

300m Low/Intermediate Hurdle Theory

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I. INTRODUCTION

The 300m hurdle is arguably the most demanding of all events in the sprint-hurdle group. It requires a combination of speed endurance and hurdling skill along with a unique stride pattern (between hurdles) awareness which requires special concentration throughout the race.

II. TECHNICAL CONSIDERATIONS

Hurdling, whether the 100/110's or the 300's, **is a sprinting action**. In fact, if we evaluate the velocities achieved in the two races, we find that the longer hurdler is actually sprinting at a faster mean velocity than the high hurdler. [Kevin Young in his WR 46.78, had an average velocity of 8.55 m/s; Colin Jackson, in his WR 12.91; averaged 8.51 m/s.]

Without question, **the hurdler should strive to accelerate the last few strides into the hurdle**. The last stride prior to the hurdle should be shorter and quicker than the previous strides.

The hurdler should gain an erect "hips tall" position during the final strides of the approach. As in high hurdling, a quick lead knee action initiates the take-off to the hurdles. **Leading with the knee if the single most important fundamental of efficient hurdle technique**. A quick lead knee results in what is often called a *delayed trail leg*, that is, the trail leg gets full extension at take-off.

The lower 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 continue driving forward and upward to allow the hurdler to return to good sprinting action.

Since the hurdle is 3-6" shorter than in the highs, the hurdler does not need to raise his or her center of mass (COM) as high as the high hurdler to clear the hurdle.

Since the parabolic path of the hurdler's COM has not deviated from normal sprinting action as much as the high hurdler's, the 300m 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 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. Complete recovery of the trail leg, continuing the knee drive forward and upward after it passes the hurdle ensures an active landing of the lead leg and continuation of effective sprinting.

The hurdle clearance stride is a good indicator of the efficiency of hurdle clearance. Ralph Mann, former world record holder and now a well-known biomechanist, compared the hurdle clearance strides of "*elite*", "*average*", and "*poor*" male hurdlers. his findings proved that shorter clearance strides with a higher percentage of the stride in front of the hurdle correlate to higher level performance (see Table A).

Table A

	Hurdle Clearance Stride	Distance Before Hurdle	Distance Beyond Hurdle	Per Cent Before Hurdle	Per Cent Beyond Hurdle
"Elite" Hurdler	3.50m/11' 6"	2.22m/7' 4"	1.28m/4' 2"	63.50%	36.50%
Average" Hurdler	4.02m/13' 2"	2.44m/8' 0"	1.58m/5' 2"	60.60%	39.40%
Poor" Hurdler	4.54m/14' 11"	2.65m/8' 8"	1.89m/6' 2"	58.40%	41.60%

The hurdler should swing back an extended lead arm in opposition to the trail leg to maintain balance over the hurdle. He should not "*drive*" or "*snap*" the elbow back, as this shortens the moment of inertia of the arm [relative to the trail leg] and creates rotation imbalances. Rotation problems are also caused by reaching too far with the lead arm, and are magnified on the curve in the long hurdle race. The trail arm on the side of the lead leg should deviate as little as possible from normal sprinting action.

III. START TO THE FIRST HURDLE

The acceleration pattern and stride pattern to the first hurdle are of vital importance as they establish the hurdler's rhythm through the first few hurdles. In covering the 45m to the first hurdle, the hurdler should predetermine through practice the number of strides he or she will take that results in a good transition to sprinting between the hurdles.

Most elite high school male hurdlers use 23-24 strides to the first hurdle. Regardless, if the hurdler takes an even number of strides to the first hurdle, the lead leg should be in the back block at the start; if the hurdler takes an odd number of strides to the first hurdle, the lead leg will be in the front block.

The following table can be used to determine the optimal number of strides to the first hurdle with the resultant stride pattern between the hurdles:

Table B

Number of strides to the 1st hurdle	Resultant strides between hurdles
20	13
21	13
22	13-14
23	14-15

The resultant stride from a 23-24 step approach to the first hurdle leads most efficiently to an effective stride pattern of 15 strides between hurdles. A 25-stride approach to the first hurdle results in a slightly shorter stride length between hurdles which may lead to the hurdler elongating or reaching to get an effective 15 strides between the first two hurdles. A 22-stride approach can lead to an effective stride pattern between hurdles which requires the hurdler to shorten or chop his strides to get an effective 15 to the second hurdle. A 25-stride approach to the first hurdle will most often result in a 17-step pattern between hurdles.

Counting the number of strides to the first hurdle (i.e., consciously counting each time the lead leg or trail leg contacts the track) can be a valuable aid for the beginning hurdler (or even the elite hurdler in the early stages of the competitive season).

Block clearance at the start of the race should result in an acceleration pattern over the first 30m of the race that is not unlike that of a 400m sprinter. By the 30m mark the hurdler should be focused on the initial hurdle and make any slight adjustments that might be necessary.

As a suggestion, when the long hurdler practices, he or she should practice at a distance of 80m. This forces the hurdler to go over the first two hurdles, and results in practice not only of the start but of the effective stride pattern.

IV. STRIDE PATTERNS

The 400m hurdles is undeniably a race, which, more than any other, requires extensive racing experience as a prerequisite for success. That is, the more times an athlete can run the race in a competitive environment, the more efficient the stride pattern can be expected to be, resulting in faster times.

Without question, the ideal stride pattern would be a consistent pattern of an odd number of steps between all hurdles. The "odd" step pattern (13's, 15's, 17's, 19's, etc., all the way) allows the hurdler to take all hurdles with the same lead leg (preferably the left -- see comments on lane positioning on the curve). An "even" step pattern between hurdles forces the hurdler to "alternate" his or her lead leg on consecutive hurdles.

It is a rare exception for a hurdler to be able to accomplish a consistent number of odd strides all the way through the race. In our 1992 Olympic Trials, only three male hurdlers were able to accomplish 13 strides for the duration of the race (Nat Page in both the semis and finals, McClinton Neal in the semis, and Kevin Young in the semis). In every other instance, the hurdler is forced to make a "transition" to a greater number of strides between hurdles. A transition takes place when the hurdler changes down to a shorter stride length (because of fatigue) which results in one or two more steps between hurdles.

In our Olympic trials in New Orleans, the median value for the hurdle at which this transition took place was the seventh hurdle. An athlete with a lesser degree of aerobic endurance (i.e., an athlete in poorer condition, or at an earlier stage of the season) would be expected to make this transition earlier in the race.

There are three forms of transitions. The preferable transition is the *single alternate*, an example of which would be the left lead-legged hurdler transitioning from 15 strides to 16 strides, requiring him to then hurdle with a right lead leg over every other hurdle for the duration of the race. In a *dual alternate* transition, the hurdler who is leading with his left and taking 15 strides between would take 16 strides and use a right lead leg, then 16 again to get back to the preferred left lead leg, and then finish the race with 17 strides between, taking all remaining hurdles with his left lead leg. The *double cutdown* is most often used by the inexperienced hurdler who is unable to hurdle with his alternate lead leg. In this case the hurdler who is taking 15 strides between hurdles and leading with his left lead leg would cutdown to 17 strides between (so as not having to hurdle with a right lead leg). The disadvantage of this type of transition is that the stride length must be drastically reduced in just a few meters of hurdle clearance from 2.31m (7' 0") to 1.85m (6' 1"). The following table shows the relationship between the number of strides between hurdles and the stride length:

Table C

Strides between hurdles	Required stride length
13	2.45 m (8' 0")
14	2.27m (7' 6")
15	2.13m (7' 0")
16	1.98m (6' 6")
17	1.85m (6' 1")
18	1.72m (5' 7")
19	1.60m (5' 1")

Very few elite hurdlers ever use a double cutdown transition in a race situation, as their ability to alternate lead legs allows them to use the more effective single or dual alternate transitions. **The most valuable technique you can teach the developing hurdler is the ability to alternate lead legs over consecutive hurdles.**

Regardless of the type of transition which takes place in a race, the long hurdler should have a race plan which dictates for him or her where the transition will take place, and should be conscious of this point in the race. At the planned transition point in the race, the hurdler should consciously try to increase the stride frequency while reducing the stride length. This change in the stride pattern should be initiated before the hurdler is "*forced*" to change due to fatigue.

The predetermined stride pattern is called the hurdler's *effective stride pattern*. Of course, variables such as wind conditions and type of track surface will have an influence on the effective stride pattern (and consequently on where in the race the transition takes place). More often than not the inexperienced long hurdler is forced to make additional late-race adjustments due to early onset of fatigue resulting from too fast of an early pace. **The ability to make additional late-race adjustments is greatly enhanced if the hurdler can alternate lead legs efficiently.** [Seven of the eight finalists in the men's 1992 U.S. Olympic Trials effectively alternated lead legs within the race.]

It is very important to be able to make any of these adjustments well in advance of the hurdle, instead of trying to rush an adjustment in the last few strides before the hurdle. Minor step adjustments may be made by moving slightly in or out in the lane on the turn, or consciously shortening the stride during the first few strides coming off the previous hurdle. This is where racing experience becomes so valuable. Experience develops the depth perception to where the hurdler can make adjustments in stride length and frequency at the sub-conscious level far in front of the approaching hurdle (and with little loss of velocity caused by "*chopping*", "*shuffling*", or "*reaching*".

V. LANE POSITIONING/HURDLING ON THE CURVE

The long hurdler who leads with the left leg has a definite advantage over a right lead-legged hurdler. The hurdler with the left lead leg can run the entire curve on the inside of his or her lane. The hurdler with the right lead leg must move to the outside of his lane to efficiently (and legally) clear the hurdles on the curve. If the hurdler with the left lead leg is able to run 24" closer to the inside lane line than the hurdler with the right lead leg for 20 strides (4 per each of the 5 hurdles on the curve), he will gain an entire meters (or .12-.13 seconds) on his opponent.

In addition to a shorter path between the hurdles on the curve, a left lead leg will allow the hurdler to avoid dragging his or her trail leg around the inside and below the top of the hurdle, resulting in disqualification.

It's worthwhile to mention here that many world class hurdlers have hurdled with a right lead leg. Seven of the sixteen semifinalists in the '92 U. S. Olympic Trials led with their right through the majority of their stride pattern. Previously-mentioned Ralph Mann was a world-record-holder in the late 70's with a right lead leg.

VI. DISTRIBUTION OF EFFORT

The hurdler's distribution of effort throughout the race can be effectively measured by the coach by using a stopwatch to determine the "touchdown times." These times can be charted and reviewed with the hurdler to evaluate his or her race. It's important to note that every hurdler, from beginner to world-class, loses velocity over the course of the race, as denoted by increasing touchdown times. Major discrepancies in the chart of a race can point to errors in judgment of transitions and late-race adjustments, as well as where fatigue sets in.

The 4th hurdle in the 300m race is at the 150m mark, or precisely 1/2 of the way through the race. The touchdown time at this hurdle is an especially valuable indicator of the distribution of effort during the early stages of the race. Ideally, the differential in times for the first and second half of the race should be no more than 5%, or about 2.0 seconds in a 40-second effort or 2.5 seconds in a 50-second effort. Another good indicator, however, more difficult to obtain, is the 200m split at 2/3 of the way through the race.

VII. RUN-IN

Many 300m hurdlers make the mistake of "*finishing*" the race at the 8th hurdle, still 10 from the finish line. Making required adjustments in stride length and stride frequency well in advance of the final hurdle enables the hurdler to clear the hurdle efficiently. The hurdler then needs to begin a drive to the finish line, concentrating on sound sprinting mechanics. A high level of anaerobic endurance that results from including a large volume of speed endurance work in the training program is the key to a fast run-in from the last hurdle to the finish.