

## Effect of Dolphin Kick Timing on Breaststroke Pullout Performance

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### ABSTRACT

Breaststroke pullouts are now permitted to include a dolphin kick. Two variations of the pullout are distinguished by the timing of the dolphin kick within the movement. One variation uses an early-initiation of the dolphin kick (performed before the initiation of the arm pull) while a second variation uses a late-initiation of the dolphin kick (performed at the completion of the arm pull). **PURPOSE:** To compare the performance of two variations of breaststroke pullouts that incorporate a dolphin kick. **METHODS:** Fourteen collegiate swimmers ( $18.9 \pm 1.17$  years,  $73.7 \pm 8.54$  kg,  $174.5 \pm 9.88$  cm) who compete in breaststroke or IM races, volunteered to participate in this study and provided informed consent prior to beginning participation. Participants completed four 45.7 m (50 yd) trials of breaststroke swimming in a 22.8 m pool. In each trial, swimming speed was increased to maximum as they approached the midpoint of the swim. After completing a turn, swimmers performed one of the two designated pullout techniques and maintained maximal effort through two complete stroke cycles. Two trials of each pullout technique were completed and filmed at 60 Hz using a calibrated underwater camera. Using 12 digitized body landmarks, a 13-segment model of the body was defined and used to compute whole body center of mass location. Two-way repeated measures ANOVA's were used to compare the time needed to travel specified distances from either the wall or the initiation of movement. Pairwise comparisons were used to follow-up any significant main effects. **RESULTS:** Time to 6 m from the wall was 0.12 s ( $p < 0.01$ ) shorter when performing the dolphin kick later in the pullout ( $3.06 \pm 0.31$  s) than with the early dolphin kick variation ( $3.18 \pm 0.24$  s). However, pullouts with the late dolphin kick variation were initiated 0.22 m closer to the wall ( $3.33 \pm 0.52$  m) than with the early dolphin kick variation ( $3.55 \pm 0.47$  m). Therefore, to provide a more equitable comparison between the variations, the analysis was repeated using time measured from the initiation of movement. This analysis produced a significant interaction between pullout variation and time to the specified distances ( $p = 0.038$ ). Subsequent analysis showed that the time to reach 3.5 m from initiation of movement was 0.27 s shorter ( $p < 0.01$ ) when performing the early dolphin kick variation ( $3.79 \pm 0.42$  s) than the late dolphin kick variation ( $4.06 \pm 0.44$  s). Participants traveled a nearly 1 m ( $p < 0.01$ ) further underwater when using the early dolphin kick variation ( $3.44 \pm 0.53$  m) than the late dolphin kick variation ( $2.50 \pm 0.53$  m). **CONCLUSION:** These data suggest that the early dolphin kick variation is superior by covering distance in less time after initiation of movement and increasing the distance covered underwater.