Supplementary Information

Article title: Target-Speed-Dependent Effects of Water Immersion on Wrist Speed Modulation and Somatosensory Processing

Journal: Experimental Brain Research

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Supplementary analyses of N20 and P25 amplitudes

Signed amplitudes from the prestimulus baseline to the N20 and P25 peaks were analyzed separately using three-way mixed-design analyses of variance, with Group as a between-participant factor and Environment and Phase as within-participant factors.

N20 amplitude showed a significant main effect of Environment ($F(1, 31) = 12.410$, $p = .001$), with a smaller negative-going amplitude in water than on land (Land: -1.79 μV; Water: -1.38 μV). No other main effects or interactions for N20 amplitude were significant. P25 amplitude also showed significant main effects of Environment ($F(1, 31) = 10.655$, $p = .003$) and Group ($F(1, 31) = 4.401$, $p = .044$). P25 amplitude was lower in water than on land (Land: 2.33 μV; Water: 1.74 μV) and lower in swimmers than in non-swimmers (Swimmer: 1.79 μV; Non-swimmer: 2.32 μV). The main effect of Phase and all interactions were not significant (all $p \geq .077$). Because interactions involving Group or Phase were not significant, the effect of the water environment was not interpreted as differing by Group or Phase.

Positioning of the practiced 50% reference speed

In this study, speed modulation skill was assessed at targets of 10%, 30%, 50%, 70%, and 90% after a speed adaptation task performed at 50% speed. The 50% target was identical to the reference speed repeatedly practiced during the adaptation task, whereas the other target conditions required participants to modulate motor output away from this practiced reference speed. Therefore, using the 50% condition as the reference, APE differences between the 50% condition and the other speed conditions were tested separately within each environment using estimated marginal means derived from the trial-level LMM (Fig. S1).

On land, APE was significantly higher at the 10%, 70%, and 90% targets than at the 50% target (all pHolm < .001), whereas the difference at the 30% target was not significant (pHolm = .128). In water, APE was significantly higher at the 10%, 70%, and 90% targets than at the 50% target (all pHolm < .001), and APE at the 30% target was also higher than at the 50% target (pHolm = .006). These findings indicate that adjusting movement speed away from the repeatedly practiced 50% reference generally resulted in greater error than reproducing the reference speed itself. Accordingly, the 50% condition should be interpreted as an index of stabilization of the practiced reference speed, whereas the other speed conditions reflect the additional requirement to modulate motor output away from that reference. Because delayed retention was not assessed, 50% APE cannot be regarded as an index of long-term skill consolidation and retention. Furthermore, although some target-versus-50% differences varied across environments, the effects of the water environment at the 10% and 30% targets cannot be explained solely by the magnitude of the deviation from the reference speed.

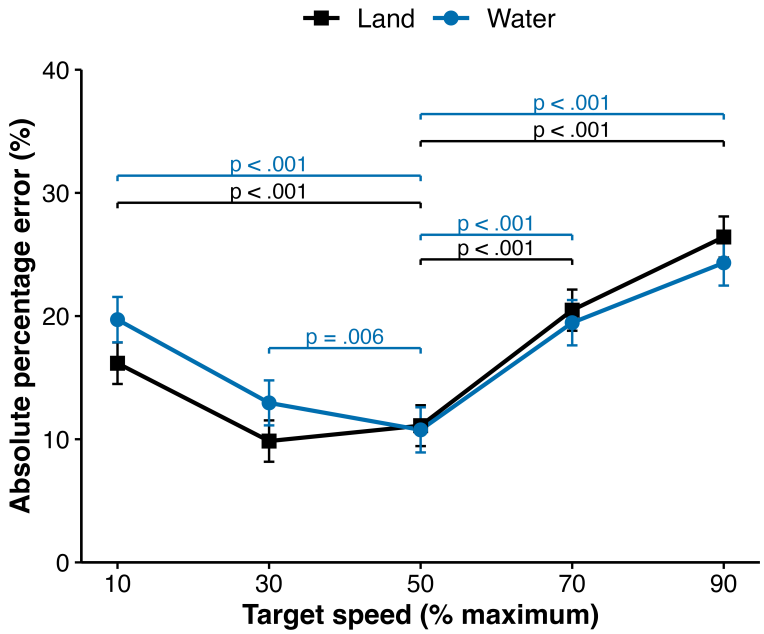


Fig. S1 APE at each target speed compared with the practiced 50% reference speed. Black squares and blue circles represent estimated marginal means for the land and water conditions, respectively. Error bars show 95% confidence intervals. Brackets and p values indicate Holm-adjusted comparisons with the 50% reference speed within each environment.