Journal of Physical Education and Sport ® (JPES), Vol.19 (Supplement issue 5), Art 261, pp. 1777-1783, 2019
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Evaluation of some quantitative aspects in the young soccer players training process during puberty

GIOVANNI ESPOSITO[1], ROSARIO CERUSO[2], TIZIANA D'ISANTO[3]
[1,2,3] University of Salerno, ITALY

Published online: October 22, 2019
(Accepted for publication: October 15, 2019)
DOI:10.7752/jpes.2019.s5261

Abstract:
Into youth soccer, it is very important to carry out evaluation tests, to obtain different data concerning the development of various skills during the growth process.Their tracking could be important for the trainer to reorganize the planning of training session and adapting it to individual athlete.The aim of this study is to collect quantitative data on anthropometric aspects and performance, and eventually re-use them to make changes in the training method.Research is experimental and has to follow the usual parameters for monitoring training courses. Anthropometric data are weight, height and BMI, while performance data include endurance with VO2max calculation (Cooper Test), speed (Three corner run) and agility (speed dribbling test). Tests were performed on a sample of 13 athletes of 13 years oldwho attended the under-14 regional championship.The data of the group under examination were compared with the absolute reference data of the functional evaluation present in the literature. BMI data shows that 6 arenormal weight, 4 in overweight and 3 overweight. Cooper test data shows that 2 are above-average, 5 on average, 5 below average and 1 low. Average speed of the triangle test is 32.38 seconds while the average of dibbling test is 25.39 seconds. Data must be useful as a tool for planning the training session.
Key words: functional evaluation; BMI; endurance test; agility test; speed test.

Introduction

Nowadays it can be seen how soccer, both at professional and amateur level, is a sport that requires a high level of physicaltraining for players (Altavilla et al. 2018). Today it is unthinkable to go on splitting the technical and tactical aspects of the game from physical abilities of players, since all these aspects influence, in a decisive way, the quality of the game. In this work are analyzed in particular the quantitative aspects characterizing the training process in which the trainer, through an adequate planning of workloads, aims to achieve a high-end result or performance (Raiola & D'Isanto, 2016).In soccer, as well as in other physical and sporting disciplines, trainers have as their main goal to improve their players thanks to training sessions, the level quality of which will encourage real learning (Arcelli 1978). If we define learning like the improvement of physical actions after several identical sessions, we realize that the concept of repetition is fundamental (Raiola 2017). In sight of a constant improvement of players, the educator's task then, will be to propose exercises where kids will feel they can perform it as long as focusing and engaging in accomplishment of the gesture (Ceruso et al. 2019). Thenit will be necessary, during various attempts, to provide players with precise technical instructions, bringing them on the way of success. After analyzing the level and potential of players, the real goal of each trainer will be to propose various and suitable sessions in order to generate continuous progressions and an optimization in training of his players (Altavilla & Gaetano 2018). The trainer must be able to observe and understand the needs of the young player to challenge his deficiencies or to improve his qualities (Valentini et al. 2018).

Functional assessment is the prerequisite for training control, using tests in which certain variables are measured (D'Isanto et al. 2019). The most important variables for measuring performance in sports team, such as soccer, are physical conditions and technical and tactical performance (Reilly, Holmes 1983). However, due to the complexity of the game of soccer, it is difficult to ensure the relative importance of each of these variables. The test is an indicator, more or less reliable, of a quality or capacity that one intends to investigate, so it must be analyzed and interpreted by an expert in the field of sport in question (Dal Monte 1983). Weineck (2009), in turn, defines the test as an indispensable tool for the programming of training processes, whether they'd be in short, medium or long term, which also allows diagnosing any limits that cannot always be caught by the simple observation of game.In literature, there are several classifications of these tests. The use of test on field in the youth sectors allows, as it happens for first teams, to detect some fundamental parameters for the trainer (Bell 1988). First, it is important to know if the training intervention was effective and if all players involved have benefited equally (Beunen et al. 1981). Also considering the aggregation of new components or the return to the group of boys after a period of injury, it is necessary to establish how their physical athleticism levels differs

Corresponding Author: GIOVANNI ESPOSITO, E-mail: g.esposito198@studenti.unisa.it

from the rest of the team (Rosch et al. 2000).Whenresults achieved by boys under tests are evaluated, it is important however, that the trainer, in addition to know the biological age of the subject, should also consider the variation of some parameters during the growth period that are due in part to changes in body size and partially to changes in some physiological functions (Bar-Or and Rowland 2004).Some studies believe that a trainer who is in front of a boy during puberty, every two or three months should ask himself if the size of the young player, his growth rate, structure of the body and his segments are within the limits of a normal range for age, sex and socio-economic group (MacDougall et al. 1991) (Rampinini et al. 2007).Besides being relevant for the trainer, functional assessment is also important for children. It is necessary to consider how puberty, or thetransition period of between childhood and adulthood, entails important somatopsychic modifications (Marella et al 1984). There is the presence of a new body that needs to be reworked from the psychic viewpoint. Through the awareness of their physical conditions, children become aware of their own body as well as their own limits (Raiola, 2013).To be able to survey objectively what the actual performance level of the group under examination was, some tests designed by illustrious authors of literature were reviewed, selecting the most appropriate and effective for the purpose, adapting them to their range of age (Marella et al. 2007). The choice fell on those realistically reproducible field tests that did not require the use of tools that were not easy to be found, obviously taking into account what Jurgen Baur calls "sensitive phases"(Baur 1993).Surely, boys are more attracted to exercises performed with the ball rather than a task consisting of repetitive runs. In a study about the energy cost during a ball conduction exercise, Reilly and Ball (1984) demonstrated how oxygen consumption, heart rate, blood lactate and perceived effort were higher during the activity of conducting with the ball compared to the standard run.

Methods and Materials

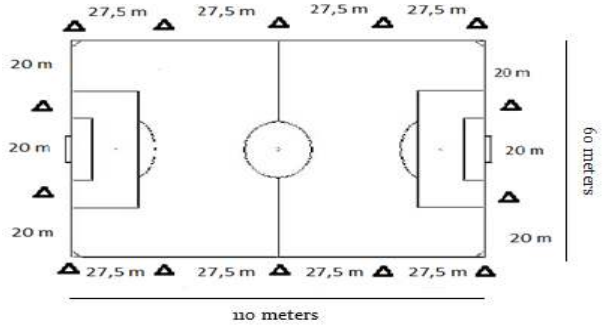
Subjects

The research was taken on a group of 13years old athletes, belonging to the team of A.S.D. Pontecagnano Academy who are competing in the under-14 provincial championship. They play their matches at the stadium "XXIII Giugno" of Pontecagnano (SA).

Experimental design

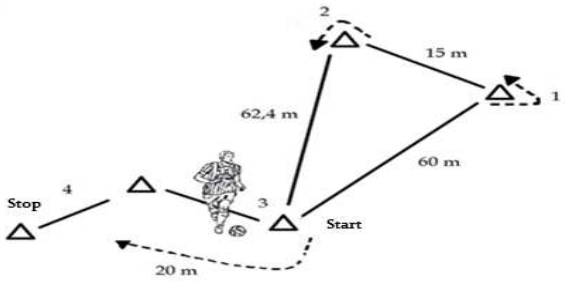
The aim of this study is to recruit quantitative data on the performance aspectsand to re-use them for reorganizing training plans.Data was collected during eight training sessions. The first phase of the research involved the detection of the anthropometric characteristics. For each boy, height and weight were obtained, from which the body mass index or BMI was subsequently derivated. In this case, the body mass index was not derived from the relationship between weight and square of the height, since ina young person this parameter presents a remarkable variability mainly linked to their age and sex. So in Italy they used the percentiles proposed by Cacciari et al. (2006) while internationally, instead, usually refer to the parameters suggested by Cole et al (2000). Here is indicated as "underweight" a BMI lower than 5th percentile; "normal weight" between 5th and 85th percentile; "at overweight risk" between 85th and 95th percentiles; "overweight" beyond 95th percentile. Once the table was created, it was useful to make some elementary statistical calculations. These parameters not only allow the identification of the variation factors and correlation among them, but also provide the definition of criteria to be used to obtain useful information for training (Altavilla et al., 2015). Furthermore, these calculations can be also important to define various work groups.

For the endurance test, we opted for the Cooper test, certainly the easiest to do for young people. It consists of running for twelve minutes with the goal of covering as much distance as possible. The result is given by the traveled distance (Cooper, 1968). It is a power test since there is a significant relationship between the distance traveled in twelve minutes and the maximum aerobic power (Gaetano, R et al, 2014). The pace setting should not be imposed but left to the sensations of each individual subject. To tracing accuratelythe actual distance traveled by the boy, measurements of the playing field were defined in a preliminary phase (Pisapia et al., 2019). This was then divided into sectors by using cones of different colors placed at specific distances. Cones weren't arranged roughly since a digital odometer was used. Boys were tested in groups of six. The time was calculated using a digital chronometer. Once the time was up, at children was asked to sit on the ground in order to allow reporting datas in the table.

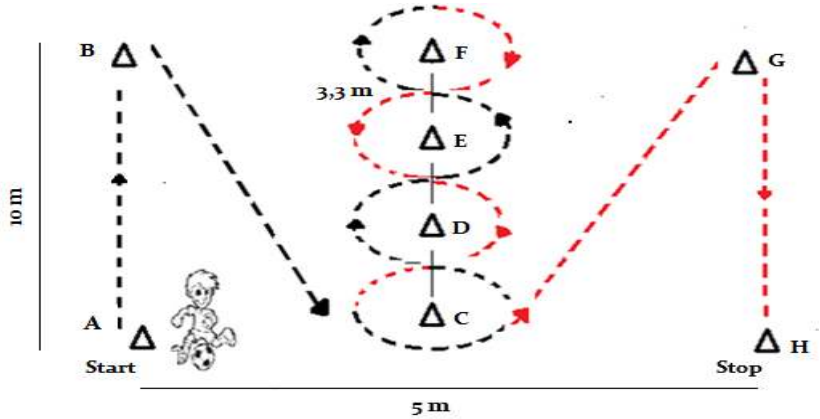


The second test involved the analysis of the speed component. Speed tests in soccer are usually characterized by time trials over short distances. In these tests, the maximum speed of each boyis required and, since the distances are relatively short, anaerobic metabolism is always used (Rago et al. 2017). In soccer, short distance trials are offered under single sprints or repeated over time, with the aim of investigating levels of this ability, with or without the addition of agility elements. For the purposes of research, the triangle race test (or Three-corner run) was used. It is a maximal and continuous test; is part of the F-Marc 2005 battery and is indicated to investigate anaerobic resistance.

The path, to be performed with the ball, provides an initial sprint of 60 m to reach a cone, where a change of direction to the left is made to reach a second cone located 15 m away from the first one. Here you make another change of direction to the left to return to the starting point (at 62.4 m), where the last change of direction is performed, this time to the right, to reach the finish line at 15 m distance. It is an easy test to perform; timing can be done manually. Unlike the Cooper test, it is not possible to test multiple athletes simultaneously, but one at a time. For a more accurate time measurement, a photocell system would be required. It could also include measuring heart rate at rest, immediately upon arrival and 2 minutes later. In fact, the heart rate, understood as the number of pulsations that heart performs in a minute, is widely used to set up and monitor anaerobic training in endurance sports (Gilman, 1996).



Agility is an essential quality; it consists in the ability to suddenly change direction and speed of movement. It is a multifactorial component because in addition to the technical component, the perceptual component, decision-making and executive speed are also evaluated. Even obtaining a good time in these tests can hide limits in one of the components that characterize this skill, since it's difficult to revive in the tests the specific stimuli that during the game occur (Giordano et al. 2019). Most of these tests are performed with the ball, usually involving sprints to be performed as quickly as possible, perhaps on a zig-zag path, while leading the ball.First tests were part of a battery designed to monitor young players and were subsequently used in talent identification programs (Reilly et al. 2000). In this case it was selected a test designed by the FIFA medical and research center, also used in battery of tests usually given to determine if a player is able to return to sport after an injury. The test was performed on a specially prepared route. The player initially places himself from the lower left cone (A), at the acoustic signal he begins to lead the ball along the straight reaching and turning around the second cone, placed at 10 m of distance (cone B). Therefore, it goes down to the cone at the bottom of the central row (C) and continue in a slalom around other 3 cones positioned at 3.33 m from each other until reaching cone F, around which it turns and then back again in a slalom between cones up to the starting line. Here it makes one change of direction of 180° turning around the cone C sprint towards the G in correspondence of which, it reverses the direction of travel to carry out the last sprint towards the finish line (H). Once test was completed, time was reported in the table.



Results

Table 1. Shows results of the anthropometric characteristics

	Age	Weight	Height	BMI	Percentile
Player 1	13	87	1,79	27,1	97,1
Player 2	13	86	1,81	26,25	96,3
Player 3	13	62	1,68	21,9	85,5
Player 4	13	55	1,65	20,2	72,6
Player 5	13	79	1,63	29,73	98,38
Player 6	13	56	1,68	19,8	68,8
Player 7	13	68	1,65	24,98	94,7
Player 8	13	56	1,52	24,2	93,3
Player 9	13	53	1,68	18,8	54,8
Player 10	13	45	1,48	20,5	75,8
Player 11	13	64	1,71	21,9	85,1
Player 12	13	53	1,68	18,8	54,8
Player 13	13	54	1,68	19,1	59,9

Data shows that 6 players are part of the "normal weight" range (Player 4, Player 6, Player 9, Player 10, Player 12 and Player 13), 4 are at risk of being overweight (Player 3, Player 7, Player 8 and Player 11) and finally 3 are overweight (Player 1, Player 2 and Player 5). Once the table was created, it was useful to make some elementary statistical calculations. These parameters not only permit the identification of variation factors and correlation between them, but also allow the definition of criteria to be used to obtain useful information for training. Furthermore, these calculations can be also important to define various work groups.Instead to what was previously believed, where it was feared that premature endurance training could cause damage during the development process, thanks to the contribution of various studies including the Vaccaro et al. (1989), it has been demonstrated that through a regular training, calibrated in an appropriate manner to the age and characteristics of the subject, a considerable improvement could be obtained in performance capacity.

Table 2. Shows the Cooper test results by comparing them with the absolute reference values for the functional assessment of young people with the Cooper test

Player number	Meters traveled	Vo2 max (mls/kg/min)
Player 1	2182,5	37,50
Player 2	2110	35,88
Player 3	2080	35,21
Player 4	2253,3	39,08
Player 5	2127,5	36,27
Player 6	2209,5	38,10
Player 7	2155	36,89
Player 8	2297,5	40,07
Player 9	2420	42,81
Player 10	2230	38,56
Player 11	2352,75	41,31
Player 12	2380	41,92
Player 13	2570	46,16

Age (13-14 years)	Excellent	Greater than average	On average	Below average	Poor
	>2700 m	2400-2700 m	2200-2399 m	2100-2199 m	<2100 m

Results of Table 2 concerning the Cooper Test shows that 2 players are part of the "above average" range (Player 9 and 13), 5 players are "on average" (Player 4, Player 8, Player 10, Player 11 and Player 12), 5 "below average" (Player 1, player 2, player 5, Player 6 and Player 7) and 1 "low" (Player 3). The analysis of results of the Cooper Test then, allowed to establish the maximum oxygen consumption (VO2max) of the boys through the formula: (traveleddistancein meters - 504.9) / 44.73. It is defined as the maximum amount of oxygen consumed per minute. It would be advisable to repeat the test later to estimate improvements or deterioration in performance.

Table 3. Shows results of the Speed dribbling Test

Player number	Time employee
Player 1	25"31
Player 2	27"44
Player 3	26"72
Player 4	28"88
Player 5	23"56
Player 6	28"35
Player 7	25"97
Player 8	24"48
Player 9	22"10
Player 10	27"10
Player 11	25"40
Player 12	23"10
Player 13	21"72
Average	25"39

Speed dribbling test (sec)	Goalkeepers	Defenders	Midfielders	Strikers
	21,14 +/- 0,58	20,68+/-0,40	20,52+/-0,38	20,69+/-0,59

Results of Table 3 shows both the time each player took for the execution of the test and the overall average time of all players. It was possible to compare results with the performance in speed dribbling of Turkish players in a study conducted by Taskin (2008) where the average time is calculated with in relation to the roles. Datas are shown in the following table.

Table 4. Shows results of the Three-corner run

Player number	Time employee
Player 1	29"10
Player 2	32"69
Player 3	32"50
Player 4	31"73
Player 5	38"75
Player 6	29"63
Player 7	33"07
Player 8	33"88
Player 9	31"25
Player 10	38"85
Player 11	32"00
Player 12	29"44
Player 13	28"09
Average	32"38

Age (13-14 years)	Excellent	Greater than average	On average	Below average	Poor
	Less than 24"	25-27"	28-30"	31-33"	More than 33"

Here, too, the time taken by each player and the overall average time of the whole team was calculated. For a more accurate measurement of times, a photocell system would be needed. It could also include heart rate measurement at rest, immediately upon arrival and 2 minutes after this.

Table 5.Multiple correlation

		VAR7	VAR1	VAR2	VAR3	VAR4	VAR5	VAR6
Pearson's correlation	VAR7	1,000	,019	-,610	,437	-,466	-,466	,166
	VAR1		1,000	,669	,855	-,555	-,554	,090
	VAR2			1,000	,195	-,102	-,101	,013
	VAR3				1,000	-,645	-,645	,069
	VAR4					1,000	1,000	-,654
	VAR5						1,000	-,654
	VAR6							1,000

Legend of table 5:
Variable1 = Weight; Variable 2 = Height; Variable 3 = BMI; Variable 4 = Meter traveled;
Variable 5 = VO2max; Variable 6 = Speed dribbling; Variable 7 = Three corner run;

- Variable 4and Variable 5show a full positive correlation because is 1.
- Variable 1and Variable 2 show a good positive correlation because is 0.669;
- Variable 1and Variable 3show an high positive correlation because is 0.855.
- Whole other correlations are low or negative.

Discussion

Results of tests showed the existence of a high variability in terms of performance amongst young players, caused by genetic and environmental factors, as well as their previous skills. This result is coherent with the expectation initially expressed in the elaborate, according to which, the development of the individual is characterized as a single, individualized and personal fact, different from person to person (Di Salvo et al. 2007). A possible confirmation of these results can be provided by the research of Malina et al (2004) where, following a detailed analysis, authors conclude that variations in performances of three motor tasks are represented by 21 to 50%body size, by the stage of sexual maturity and by previous years of training. Even Le Gall et al (2010), with their research, offer a realistic overview of the analyzed group, believing that performance in tests can vary according to age group and game position.

From the study of the Pearson correlation coefficient, which is an index that expresses a possible linearity relationship between two statistical variables, interesting information emerged. As shown in the table 5, a full positive correlation emerged between the variable 4 (meters traveled) and the variable 5 (VO2max) since the correlation is 1. A good positive correlation also emerged between the variable 1 (weight) and the variable 2 (height) since the correlation is equal to 0.669. Finally, a high positive correlation occurred between the variable 1 (weight) and the variable 3 (BMI) since the coefficient is equal to 0.855. All other correlations are low or negative.

The present paper complements the existing literature, as previous studies had already provided us insights that have determined widespread training methodologies. However, it is important to keep in mind that this research has focused exclusively on certain elements that characterize the service. Further studies on the relevance of specific protocols and training tests at different ages during adolescence would be needed.It would be advisable to compare the measures through the subsequent years of development of participants, as many of the physical qualities that distinguish players may not be evident until late adolescence, although any further improvements in players may be confused due to prolonged training (Odasso et al. 1984). Secondly, the number of tests performed was limited because the battery in question was performed during the competitive season in preparation for games and therefore there were strong demands in terms of training time. A recommendation for further future researchers could be to carry out a similar study to identify, for those who have the possibility, the physiological capabilities directly, rather than relying on performance-based estimates, focusing in detail on this specific element (D'Elia et al. 2019).

Conclusion

Through this research work, it was possible to see how tests are an indispensable control tool. I must also recognize the educational value of evaluation because, through the awareness of their physical fitness level, children become aware of their own limits as well as their own body. This paper can be considered as a basis against which to go on to develop further studies that I hope can be fruitful by certainly seeking (through greater experience and further knowledge) to deepen the control strategy.

References

Altavilla,G.,Mazzeo,F.,D'Elia,F.,Raiola,G.(2018)*Physicalcommitmentandspecific work for each role in an elite soccer team*, Journal of Physical Education and Sport, 18 (2),570-574.

Altavilla, G., Furino, F., Di Palmo, M., Raiola, G.(2015)*The child hypokinetic and the overtrained*, Sport Science, 8, pp. 72-74.

Altavilla, G., Gaetano, R. (2018), *Physiological effects of warm-up and problems related to team sports*, Sport Science, 11, pp. 83-88.

Arcelli, E. *Considerazioni di tipo fisiologico sulla preparazione atletica dei calciatori,* in "Notiziario del Settore Tecnico FIGC", n. 7, luglio 1978.

Bar-Or,O.,&Rowland,T.W.,*Pediatricexercisemedicine,*HumanKinetics,Champaign Illinois2004.

Baur, J., *Allenamento e fasi sensibili,* SdS, 1993, pp. 28-29, 130-136.

Bell, W., *Physiological characteristics of 12-year-old soccer players,* In Reilly, T., Lees, A., Davids, K., & Murphy, W.J., *Science and football,* Taylor & Francis, 1988.

Beunen, G., Ostyn, M., Simons, J., Renson, R., & Van Gerven, D., *Chronological and biological age as related to physical fitness in boys 12 to 19 years,* in "Annals of Human Biology", n. 8.4, 1981.

Cacciari E., Milani S., Balsamo A., Spada E., Bona G., Cavallo L., Tonini G., *Italian cross-sectional growth charts for height, weight and BMI (2 to 20 yr.),* in "Journal of Endocrinal Investigation", n.29, 2006.

Ceruso, R., Esposito, G., Federici, A., Valentini, M., D'isanto, T., *Preliminary work about the basis data for monitoring youth soccer team planning training*(2019), Journal of Human Sport and Exercise, 14 (Proc2), pp. S251-S257.

Cole T. J., Bellizzi M. C., Flegal K. M. & Dietz W. H., *Establishing a standard definition for child overweight and obesity worldwide: International Survey,* in "British Medical Journal", n. 320.7244, 2000.

Cooper K. H., *A means of assessing maximal oxygen intake, in* "Jama", n. 15, 1968.

D'elia, F., D'isanto, T., Altavilla, G. (2019) *Training and performance in the transition period*, Journal of Human Sport and Exercise, 14 (Proc2), pp. S258-S262.

Dal Monte, Antonio. *La valutazione funzionale dell'atleta*. Sansoni Editore, 1983.

D'Isanto, T., D'Elia, F., Raiola, G., Altavilla, G. (2019). *Assessment of sport performance: theoretical aspects and practical indications*. Sport Mont, 17(1), 79-82.

Di Salvo, V., Baron, R., Tschan, H., Montero, F. C., Bachl, N., & Pigozzi, F. (2007). *Performance characteristics according to playing position in elite soccer.* International journal of sports medicine, 28(03),222-227.

Gaetano, R., Rago, V. (2014*) Preliminary study on effects of hiit-high intensity intermittent training in youth soccer players*, Journal of Physical Education and Sport, 14 (2), pp. 148-150.

Gilman, M., B., *The use of heart rate to monitor the intensity of endurance training*,Sport Medicine, n. 21.2, 1996

Giordano, L., Federici, A., Valentini, M., D'elia, F. (2019) *Dribbling in football: Confronting learning theories*, Journal of Human Sport and Exercise, 14 (Proc2), pp. S228-S232.

Giordano L., Ceciliani A., Izzo R., D'Elia F., (2019) *Dribbling techniques*, Journal of Human Sport and Exercise, 14(3proc), in press

Le Gall, F., Carling, C., Williams, M., & Reilly, T., *Anthropometric and fitness characteristics of international, professional and amateur male graduate soccer players from an elite youth academy,* in "Journal of Science and Medicine in Sport", n.13, 2010.

MacDougall, J. D., Wenger, H. A., & Green, H. J*., Physiological testing of the high- performance (II ed.),* Human Kinetics, Champaign Illinois 1991.

Malina, M., Eisenmann, J. C., Cumming, S. P., Ribeiro, B., & Aroso, J., *Maturity- associated variation in the growth and functional capacities of youth football (soccer) players 13-15 years*, in "Journal of Applied Physiology", n. 91, 2004.

Marella, M., & Risaliti, M., *Il libro dei test. Le prove di valutazione fisicaper tutti gli sport,* Edizioni Correre, Milano 2007.

Marella, M., Nicoletti, I., Salvini, A.,*Nuovi orientamenti per l'avviamento dei giovani allo sport*, Società Stampa Sportiva, Roma 1984.

Odasso, A. Trucchi, G., Vatta, S., *L'allenamento calcistico. Ricerca della condizione per mezzo di esercitazioni tecniche*, Tipo Velox Edizioni Torino pp. 155-156, 1984.

Pisapia, F., Federici, A., Valentini, M., D'isanto, T. (2019) *Pilot study on sprint training methods in different types of athletes*, Journal of Human Sport and Exercise, 14 (Proc2), pp. S189-S197.

Rago, V., Pizzuto, F., Raiola, G. (2017) *Relationship between intermittent endurance capacity and match performance according to the playing position in sub-19 professional male football players: Preliminary results*, Journal of Physical Education and Sport, 17 (2), pp. 688-691.

Raiola, G. (2017) *Motor learning and teaching method*, Journal of Physical Education and Sport, 17, 2239-2243.

Raiola, G., D'Elia, F., Altavilla, G.(2018)*Physical activity and sports sciences between European Research Council and academic disciplines in Italy*, Journal of Human Sport and Exercise, 13, pp. S283-S295.

Raiola, G., D'isanto, T.(2016)*Assessment of periodization training in soccer*, Journal of Human Sport and Exercise, 11 (Proc1), pp. S267-S278.

Raiola, G. (2013) *Body knowledge and motor skills*, nKnowledge Cultures, 1 (6), pp. 64-72.

Rampinini, E., Bishop, D., Marcora, S., Ferranti Bravo, D., Sassi, R., & Impellizzeri, F. M., *Validity of simple field test as indicators of match related physical performance in tol level professional soccer players, in "*International Journal of Sports Medicine", n. 28.03, 2007.

Reilly, T., & Ball, D., *The net physiological cost of dribbling a soccer ball, in "*Research Quarterly for Exercise and Sports", n. 55.3, 1984.

Reilly, T., & Holmes, M., *A preliminary analysis of selected soccer skills, in "*Physical Education Review", n. 6.1, 1983.

Reilly, T., Nevill, A. M., Franks, A.,*A multidisciplinary approach to talent identification in soccer,* Journal of Sports Sciences 18, 2000b

Rosch, D., Hodgson, R., Peterson, L., Graf-Baumann, T., Junge, A., Chomiak, J., & Dvorak, J., *Assessment and evaluation of football performance, in "*American Journal of Sports Medicine", n. 28.5, 2000.

Taskin H., *Evaluating sprinting ability, density of acceleration, and speed dribbling ability of professional soccer players with respect to their positions*, in "Journal of Strenght e Conditioning Research", n. 22, Semptember 2008.

Vaccaro, P., Mahon, A., D.,*Ventilatory threshold and VO2max changes in children following endurance training,* Medicine and science in sports and exercise, n. 21.4, 1989

Valentini, M., Riccardi, F., Raiola, G., Federici, A. (2018), *Educational research: Motor area and relational area during children's personality development*, Journal of Physical Education and Sport, 18,2157-2174.

Weineck,Jürgen.*L'allenamentoottimale:unateoriadell'allenamentobasatasuiprincipi della fisiologia del movimento, con particolare riferimento all'allenamento infantile e giovanile*. Calzetti-Mariucci,2009.