International Journal of Yoga, Physiotherapy and Physical Education
www.sportsjournal.in
ISSN: 2456-5067
Received: 27-01-2023, Accepted: 12-02-2023, Published: 28-02-2023
Volume 8, Issue 1, 2023, Page No. 51-53

One of the fascinating events in track and field: Hurdles

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Abstract
Hurdles races are complicated technical event that require speed, power, flexibility, mobility, and a high level of coordination. Hurdling is a faultless, perfect sprint over barriers. Efficient straightway sprinting requires linear motion with contributes of all body parts; feet, knees, hands, elbows etc. In hurdling one must try to maintain-one's form as close to sprinting as possible. The more one deviates from sprinting mechanics the slower one will finish. The hurdler must try to sprint over the hurdles with minimum interruption of normal sprint action. Hurdling is essentially a form event, and form can be learned. The process may be long and tedious, but there have been many "made" champions who have reached the top by courage, tenacity of will, and patience. Hurdling is one of the most spectacular events of the track and field program. It is a form event which demands exactness in rhythm and timing. It is almost incredible that the hurdler's time is only slightly slower than the sprinters time. Such speed is possible today because hurdling now consists of stepping or striding over, rather than jumping over, the barriers. Running the hurdles is the most difficult and the most technically challenging form of running because it involves both the athletic ability to generate muscle power and the science of integrating the speed of maximum forward movement with the efficient grace necessary to clear the hurdles.

Keywords: Hurdles, track and field

Introduction

Hurdling, sport in athletics (track and field) in which a runner races over a series of obstacles called hurdles, which are set a fixed distance apart. Runners must remain in assigned lanes throughout a race, and, although they may knock hurdles down while running over them, a runner who trails a foot or leg alongside a hurdle or knocks it down with a hand is disqualified. The first hurdler to complete the course is the winner. (The Editors of Encyclopædia Britannica) Hurdling probably originated in England in the early 19th century, where such races were held at Eton College about 1837. In those days hurdlers merely ran at and jumped over each hurdle in turn, landing on both feet and checking their forward motion. Experimentation with numbers of steps between hurdles led to a conventional step pattern for hurdlers—3 steps between each high hurdle, 7 between each low hurdle, and usually 15 between each intermediate hurdle. Further refinements were made by A.C.M. Croome of Oxford University about 1885, when he went over the hurdle with one leg extended straight ahead at the same time giving a forward lunge of the trunk, the basis of modern hurdling technique. A major improvement in hurdle design was the invention in 1935 of the L-shaped hurdle, replacing the heavier, inverted-T design. In the L-shaped design and its refinement, the curved-L, or rocker hurdle, the base-leg of the L points toward the approaching hurdler. When upset, the hurdle tips down, out of the athlete's path, instead of tipping up and over as did the inverted-T design.

Historical preview

Track and field hurdle events have a long history. The two major hurdle races for men appeared in the mid-19th century in England. Around 1830, hurdle races of 100 yards were run over heavy wooden barriers. The distance was extended to 110 meters in 1888. The elongated hurdle race at 400 meters was introduced around 1860 in Oxford. Runners jumped over 12 heavy wooden barriers that were spaced equal distances apart. The 110-meter hurdles were introduced as an Olympic Games race in 1896, just after the heavy, solid hurdles were replaced with lighter-weight hurdles that could be knocked over forwards. The 400-meter hurdles became an Olympic sport for men in 1900. Jim Thomas (2015)

Hurdles in Pre Olympics

Technique Development

Improvement in the design of Hurdle: For the first hurdles races in England around 1830, wooden barriers were placed along a stretch of 100 yards (91.44 m). In 1837 the design of the hurdles were solid ship "rigidly staked into the meadow". The massively constructed hurdles of the early days were first replaced in 1895 with somewhat lighter T-shaped hurdles that runners were able to knock over. However, until 1935 runners were disqualified if they knocked down more than three hurdles, and records were only recognized if the runner had left all hurdles standing. Carpenters horse type hurdle come up after inverted 'T' shape. In 1935 the L-shaped hurdle was introduce. Ones that easily fall forward if bumped into and therefore reduce the risk of injury. The current running style where the first hurdle is taken on the run with the upper body lowered instead of being jumped over and with three steps each between the hurdles was first used by the 1900 Olympic champion, Alvin Kraenzlein.

Various Heights and Distance of Hurdles: The first standards were attempted in 1864 in Oxford and Cambridge: The length of the course was set to 120 yards (109.7 m) and over its course, runners were required to clear ten 3 foot

6 inch (1.07 m) high hurdles. After the length of the course was rounded up to 110 meters in France in 1888, the standards were pretty much complete (except for Germany where 1 meter high hurdles were used until 1907).

Clearance Technique and Stride Pattern
Training Development

Difference of high and low hurdles: The above is a description of a normal hurdling action. What differences then occur between men and women's high hurdles at 1.067/0.84 meter and men's 400 meters hurdles at 0.914/0.76 meter in height? Generally, the technique of the hurdle clearance is similar but due to the different hurdle heights certain modifications occur. Hurdling whether the 110's/100's or the 400's, is a sprinting action. In fact, if we evaluate the velocities achieved in the two races, we find that the long hurdler is actually sprinting at a faster mean velocity than the high hurdler. Technically, barrier clearance of 400 meter hurdles is more economical, with less exaggerated and less vigorous movement than 110/100 meter hurdles. For any athlete, the higher the hurdle becomes, the greater the lean required over it. Continue lean forward, aided by a positive and more extensive arm action helps to keep the flight path of the centre of gravity over the hurdle as horizontal to the ground as possible. Low hurdles need not be cleared as closely as the high hurdles. With lower hurdles the use of the lead knee and the trail knee is also not as great as for the high hurdles. The 400 meter hurdler finds it easier to "relax" during hurdle clearance than the 110/100 meter hurdles. The high hurdler men need to get the lead arm well forward to assist the drive at the hurdle. The hips and shoulders are kept square to the front from the take-off to the landing. The speed of clearance is determined by the lead leg speed. As the lead leg is lifted, the opposite arm is pushed forward in a position parallel to the lead leg. With the low hurdles at 0.914/0.762 meter, the centre of gravity is well above the barrier. The 400 meter hurdle height requires less body lean into the hurdle than in the high hurdles. Although the trail leg may clear the hurdle in a lower plane than in the high's, it must allow continue driving forward and upward to allow the hurdler to return to good sprinting action. There is no need for an aggressive body dip to clear these hurdles. The only lean required is, good sprinting technique. Thus, for low hurdles the legs need to be raised only slightly for the clearance to be effective and it is not necessary to bring the trail knee to hip level. But in the 110/100 meter hurdles the trail leg is lifted high, fast and well bent to just above hip height and the take off leg is extended in a smooth, continuous movement. Therefore hip flexibility is not of as important as it is in the men's high hurdles. The men's 400m hurdlers are not as vigorous in their action as the high hurdlers because the economy of the effort becomes an important factor. The clearance technique is somewhere between that of the high and the men's 400m hurdles. Less body lean and flexibility is required than for the high hurdles but the lead arm still reaches forward to aid the lean across the barrier. The stride length for the hurdler who takes 13 strides between hurdles averages 2.45m versus an average stride length of 2.05m for the high hurdler. The hurdle clearance stride for the intermediate hurdler is approximately 3.50m, and is about the same for the high hurdler. Of course, since the hurdle is 0.153/0.08 meter shorter than in the high's, the hurdler does not need to raise the center of mass as high as the high hurdler to clear the hurdle. The parabolic path of the hurdler's center of mass has not deviated from normal sprinting action as much as the high hurdler's, the 400m hurdler does not need to be as aggressive in trying to snap the lead leg down nor does he need to snap the trunk back, since he has not leaned into the hurdle as much as the high hurdler would. It's a sometimes suggested that the long hurdler float or glide over the hurdle relative to the more aggressive action of the high hurdler. However, these terms are misnomers and more often than not connote slowing down over the hurdle. To ensure an active landing of the lead leg and continuation of efficient sprinting:

- Complete recovery of the trail leg.
- Continue the knee drive forward and upward after it passes the hurdle

The hurdle clearance of both the event depends largely on the athletes take off distance from the hurdle, which would depend on sound factor such as:

- Speed of the approach run
- Height of the athlete and the hurdle
- Flexibility of the hip and the knee joint

An athlete, in spite of having good speed, speed endurance, flexibility and co ordination, may not have good time, if do not have a sound technique where the part of clearance play a major role in both the discussed events.

Modren Olympics
Technique Development

Improvement in the design of Hurdle, Various Heights and Distance of Hurdles: The standardized distance and height for women in 1926 i.e. 80m. With 8H. (76.2cm in ht. 8m in between distance and 12m. from start to 1st hurdle and last hurdle to finish). 1972, the distance of women hurdle was increased from 80mts. to 100mts. In 1900 and 1904, the Olympics also included a 200 meter hurdles race, and the IAAF recognized world records for the 200 meter hurdles until 1960.Norman G Richard got silver medal in 200 meter hurdles in 1900 Olympics. 400mts.Hurdle Men included in 1900 Olympics Paris. The 400 m hurdles have been an Olympic discipline since 1900 and 1984 for men and women, respectively. 400mts hurdle Women included first time in the European championship in 1978 Prague, in W.C. in 1980 at sittard (Holland) and Olympics in 1984 Los Angeles. 100 meter hurdles, Height is 0.84 meter the first hurdle is placed after a run up of 13.00meter from the starting line. The next nine hurdles are set at a distance of 8.50 meters (30 ft) from each other, and the home stretch from the last hurdle to the finish line is 10.50 meters (46 ft) long. 110 meter hurdles, height is 1.067 Meter, the first hurdle is placed after a run up of 13.72 meters (45 ft) from the starting line. The next nine hurdles are set at a distance of 9.14 meters (30 ft) from each other, and the home stretch from the last hurdle to the finish line is 14.02 meters (46 ft) long. 200 meter hurdle uses only for men in 1900 and 1904 Olympics the height of hurdle is 76.2cm and there are respectively 10 hurdles in each lane. The distance from last hurdle to finish line is 13 meter. 400meters hurdle event for both men and women. The height for both men and women are respectively 0.914 meter and 0.760 meter. The Distance from start to first hurdle 45 meter and distance in between hurdles 35 meter and from last hurdle to finish 40 meter.

Clearance technique and Stride Pattern

Generally in high hurdles athletes use 8 strides from start to first hurdle and in between athlete uses 3 strides and from last hurdle to finish athlete uses 5-6 strides. In intermediate Hurdles male athletes normally uses 22 stride pattern and female uses 22-26 strides from approach to first hurdle and in between the hurdles men uses 13-15-17 strides and female uses 17-19 strides and from last hurdle to finish 18 to 21 strides. Hurdle Clearance stride of elite athlete is 3.50meter, Hurdle Clearance stride of elite athlete is 4.02meter, Hurdle Clearance stride of elite athlete is 4.54meter.

Conclusion

The improvement of performance is interrelated with the design of hurdle, due to the changes of surface and nails of spikes and also the progression of technique and training. Improvement of performance from its inception.

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