RACE PATTERN OF 60-M HURDLES IN WORLD-CLASS SPRINT HURDLERS: A BIOMECHANICAL ANALYSIS OF WORLD INDOOR CHAMPIONSHIPS 2010

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INTRODUCTION: Earlier competition reports of sprint hurdle performances show that the world-class hurdle sprinters achieve their maximal race velocity somewhere between the third and sixth hurdle (Brüggemann & Glad, 1990; Brüggemann et al., 1999). No competition analysis has been done for the indoor sprint hurdle performance, where the official distance is 60 meters consisting of five hurdles. It is not known if the hurdle sprinters change their race pattern towards a more aggressive start in the 60-m hurdle race. The purpose of the present study, therefore, was to examine the race pattern of 60-m hurdles in world-class sprint hurdlers.

METHOD: The data was collected during the IAAF World Indoor Championships in Athletics (Mar 12-14, 2010, Doha, Qatar). The finals of 60-m hurdle races were filmed by two high-speed video cameras (300 fps) set above the spectator stands close to hurdles three (H3) and five (H5). The cameras were synchronized by the light signal of the starting gun and panned to follow the athletes throughout the race.

The instants of take-off (TO) and touchdown (TD) to each hurdle were analyzed from the video recordings. Intermediate times (H1-5) were calculated from the start (gun signal) to each hurdle TD. Interval times (H1/H2, etc) represent the time between two consecutive hurdle TDs. Hurdle clearance times were calculated from TO to TD for each hurdle. Run-in times were calculated from the final results minus the 5th intermediate times. Final results were provided by SEIKO (official timing for the event). Pearson's correlation coefficient was used to examine the relationships between selected variables. Level of significance was set at $P<0.05$.

RESULTS: The main data is presented in Table 1. All the men sprint hurdlers achieved their fastest interval by H4, whereas three of the women finalists got their fastest interval only between H4 and H5. The maximum interval velocity (MaxInterV) for men and women is 9.12 ± 0.19 ms^{-1} and 8.72 ± 0.18 ms^{-1} respectively. The fastest interval times were significantly correlated to race result both in men and women ($r = -.74$, $P<.05$ and $r = -.83$, $P<.05$, respectively).

Table 1. Time analysis of 60-m hurdle finalists in World Indoor Championship 2010. (mean±SD)

	Time[s]											
	H1	H2	H3	H4	H5	Result	H1/H2	H2/H3	H3/H4	H4/H5	Run-in	Mean ClearT
Men (n=8)	2.57 ±0.08	3.61 ±0.08	4.62 ±0.11	5.63 ±0.14	6.66 ±0.16	7.53 ±0.16	1.04 ±0.02	1.02 ±0.03	1.01 ±0.03	1.02 ±0.03	0.88 ±0.01	0.33 ±0.02
Women (n=8)	2.61 ±0.04	3.68 ±0.04	4.61 ±0.04	5.59 ±0.06	6.58 ±0.08	7.92 ±0.11	1.02 ±0.02	0.99 ±0.02	0.98 ±0.02	0.99 ±0.02	1.34 ±0.03	0.29 ±0.01

The split times showed a stronger correlation to race result for men rather than for women, except for run-in, that was significantly correlated to race time for women only (Table 2).

Table 2. Correlation characteristics of the final results and the interval times.

	H1/H2	H2/H3	H3/H4	H4/H5	Run-in	MaxInterV	MeanClearT
Men (n=8)	.32	.90**	.97**	.77*	.22	-.74*	.73*
Women (n=8)	.69	.80*	.77*	.75*	.85**	-.83*	-.25

(*P<0.05, **P<0.01)

Women showed an expected trend of quicker hurdle clearance than men (Mean: 0.29±0.01 s vs. 0.33±0.02 s, respectively). Interestingly, the mean hurdle clearance time (MeanClearT) showed a significant correlation to final result for men ($r = .73$, $P<.05$) but not for women ($r = -.25$).

DISCUSSION: The present data shows that the race pattern for indoor 60-m hurdles is similar to the beginning of the outdoor 100-m/110-m hurdles. Women tended to reach their maximal interval speed later than men, which is in line with the previous results from outdoor competitions (Brüggemann & Glad, 1990; Brüggemann et al., 1999). The observed significant relationship between the mean hurdle clearance time and race result for men only suggests that hurdle clearance plays a more important role in race performance for men than for women. This is likely due to a relatively lower hurdle height in women's sprint hurdles enabling faster clearance and smaller loss of horizontal velocity (Salo et al., 1997). The longer run-in distance in women's 60-m hurdles, as compared to men (13m vs. 9.72m, respectively), may further favour the role of high 'pure' running speed as an indicator of race performance in women's indoor sprint hurdles. This was supported by the significant correlation between the run-in time and race result for women.

CONCLUSION: The racing patterns of world-class hurdle sprinters in 60-m hurdles were found to be similar to the beginning of the race of those reported in 100-m/110-m hurdle competitions. Hurdle clearance seems to play more important role in competition performance for men than in women at the world-class level.

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