



DEVELOPMENT OF THE SPEED RACE AT THE YOUNG FOOTBALLERS

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Abstract

Soccer - Ball is characterized by the intermittent efforts; that means a brief effort succession and repeated, interrupted of periods of more passive recuperation. The modelling of the footballer's activity shows that 90% of the footballer's sprints are lower to 25 m, what means that it is useless to work on distances superior to 25 – 30 m (Kacani L. 1986, PALFAI J., 1989, Taelman R. and Simon J. 1991, TURPIN B., 2002). We work therefore on 10, 20 or 25 - 30 m maximum to maximal speed. The objective of this transverse survey, is to look for in a first time, the time achieved by 32 young footballers aged of 10 at 18 years on 15 and 30 m of sprint according to features of their growth and thereafter, to determine the effect of the length and the character of rest intervals on the performance of the speed in the goal to establish norms permitting his/her/its development. The studied cases belong to the Club Athletic Bizertain. 8 among them are part of the sectorial selection of the north and 2 make part of the young national selection. The treatment of results was assured by the software statistical SPSS 10.0 and this while referring to the usual statistical rules, to know the average and the gap type and, the test of student by gotten under way samples (P is fixed to < 0,05). 4 types of tests have been achieved by players: of sprints on 15 and 30 m; 3 sets of 8 sprints on 15 and 30 m (achieved selectively by the players aged of 13 years, age more favorable to the development of the speed according to results of the first test) inserted of 15, 30 and 60 seconds of recuperation between repetitions and 2 mn 15 between sets; Vo₂ max has been verified by the test shuttle of Luc Leger; the cardiac frequency has been recorded by a sportester (Polar electro Finlande oy). The gotten results, evolution of the speed were very irregular of 3.22 s + / - 0,19 at 10 years until 2,45 s + / - 0,22 at 18 years, on 15 m and 4,44 s + / - 0,22 at 10 years until 4,25 s + / - 0,18 at 18 years, on 30 m, coming closer of the adult performance. By comparison to the foreign players, these times are identical to the international norms. Pauses of 4 s provoked a fall of the speed equivalent to 10% in the 5th repetition; what means that this interval is rather favorable to the staying - speed and not to the speed; pauses of 30 s provoked a global fall of the equal speed to 2% (4 to 6%, at the young having a V₀₂max limited: 56,1 + / - 3,2 ml/Kg/mn) and the Cardiac Frequency oscillated between 165 and 170 beatings per minute. It means that the time reserved to the recuperation was insufficient; pauses of 60 s (13 times the time of work) didn't provoke any change of the speed nor the FC all along the set, what means that they encourage the improvement of the speed. Players who have a reduced V₀₂max (true by test shuttle of Luc LEGER) have the lowest values of speed (corresponding time to every age x 8: number of repetitions in every set x 3 to 4) by



opposition to those that have an elevated VO_{2max} (62,11 \pm 1,9 ml/mn/Kg), what testifies that there is an interrelationship between these 2 factors. The time of recuperation must correspond at 13 times the time of work between repetitions (+ / - 60 s) and to the triple or quadruple of the necessary global time to the effort provided in every set.

Keywords: *Speed of race, Childhood and adolescence, Cardiac frequency, VO_{2max}*

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1. Introduction:

The modelling of the footballer's activity at the time of a high-level match shows that it is an intense action every 43 seconds and that the short sprints are estimated to 185 (in 1985). Accelerations and decelerations are distributed in 40% of sprints of 0 to 5 meters, 30% of sprints of 5 to 10 meters and 10% of sprints superior to 20 meters (Tupo B, 2002). In a general manner, this type of effort lasts 5 at 30 seconds (Taelma R and Simon J, 1991). The importance of a precocious formation of the speed is underlined by a lot of authors among the what Meinel K. , KOHLER E. , KOINZER K. , FREY G. , Hollman W. and Hettinger T. (Weineck J, 1998). This formation is distributed in different periods. At the driven children, during the preschool period (between 5 and 7 years), we can observe a strong improvement of the capacity of movement coordination implied in the race, what results in an increase extraordinary of the race speed. To the first school stage (between 6 / 7 and 10 years), occurs the biggest development of the frequency and the speed of movement. To the second school stage, according to Kousnevos,

the frequency of movements and the speed of race increase considerably, them also. We deduct that to this stage as to the precedent, it is necessary to intensify the work of the speed but not the staying - speed, because efforts of this type are not adapted to the weak lactic anaerobic capacity and can provoke reactions " anti physiological " in the organism (Weineck J, 1998). The method of games is indicated too much in these periods, what we can understand through the works of a lot of specialists in the domain of the human growth. At the end the puberty (13 at 15 years), times of latency and reaction reach values equivalent to those of the adult. Big changes appear in the maximal strength and the force - speed as well as in the capacity aerobic (visible in the improvement of the staying - speed and the staying forces). During this period, speed gains for these reasons (Weineck J, 1998). It show us again the importance of the speed: 0,18 second of gap provoke a difference of 1,44 m between two players (Tupo B, 2002).

2. Objectives of Study:



The objective of this survey is to look for in a first time, the young footballer time aged of 10 at 18 years on 15 and 30 m, according to features of the growth and thereafter, to determine the effect of the length and the character of rest intervals on the performance of the speed in the goal to establish norms permitting his/her/ development.

3. Methods and Material:

Subjects: 32 players, children and teenagers belonging to the Club Athletic Bizertain of which 8 being part of the sectorial selection of the north and 2 of the young national selection were the object of our experiences. These players belong to 3 age groups: 10 at 11 years - before the puberty (makes some, this slice begins at 9 years), 11/12 at 13/14 years - puberty, 13/14 at 18/19 years - adolescence.

Statistics: The treatment of results was assured by the software statistical " SPSS 10.0 " and this while referring to rules statistical usual, to know the average and the gap type, and the test of student by gotten under way samples, to determine the average of speed values on 15 and 30m achieved by the young players of different ages. The level of significance is fixed to $P < 0,05$.

Tests and experimental steps: In this transverse survey we resorted to 4 types

of tests. In a first time, we looked for the time of players on 15 and 30 m (departure on stop, on the initiative the player). Thereafter, we studied the evolution of the speed, selectively at the players aged of 13 years during 3 sets of sprints on 30 m. Every set is formed of 8 sprints inserted of rest pauses (walking, small trot, breathing) equivalent to 15, then to 30 and thereafter to 60 s. These sets are inserted of pauses of 2 min 15 recuperation s (since the maximum time of this continuous effort should not pass 30 to 35 s, it must be followed of a period of recuperation that varies between the triple and quadruple of the necessary time to the effort (Tupo B, 2002,; Palfao JS, 1989 and Platonov VS, 1992). The choice of this age comes back to the fact that it presents to him only 7 to 9% of the global volume of speed gain considered between 10 and 18 years. Finally, we corroborated the speed and the VO₂max of players (true by the test shuttle of Luc LEGER), since the staying (aerobic) can be affected slightly by the anaerobic capacity. Under the doorstep anaerobic, biggest part of the effort is covered by the way aerobic (using the oxygen of air) but the way anaerobic participle in spite of all in least part (Taelman R and Simon J, 1991). Concerning the choice of 15 and 30 m, we agree perfectly with Palfai J. (1989) that recommends tests that don't pass 30 m of sprint (in line or in Slalom) and with



Turpin B. (2002) that considers that it is useless to use distances superior to 25 - 30 m, that, according to the modelling of the footballer activity don't correspond to the reality of the game and it contrary to Cazorla and Rhor that recommend a test of 60 m. A lot of works are about the speed but while referring to athletics (100 m). He is right to know that the footballer's speed is different: the stride is less big, the center of gravity is lower,

muscles are less lax, it is less impulse (Tupo B,1990 and Wirhed R, 1994). The cardiac frequency has been recorded by a sportester (Polar electro Finland oy). Tests took place in room on synthetic land, by two (not of maximal speed without duel) after an adequate warming-up. Work was organized Wednesdays, that means before the work "hard " of the week middle and when players recovered.

4. Results and Interpretation:

Age	10	11	12	13	14	15	16	17	18
Time of sprint on 15 ms, to the stop, (+/- α)	3,22 0,19	3,12 0,18	3 0,22	2,74 0,19	2,65 0,21	2,58 0,2	2,52 0,21	2,48 0,19	2,45 0,22
Time of sprint on 30 ms, to the stop, (+/- α)	5,44 0,22	5,32 0,19	5,16 0,24	4,81 0,22	4,59 0,16	4,41 0,17	4,36 0,16	4,32 0,19	4,25 0,18

Table 1: Evolution in the days of sprint on 15 and 30 m at the young footballers (in second, n=32)

• **Interpretation of results and discussion**

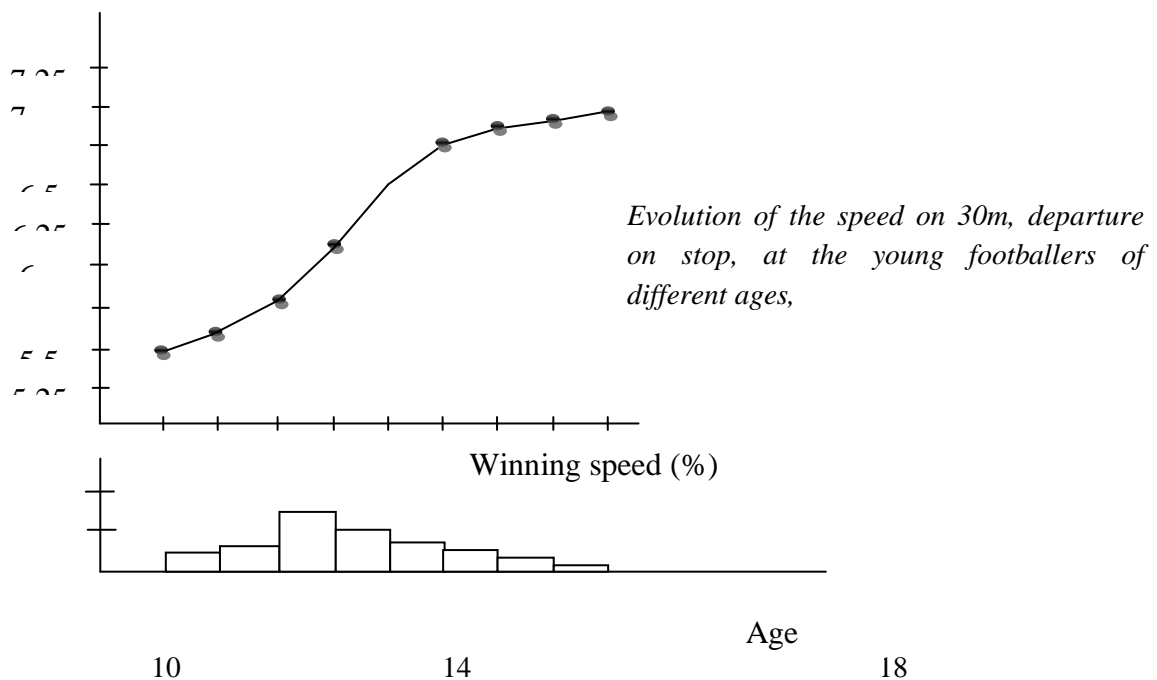
According to the table 1, the time achieved on 15 and 30 m by the players aged of 18 years reached of levels very near of those of seniors, with 4,25 s on 30 m, VS 3,90 to 4,29 s at the French professionals (in October 2000) for example, according to Turpin B (2002); 4,8 to 5,1 s according to Taelman R. and Simon J (1991); 3,9 to 4 s, according to Palfai J (1989) at the Hungarian players;

and with 2,45 s, on 15 m, VS 2,6 to 2,9 s, according to Taelman and Simon. By comparison to the foreign players, our young achieved of the identical times to the international norms. On 30 m, departure on stop and by comparison to the young hungarian players, our players aged of 10 years showed an equal time for example, to 5,44 s + / - 0,22 VS 5,2 to 5,5 s at hungarian; at 11 years, the time of our young is equal to 5,32 s 0,19, VS 5,0 to 5,3 s at hungarian; at 12 years, the time of



our players is 5,16 s + / - 0,24, VS 4,8 to 5,1 s at hungarian. These gains of speed between 10 and 18 years present 27 and 25% reciprocally, on 15 and 30 m. Thereafter, the performance takes a character a lot more regular and constant and the frequency of movement will be modified little. It means that the work of

the speed will only be considered in the setting of a yearly program of practice. Besides, it is to this age that one begins to recruit these young in category seniors, exactly according to especially, of criteria of speed and technique. With age the speed of race evolves irregularly.



Indeed, the improvement of the speed on 15m, at the age of 10 - 14 years (10/12 years - sportive preparation of basis, 13/14 years - deepened sportive preparation (Kacanol L and Horsky L, 1986) presents 20%, on the other hand it presents 17,5% concerning the distance of 30 m. These volumes testify that this age is favorable to the work of the speed, because, it is characterized by an increase of the size and the weight that entails a decrease of the coordination quality (the

teenager becomes clumsy) but, at the same time, an increase of the physical qualities to know the aerobic, the speed and the suppleness. It is due to the big excitability of the regulating nervous mechanisms of the locomotive function and to the metabolic process intensity. The nervous process hyperactivity permits the acceleration of the succession of properties of contraction and laxity muscular and therefore a maximal rhythm of movement.



The highest growth of the speed (around 7 to 9%) is displayed by the children aged of 12 at 13 years, what determines besides, the beginning of the sportive preparation period deepened that spreads from 13 at 14 years. This period is characterized by important modifications of the organism with the signs, typical of the period of puberty. It is a period of growth agitated, characterized by a disruption of the balance between organs, an instability in actions and behaviors of the player, as well as a tendency to the critical approach. During this period, players need a lot of understanding and a psychopedagogical accompaniment. The sportive preparation must be compatible with the general development of functions within the organism; it must be a middle intensity and the too important efforts are proscribed to this age. In the physical preparation, conditions are favorable to the development of faculties of coordination and speed that can make themselves preferably by the method of exercise repetition to dominant technico-tactical. Comes the period of sportive preparation of basis before this stage (10 - 12 years) in which, it is useful to resort to methods of games and repetition, to the race on the small distances, to jumps to work the speed in the setting of a global "training" to Soccer - Ball and no in view of an actual physical preparation.

Shopping can be organized under shape of relays or pursuits inserted of active rest pauses (it is satisfying for players). It is a stage in which the content of the practice is even less centered on the physical preparation; are predominant the exercises, fundamental of the technique in the collective shapes of practice. Among the tasks, the development of the varied physical preparation urgently on faculties of coordination and speed of players. This period comes after pre - pubertal period (9 - 11 years) that is the age of motor acquirement. To this age, the organ of the balance and the sensory organs reach their morphological and functional maturity. It is the moment to acquire some precise motor cleverness: technical work of the fundamental (controls / passes, controls / sequences, technical gestures of basis, : by one, to 2, to 3; work on the two feet, with little displacement) and work of the coordination (gestural coordination, vivacity, supports, displacements, suppleness, rhythm). Between 14 and 18 years (period of the special sportive preparation), the speed deludes to itself 8%, solely. For this period, we note a reduction of the growth in length, but an increase of the growth in width, what entails an increase of strength. Adolescence is the period privileged for the perfection of the technique and the increase of the physical qualities of which strength (abdominal, speed maximal



aerobic, speed, strength). We are therefore here, in full formative period of the player.

The trainer can work the speed at the same time as it makes a work on the aerobic glycolyse, for example, in the technico - tactical situations to 3 against 3 where it can organize on the wing a sprint in duel while partners defenders and attacking are in race to 50% (of the maximal speed) while doing to go players by every station, the alternation of shoppings to 50% and 100% will be good. We demonstrated that the age of 12 at 13 years presents, to him only, 7 to 9% of the global potential of speed at the young players and we add that the frequency of movement will be modified little thereafter. Therefore, it is there about a remarkable speed volume, acquirement in one record time. It is for this reason that we decided to verify the effect of the different pauses of rest on the speed of players aged of 13 years. For that, we organized a test formed of 3 sets of sprints on 30 m. Every set is composed of 8 sprints. These sprints are inserted of 15 s of rest in the first set, 30 s in the second set and 60 s in the third set. Sets are spaced of periods of 2 mn 15 recuperation each, since the maximum time of this continuous effort should not pass 30 to 35 s and must be followed of a period of recuperation that varies between the triple

and quadruple of the necessary time to the effort.

According to Platonov I. V, some too short pauses succeed quickly to the accumulation of products of the anaerobic metabolism, that determines a decrease of the work capacity. This type of practice drives therefore to the anaerobic capacity improvement, rather than to those of speed qualities. The respect of the optimal length of pauses permits to assure a volume raised of work, with sets of the order of 5 - 10 s (5 at 6 times), 15 - 20 s (3 at 4 times), 25,30 s (2 at 3 times). Following the nature of the exercise, the length of pauses between sets varies 2 to 5 mn. Exercises aiming to raise the absolute level of speed on a distance, rarely last beyond 30 s concerning distances of 30 m. In case of recourse (in workouts) to sets of 5 sprints, we would agree that the recuperation is equivalent to 70 to 80 s between two sets; 7 to 8 mn after 5 sets; 8 at 9 minutes after 5 new sets. Exercises of walking, small trot and breathing destined to loosen muscles facilitate the recuperation for the short intervals; in the case of longer intervals light technical exercises are recommended. Players can juggle of feet or the head, to make passes, of heads, to receive them. Periods of rest must, logically to include a muscular activity of weak intensity, during which groups of muscles that work are the same



that those that have been solicited at the time of the execution of the main exercise. In sprints inserted of 15 s and by comparison at the best time that is taken like reference of 100%, the speed fell of an average of 10% in the fifth repetition. It means automatically that pauses of 15 s provoke an improvement of the staying - speed and not of the speed. In sprints inserted of 30 s the speed fell in the same way especially of an average of 2% at players having a lower VO₂max. At this category of players, the speed decreased 4 to 6%. The cardiac frequency was an average of 165 to 175 bpmn. What means that these players didn't have sufficiently of time to recover, whereas the nervous center processes are again enough active and organized to release on the following efforts with enough efficiency.

In sprints, spaced of 60 s the speed didn't fall all along the test. This time of recuperation is few meadows equal at 13 times the time of work (4,81 + / - 0,22). The cardiac frequency kept the same averages that in the first and the second sprint being located between 150 and 160 bpmn. It means automatically that of rest pauses superior to 60 s assure the total restoration of the work capacity and agree therefore to the improvement of the speed. At the young footballers aged of 13 years, the work of the speed cannot limit itself to the execution of maximal or nearly

maximal intensity exercises; of the less intense exercises (85 to 95% of the maximum) must be exercised also insofar as the variability of the intensity of this work constitutes one of conditions, indispensable of the efficiency (the variability encourages adaptability). While playing on the length of rest intervals or on the intensity of the effort is inversely possible, at the time of repetitions to benefit from the maintenance of excitation of the central nervous system, whereas the psycho - chemical disruptions were largely unobtrusive. Here is an example of sitting proposed by the national technical direction at the time of practicum of retraining of trainers of D1 and D2 in October 1994 to the CTNF of Clairefontaine:

10 XS 10m, with 30 s of recuperation between every sprint

5 mn of recuperation

10 XS 20 m, with 1mn of recuperation between every sprint,

8 mn of recuperation

10 XS 30 m, with 1mn 30 s of recuperation between every sprint,

Since the cardiac frequency at the young footballers to rest is raised more than at adults, we can affirm that this fall can be considered like an indication that characterizes the speed of race. The fall of the speed, considered according to



stations in sets of sprints inserted of 30 s, concerned goal keepers a lot more. Indeed, guards don't have need of the same work that makes outfielders. In match, times of efforts are very brief, and the very long rest times; what makes that they don't need work in lactic, nor in staying. Only the work of startings and changes of direction brutally interests them. They make some sufficiently in workouts while intervening in situations against attackers or while sprinting toward the goal. Come thereafter, outfielders who have a physical condition less developed and without consideration of the station or the compartment in which they evolve, contrary to the case of the total distance browsed during a match, for example (3,4). We noticed a general manner that players who have a low value of VO₂max (around 56,1 + / - 3,2 ml/mn/kg) have the lowest speed. On the other hand, those that have good values of VO₂max (around 62.11 + / - 1. 9 ml/mn/kg) are quickly best). It testifies because there is a certain interrelationship between the level of VO₂max and the level of the speed. Indeed, the staying (aerobic) can be affected slightly by the anaerobic capacity. Under the doorstep anaerobic, biggest part of the effort is covered by the way aerobic (using the oxygen of air) but the way anaerobic participates, in spite of all in least part.

5. Conclusion:

The evolution of the speed at the young footballers aged of 10 at 18 years is very irregular, presenting an acquirement of 27% on 15 m and 25% on 30 m of the potential global considered of pre - pubertal period until the adult age. This evolution passes 3,22 s + / - 0,19 at 10 years until 2,45 s + / - 0,22 at the age of 18 years, on 15 m and 5,44 s + / - 0,22 at 10 years until 4,25 s + / - 0,18 at 18 years, on 30 m. These last values are near of those of adults. Between 10 and 14 years, gains of speed present a volume of 20% on 15 m and 17% on 30 m. The survey of the effect of rest intervals on the speed achieved on 30 m at the age of 13 years (age more favorable to the development of the speed according to results of the first test) showed that pauses of 15 s provoke a fall of speed in the fifth repetition, equivalent to 10%; what means automatically that this length of recuperation is rather useful for the staying speed and not for the speed. Pauses of 30 s provoked a fall of the equal speed also to 2%. This fall was more important (4 to 6%) at the young that are a VO₂max limited (56,1+ / - 3,2 ml/mn/Kg) and the FC oscillated between 165 and 175 bpmn, what means that the length of recuperation was insufficient. Pauses of 60 s (equivalent to few meadows at 13 times the time of work: 4,81 s + / - 0,22) didn't provoke any change of the speed



nor the cardiac frequency by comparison to the first and the 2nd sprint (between 150 and 160 bpmn); what means automatically that they follow the improvement of the speed. We conclude therefore, that pauses of rest between sprints must correspond at 13 times the time of work. Between sets, the time of recuperation is 2 mn 15, since the maximum time of the continuous effort should not pass 30 to 35 dry and that it must be followed of a period of recuperation, that varies between the triple and the quadruple of the necessary time to the effort (4,25 s, time of every sprint 8 sprints 4 = 136 s). We showed that players who have a reduced VO₂max (true by the test shuttle of Luc LEGER) have the lowest values of speed (56,1 + / - 3,2 ml/min/kg, 62,11 + / - 1,9 ml/min/kg for best). It testifies that there is an interrelationship between these two factors. The survey of the speed, in consideration of the station showed that the player's speed is not determined for example by the compartment, contrary to the total distance browsed during a match. By comparison to the foreign players times achieved by our young players are identical to the international norms with: at 10 years for example, 5.44 s + / - 0.22 on 30 m, departure on stop, 5.2 to 5.5 s, at hungarian in the same way age; at 11 years, 5.32 s + / - 19, from 5. 0 to 5.3 s; at

12 years, 5. 16 s + / - 0.24 and 4. 8 to 5.1 sec.

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