

USATF 2008 SUPER CLINIC
CRITICAL GENERAL PERFORMANCE DESCRIPTORS
FOR THE SHORT HURDLES

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In the hurdle performance, **General Performance Descriptors** identify the result of the athlete's effort. These descriptors identify how well the athlete is doing, however, they do not identify how the performer is mechanically producing the results. Those general descriptors that are directly related to performance include:

1. Horizontal Velocity
2. Air Time
3. Stride Length
4. Ground Contact Time

Although these descriptors do not identify specifically how the elite athlete produces a successful hurdle performance, they will indicate the general areas that must be emphasized to accomplish this task.

Horizontal Velocity

The most obvious general performance descriptor in the hurdle race is horizontal velocity over the hurdle. Ignoring the importance of the Start, the athlete that can produce the greatest amount of horizontal velocity, and maintain it over the barriers, will be the most successful.

As simple as this seems, this result also points out the weakness in looking at these general descriptors for assistance in effectively evaluating the performance. Although the velocity result will indicate how fast the athlete is moving, it gives no information regarding how the hurdler is producing the result. Thus, except for categorizing a hurdler, this result is of little use to a coach.

For the elite hurdlers, the range of horizontal velocity values are presented in Figure 1. As with all results presented herein, the results are in terms of good, average, and poor values. These are based upon the results of all elite short hurdlers analyzed to date.

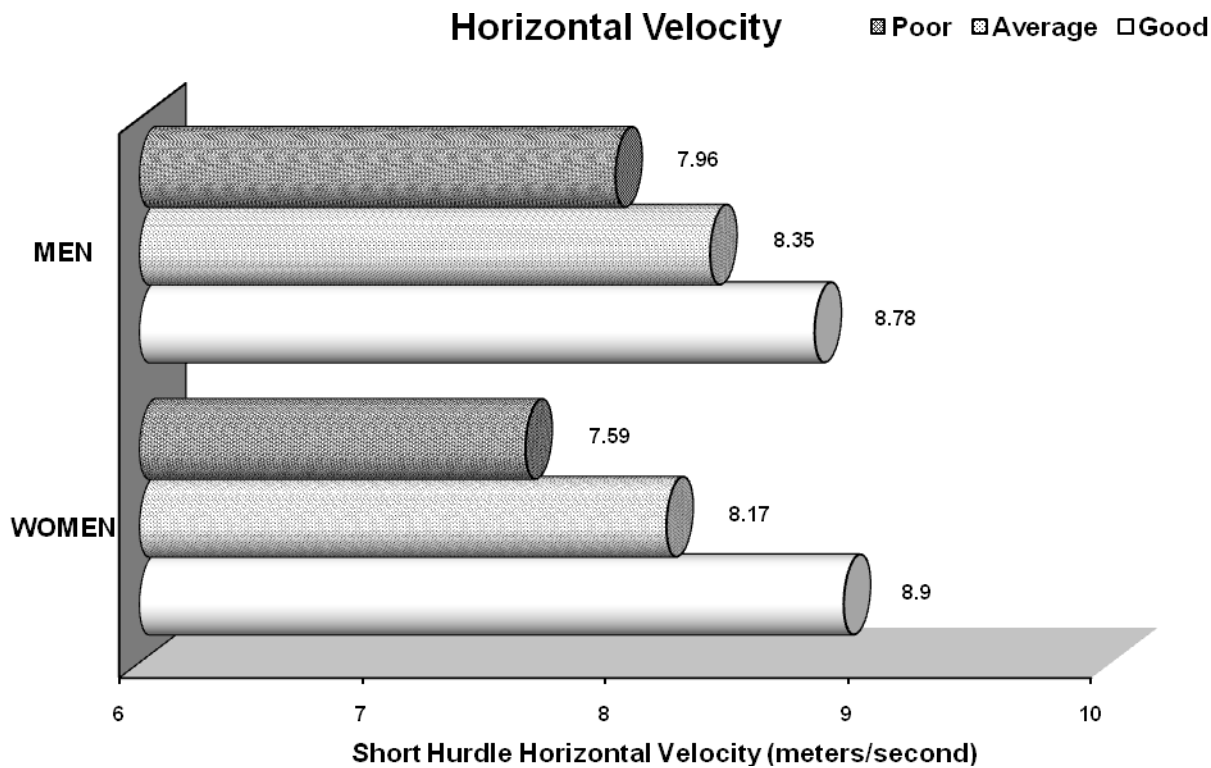


Figure 1: Horizontal Velocity Results

These velocity results are interesting in that the best velocity result for the elite men hurdlers is exceeded by the result of the best woman hurdlers. This is a result of the differences in the rules concerning hurdle height and spacing of the two events. Since the men must project their body center much higher over the barrier, and the distance between the barriers are much closer (in relation to their leg length), generating horizontal velocity is a much more difficult task.

Air Time and Stride Length Over the Hurdle

Since a barrier must be cleared, the height of the hurdle will dictate the minimum amount of time the hurdler must spend in the air. Likewise, the air time will dictate the minimum length of the hurdle stride.

Since the hurdle forces the athlete to deviate from the normal sprint mechanics in a detrimental fashion, the amount of deviation should be minimized as much as possible. Thus, the better hurdlers minimize both the air time and stride length over the barrier. This is accomplished through superior mechanics, which allow the athlete to minimize the amount the body must be elevated to clear the barrier.

Figure 2 shows the air time over the hurdle for all elite hurdlers analyzed to date.

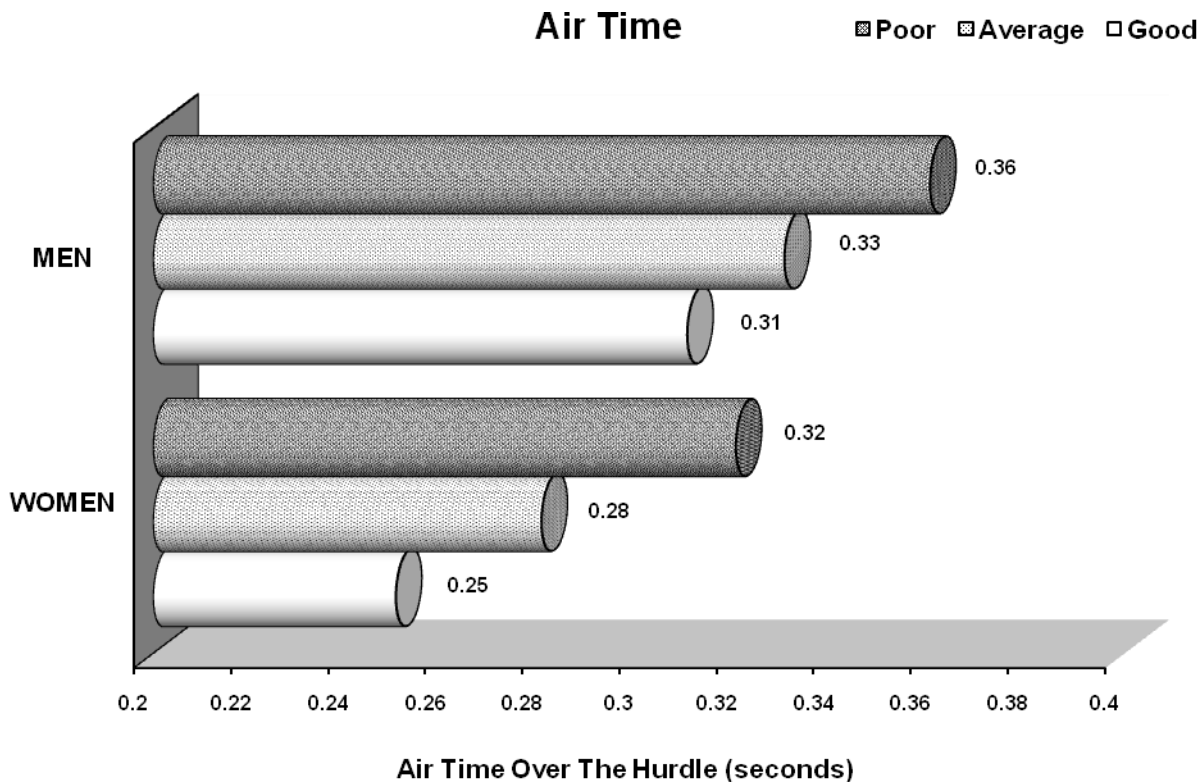


Figure 2: Air Time Results

It is evident that, due to the need to clear the barriers, hurdle air time far exceeds that of a sprint performance. In fact, even the best hurdlers are in the air two (women) or three (men) times longer than their sprint performance.

It should come as no surprise that this air time is directly related to how much the hurdler must raise their body center to clear the barrier. This distance is determined by two factors; the quality of the hurdle technique and the anthropometrics of the athlete.

As shown in Figure 3, if the hurdler has excellent hurdle technique, they are able to tightly compress their body around their body center, allowing them to clear the barrier with a much lower body center as compared to a hurdler with poor technique. Since the vertical clearance margin is very small, especially in the men's race, every millimeter saved means a significant difference.

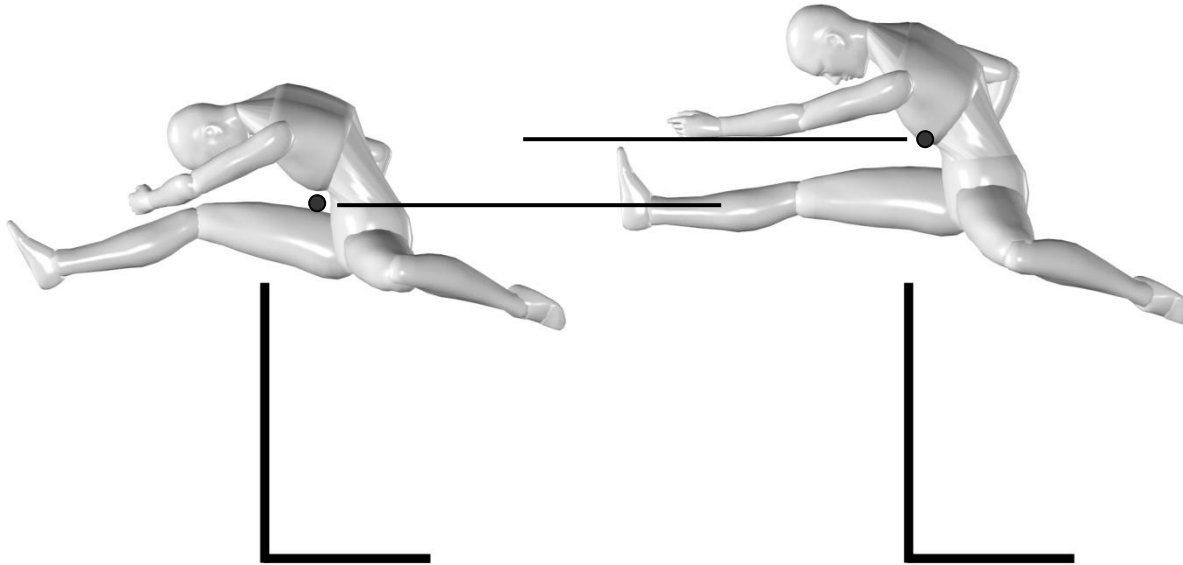


Figure 3: Body Center Position Over The Hurdle

Regardless of the quality of the hurdle technique, the anthropometrics of the athlete is a major factor in dictating how much the body center must be raised to clear the barrier. As seen in Figure 4, the performer who is short, with short legs, will be forced to raise their body center much higher as compared to a hurdler who is tall, with long legs.

This height handicap is evident coming off of the barrier as well. The body center of the performer who is short will fall farther as it returns to the ground, as compared to a hurdler who is tall.

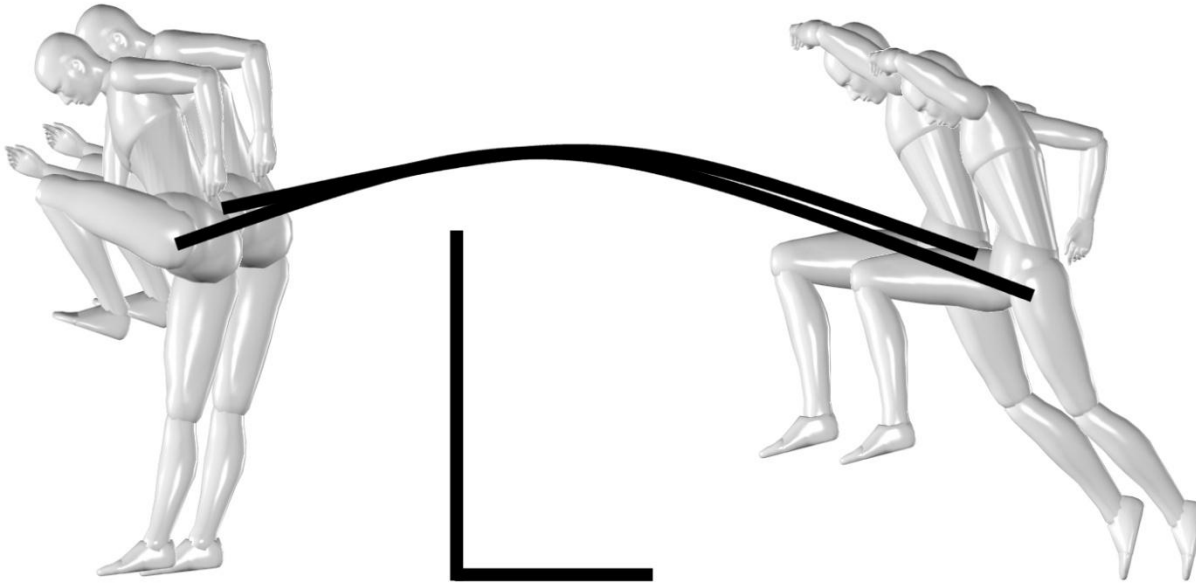


Figure 4: The Anthropometric Height Factor

The importance of minimizing air time cannot be underestimated since it affects the following:

1. **Effective Force:** Since the athlete cannot exert ground forces while in the air, the hurdle air time should be minimized.
2. **Expended Force:** Since the height the body center is raised is directly related to the amount of vertical force required (more height needs more effort), the hurdle air time should be minimized.
3. **Impact Force:** Since the vertical force required to stop the downward fall of the performer is directly related to the height the body center is raised (more height produces faster fall), the hurdle air time should be minimized.
4. **Stride Length:** As will be seen, the height the body center is raised is directly related to the hurdle stride length results (more height produces longer stride length). Since all elite athletes competing in the short hurdles have difficulties squeezing three steps between the barriers (see Table 1-2), the hurdle air time should be minimized.

Since the performer must manage ten barriers, the manner in which they maximize the Effective Force while minimizing the Expended Force, Impact Force, and Stride Length will determine, to a large degree, the outcome of the race.

Figure 5 indicates the stride length consequences of the extended hurdle air time. In comparison to their sprint results, the hurdlers are covering up to twice the distance during hurdle clearance.



Figure 5: Stride Length Results

There are two interesting trends that are inherent in these length results. First, note that the lengths of the before and after results are not equal. If a performer wishes to clear a barrier as efficiently as possible, mathematics tells us that they should project their body center so that it would reach its peak directly over the hurdle.

Although this would be the preferred body center path, hurdlers are prevented from doing this due to the need to clear the extended lead leg as it is rotated up and over the barrier. As shown in Figure 6, this forces the athlete to shift the peak of the body center well before the barrier. Moreover, the height of the body center must be increased so that it will clear the hurdle on the way down. Thus, the unbalanced before/after stride lengths are an unavoidable, and detrimental consequence of the demands of the event. The better hurdlers, however, will minimize this consequence by minimizing the lead leg clearance.

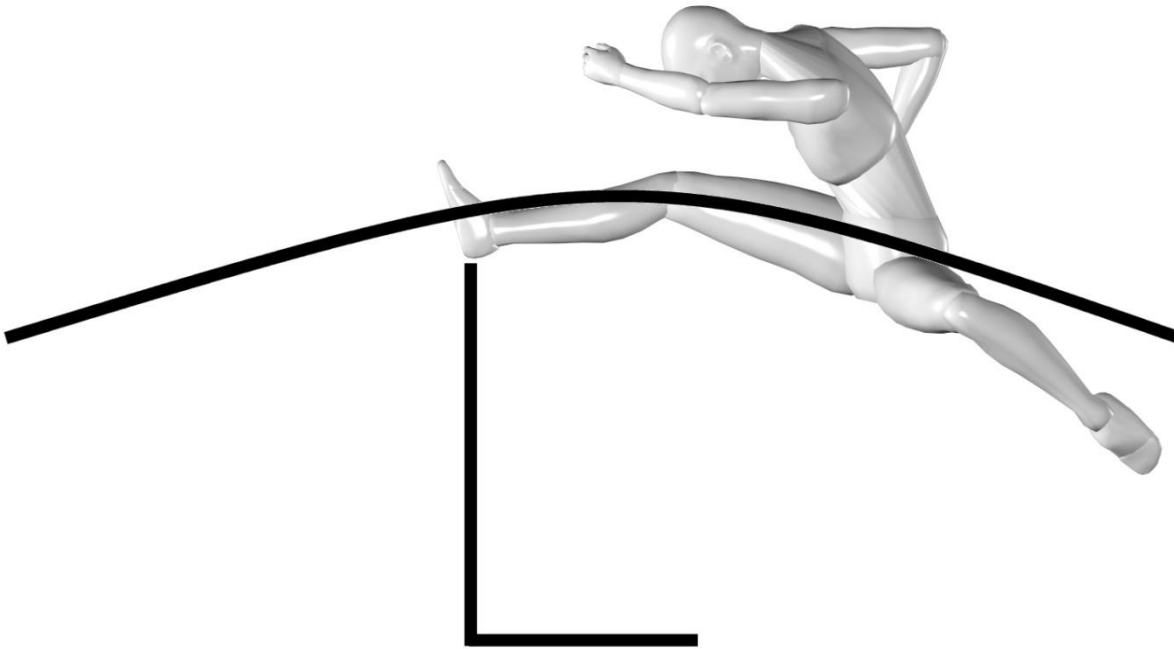


Figure 6: Actual Body Center Path Over The Hurdle

The second trend is that, as with horizontal velocity, the women short hurdlers outperform the men in minimizing stride distance (as well as air time). Once again, this situation is produced by the differences in the rules governing the two events, specifically the large difference in the heights of the barriers. Since the women have little challenge to clear the barrier, their stride length can be greatly reduced. It should be noted, however, that the Figure shows that only the better women hurdlers take major advantage of this shortened stride length opportunity.

Ground Time Going Into and Coming Off The Hurdle

Of all of the general performance descriptors, ground time going into and coming off the hurdle provide the greatest insights into how the elite performance is accomplished. Since the ground phase of the hurdle clearance is the only time when the athlete can apply force to alter the body's velocity, it is not surprising that this is where great hurdle results are produced.

Figure 7 shows the ground time results involved in hurdle clearance for all elite hurdlers analyzed to date. Ground time is dependent upon how quickly the hurdler can produce the ground forces required to successfully project the body into the barrier, then control the subsequent touchdown. As the Figure indicates, the better hurdlers minimize this variable,

resulting in an increase in stride rate and, therefore, an increase in horizontal velocity (assuming no other results are affected by this change).

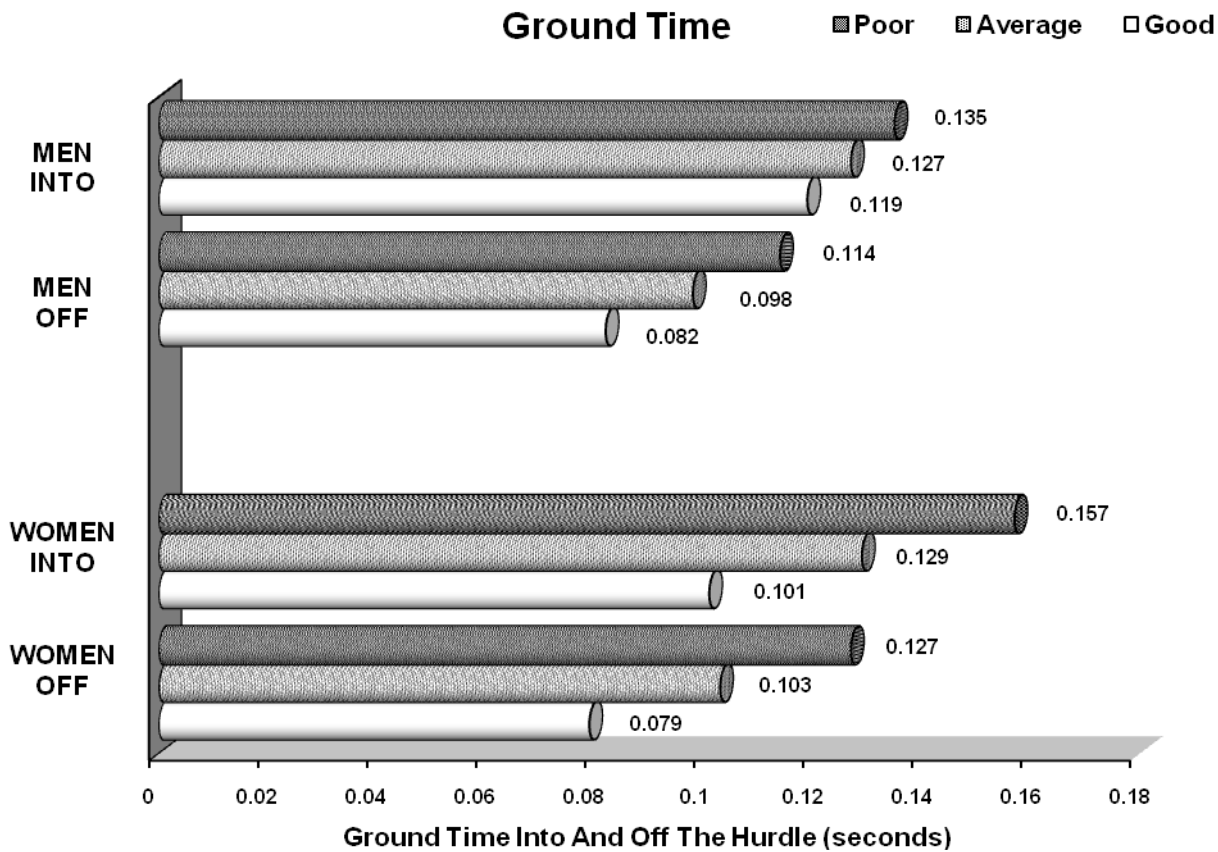


Figure 7: Hurdle Ground Time

Ground time is dependent upon how quickly the hurdler can produce the ground forces required to successfully project the body into the barrier, then control the subsequent touchdown. As the Figure indicates, the better hurdlers minimize this variable, resulting in an increase in stride rate and, therefore, an increase in horizontal velocity (assuming no other results are affected by this change).

Summary:

In summary, elite hurdle performance is achieved through improving hurdle time by decreasing ground contact time. This must be done without compromising the air time of the hurdle stride.