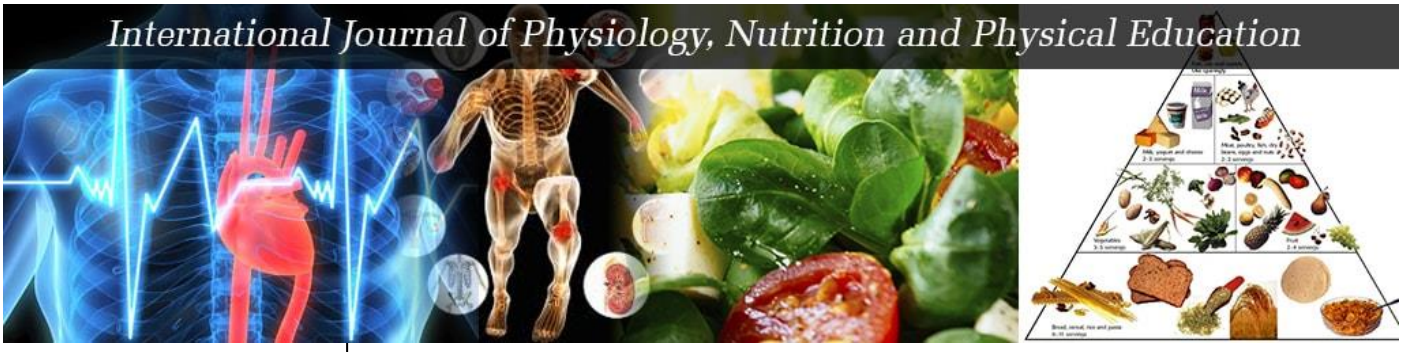

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Effects of a Sandball-Based training program on jumping and sprinting skills in middle school students

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Abstract
The purpose of our study was to assess the jump and sprint capabilities of young handball players on a program or continuum based on Sandball. This experimental study involved 30 students, including 15 girls and 15 boys. The experimental phase consisted of measuring anthropometric parameters (age, height and weight) and the countermovement jump tests (vertical jump), horizontal relaxation with momentum, repeated sprint test (TSR), flexion-extension test of the upper limbs were been measured. The results obtained show a significant difference between the vertical jump performance before and after in girls ($p = 0.035$), no significant difference between the number of push-ups and the time performed before and after in girls ($p = 0.271$ and $p = 0.116$). However, a significant difference was observed between the number of push-ups in boys ($p = 0.002$) also on the T30m in girls ($p = 0.167$), and in boys ($p = 0.030$), as well as on the T15m in boys ($p = 0.031$). Furthermore, no significant difference was observed in the number of push-ups and the time performed in girls ($p = 0.271$ and $p = 0.116$), however a significant difference was noted in boys ($p = 0.002$). In conclusion, the Sandball-based continuum improves sprint and jump performance. This study highlights the interest of Sandball in the process of improving the counterattack. Indeed, this program allows young players to have good gestural velocity in the progression of the ball.

Keywords: Training program, Sandball, sprint, relaxation and college students

Introduction
Handball is one of the most spectacular physical and sporting activities indoors, the challenges of optimizing performance are becoming increasingly important in training methodology, from athlete detection to training. The flourishing of handball becomes a real social phenomenon. Sandball is a physical activity like handball, which is played in a sandy area and has a reduced number of players. This sport produces a particular spectacle, it is a school where each participant strives to give the best of himself, an area of personal accomplishment in which the parties present affirm their passion. It conveys certain values such as: "doing Play", loyalty, respect for the rules of the opponent. It is in this perspective that Guay (1993) gives it one of the most adequate definitions, namely: "a competitive and fun physical activity practiced for an issue according to written rules and a spirit of fairness, desire to win and loyalty ". This situation has led governments around the world to give it a prominent place and to elevate it to the rank of a privileged tool of representation and international cooperation.
This is the reason why, our country, the Congo has opted for the practice of a multidisciplinary sport sanctioned by the increase in the number of practitioners and sports associations. However, we realize that despite all the investment efforts made by the Congolese authorities with a view to development and popularization, sport in general and handball in particular suffers from many ills and is lagging behind. Thus, handball, which is a spectacular game, requiring good physical condition, a certain motor skills, intelligence and flawless concentration presents notable shortcomings, particularly at the general level. But, when you look at it more closely, we see that handball seems to be relegated to the rank of outsider in the race for notoriety. Indeed, in recent years, the evolution of handball seems to be in constant decline. Our first question started from the fact that the championships were badly organized and the frequency of irregular matches.

The results of the matches showed that the level of play in handball was average, bordering on acceptable in the country. Subsequently, we have observed for a few years that the community was no longer registering members, the next generation was no longer assured and the population was losing interest. The last remark concerned the deplorable state of the training grounds and the lack of space for practitioners, the glaring insufficiency of volunteers and high level coaches. So one wonders how to develop a discipline that registers so many problems. This situation which concerns us at the top deserves reflection and solution. Carrying out a study on handball has always aroused great interest in us. Indeed, it is a duty as a practitioner and future specialist in physical and sports activities to reflect on all the problems that handball faces and to propose suitable solutions that can help improve the situation. This led us to reflect on the following theme: "Effects of a Sandball training program on jumping and sprinting skills in college students"

The observation of the handball matches during the national championships allowed us to note, the insufficiency of counterattack and rapid offensive mounting in the various teams. These actions are characterized by loss of balls and goals scored in the attack phase, which have a corollary to the reduction of goals scored in counterattack. From what follows we wonder that Sandball can promote speed and speed through short sprints and handball jumps?

The hypothesis of our study is that Sandball improves jumping and sprinting skills in college students.

The objective of our study is to assess the jumping and sprinting skills of young handball players following a program or continuum based on Sandball.

Our specific objectives were to measure the height and muscular power of the legs in the handball players before and after jump test, series of repeated sprints and to compare the performance in the jump jump test according to the four methods before and after.

2. Material and Methods

The research was carried out through various electronic databases: Pubmed, Physiotherapy Evidence Database (PEDro), EM Consulte, "Kinesitherapy, the Journal", "Scientific Kinesitherapy". The research extended over a period from 2017 to 2018. Most of the references cited in the introduction and in the literature review section were extracted from the Anglo-Saxon literature using the following keywords that we have combined: Countermovement jump "," sprint "," sandball "," Recovery "," Muscular function "," handball ". It was selected, the articles whose title, abstract and keywords were directly related to the research subject. The research was supplemented by other bibliographical references and names of authors appearing in the articles which were selected.

2.1 Fields of investigation

This study, of an experimental type, took place in Brazzaville in the 9 Djiri district and specifically at Bernadette Bayonne college; in the period from March 2 to April 30, 2018.

2.2. Population

The population of our study consisted of students from the 6th grade registered regularly and attending the CEG Bernadette Bayonne for the 2017-2018 school year.

2.2.1 Sample

Our sample focused on a population of 30 students including 15 girls and 15 boys attending the 6th grade at the CEG Bernadette Bayonne. This College of General Education was chosen in a reasoned way, Indeed, the presence of a sandy space for sandball and close to our home. All students were included: Attending the 6th grade and in good health; Aged over 15 years; Regular during PSE; Having participated in the pre and post tests. Be at least 15 years old; Irregular during PSE; not having participated in the pre and post tests.

2.3 Procedure

The experimental phase began with the measurement of anthropometric parameters (age, height and weight) followed by warm-up. Before the training session, the first test of countermovement jump (vertical jump) without momentum is performed and followed by the horizontal relaxation with momentum. Then, the second repeat sprint test (TSR) is carried out over 15 meters and 30 meters. Finally, the third test on extension flexion of the upper limbs is performed. At the end of the training, the same tests are carried out in accordance with the protocol laid down. The test measurement technique and tool are detailed above.

2.4 Measures

The age of the subjects was recorded from the sports licenses made available to us. It was determined knowing that it is the difference between the current year and the year of birth. Knowing the date of birth, we deduced the age of our subjects. The size was measured by a traditional measuring rod with an accuracy of 0.1 cm: the subject standing, the arms alongside the body and the gaze fixed towards forward. A board perpendicular to the vertical board of the board was placed on the head. The measurement was taken from a measuring tape graduated from the bottom up. The body mass was recorded using an electronic scale scale Seca brand with a maximum range of 150 kg and having an accuracy of 0, 1 kg or so. The body mass index (BMI) is an essential tool, used routinely by the medical profession and other health professionals to estimate the prevalence of undernutrition, overweight and obesity. (WHO). It is obtained by dividing body mass (kg) by the square of height (m x m).

2.4 Tests

2.4.1 Vertical jump test

Each Sandballeur performed a CMJ jump test. This test was made more or less possible thanks to the traditional use. The students were placed against the wall and raised their hands below the head with a piece of chalk draw a line, and he made a half bend to perform the vertical jump and draw a line where it stops. In 1921, Sargent proposed the first field method for estimating this vertical movement of the center of mass by the difference in height of footprints left by the outstretched hand between the climax of the jump and the standing position. The jump height thus estimated was proposed as a measure of muscle power by a namesake. During the CMJ, the student stands up, hands at the hips, looking straight ahead and in a still position. At the signal, the student performs a free swing movement (bending of the knees) and jumps as high as possible (keeping hands in contact with the waist). The reception is done in a flexible way and.

2.4.2 The vertical expansion test

Vertical expansion (DV) is appreciated thanks to the use of the method. Students are then asked to jump as high as possible with a counter-movement and knee flexion around 90°.

2.4.3 Horizontal relaxation
The student stands upright behind the jump line drawn in front of the pit, barefoot and joined, with the toes just behind the line. At the signal, the student bends at the knees and raises both arms back with a vigorous detent, jumped as far as possible while simultaneously throwing the arms forward. The student lands with his feet together without losing his balance. He performs two tests, the best result being counted.

2.4.4 Arm power
The arm power test consists of carrying out a development of the striking force. The student is in a prone position, arms bent toward the chest and forehead facing forward. His two hands, spread apart from the width of his shoulders. The student then tries to lift the body as high as possible, keeping his arms straight and his forehead facing forward. The assessor takes the time and the number of pumps performed per person. The position must be maintained until exhaustion for the result to be validated. The student performs two tests before and after. For each student, the two tests are kept

2.4.5 Warming up
All subjects performed a warm-up before starting the training sessions. They did a moderate pace run for 5 minutes and a series of specific stretches for five minutes. Finally, they performed two submaximal sprints over 15m and 30m (around 80% of maximum speed).

2.4.6 Repeat Sprint Test (TSR)
Students perform a 15m and 30m sprint test with a start at a stop. The performances were measured from a time recording. To do this, the entire race was done using a 100-time stopwatch that captures several students per second. The stopwatch is started when the student takes off the rear foot during the start, and subsequently stopped when the student crosses the finish line. The number of students between these two extreme positions allows performance to be measured with an acceptable accuracy of two hundredths of a second. We considered a series to be the realization of 2 x 15 m. The students had to make two series [(2 x 15 and 2 x 30m)] before and after.

2.4.7 Leg power
The leg power test consists in carrying out, on a horizontal press, a maximum concentric thrust from a bent, standardized and individualized position (knees and hips bent at 90 °). The position criteria for each student are noted in the first session and reproduced identically in the following session. Prior to the evaluation, each student receives strict and clear instructions and then achieves sub-maximums so as to get accustomed to the movement and specifically warm up the muscles. During the test, the student performs a single test before and after. The two tests, based on the maximum speed developed, are used for the analysis of the results. Students are asked to jump further.

2.5 Statistical Analysis
The study data were processed by IBM SPSS Statistics 21.0 software. Means were used for all variables in the study. The normality of the distribution of the variables was verified by the Shapiro-Wilk test. The confidence level was set at 95% and the 5% represented the level of significance of all the statistical tests ($p< 0.05$)

3. Results
Anthropometry Table 1 presents the anthropometric characteristics of Sandballers in the form of more or less standard deviation means.

Table 1: Anthropometric characteristics of girls and boys

	Filles (n = 15)			Garçons (n = 15)		
	Moy ± Et	Min	Max	Moy ± Et	Min	Max
Old (an)	13,46 ± 0,91	12	15	13,86 ± 0,91	12	15
Height (m)	1,58 ± 0,06	1,50	1,70	1,58 ± 0,07	1,50	1,70
Weight(kg)	55,06 ± 5,17	45	61	56,33 ± 5,78	50	66
BMI ($kg.m^{-2}$)	21,91 ± 2,50	18,29	25,72	22,50 ± 2,59	18,21	29,33

BMI: Body mass index

Sandballers are on average 13.46 ± 0.91 years old, have an average height of 1.58 ± 0.06 m, an average weight of 55.06 ± 5.17 kg and a body mass index of 21, 91 ± 2.50 kg.m-2 (table 1).
Sandballers are on average 13.86 ± 0.91 years old, have an average height of 1.58 ± 0.07 m, an average weight of 56.33 ± 5.78 kg and a body mass index of 22, 50 ± 2.59 kg.m-2 (table 1)
Muscle velocity of lower limbs Figure 1 shows the Comparison of Sprint Time Before and After Sandball Training for Girls and Boys

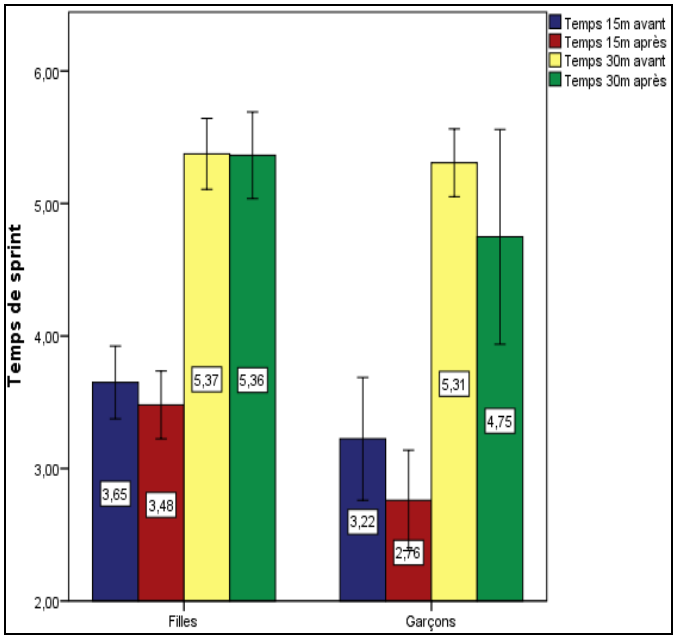

Fig 1: Comparison of sprint time before and after Sandball training for girls and boys

*: Significant difference between the average before and after; **: Significant difference between the mean before and after at $p< 0.01$. Significant difference between T15m before and after in girls (p = 0.003). None Significant difference between the T30m before and after in girls (p = 0.167). Significant difference between the T15m before and after in boys (p = 0.031). Significant difference between the T30m before and after in boys (p = 0.030).

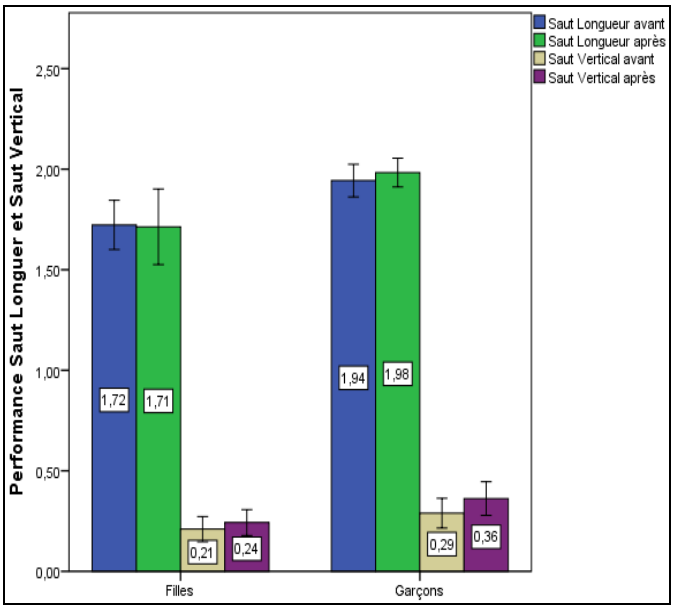

Fig 2: Shows the comparison of long jump and vertical jump performance before and after Sandball training in girls and boys
Figure 2: Comparison of long jump and vertical jump performance before and after Sandball training in girls and boys

No significant difference between the long jump performance before and after in girls (p = 0.955).
Significant difference between vertical jump performance before and after in girls (p = 0.035)
No significant difference between the long jump performance before and after in boys (p = 0.332).
Significant difference between vertical jump performance before and after in girls (p = 0.043)

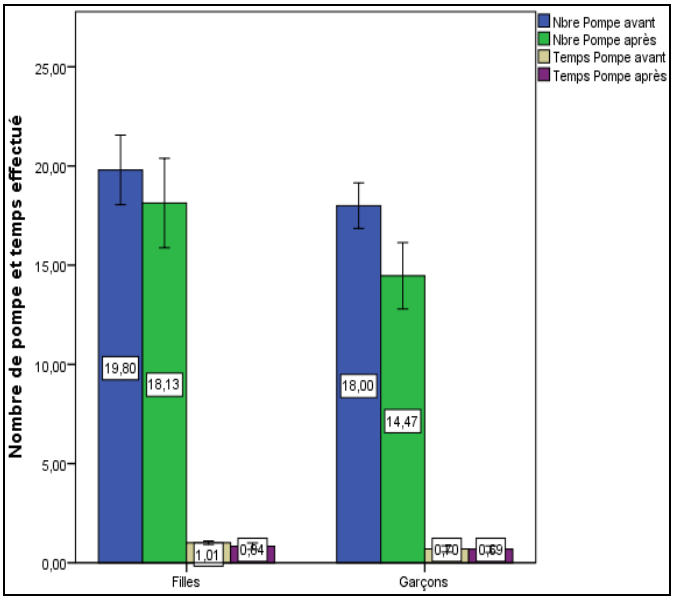

Fig 3: shows the Comparison of the number of push-ups and the time before and after Sandball training for girls and boys

No significant difference between the number of pumps and the time before and after in girls (p = 0.271 and p = 0.116 respectively).
A significant difference between the number of pumps before and after in boys (p = 0.002). No significant difference between the time spent in boys (p = 0.723)

4. Discussion

4.1 Anthropometric characteristics

The present study was carried out with the aim of studying the effect of training on repeated jumping and sprinting skills in handballers through Sandball. There are potential limitations in this study. The population used is less representative (n = 15) by sex. The sample size in this study therefore represents a realistic size that we worked on according to the internal logic of handball. It is also representative of the sample sizes often used in genetic pilot studies (Loy *et al*. 2015) [13].
Our general working hypothesis was as follows: the elimination of dribbling in the progression of the ball, improves the capacities of velocities and jumps.
Indeed, the results (table 1) compared of anthropometry are not significant between the two groups (girls and boys), this can be explained by the validity of our sample, that is to say the use of same selection criteria for groups, in particular BMI is proportional to body weight in students as we noted earlier. (BMI = Weight / height²). We see that, the BMI is directly proportional to the weight in this equation. This average BMI value does not differ from the experimental group and allows classification among subjects with normal weight.
The results obtained in the figures show a significant difference in each test. Finally, the test results for the 15 people by gender are supposed to be in this category. This requires very large sample sizes in order to recruit enough subjects in this category. It is therefore reasonable to think that the students used in this study have on average a good level of aerobic physical condition. Compared to that reported by Esco and Williford (2011) [10]

4.2 Volution of the jump capacity after the practice of repeated sprints

Students recorded no significant difference in their CMJ performance in long jump before and after in girls and a significantly increased power, between vertical jump performance before and after in girls, no difference in their CMY performance significant long jump before and after in boys and a significant increase in power, between vertical jump performance before and after in boys, after SESR. This can be explained by the fact that there was therefore a muscular strengthening through the exercise Sandball, in fact, sandball is practiced on the sand, this therefore allows a good recruitment of explosive and plyometric contraction factor of the most in demand muscles (Bishop *et al*., 2008; Sayers and Clarkson, 2001) [15]. Analysis of our results reveals, however, that weekly Sandball work seems to have a positive impact on support for handball. The tests that were carried out during the Sandball activity. The context of the activity, with important issues to bring muscle building exercises to the fore. It is also known that muscle stiffening can occur when you forget to include the necessary exercises when building muscle. Indeed, the reduction in jump height at CMY recorded in this study, rounding off 12.6%, is observed by Delextrat *et al*. (2012) [8] in Spanish female basketball players and closed to the 11.9% reported in a group of women subjected to a plyometric session (Jakeman *et al*. 2010) [11]. The decrease in jump performance recorded at the end of the session can then be associated with muscle damage caused by the abrupt and intense contractions required by the margins of multi-jump roll and jumps performed at maximum speed and especially on the sand (Clarkson and Hubal, 2002) [6].

The results of the (Figure 1) comparison of the sprint time before and after sandball training in girls and boys, shows a significant difference between the average before and after in girls. While in boys it shows the highly significant difference between mean before and after. This allows us to deduce that sprints are different technical elements from bass to handball, rapid ball progression and less pass to the target. This program promotes the potential to reach the target quickly without dribbling. In addition, it is known that individual progression in the absence of dribbling, increases speed, gestural speed through the demarcation of partners, information gathering, ball calls and technical-tactical efficiency in attack. In modern handball, the majority of energy metabolism is aerobic metabolism, but anaerobic metabolism also plays a decisive role in this activity. It is during intense actions, especially during duels (Bangsbo, 1994) [1] such as sprints, that the differences are observed between the learners. Indeed, most of the studies have looked at the analysis of these factors determining handball practice, showing that for adults, the performance in sprints and jumps is better among international players than among professionals or even amateurs. These performances can differentiate a successful student from a poor one or even players from different divisions (Cometti., 2008) [4]. These handball qualities can be improved following a specific sandball training program regardless of the level of students (Duffield *et al*., 2008) [9]. It has been shown that a training program based on the development of speed, agility and speed seems to be an effective way to improve the power of young handball players (Sedano *et al*. 2011). As in adults, elite players of different ages (13, 14, 15 and 16) outperformed non-elite players in terms of strength and speed as well as several technical skills (Carling *et al*. 2012) [5]. Therefore, these qualities can be decisive factors in the choice of player positions.

Most of the studies carried out which are concerned with the qualities of speed and jumps in young handball players are cross-sectional studies and in most of the cases there is no control group to see the effect of pubertal maturation on The obtained results

4.1 Physiological analysis of handball requirements

The results of the (Figure 2) Compared long jump performance and vertical jump before and after Sandball training in girls and boys. In girls the results of the (Figure 2) show no significant difference between the jump

performance longueur avant et après chez les filles, au niveau de saut vertical avant et après aucune différence significative n'est notée.

In boys the results also show no significant difference between the long jump performance before and after in the boys. Significant difference between the vertical jump performance before and after in boys is noted. Indeed, analysis of the results during the test showed that there is a balance between training stimulus and muscle performance in girls and boys. By comparing the results obtained by the two groups, we can say that the two weekly sessions were beneficial for the "Masculin" and "Female" group. The improvement of the relaxation is very close to the threshold of statistical significance. These results support some longitudinal studies in group sports that have also found muscle improvements as a result of specific training. In 2008, Buchheit studied the effect of intermittent physical preparation in men's and women's handball. The authors of both studies conclude that an entire season of physical preparation, whether in a men's or women's team, leads to slight but significant increases in the percentage of lean mass, maximum strength and the explosiveness of the lower limbs, the strength and power of the upper limbs and the speed of throwing. Contrary to what we observe, these two studies show no improvement in the sprint while the players have benefited from a specific training. However, several works are in line with our results and, after several weeks of training, they find improvements in strength, speed and vertical relaxation. In any case, the improvements in muscle function seen in the press test are probably responsible for the improvements observed in sprint and vertical relaxation. Numerous research confirms this link between muscle improvement and functional improvement. Power, relaxation and agility are often important in critical moments of the game. Markovic *et al*. (2007) [14] mention that the power of the lower limbs, and in particular vertical relaxation, is considered a crucial element for athletic performance. Strength and power share importance with the Two different mechanisms, muscular hypertrophy and neural adaptations are central to muscle strength development (Stolen *et al*.2005) [17]. The results in Figure 3: Comparison of pump number sets and time before and after Sandball training in girls and boys, shows that no significant difference between the number of pumps and the time performed before and after in girls (p.271 and p-0.116 respectively). The results in the boys show that, a significant difference between the number of pumps before and after (p.002). There is no significant difference between the time it takes (p.723).

5. Conclusion

At the end of our study, the goal was to identify the abilities of sprints and jumps to improve the progression of the ball to handball by a continuum based on Sandball. Our study showed that young 'sandbals' improved their performance in sprinting and jumping. It highlights the real interest of specific work in collective sports requiring intermittency of the game, even when the structure is not professional and the number of training sessions is reduced. Through the results obtained we can say that Sandball allows young people to have a good gestural velocity in ball progression. This

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