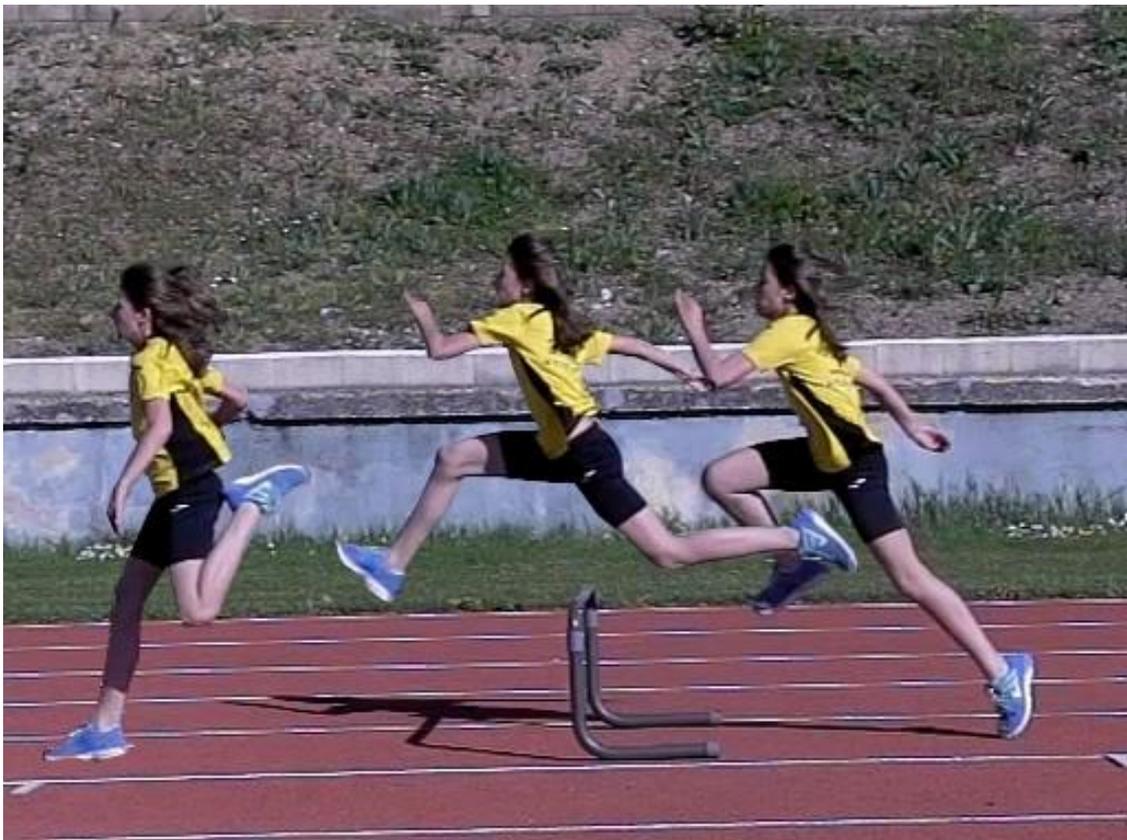


# **IMPORTANCE OF DISTANCE DELIMITATION IMPULSE IN THE TECHNICAL LEARNING OF HURDLING**



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## 1. INTRODUCTION.

In the initiation stage, it is expected that the child acquires a complete knowledge of the hurdle's technique through a comprehensive education (Dessons et al, 1986; Gil, Marín and Pascua, 2005). It is necessary to try to avoid the incorrect teaching techniques because they can result in the young athletes developing bad habits that will be very difficult to solve in the future.

Hurdles generate fear in all of the people that have not had any type of contact with them before and have not dominated passing the hurdles. They present an obstacle in a way that makes people uncomfortable, and they generate uncertainty that provokes, generally, a very close approach to the hurdle, causing a series of mistakes that will immensely brake the athlete's speed;

- Excessive vertical jump in order to avoid the collision with the hurdle.
- Wrong gesture of the lead leg that will tend to move in a pendulum motion and will go sideways to the race line due to the same objective, trying to avoid the collision with the hurdle.
- "Defensive" arrival to the base with the heel having some inclination towards the back of the trunk which, at the same time, facilitates the already mentioned excessive vertical jump.
- Distant and delayed drop of the lead leg after the hurdle.
- Lack of tension of the lead leg during the landing, which due to the great impact of the drop will provoke the sinking of the hip.
- The trail leg (the momentum) arrives slowly and without tension on the other side of the hurdle, landing excessively close to the lead leg and not being aligned in the line of the race, therefore impeding the continuation of the race.

### (Figure 1)

All of these actions, which occur as a result of a protective instinct that goes against the correct aggressive attitude required for a quick race. Therefore, it is appropriate to pay close attention to the first experiences with hurdles that children must have in order to prevent generating any kind of defensive mechanism that would be difficult to correct in the future (Rius, 2005; Gil et al, 2006).

Thus, to avoid a bad experience with the hurdles, we will have to make fun proposals for a proper initiation experience. For this reason, several factors we will need to be taken into account (Dessons et al, 1986; Piasenta, 1988; Gil, Marín y Pascua, 2005; Rius, 2005; Gil et al, 2006; Piasenta, 2011):

- Use of light and low hurdles.
- Individualization of the distances between hurdles according to the physical possibilities of each athlete in order to ensure the correct rhythm between hurdles and a good connection between the sprint and the position of the hurdles.

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- Hip specific mobility work in order to facilitate the learning of the trial leg's movement and, with it, the dynamic passing of the hurdle (Dessons et al, 1986; Piasenta, 1988; Gil, Marín y Pascua, 1991; Rius, 2005; Gil et al, 2006; Piasenta, 2011).

In addition, it is necessary to comment that, regardless of the use of a suitable material and a correct methodology, in the majority of situations, the child's instinct will drive him to an extremely close approach to the hurdle.

To solve this problem, we propose the use of visual limiting references of the impulse point that, according to our hypothesis, will help to get a far and aggressive take off that causes a quick clearance of the hurdle minimizing the loss of horizontal velocity during the flight and facilitate the continuation of the race.

## The aims of this work are:

- To verify scientifically that the location of visual limiting references of the impulse, when in the correct place, redirects the action of the athletes who are new to jumping hurdles, helping them to improve their performance.
- To facilitate beginners to progress to, with guarantees of technical success, the official heights of the hurdles and the distances between them.

## 2. SAMPLE, MATERIAL AND METHOD.

To investigate the hypothesis of the study, an experimental approach to the problem was carried out. A longitudinal and controlled experimental design (pre and post-testing) was used to assess the effects of specific hurdle training in young athletes (12 males aged  $10.50 \pm 0.8$  years and 28 females aged  $10.88 \pm 0.9$  years) with no background in this area.

The intervention study was conducted over a period of 6 weeks (one hurdle training session per week).

All were subjected to a series of preliminary tests consisting of:

- 30m (Stand starting). The purpose of this test was to assess the speed of the athlete in order to use the average speed of the race as an absolute speed reference.
- 4 hurdles race (stand starting). Each athlete had the opportunity to choose the distance between hurdles that felt the most comfortable. This includes the following four setups that Piasenta (1988) proposed:
  - ✓ 9.5m up to the first hurdle and 5.5m between hurdles (26m)
  - ✓ 10m to the first hurdle and 6m between hurdles (28m)
  - ✓ 10.5m up to the first hurdle and 6.5m between hurdles (30m)
  - ✓ 11m to the first hurdle and 7m between hurdles (32m)

Each test was performed two times, keeping the best time. Both tests were recorded with a camera Casio Exilim EXF1 (high 300 frames per second recording rate).

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In order to ensure a similar environment for all participants, hurdles were adjusted to the height of the knee of each athlete and separated by a certain distance depending on the physical capabilities of the athletes.

So as to be able to compare the times of both runs, we took into account that the distance of the race was always similar, though not necessarily equal, to 30 meters. It was therefore necessary to calculate the average speed of each one of them. Then we could set what relative value supposed the value of speed in the race with hurdles regarding to the value achieved in the career without hurdles. We named this relative value, performance index.

### (Table 1)

Once we calculated the performance index of each athlete, we divided the sample into two groups with the sole criterion that the mean value of each group's performance index was similar in order to establish an experimental and a control group.

The averages obtained for each group were:

- Control group:  $78.208 \pm 5.00$ .
- Experimental group:  $78.146 \pm 4.51$ .

Other variables were also analyzed in order to compare them with the results obtained in the final test and to see the improvement of the subjects:

- Distance from the prior support to the hurdle (attacking distance).
- Prior support to the hurdle contact time
- Hip length with respect to the ground at the highest point of the phase of flight.
- Flight time.
- Horizontal distance from the hips at the highest point during the phase of flight beyond the vertical projection of the hurdle and its situation with respect to the same.
- Distance of the post support to the hurdle (falling distance).
- Contact time of the hurdle's post support.

We designed a hurdles training session that both groups performed over 6 sessions, once per week. The only difference of work between the experimental and the control group during the session, resided in the specific part during which the experimental group worked with visual limiting references of the impulse to each hurdle while these references were not used with the control group. Based on empirical experience, these references were placed at a distance of 1.25m, initially considered suitable for the adaptation of all the subjects of the group. As the work progressed, this distance was progressively increased as the subjects were improving their capacity.

As they are children, there is a competitive exercise in the specific part of the session that also assumes a motivating, playful aspect in the training. It helps them develop naturally the technique needed to run as quickly and aggressively as possible, using the ground in order to produce the impulsion.

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The work done in this session type was developed with light and low hurdles that facilitate the acquisition of the technical foundations desired to minimize the emotional constraints. In addition, this experiment focused on the aspect of long-term training, working individually with each child through the adaptation of the height of the hurdles and the distance between them; in the latter case, due to the assimilation of the work of some athletes, the adaptation was often session to session.

It is also necessary to point out that in accordance with the basic principles of child training (Rius, 2005), we developed a multilateral work, although initial and final tests were carried out only by the dominant side.

Finally, this session type included hip mobility work so as to familiarize participants to move in abduction of the trial leg and also to maintain or improve the level of mobility of departure.

## **Statistical Analysis:**

Values of the descriptive analysis were expressed as mean and standard deviation (Mean±SD). After testing the normal distribution of the sample with the Kolmogorov-Smirnov test, Student's t-test were run to analyze the relationships between paired (pre and post- results) and independent samples (experimental and control group).

All data analysis were performed WITH SPSS for Windows (version 20.0, SPSS, Inc., Chicago, IL, USA) setting the significance levels at  $\alpha=0.05$ .

## **3. RESULTS AND DISCUSSION.**

The average attendance (65.83%) of the subjects was similar in both groups. While this level of attendance should be considered correct, we are aware that due to the few sessions that were carried out, 34.17% of absence will affect our results.

At the end of these six sessions of training, the initial tests were repeated. Once again, each athlete had the opportunity to choose the distance between hurdles in which he felt more comfortable.

The average speed and the performance index were analyzed as shown in table 2. We also observed a significant progress of both groups that was much higher in the experimental group.

### **(Table 2)**

We note that the two average performance index values have increased. It seems therefore that the work done with the two groups has been able to influence in improving the performance of the subjects. It can be considered that the work done in a traditional way with the hurdles makes the subjects improve considerably, but the work proposed with visual limiting references of the impulse to each hurdle make subjects improve even more. It should be also noted that the subjects have increased their distance between hurdles, coming closer

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to the official distances corresponding to their age, and thus fulfilling one of the objectives we set in the present study.

The final average value of the performance index obtained in the experimental group is significantly higher ( $t = -2.53$ ;  $\alpha = 0.016$ ) compared to the one in the control group. In six working sessions the experimental group almost doubles the improvement achieved by the control group (4.74% vs 8.38%). This means that the subjects in the experimental group go much faster in test hurdles and are more aggressive and effective in their execution.

To compare these final results, an analysis of the variables mentioned above was done (all made with respect to the second hurdle).

In table 3, it can be observed how both groups decrease in the prior support's time to the hurdle's mean value (significantly in the case of experimental group:  $t = 3.28$ ;  $\alpha = 0.004$ ), denoting a faster arrival at this point than in the pretest. This is probably due to the greater confidence of athletes, produced by their familiarization with the hurdles. However, there is a very significant striking decline ( $t = 4.54$ ;  $p < 0.001$ ) in 16cm from the average attacking distance of the control group compared to the also very significant increase ( $t = 4.40$ ;  $\alpha < 0.001$ ) of this distance also in 16 cm obtained by the experimental group. This causes a difference of 6cm for the control group at this distance in the pretest while in the post-test we observed a significant ( $t = -2.62$ ;  $\alpha = 0.012$ ) difference of 26 cm with the highest value for the experimental group. In our opinion, this fact can only be explained, on one hand, by the instinctive tendency of beginners to approach and overcome the obstacle, while on the other hand, we see how athletes who have worked with visual limiting references from the attacking distance have assimilated the convenience of a distant attack even when such references are removed.

### (Table 3)

### (Figure 2)

As the highest point in which the hip is in the flight phase, it can be seen that both groups have improved very significantly, ( $t = 5.31$ ;  $\alpha < 0.001$ ) for the control group and ( $t = 4.08$ ;  $\alpha = 0.001$ ), since this height has decreased, which implies a less pronounced leap towards the vertical. This reduces the loss of time in the phase of flight, as shown in table 4.

### (Table 4)

Regarding the horizontal distance and situation of the hip at its greatest height with respect to the vertical projection of the hurdle, it is seen that both groups remain technically incorrect when beginning their descent once clearing the obstacle. However, the data is very different from one group to another. While in the control group this distance increases by 1.2cm, in the experimental group this distance is very significantly reduced ( $t = 4.46$ ;  $\alpha < 0.001$ ) by almost 23 cm. In any case, it should be noted that the huge initial difference between both groups ( $t = -3.09$ ;  $\alpha = 0.004$ ) has made easier the improvement of this parameter by the experimental group in what could be considered an error of study designs that should be corrected in future studies and what, in our opinion, is the main limitation of the present study. Nevertheless, it is

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also remarkable that in the post-test, as shown in table 5, despite that big initial difference, the experimental group achieved a better final result than the control group.

### (Table 5)

In what refers to the first support after passing the hurdle (fall's distance), it would be normal that after the training work, the distance decreases due to an increase in the distance of the previous support. However, this does not happen in the control group as it is shown in table 6 while on the contrary, in the experimental group, there is a strong decrease ( $t= 3.12$ ;  $\alpha = 0.006$ ) in the final average distance of the rear support of almost 20 cm. Once again, the only explanation for this remarkable difference between the two groups is the assimilation of the work done with the boundary references from the distance of attack by the subjects in the experimental group.

In both groups it reduces the fall's support time in the final evaluation but that reduction was only significant ( $t= 4.61$ ;  $\alpha < 0.001$ ) in the experimental group reflecting increased activity of athletes, especially in the experimental group, in the search for the ground in order to run between hurdles.

## 4. CONCLUSIONS

1. Using visual limiting references of impulse or not, inexperienced subjects tend to significantly improve their performance in just six working sessions.
- 2 Visual limiting references of the impulse seem to be the reason for the great improvement in the performance of the subjects in the experimental group, which was significantly higher than the one in the control group.
3. Visual limiting references of the impulse improve both the height and the location of the hip during the hurdle's clearance.
4. The use of visual limiting references of the impulse point is a valuable tool that facilitates learning techniques required for the correct clearance of hurdles.