

Hurdle Specific Flexibility

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Günter Tidow is widely known in international athletics circles. His scientific research and writings have consistently been on the highest level. This paper was presented at the „Techniques in Athletics“ Conference at Cologne, Germany, in June, 1990.

The statement that specific flexibility is a must for high hurdlers is probably accepted by everyone (cf. Gambetta & Hill, 1981; Bush, 1984; Pereversjov et al.1984). The question, however, as to what extent flexibility is needed precisely could - up to now - only be answered subjectively by analyzing the movement behavior of world class athletes.

Doing so, it is quite obvious that within the split phase (Fig. 1) the knee flexors of the lead leg as well as the hip flexors of the trail leg are highly stretched. On the other hand, without the bar clearance (Fig. 2, F) and especially within the preparation for landing phase (Fig. 2, G), considerable specific flexibility of the adductors of the bent trail leg is indispensable.

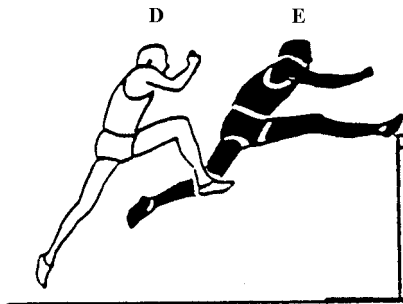


Figure 1: Split phase (E) of the hurdle stride

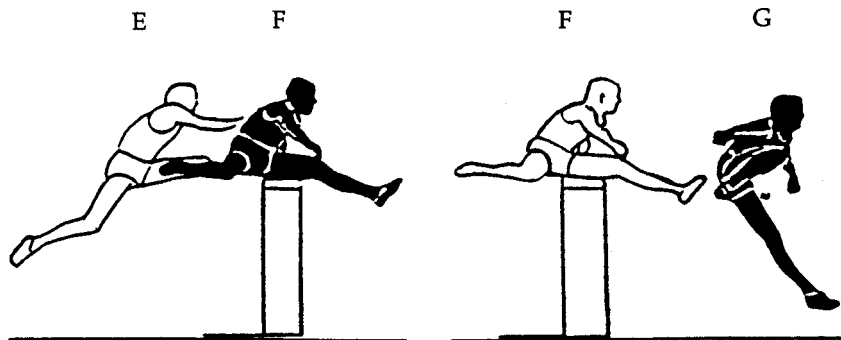


Figure 2: Bar clearance (F) and preparation for landing phase (G) of the hurdle stride

Whereas a corresponding range of motion in the respective joints is a prerequisite for specialists, conditions are sometimes quite different with decathletes and sports students. Apart from this, even certain flaws of top hurdlers might be traced back to flexibility deficiencies. This is why, in my opinion, a testing apparatus was needed to assess hurdle specific flexibility and to make available set values flexibility training can be directed to.

Experts would remark here that the hurdle sit table test (HSTT), introduced by Grosser in 1972, has already been at hand for several years. This is definitely true. Our main objective, however, was to mirror the above-mentioned phases of the hurdle stride as close as possible while testing. Furthermore we felt that spreading and abducting abilities are different demands needing different tests.

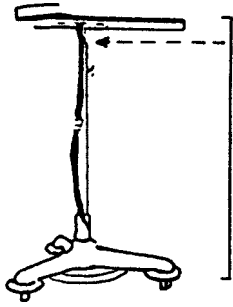


Figure 3: Hurdle-Fleximeter prepared for the abduction test

These considerations led to the construction of the hurdle-fleximeter, by means of which the Abduction Test (AT) as well as the Split Test (ST) can be performed (cf. Tidow 1983). The hurdle-fleximeter (Fig. 3) consists of a wheeled upright with a T-shaped top. The top is closely connected with the upper end of an aluminum pipe with a yardstick on it. This measuring pipe glides vertically within a second pipe. If you lift the top, the vertical distance from the T-level to the floor is indicated at the upper rim of the guidance pipe.

The Abduction Test is performed as follows (Fig. 4):

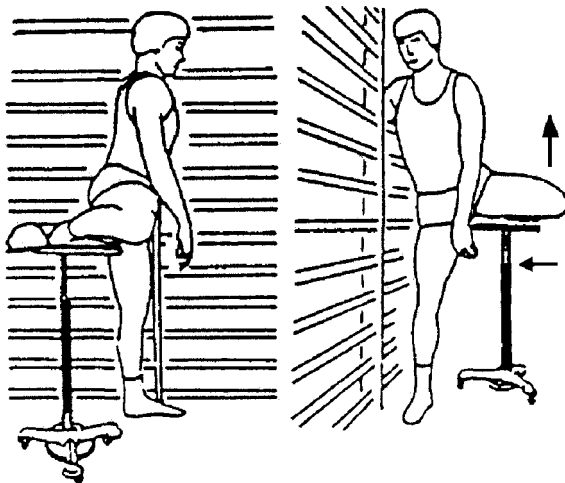


Figure 4: Abduction Test

After making sure that the subject remains in a vertical posture and having fixed his trail foot to the T-bar by means of a belt, he is asked to raise his bent and abducted trail leg as high as possible and to hold the final position for at least two seconds.

A test result of 97, for example, indicates that the inner part of the ankle was 97cm above ground. Dividing 97 by the leg length (e.g., 100cm) - which was measured beforehand by means of the hurdle-fleximeter - the AI, i.e. the Abduction Index, can be computed. An index of .97 implies that the subject has raised his ankle up to a level equaling 97% of his leg length.

To perform the Split Test the hurdle-fleximeter has to be rearranged in the following way (Fig. 5): At first the T-bar is fixed at 3 ft. 6 inches, i.e. at high hurdle bar level.

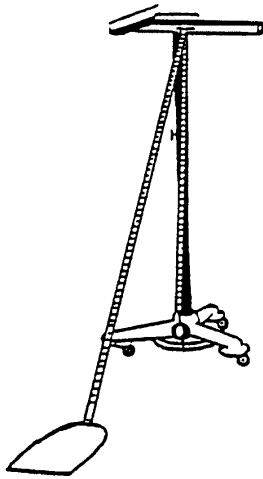


Figure 5: The Hurdle –Fleximeter prepared for the Split Test

Then, a tape measure - kept in a permanent stretched state by means of a counterweight - is connected with a little platform the subject stands on. He is asked to lay his lead leg heel on the T-bar and to grip his lead leg shank near the ankle with his counter arm (Fig. 6). For stability/safety reasons the other hand should glide along a bar parallel to the extended lead leg. Finally, the tester controls the advance of the wheeled fleximeter while the subject increases the spreading distance between supporting and leading foot by shifting body weight in the direction of the latter (Fig. 6).

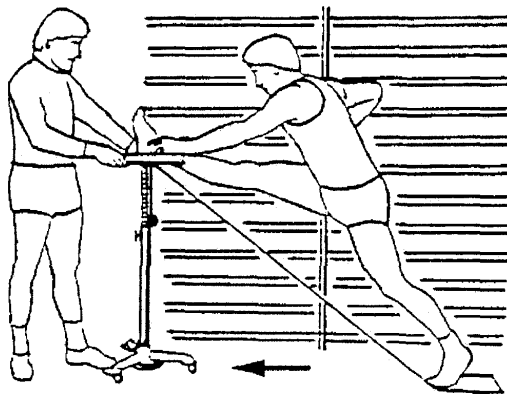


Figure 6: Performing the Split Test

When the spread maximum is attained, the tester can read the corresponding result on the tape measure immediately. The tape glides over one of the two rollers connected with the T-bar thus facing the tester's view.

The Split Index (SI) is calculated by dividing the test result of 190cm, for example, by double leg length (including the additional „lift“ caused by the plantar flexion of the trail foot). Thus, an SI of .85 indicates that 85% of the anthropometrically limited distance has been attained.

Comparison between body positions during the tests with the corresponding phases of the hurdle stride show the main requirements of the tests mentioned above have been fulfilled, at least to a certain degree (Fig. 7 and Fig. 8).

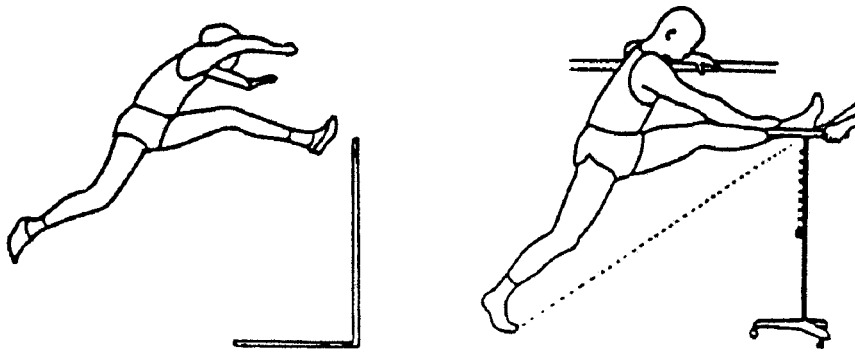


Figure 7: Split phase of the hurdle stride in direct comparison to the Split Test

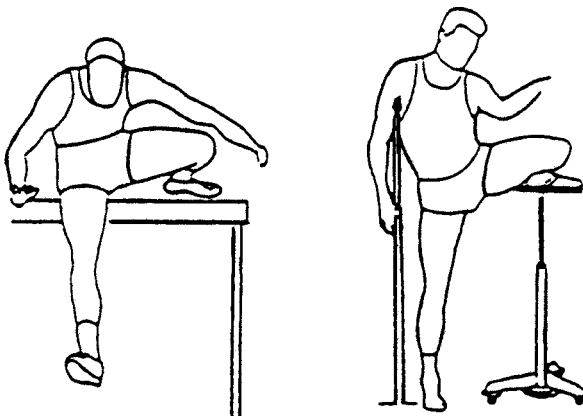


Figure 8: Preparation for landing phase in direct comparison to the Abduction Test

All in all, 100 male subjects took part in the tests: the (national) best 51 junior decathletes, 44 sports students and five high hurdlers, among them the Federal Republic of Germany champions (youth and men).

The main results are presented in Table 1.

Table 1: Means and SD of the Split Test Indexes (SI) and the Abduction Test Indexes (AI) for decathletes (DC; n=51), sport students (SS; n=44) and high hurdlers (HH; n=5)

INDEX	DC	SS	HH
SI	86.9±3.5	82.9±4.5	92.5
AI	95.6±6.4	93.7±6.0	105.0

As could be expected, the specific flexibility of high hurdlers was far superior in both tests. This is why their arithmetic means functioned as set values to assess stretching capacities of the other groups. The (average) results of the best junior decathletes and of the sports students did not differ significantly.

While the arithmetic means -representing central tendencies - given in Table 1 may appear to be acceptable, they tend to conceal individual values. These individual results may be either advantageous or limiting to high hurdle technique. The identification of individual flexibility deficiencies was, of course, the main objective of the tests introduced here.

A comparatively low correlation of .62 between ST and AT results imply that flexibility is not a „general“ ability. This is why we suggest that Grosser’s Hurdle Sit Table Test (HSTT), which was also performed (but only by the sports students) and which correlated far closer with the Split Test (r=.75) than with

the Abduction Test ($r=.41$), should be applied primarily when there is lack of time or for a more complex assessment. For differential diagnosis either ST and AT should be performed separately.

Referring to technique the following consequences can be derived from limited specific flexibility:

(1) Poor Split Test Results:

- Due to the fact that the m. biceps femoris is a two-joint muscle, the hurdle attack phase cannot be executed properly. An accentuated shift (forward lean) of the upper body - with an erect spinal chord - would cause the lead leg knee to bend. Consequently, a flat trajectory is prevented - otherwise the foot of the lead leg would collide with the bar.
- If insufficient spreading abilities are caused by shortened hip flexors, e.g., m. iliopsoas, the pushing leg cannot take over its „trailing function“ within the spread phase. Thus its knee is not - as it should be - well behind the trunk, but far too early beneath the hip joint. Consequently the deliberately delayed but (then) smooth and dynamic action of the trail leg is hampered or even destroyed.
- A further negative effect of limited spreading abilities is the reduction or even prevention of producing a slight forward rotational impulse around the lateral axis, needed for a quick touchdown after clearing the hurdle.

(2) Poor Abduction Test Results:

- That limited abducting abilities (in an indirect way) affect the flight curve negatively is known to everyone. This applies to the „hurdle sit phase“ (bar clearance phase).
- In addition, lacking abducting abilities prevent the hurdler compensating for the active downward movement of the lead leg after clearing the hurdle by a reactive forward-upward action of the trail leg. Thus, the needed forward lean of the upper body cannot be sustained.
- Furthermore, poor abduction capacities prevent the pelvis axis from tilting (or slanting) towards the side of the lead leg. The tilt elongates the length of the lead leg. Thus it can contact ground earlier. Apart from this the tilt provides a „buffer-capacity“ for a smoother compensation to the impact when landing.
- Finally, an above-average abducting flexibility enables the athlete to preserve a high level of the CG within the landing phase. Consequently, the contact time as well as the landing load of the supporting leg are reduced. Thus the first stride of the inter-hurdle-sprint can be performed remaining tall with a high knee lead.

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