

CRITICAL GENERAL PERFORMANCE DESCRIPTORS FOR THE LONG HURDLES

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Although all of the trends that were found in the short hurdles are also evident in the long hurdles, due to the length of the race, some compromises are made to account for the fatigue factor.

Horizontal Velocity

Since the long hurdles covers more than 300 meters, the body cannot complete the event solely on the anaerobic systems. This forces even the elite athlete to compromise in the areas of speed and energy expenditure. As the elite hurdle results of Figure 1 indicate, this results in a decrease in velocity, in the non-fatigue state, of approximately 11 percent in the women's race as compared to the short hurdle results.

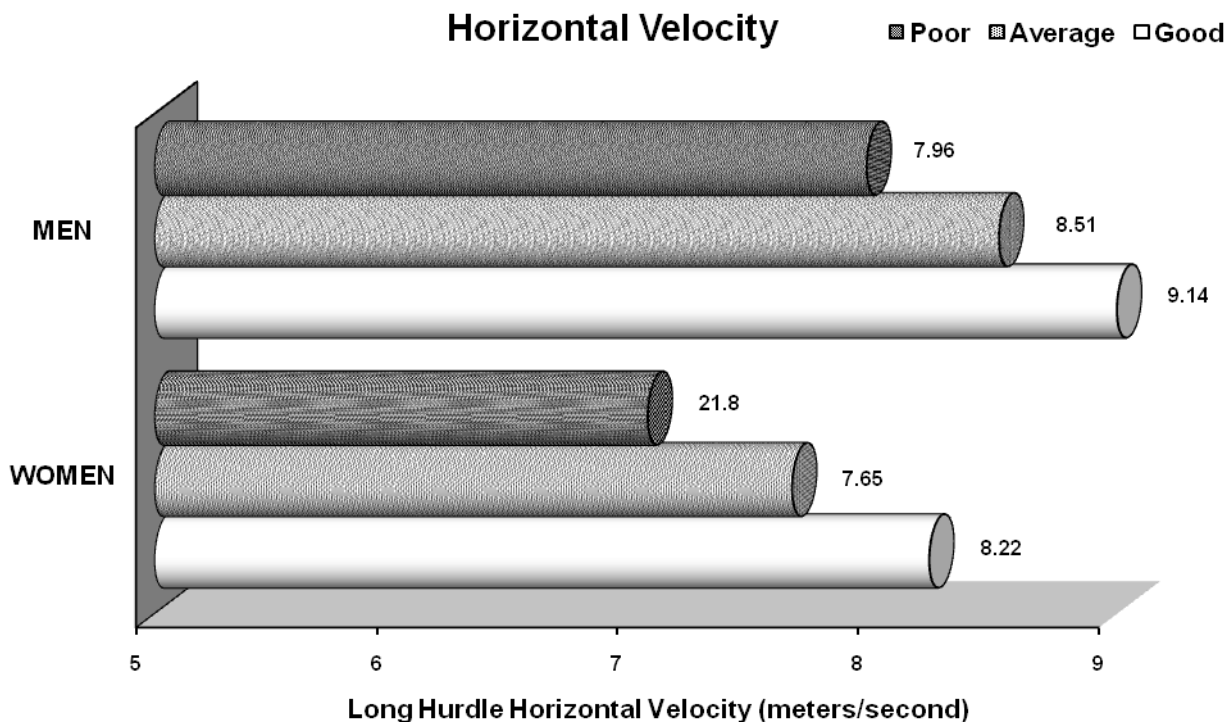


Figure 1: Non Fatigue Horizontal Velocity Results

The same velocity decrement is not evident in the comparison between the short and long men's race. This is due to the fact that the short race is run over hurdles that are much higher. Thus, the additional time required to negotiate the higher hurdle is about the same as the additional time required to handle the fatigue situation in the longer race. Thus, the velocities of the two races are approximately equal.

Regardless of the quality of the elite hurdler, some decrement in velocity occurs as fatigue sets in. As shown in Figure 2, the decrement in velocity is approximately 17 percent as compared to the non-fatigue state.

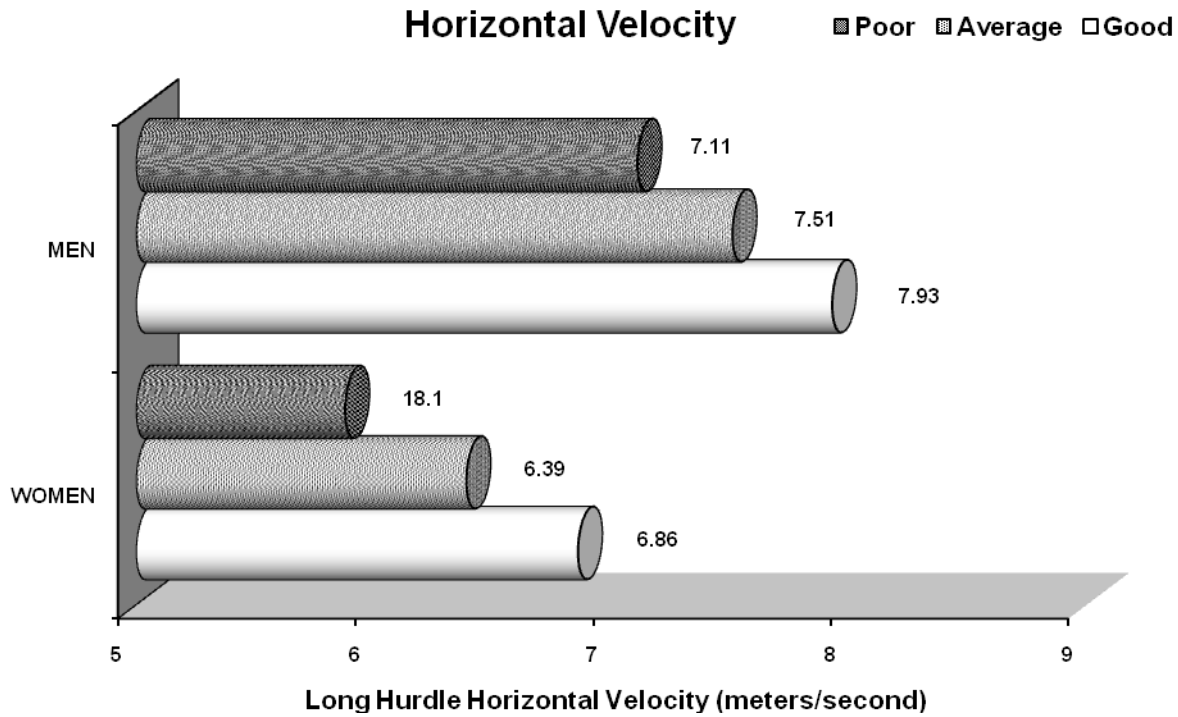


Figure 2: Fatigue Horizontal Velocity Results

As in all fatigue related races, the better hurdlers maximize their non fatigue velocity, while limiting their loss of velocity in the fatigue state.

Air Time and Stride Length Over the Hurdle

Since the height of the long hurdles are less than the short race, the expectation would be for the long hurdlers to produce a shorter air time and hurdle stride length. Instead, as shown in Figures 3 and 4, this is not the case.

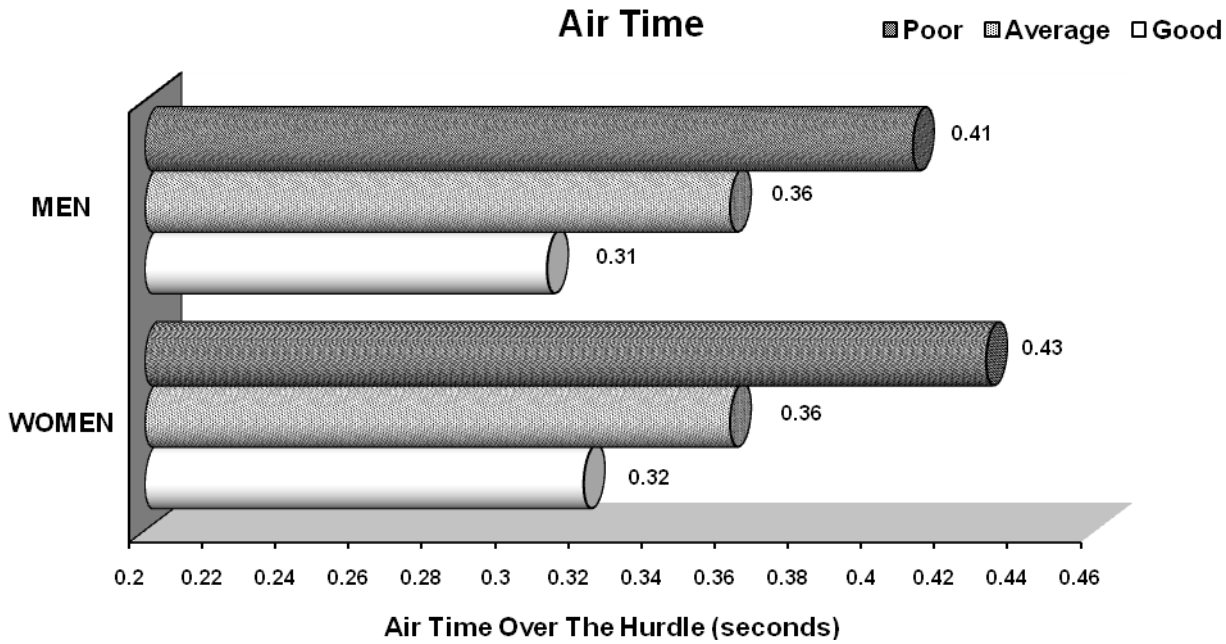


Figure 3: Non Fatigue Air Time Results

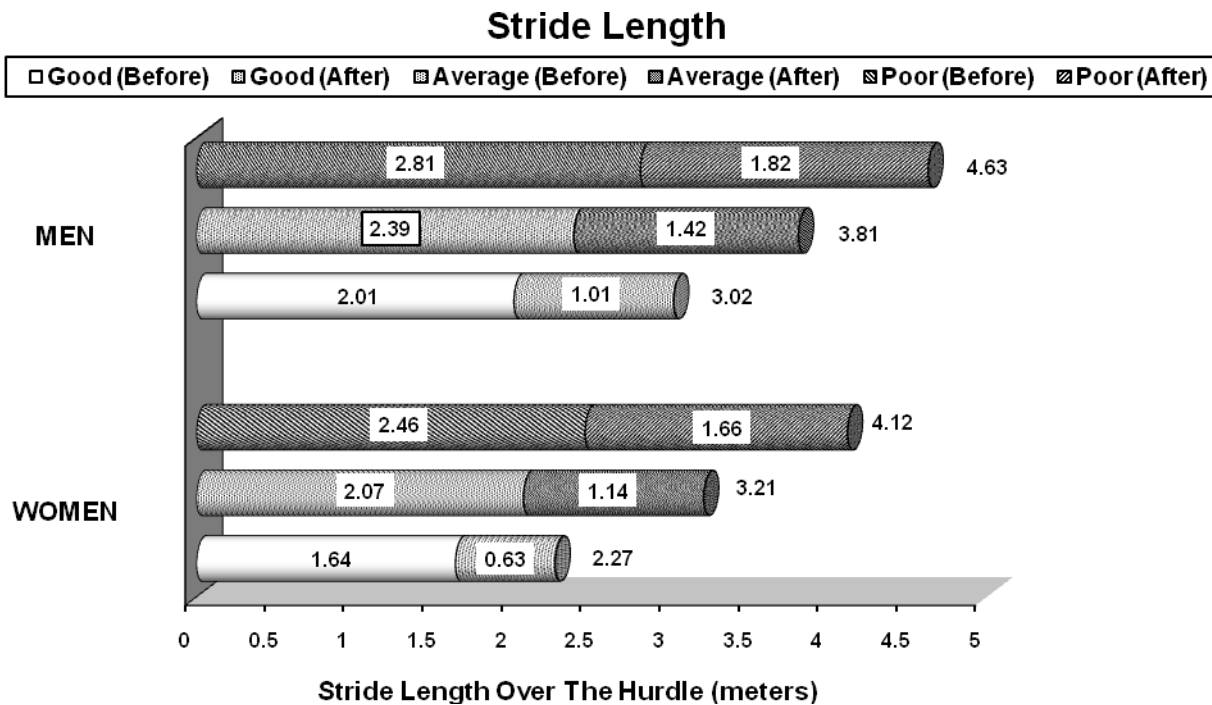


Figure 4: Non Fatigue Stride Length Results

Both air and length results are approximately the same, if not slightly higher, than the short hurdles. This is due to the fact that, in the long hurdles, the athlete must lengthen their stride length to produce the 13 (men) or 15 (women) step pattern rate used by the elite hurdler.

Thus, in the long hurdles, this criteria makes the need for minimal hurdle clearance less of a critical factor. The air time and stride length should still be minimized, but not to the extent that it makes reaching the required step pattern difficult to attain.

In the fatigue state, as shown in Figures 5 and 6, stride length suffers approximately a 10 percent decrement, however, air time remains virtually the same.

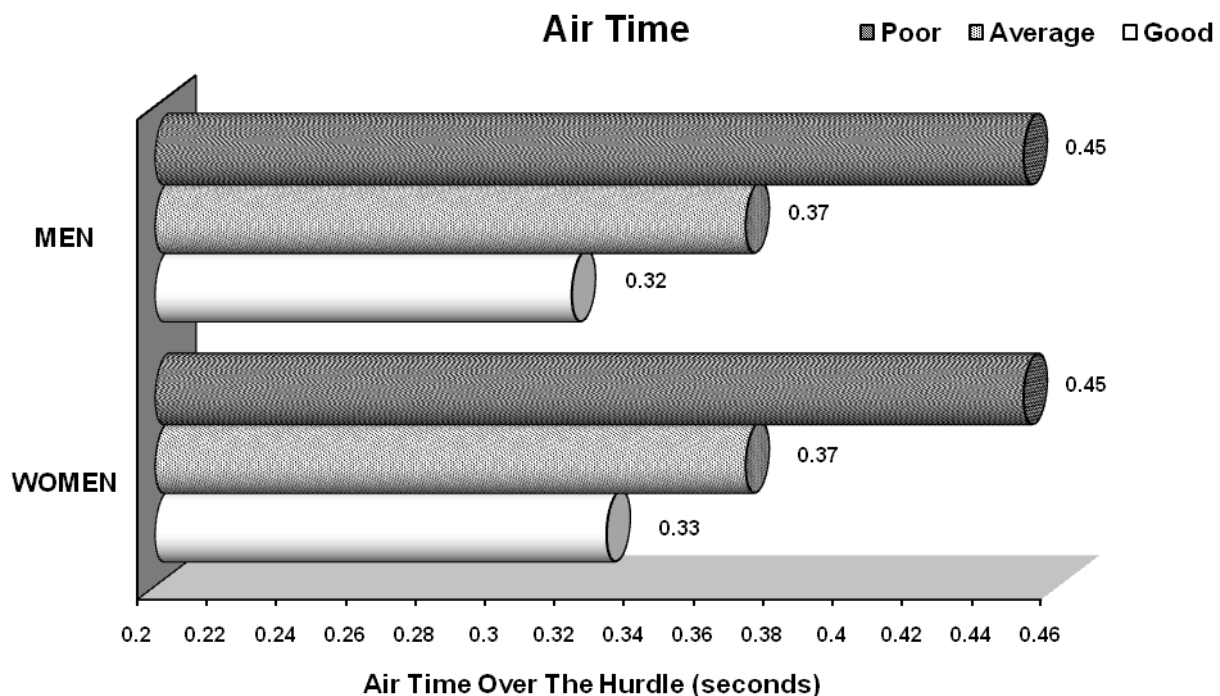


Figure 5: Fatigue Air Time Results

The fact that air time does not change in fatigue has been seen in other running events. It is postulated that a certain amount of air time is required to recover the body segments for the ground phase coming off the barrier, so the time must be maintained. This further points to the critical need for the athlete to be able to produce and maintain the large ground forces during the hurdle performance.

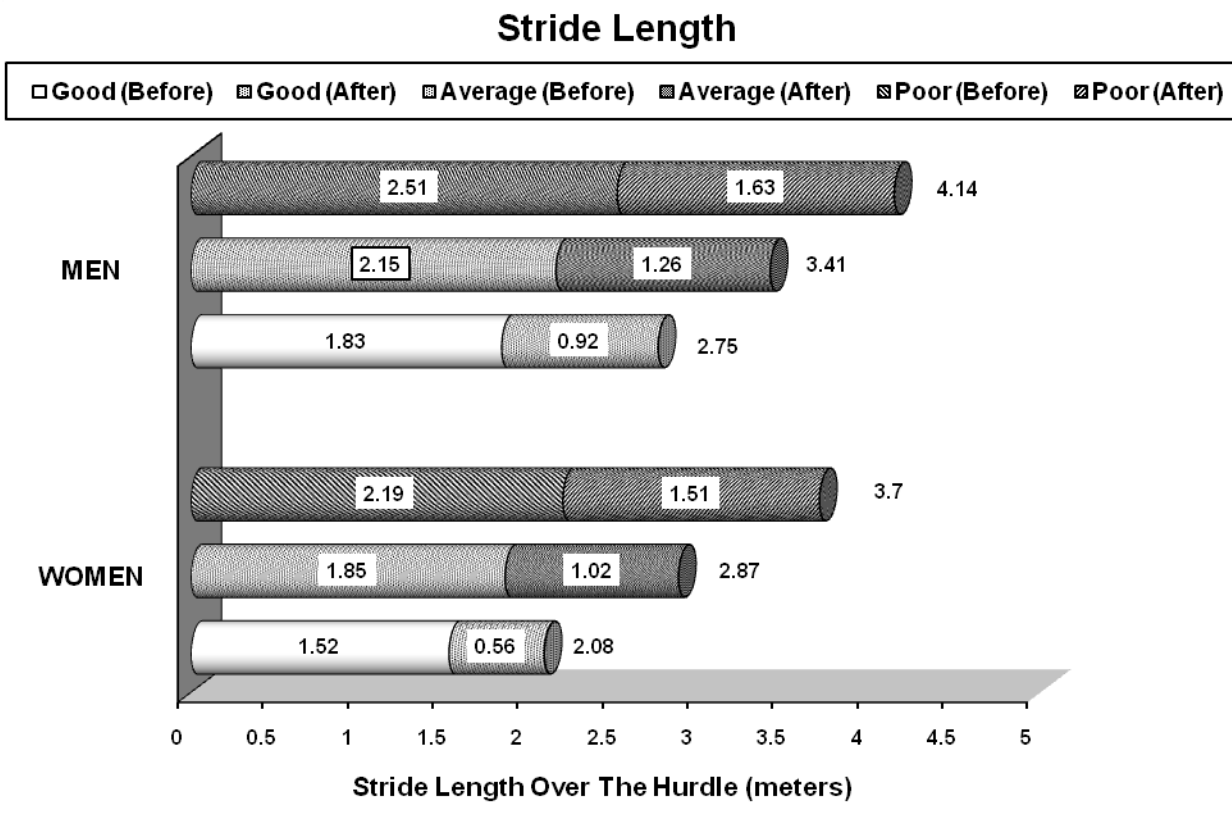


Figure 6: Fatigue Stride Length Results

Since the hurdler is in the air the same amount of time, the decrease in stride length is solely due to the decrease in horizontal velocity. Thus, the critical importance of striving to minimize ground contact time, both in non-fatigue and fatigue, is further emphasized. Additional data on this conclusion will be presented in the discussion on ground times.

Ground Time Going Into and Coming Off The Hurdle

Due to the same stride length demands that required high air time and hurdle stride length results, the ground times, both before and after the hurdle are also higher than expected in the long hurdles. Figure 7 shows the non-fatigue ground time results involved in hurdle clearance for all elite hurdlers analyzed to date.

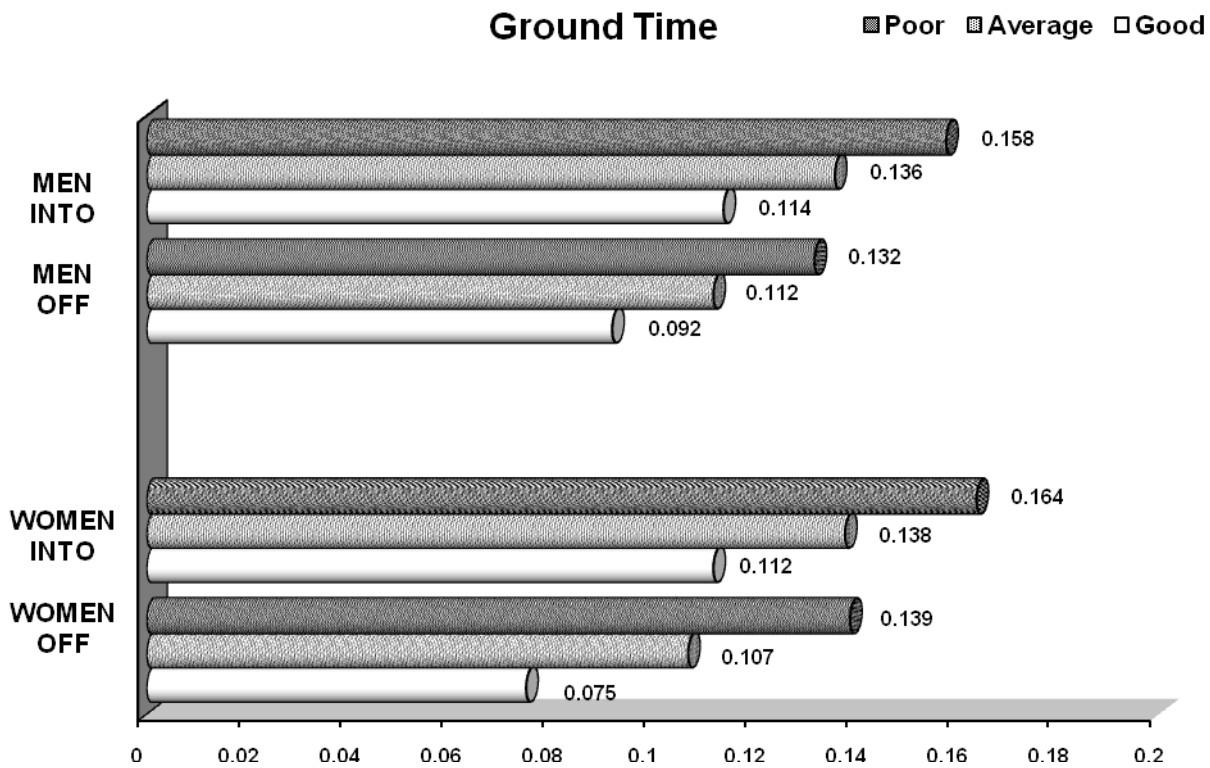


Figure 7: Non Fatigue Hurdle Ground Time

As in the short hurdles, minimizing the ground time is the key to producing faster hurdle times and, therefore, greater horizontal velocity. Unfortunately, this reduction of time requires the expenditure of large amounts of strength and, therefore, energy. Thus, the compromise in the long hurdles is balancing the speed of the race with the available speed endurance.

In comparison, Figure 8 shows the fatigue ground times for all elite athletes investigated to date.

Note that all of the trends found in both the short hurdles and non-fatigue portion of the long hurdles are also found in these results. For both going into and coming off the barrier, minimizing the ground time result continues to be the key to performance.

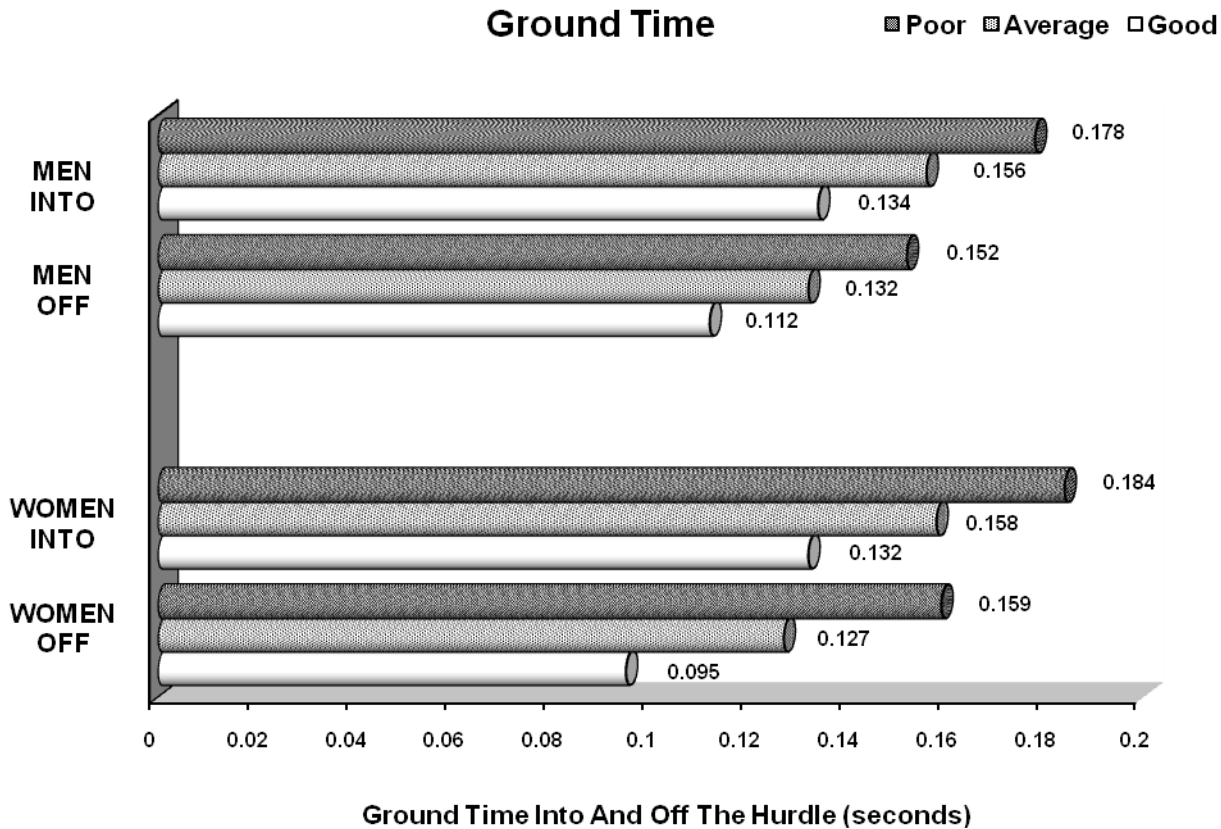


Figure 8: Fatigue Hurdle Ground Time

Summary:

With several compromises due to the fatigue factor, the key to the long hurdle performance is, like the short hurdles, achieved through decreasing hurdle clearance time by decreasing ground contact time as well as the time required to negotiate the barrier.