PREDICTORS OF SUCCESS IN THE 3000M STEEPLECHASE WATER JUMP

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INTRODUCTION

While the steeplechase has been contested for over 150 years, relatively little research has been completed regarding the technique involved in this unique event. In our research, we looked at six different characteristics of the water jump barrier technique: Minimum hip angle of the lead leg at take-off, knee angle of the support leg (pushing off the barrier), take-off distance, center of mass height above the barrier, approach speed, and landing distance (see figure 1). These characteristics were chosen due to past work by coaches and researchers [1,2]. This study determined which characteristics are significant predictors of the ratio of race pace to speed through the water jump.

Figure 1: Definitions of some of the measured characteristics.

METHODS

Seventeen women and 19 men were filmed and digitized to measure two-dimensional characteristics of water-jump technique in the 3000-meter steeplechase using Peak Motus 8.2 (Centennial, CO). Subjects were filmed at three different meets during 2004: The Cardinal Invite (Palo Alto, CA), The Oxy Invite (Eagle Rock, CA), and The Olympic Trials (Sacramento, CA). These meets provided a range of athletes from Division II NCAA athletes to Olympic qualifiers, including one Olympic Finalist.

Multiple linear regression was used to determine which characteristics of technique significantly predict the ratio of race pace to speed through the jump. Speed through the jump was measured between 2.5 m prior to the barrier and 2.5 m past the water. The ratio of speeds was chosen to normalize speed between athletes.

RESULTS AND DISCUSSION

Approach speed and landing distance were significant predictors of speed divided by race pace for men and women (Tables 1 and 2). All other variables in the full model were rejected due to non-significance at the 0.05 alpha level. The ratios of race pace to speed through the water jump for women and men respectively were 0.89 and 0.92.

While approach speed and landing distance were significant predictors of the ratio of race pace to speed through the jump, they were very different in how much variance they explained for each model. Approach speed was clearly the most noticeable factor for women. However, for men, landing distance was much more critical. With the event being fairly new for women, race times are dropping rapidly. This should increase their approach speed, which may lead to landing distance explaining more of the variance for women in the future as is seen with the men.

Table 1: Prediction for speed divided by race pace for women.

Variable	β	Partial R^2	*p*-value
Approach Speed (m/s)	0.113	0.614	<0.001
Landing Distance (m)	0.067	0.078	<0.001
Intercept	0.013		0.016

Table 2: Prediction for speed divided by race pace for men.

Variable	β	Partial R^2	*p*-value
Approach Speed (m/s)	0.013	0.015	0.044
Landing Distance (m)	0.136	0.605	<0.001
Intercept	0.443		<0.001

CONCLUSIONS

Success in completing the water-jump of the 3000m steeplechase without dropping from race pace dramatically can be accomplished by accelerating during the approach to the barrier and accomplishing a relatively long landing distance. There are obviously limits to how much acceleration and how far of a jump off the barrier should be attempted. However, with the athletes analyzed in this study, the larger the approach speed and the longer the jump into the water, the better the athletes were able to keep their water-jump horizontal velocity close to their race pace.

REFERENCES

1. Fix D, et al.. *Track and Field Q Rev*, **84**, 23-25, 1984.
2. Benson T. *Mod Athlete and Coach*, **38**, 15-18, 1993.