## Supplemental Material 2. Detailed Results

### Performance on the heterogeneous condition

A 2 × 2 × 2 × 2 repeated measure ANOVA was conducted for Hetero ACC. No interaction was observed, $F's(1,76) \leq 1.84$, $p's \geq 0.18$, $\eta^2 \leq 0.02$, $\varphi \leq 0.05$. No main effect of condition, order of administration, or version was observed, $F's(1,76) \leq 3.28$, $p's \geq 0.07$, $\eta^2 \leq 0.04$, $\varphi \leq 0.43$. A main effect of group was observed, $F(1,76) = 7.98$, $p < 0.01$, $\eta^2 = 0.10$, $\varphi = .80$, with athletes in the concussion group exhibiting a higher ACC (86.25 ± 14.81%) relative to those in the control group (93.03 ± 3.85%; $t(78) = 2.78$, $p < 0.01$), irrespective of condition. A 2 × 2 × 2 × 2 repeated measure ANOVA was conducted for Hetero RT. No interaction was observed, $F's(1,76) \leq 1.02$, $p's \geq 0.32$, $\eta^2 \leq 0.01$, $\varphi \leq 0.17$. No main effect of condition, order of administration, version, or group was observed, $F's(1,76) \leq 2.88$, $p's \geq 0.09$, $\eta^2 \leq 0.04$, $\varphi \leq 0.39$. A 2 × 2 × 2 × 2 repeated measure ANOVA was conducted for Hetero IES. No interaction was observed, $F's(1,76) \leq 0.07$, $p's \geq 0.79$, $\eta^2 < 0.01$, $\varphi \leq 0.06$. A significant main effect of group was observed, $F(1,76) = 4.73$, $p = 0.03$, $\eta^2 = 0.06$, $\varphi = 0.57$, with athletes in the concussion group exhibiting a higher IES (11.77 ± 3.34) relative to those in the control group (9.48 ± 1.63; $t(78) = 2.18$, $p = 0.03$), irrespective of condition. No main effect of condition, order of administration or version was observed, $F's(1,76) \leq 1.76$, $p's \geq 0.19$, $\eta^2 \leq 0.02$, $\varphi \leq 0.26$.

Global switch-costs

A 2 × 2 × 2 × 2 repeated measure ANOVA was conducted for Global ACC cost. No interaction was observed, $F's(1,76) \leq 2.72$, $p's \geq 0.10$, $\eta^2 \leq 0.04$, $\varphi \leq 0.37$. A main effect of group was observed, $F(1,76) = 9.07$, $p = 0.004$, $\eta^2 = 0.11$, $\varphi = 0.85$, with the concussion group exhibiting a higher cost (11.16 ± 14.4 %) than the control group (4.13 ± 3.6%; $t(78) = 2.98$, $p = 0.004$). No main effect of condition, order of administration or version was observed, $F's(1,76) \leq 2.28$, $p's \geq 0.14$, $\eta^2 \leq 0.03$, $\varphi \leq 0.32$. A 2 × 2 × 2 × 2 repeated measure ANOVA was conducted for Global RT cost. No interaction was observed, $F's(1,76) \leq 3.19$, $p's \geq 0.08$, $\eta^2 \leq 0.04$, $\varphi \leq 0.42$. No main effect of group, condition, order of administration or version was observed, $F's(1,76) \leq 0.37$, $p's \geq 0.55$, $\eta^2 \leq 0.01$, $\varphi \leq 0.10$. A 2 × 2 ×2 × 2 repeated measure ANOVA was conducted for Global IES cost. No interaction was observed, $F's(1,76) \leq 0.91$, $p's \geq 0.34$, $\eta^2 \leq 0.01$, $\varphi \leq 0.15$. A main effect of group was observed, $F(1,76) = 2.21$, $p = 0.03$, $\eta^2 = 0.03$, $\varphi = 0.31$, with athletes in the concussion group exhibiting a higher IES (6.61 ± 3.2) relative to controls (5.36 ± 1.6;

$t(78) = 2.24$, $p = 0.03$). No main effect of condition, order of administration, or version was observed, $F's(1,76) \leq .2.21$, $p's \geq 0.14$, $\eta^2 \leq 0.03$, $\varphi \leq 0.31$.

Local switch-costs

A $2 \times 2 \times 2 \times 2$ repeated measure ANOVA was conducted for Local ACC cost. No interaction was observed, $F's(1,76) \leq 1.89$, $p's \geq .17$, $\eta^2 \leq 0.02$, $\varphi \leq 0.27$. No main effect of group, condition, order of administration or version was observed, $F's(1,76) \leq 1.28$, $p's \geq 0.26$, $\eta^2 \leq 0.02$, $\varphi \leq 0.20$. A $2 \times 2 \times 2 \times 2$ repeated measure ANOVA was conducted for Local RT cost. No interaction was observed, $F's(1,76) \leq 1.25$, $p's \geq 0.27$, $\eta^2 \leq 0.02$, $\varphi \leq 0.20$. No main effect of group, condition, order of administration or version was observed, $F's(1,76) \leq 0.62$, $p's \geq 0.43$, $\eta^2 \leq 0.01$, $\varphi \leq 0.12$. A $2 \times 2 \times 2 \times 2$ repeated measure ANOVA was conducted for Local IES cost. No interaction was observed, $F's(1,76) \leq 4.19$, $p's \geq 0.05$, $\eta^2 \leq 0.05$, $\varphi \leq 0.52$. No main effect of group, condition, order of administration or version was observed, $F's(1,76) \leq 0.75$, $p's \geq 0.39$, $\eta^2 \leq 0.01$, $\varphi \leq 0.14$.

Working Memory switch-cost

A $2 \times 2 \times 2 \times 2$ repeated measure ANOVA was conducted for Working Memory ACC cost. No interaction was observed, $F's(1,76) \leq 1.51$, $p's \geq 0.22$, $\eta^2 \leq 0.02$, $\varphi \leq 0.23$. A main effect of group was observed, $F(1,76) = 8.22$, $p = 0.005$, $\eta^2 = 0.10$, $\varphi = 0.81$, with athletes in the concussion group exhibiting a higher cost ($9.63 \pm 14.7\%$) relative to controls ($2.83 \pm 3.7\%$; $t(78) = 2.83$, $p = 0.006$). No main effect of condition, order of administration or version was observed, $F's(1,76) \leq 2.72$, $p's \geq 0.10$, $\eta^2 \leq 0.04$, $\varphi \leq 0.37$. A $2 \times 2 \times 2$ repeated measure ANOVA was conducted for Working Memory RT cost. No interaction was observed, $F's(1,76) \leq 2.86$, $p's \geq 0.10$, $\eta^2 \leq 0.04$, $\varphi \leq 0.39$. No main effect of group, condition, order of administration or version was observed, $F's(1,76) \leq .41$, $p's \geq 0.52$, $\eta^2 \leq 0.01$, $\varphi \leq 0.01$. A $2 \times 2 \times 2 \times 2$ repeated measure ANOVA was conducted for Working Memory IES cost. No was observed, $F's(1,76) \leq 3.02$, $p's \geq 0.09$, $\eta^2 \leq 0.04$, $\varphi \leq 0.40$. A main effect of group was observed, $F(1,76) = 5.26$, $p = 0.03$, $\eta^2 = 0.07$, $\varphi = 0.62$, with athletes in the concussion group exhibiting a higher cost ($5.88 \pm 3.2\%$) relative to controls ($4.64 \pm 1.3$; $t(78) = 2.27$, $p = 0.03$). No main effect of condition, order of administration or version was observed, $F's(1,76) \leq 0.40$, $p's \geq 0.09$, $\eta^2 \leq 0.01$, $\varphi \leq 0.10$.

**Individual scores at rest and post-exercise**

Chi-square analyses indicated no significant difference of proportions of failure between the Rest and Post-Exercise conditions for the concussion group, $X^2$*'s* (1,40) ≤ 2.18, *p's* ≥ 0.14.

Of the forty athletes in the concussion group, twelve were categorized in the Fail group (30.0%) based on Hetero ACC. Of these, one failed only on the Rest condition, four failed only on the Post-Exercise condition, and seven failed on both conditions. Moreover, four athletes were put in the Fail group (10.0%) based on their Hetero RT. Specifically, one athlete only failed on the Rest condition, one athlete only failed on the Post-Exercise condition, and two athletes failed on both. Further, eleven athletes were put in the Fail group (27.5%) based on Hetero IES. Of these, one athlete failed only on the Rest condition, four failed only on the Post-Exercise condition, and six failed on both conditions.

Of the forty athletes in the concussion group, seven athletes were categorized in the Fail group (17.5%) based on the Global ACC cost. Of these, one failed only on the Rest condition, five failed only on the Post-Exercise condition, and one failed on both conditions. Moreover, two athletes were categorized in the Fail group (5.0%) based on their Global RT cost. Specifically, these two athletes failed only on the Post-Exercise condition. Further, four athletes were categorized in the Fail group (10.0%) based on Global IES cost. Of these, two failed on the Post-Exercise condition and two failed on both conditions. No athlete failed only on the Rest condition.

Of the forty athletes in the concussion group, four athletes were categorized in the Fail group (10.0%) based on Local ACC cost. Of these, one failed only on the Rest condition, one failed only on the Post-Exercise condition, and two failed on both conditions. Moreover, four athletes were categorized in the Fail group (10.0%) based on their Local RT cost. Specifically, two only failed on the Rest condition, one athlete only failed on the Post-Exercise condition, and one failed on both. Further, five athletes were categorized in the Fail group (12.5%) based on Local IES cost. Of these, one failed on the Rest condition, one failed only on the Post-Exercise condition, and three failed on both conditions.

Of the forty athletes in the concussion group, five athletes were categorized in the Fail group (12.5%) based on Working Memory ACC cost. Of these, three failed on the Post-Exercise condition and two athletes failed on both conditions. No athlete failed only on the Rest condition.

Moreover, three athletes were categorized in the Fail group (7.5%) based on their Working Memory RT cost. Specifically, one athlete only failed on the Rest condition and two athletes only failed on the Post-Exercise condition. No athlete failed on both. Further, five athletes were categorized in the Fail group (12.5%) based on Working Memory IES cost. Of these, one failed on the Rest condition, two failed on the Post-Exercise condition, and two failed on both conditions.