

HURDLE TECHNIQUE OF AN ELITE ATHLETE



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This paper is a descriptive analysis of the hurdle technique of Charles James, a L.S.U. (1984) freshman, delineated in a synthesis of 35 mm motor drive photographs, with form analysis supported by cinematography.

A Redlake Locam with a 25mm lens was set up ninety feet perpendicular to the plane of action. The start and the first seven strides were photographed twice at 200 fps as the subject cleared a flight of four hurdles. The hurdles and starting blocks were then moved back so that the first hurdle bisected the horizontal field of view, allowing space to photograph the seventh and eighth, the hurdle stride, and the first two of the three strides between hurdles. This procedure was repeated to photograph action at the second, third, and fourth hurdles. The film was examined to make selected temporal, linear, and angular measurements.

The James version of hurdle form presents some interesting elements of technique that are related to stride patterning. His All-American prep efforts, while at Truman High School, Levittown, PA, included :13.39 (39"); :14.23 (42"); and :37.02 for the 300m event. As a college freshman, he placed seventh in the NCAA finals with :13.92, and he also posted a 1984 national freshman best of :13.67.

James starts from blocks set medium-long with the right pedal 17" and the left 33" from the starting line. He responds to the starting gun with a good reaction time of 0.165 sec. With no discernible pressure on the rear pedal, he catapults from the front pedal at a body inclination of 35°. The first stride is 4'10", with subsequent strides and body angle systematically increasing after a short 3'8½" second stride.

APPROACH

At the completion of eight strides, noticeably holding back on the



sixth, seventh, and eighth, he attacks the initial hurdle from 6'2½" out, at an angle of 63°, with a well-flexed left lead leg. During the support period of 0.075 sec, the lead right arm is positioned across the chest and the left remains at the side, in a state of dynamic readiness, to drive forward when the trail leg begins its hip circle. Lead leg drive is coordinated with a good trail leg split. As the lead leg drives rapidly for the rail, it is systematically extended at the knee. Coincident with the arrival of the lead foot at the rail, the takeoff leg is hyperextended at the hip with the knee flexed at 120°. There is no evidence of premature trail leg pull through.



CLEARANCE

An overemphasized flexion of the hips and trunk occurs during the layout. While it looks good, it is unnecessary at this stage. Since it occurs during the downward flight of the center of mass, simultaneously with



descent of the lead leg, it precipitates a downward pelvic tilt, which may contribute to hitting the hurdle with the seat, a rather common problem with this subject.

The lead arm begins to extend at the elbow as the shank of the lead leg crosses the rail and the trajectory of the center of mass continues its descent. Trail leg pull through, initiated earlier, shows the hip and knee of the trail leg correctly crossing the rail at the same time.

TOUCHDOWN (Figures 13-15)

The trail leg is swung from its abducted layout position into an adducted hip circle pattern that shows the trail foot nicely clearing the hurdle, with the toe pointing laterally. The hip circle is continued and well coordinated with the action-reaction descent of the lead leg, now slightly flexed at the knee, to help return it to the track as quickly as possible. The seat can be seen making contact with the rail at this time. Just prior to landing, the lead leg is completely extended at the knee, as the trail leg is moving forward, away from the armpit. The lead arm is sweeping back, flexed at the elbow, just passing outside of the trail leg, which is returning to a sagittal plane.

ROCKER STRIDE (Figures 14-15)

At touchdown, 5'5" from the hurdle, the lead leg is completely extended or posted. During the support period of 0:11 sec, the ankle "gives", evoking a plyometric and stretch reflex mechanism for the plantar flexors. There is no evidence of any knee flexion. Left arm action is manifested again in a vigorous drive forward to coordinate with touchdown. The right arm is swept back, coincident with the knee drive oriented return of the right leg. The erect body rocks or pivots over the posted left leg and vaults into the next stride with high powerful arm action. The knee of the right lead leg does not strive for horizontal distance in the "rocker" stride as the left trail leg begins forward recovery prior to the end of the stride.

With upright posture, James advances to the second hurdle with strides of 4'9", 7'0", and 6'5 $\frac{1}{4}$ ", requiring 0.18, 0.18, and 0.16 respectively, and pivots into the second hurdle at an angle of 62°. Takeoff and touchdown for the second hurdle are 6'4 $\frac{3}{4}$ " and 5'4 $\frac{1}{4}$ " respectively for an 11'9" stride.



Touchdown average velocity improves from 19.71 ft/sec for the first hurdle to 27.72 ft/sec for the second, 27.95 ft/sec for the third, and 28.65 ft/sec for the fourth hurdle (Table I).

TABLE I: SELECTED MEASUREMENTS OF THE APPROACH TO THE FIRST HURDLE AND THE INTERVAL BETWEEN THE NEXT THREE

Stride #	Angle°	Stride Length ft-in	Time sec	\bar{X} vel ft/sec to touchdown
1	35	2-1* (4'10")**	0.64	
2	42	3-8½	0.28	
3	45	4-7	0.30	
4	47	5-2½	0.31	
5	49	5-6½	0.22	
6	56	5-1½	0.16	
7	63	6-2½	0.11	
8	upright	5-9½	0.10	
HS ₁ ***	63	takeoff 6-2¼ > 11-7¼ touchdown 5-5	support 0.07 airborne 0.36 touchdown 2.55	> 0.43 19.71
1	upright	4-9	support 0.11 airborne 0.07	> 0.18
2	upright	7-0	0.18	
3	upright	6-5¼	0.16	
HS ₂	62	takeoff 6-4 3/4 > 11-9 touchdown 5-4¼	support 0.12 airborne 0.44 touchdown 3.63	> 0.56 27.72
1		4-9 3/4	support 0.13 airborne 0.06	> 0.19
2		7-1	0.17	
3		6-4 3/4	0.16	
HS ₃	63	takeoff 6-4¼ > 11-7¼ touchdown 5-3¼	support 0.12 airborne 0.43 touchdown 4.7	> 0.55 27.95
1		4-9 3/4	support 0.12 airborne 0.08	> 0.20
2		7-1 3/4	0.17	
3		6-7	0.16	
HS ₄	63	takeoff 6-2¼ > 11-6½ touchdown 5-4¼	support 0.11 airborne 0.41 touchdown 5.75	> 0.52 28.65

*from starting line

**from starting blocks

***hurdle stride

COMMENTARY

Essentially, James' hurdle technique is the same after the first barrier. The hurdles just come up sooner! The strides over the hurdles are long enough but too close at takeoff and too distant on touchdown due to an overstriding pattern in the approach to the first hurdle. James is sprinter oriented, which encourages the overstriding. The disposition of the hurdle stride requires a very quick flexed lead leg swing up and a precisely timed, well executed high trail leg hip circle (Fig. 6-13). The parallel layout looks good, but may slow down the action-reaction hip circle snapdown--at the risk of hitting on the way down (Fig. 11). The first step off the hurdle is a vault, not a stride in the normal sense (Fig. 14-15). Since the posture at touchdown is upright, this technique has not slowed down progress, other than producing a relatively short first stride (Fig. 15).

A college effort to eight stride has presented problems: general overstriding to the first hurdle, the skewed hurdle stride, hitting hurdles (on the way up and down), and a short rocker step (Table I).

During the indoor campaign, he still uses the seven stride approach (left lead leg forward in the blocks) and then switches to eight strides outdoors. Apparently he feels more aggressive with the former approach, in spite of the fact that his sprint race start is with the left leg back.

James needs a rhythmic adjustment to the approach and consistency in the cadence of the interval between hurdles. The hurdle stride is about right for distance and takes little time to execute (Table I). This is of limited value, however, if hurdles are hit frequently.

If the position is taken that the hurdles are the most technical event on the track, then attention must be directed to the quick artificial stride pattern between hurdles, which is necessary for success. This pattern is best developed if the approach is eight strides, forcing the hurdler to adjust rhythm immediately. A popular way of working on the interval between hurdles is to place the hurdles closer together in training and drill the quick frequency pattern until it becomes a reflex. There is rarely a problem in competition where the interval is restored to 30 feet. The rhythm of the training remains and the race becomes not just a sprint, but a sprint tailored for the event.