were no significant differences in the speed and the power between the key and rotation players of U12 and U13 age category. Looking at the obtained results, in this study with this number of participants, it is likely that some other factors such as football skills were important in the assessment of quality by the coach. In a repeated study it would be advised to increase the number of participants in order to reach more precise conclusions. Nonetheless, speed and power should be evaluated regularly as important predictors of soccer success.

Acknowledgements
There are no acknowledgments.

Conflicts of interest
The authors declare that there are no conflict of interest.

Received: 07 July 2024 | **Accepted:** 22 September 2024 | **Published:** 01 October 2024

References

Aquino, R., Alves, I. S., Padilha, M. B., Casanova, F., Puggina, E. F., & Maia, J. (2017). Multivariate profiles of selected versus non-selected elite youth Brazilian soccer players. *Journal of Human Kinetics*, *60*(1), 113-121

Bidaurrazaga-Letona, I., Zubero, J., Lekue, J. A., Amado, M., & Gil, S. M. (2016). Anthropometry and somatotype of pre-adolescent soccer players: Comparisons amongst elite, sub-elite and non-elite players with non-players. *Collegium Antropologicum*, *40*(4), 269-277.

Cárdenas-Fernández, V., Chinchilla-Minguet, J. L., & Castillo-Rodriguez, A. (2019). Somatotype and body composition in young soccer players according to the playing position and sport success. *The Journal of Strength & Conditioning Research*, *33*(7), 1904-1911.

Chamari, K., Hachana, Y., Kaouech, F., Jeddi, R., Moussa-Chamari, I., & Wisløff, U. (2005). Endurance training and testing with the ball in young elite soccer players. *British Journal of Sports Medicine*, *39*(1), 24-28.

Cobley, S., Baker, J., Wattie, N., & McKenna, J. (2009). Annual age-grouping and athlete development: a meta-analytical review of relative age effects in sport. *Sports Medicine*, *39*, 235-256.

Costa, I. T. D., Albuquerque, R. M., & Garganta, J. (2012). Relative age effect in Brazilian soccer players: a historical analysis. *International Journal of Performance Analysis in Sport*, *12*(3), 563-570.

de Gouvêa, M. A., Cyrino, E. S., Valente-dos-Santos, J., Ribeiro, A. S., da Silva, D. R. P., Ohara, D., ... & Ronque, E. R. V. (2017). Comparison of skillful vs. less skilled young soccer players on anthropometric, maturation, physical fitness and time of practice. *International Journal of Sports Medicine*, *38*(05), 384-395.

Deprez, D. N., Fransen, J., Lenoir, M., Philippaerts, R. M., & Vaeyens, R. (2015). A retrospective study on anthropometrical, physical fitness, and motor coordination characteristics that influence dropout, contract status, and first-team playing time in high-level soccer players aged eight to eighteen years. *The Journal of Strength & Conditioning Research*, *29*(6), 1692-1704.

Duarte, J. P., Coelho-e-Silva, M. J., Costa, D., Martinho, D., Luz, L. G., Rebelo-Gonçalves, R., ... & Malina, R. M. (2019). Repeated sprint ability in youth soccer players: independent and combined effects of relative age and biological maturity. *Journal of Human Kinetics*, *67*(1), 209-221.

e Silva, M. C., Figueiredo, A. J., Simoes, F., Seabra, A., Natal, A., Vaeyens, R., ... & Malina, R. M. (2010). Discrimination of u-14 soccer players by level and position. *International Journal of Sports Medicine*, *31*(11), 790-796.

Figueiredo, A. J., Coelho-e-Silva, M. J., Cumming, S. P., Malina, R. M. (2018). Relative age effect: Characteristics of youth soccer players by birth quarter and subsequent playing status. *Journal of Sports Sciences, 37*(6), 677-684.

Gissis, I., Papadopoulos, C., Kalapotharakos, V. I., Sotiropoulos, A., Komsis, G., & Manolopoulos, E. (2006). Strength and speed characteristics of elite, subelite, and recreational young soccer players. *Research in Sports Medicine*, *14*(3), 205-214.

Gravina, L., Gil, S. M., Ruiz, F., Zubero, J., Gil, J., & Irazusta, J. (2008). Anthropometric and physiological differences between first team and reserve soccer players aged 10-14 years at the beginning and end of the season. *The Journal of Strength & Conditioning Research*, *22*(4), 1308-1314.

Hirose, N. (2009). Relationships among birth-month distribution, skeletal age and anthropometric characteristics in adolescent elite soccer players. *Journal of Sports Sciences*, *27*(11), 1159-1166.

Huertas, F., Ballester, R., Gines, H. J., Hamidi, A. K., Moratal, C., & Lupiáñez, J. (2019). Relative age effect in the sport environment. Role of physical fitness and cognitive function in youth soccer players. *International Journal of Environmental Research and Public Health*, *16*(16), 2837.

Johnson, A., Farooq, A., & Whiteley, R. (2017). Skeletal maturation status is more strongly associated with academy selection than birth quarter. *Science and Medicine in Football*, *1*(2), 157-163.

Meylan, C., Cronin, J., Oliver, J., & Hughes, M. (2010). Talent identification in soccer: The role of maturity status on physical, physiological and technical characteristics. *International Journal of Sports Science & Coaching*, *5*(4), 571-592

Morales, V. R., Alves, I. V. G., Galatti, L. R., & Marques, R. F. R. (2018). The relative age effect on Brazilian elite futsal: Men and women scenarios. *Motriz: Revista de Educação Física*, *23*.

Philippaerts, R. M., Vaeyens, R., Janssens, M., Van Renterghem, B., Matthys, D., Craen, R., ... & Malina, R. M. (2006). The relationship between peak height velocity and physical performance in youth soccer players. *Journal of Sports Sciences*, *24*(3), 221-230.

Vaeyens, R., Güllich, A., Warr, C. R., & Philippaerts, R. (2009). Talent identification and promotion programmes of Olympic athletes. *Journal of Sports Sciences*, *27*(13), 1367-1380.

Rebelo, A., Brito, J., Maia, J., Coelho-e-Silva, M. J., Figueiredo, A. J., Bangsbo, J., ... & Seabra, A. (2012). Anthropometric characteristics, physical fitness and technical performance of under-19 soccer players by competitive level and field position. *International Journal of Sports Medicine*, 312-317.

Reilly, T., Williams, A. M., Nevill, A., & Franks, A. (2000). A multidisciplinary approach to talent identification in soccer. *Journal of Sports Sciences*, *18*(9), 695-702.

Rickesh, P., Nevill, A., Cloak, R., Smith, T., Wyon, M. (2019). Relative Age, Maturation, Anthropometry and Physical Performance Characteristics of Players Within an Elite Youth Football Academy. *International Journal of Sports Sciences and Coaching.* 14 (6) 703-713

Slimani, M., & Nikolaidis, P. T. (2017). Anthropometric and physiological characteristics of male Soccer players according to their competitive level, playing position and age group: a systematic review. *Journal of Sports Medicine and Physical Fitness, 59*(1), 141-163.

Toselli, S., Mauro, M., Grigoletto, A., Cataldi, S., Benedetti, L., Nanni, G., ... & Greco, G. (2022). Assessment of body composition and physical performance of young soccer players: differences according to the competitive level. *Biology*, *11*(6), 823.

Wong, PL., Chamari, K., Dellal, A., Wisløff, U. (2009). Relationship Between Anthropometric and Physiological Characteristics in Youth Soccer Players. *Journal of Strength and Conditioning Research,* 23 (4), 1204-1210.