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Belly breathing maneuver reduces the passive drag acting on gliding swimmerYusuke Maruyama¹, Toshimasa Yanai²¹Graduate School of Sport Sciences, Waseda University²Faculty of Sport Sciences, Waseda University

The purpose of this study was to test the hypothesis that the passive drag acting on a gliding swimmer is reduced if the swimmer adopts belly breathing maneuver (expanding the belly wall component) rather than chest breathing maneuver (expanding the rib cage component). Eleven male subjects participated in this study. A specialized towing machine was used to tow each subject with the tension set at various magnitudes and to record time-series data of towing velocity. The subject was asked to inhale air by expanding the belly wall or the rib cage expanded and to maintain the body configuration throughout gliding. The steady-state velocity was measured and the coefficient of drag was calculated for each

towing trial to compare between the breathing maneuvers. The results showed that the steady-state velocity was significantly higher with belly breathing maneuver (1.13 ± 0.09 m/s \sim 1.95 ± 0.10 m/s) than with the chest breathing maneuver (1.11 ± 0.08 m/s \sim 1.90 ± 0.08 m/s) ($p < 0.05$). The coefficient of drag was significantly lower with the belly breathing maneuver ($0.030 \pm 0.003 \sim 0.031 \pm 0.003$) than chest breathing maneuver ($0.028 \pm 0.002 \sim 0.030 \pm 0.004$). These results indicate clearly that adopting the belly breathing maneuver during gliding reduces the passive drag and the hypothesis was supported.