TACSM Abstract

Effect of Block Design on Swimming Relay Start Performance

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ABSTRACT

Starting blocks used in competitive swimming often incorporate a wedge for the rear foot to push against when performing flat starts. In most competitions, this wedge cannot be removed so relay starts must be performed with the wedge in place despite the common addition of an approach step during a relay starts. The presence of the wedge constrains the length of the approach step but does provide an inclined surface from which to push which may improve propulsive force development. **PURPOSE:** The purpose of this study was to evaluate the effect of using a wedge in relay start performance. **METHODS:** Eight collegiate swimmers (177.69 ± 8.73 cm, 74.7 ± 9.11 kg, 19.59 ± 0.59 years) provided informed consent and completed eight maximal effort relay starts, four with the wedge in place and four without. For all starts, participants were instructed to maintain a streamline position upon entering the water and to glide as far as possible. A relay judging platform was installed on the block and used with an in-water touch pad to measure the exchange time for the relay start. Two synchronized cameras captured movements at 60 Hz above and below water. A 16-point model of the body was used to compute center of mass position for above water movements. Takeoff velocity and angle were defined using the horizontal and vertical velocity of the whole body center of mass. Time to 7m was measured as the time needed for the wrist to reach a point 7m from the pool wall. Paired t-tests were used to compare dependent measures between start conditions. **RESULTS:** Exchange time ($t(7) = 0.11$, $p = 0.99$), takeoff angle ($t(7) = 0.60$, $p = 0.57$), and time to 7 m ($t(7) = 0.69$, $p = 0.51$) were not different when using the wedge as compared to not using the wedge (Table 1). However, takeoff velocity without the wedge was 2.4% faster ($t(7) = 2.48$, $p = 0.04$) than with the wedge on the block ($p<0.05$). This difference was characterized by a moderate effect size (Cohen $d = 0.46$). **CONCLUSION:** Presence of the wedge on the block had a minimal effect on relay start performance. It adversely affected start performance by decreasing takeoff velocity however no other kinematic variables were affected. Having the wedge on the block may constrain the step length of the swimmer during the relay start, which might explain the decrease in velocity.

Table 1. Kinematic Characteristics of Relay Start Performance for Starting Block Conditions.

	Exchange Time (s)	Takeoff Velocity (m/s)	Takeoff Angle (deg)	Time to 7m (s)
Wedge	0.24 ±0.11	4.26 ±0.19*	-3.5 ±5.5	2.13 ±0.42
No-Wedge	0.24 ±0.10	4.16 ±0.21	-2.5 ±5.1	2.20 ±0.38

*$p<0.05$

Keywords: wedge, relay start, takeoff velocity, step length