

Supplementary material 2: Sensitivity analysis

Title: The effect of heat stress and dehydration on carbohydrate use during endurance exercise: A systematic review and meta-analysis

Journal: Sports Medicine

Running heading: Heat stress and dehydration's impact on carbohydrate use in endurance exercise: A systematic review

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These analyses exclude studies with low methodological quality (i.e., studies that did not meet 60% quality based on risk of bias (Supplementary material 1; Tables 1 and 2) or were non-randomised.

1. The effect of prolonged exercise in hot vs. temperate conditions on RER, carbohydrate oxidation and glycogen use

Greater RER values were found in hot conditions vs. temperate conditions (SMD: 0.35, 95% CI 0.14 to 0.56, $P = 0.001$; $Z = 3.22$, *small* effect, Figure 1). In hot conditions, carbohydrate oxidation (SMD: 0.33, 95% CI 0.08 to 0.55, $P = 0.009$; $Z = 2.59$, *small* effect, Figure 2) and glycogen use (SMD = 1.10, 95% CI 0.43 to 1.76; *large* effect; $P = 0.001$; $Z = 3.21$; Figure 3) were higher.

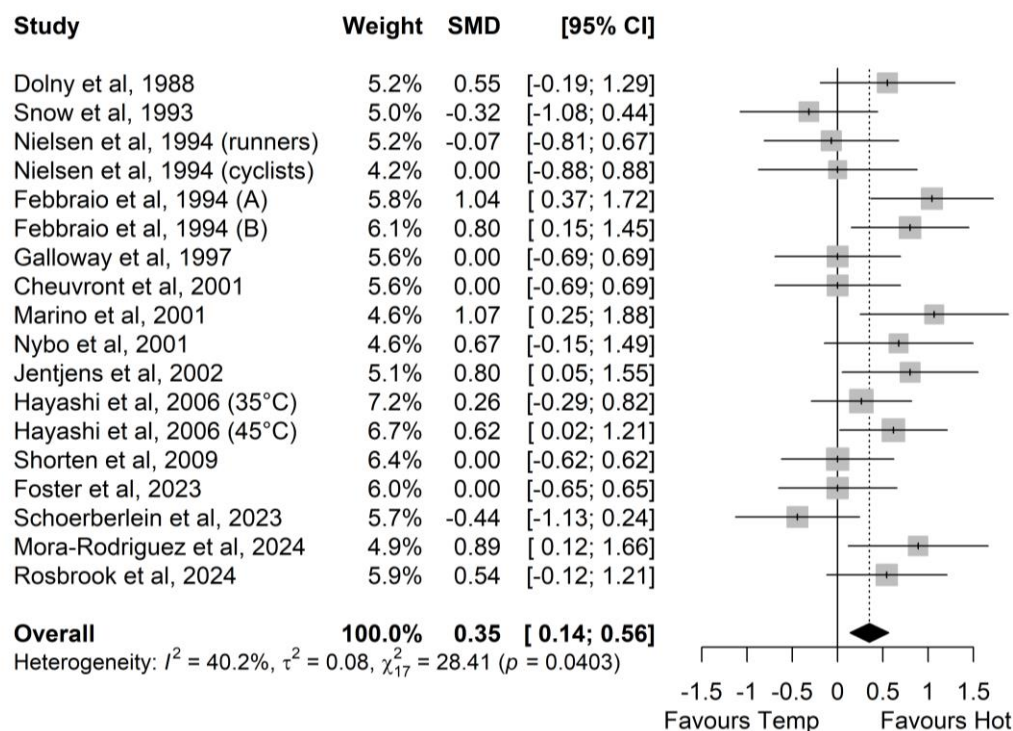


Figure 1. Comparison of the effects of prolonged exercise in Hot vs. Temperate (Temp) conditions on the Respiratory Exchange Ratio (RER). Forest plot shows standardised mean differences with 95% confidence intervals. Squares represent the standardised mean difference for each study. The diamond represents the pooled standardised mean difference for all studies. SMD standardised mean difference, CI confidence interval.

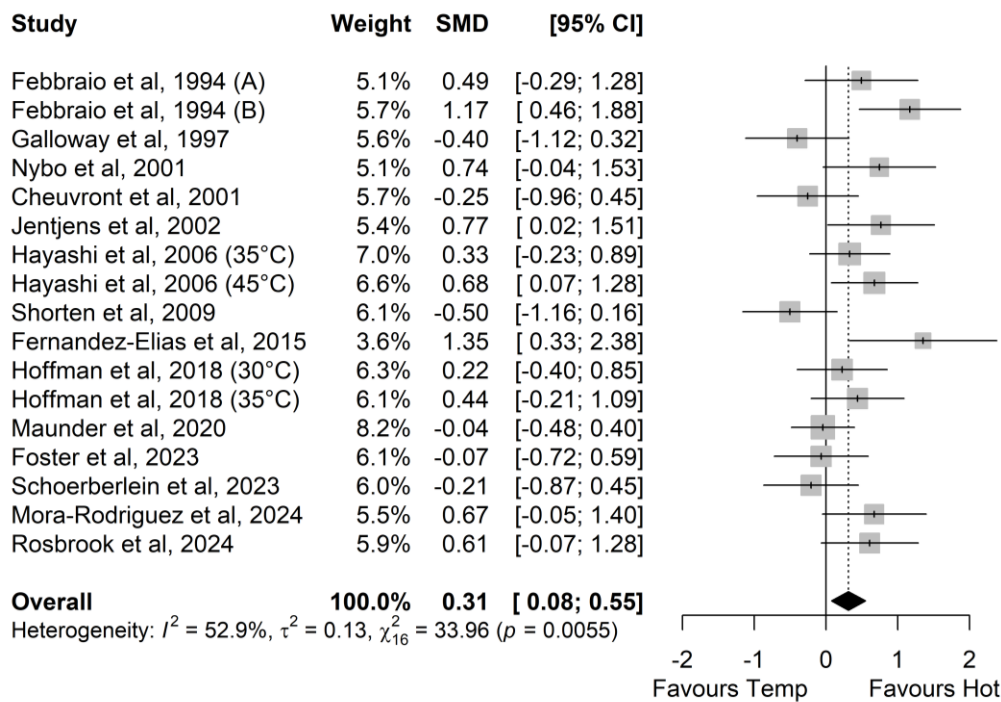


Figure 2. Comparison of the effects of prolonged exercise in Hot vs. Temperate (Temp) conditions on carbohydrate oxidation. Forest plot shows standardised mean differences with 95% confidence intervals. Squares represent the standardised mean difference for each study. The diamond represents the pooled standardised mean difference for all studies. SMD standardised mean difference, CI confidence interval.

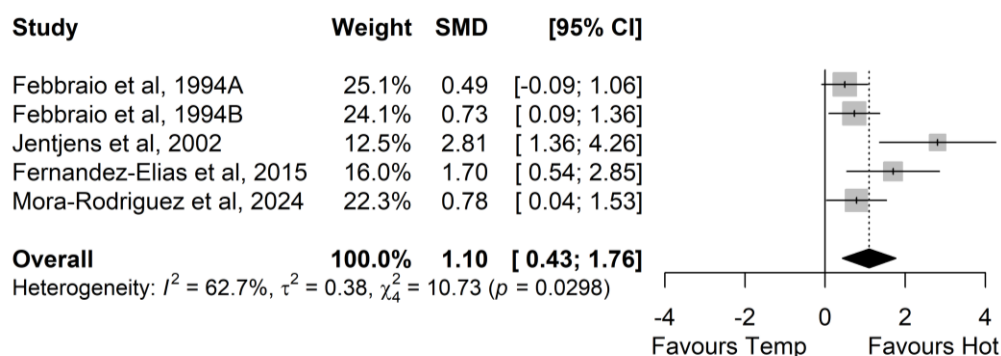


Figure 3. Comparison of the effects of prolonged exercise in Hot vs. Temperate (Temp) conditions on glycogen use. Forest plot shows standardised mean differences with 95% confidence intervals. Squares represent the standardised mean difference for each study. The diamond represents the pooled standardised mean difference for all studies. SMD standardised mean difference, CI confidence interval.

2. The effect of prolonged exercise in hydrated vs. dehydrated status on RER, carbohydrate oxidation and glycogen use.

A greater RER was found in a dehydrated state (SMD 0.24, 95% CI 0.06 to 0.42; $P = 0.008$; $Z = 2.67$; *small* effect; Figure 4). However, the effect was only observed in hot (SMD: 0.30, 95% CI 0.05 to 0.55; $P = 0.008$; $Z = 2.34$; *small* effect) and not in temperate conditions (SMD: 0.15, 95% CI -0.15 to 0.47; $P = 0.359$; $Z = 0.92$; *trivial* effect).

Greater carbohydrate oxidation was observed in a dehydrated vs. hydrated status (SMD: 0.26 (95% CI 0.06 to 0.56; *small* effect; $P = 0.013$; $Z = 2.49$; Figure 5). However, the effect was only observed in hot (SMD 0.32; 95% CI 0.09 to 0.56; *small* effect; $P = 0.008$; $Z = 2.67$; *small* effect) and not in temperate conditions (SMD 0.54; 95% CI -0.85 to 1.92; $P = 0.446$; $Z = 0.76$).

Only one study reported muscle glycogen use in dehydrated condition, consequently, no meta-analysis was performed.

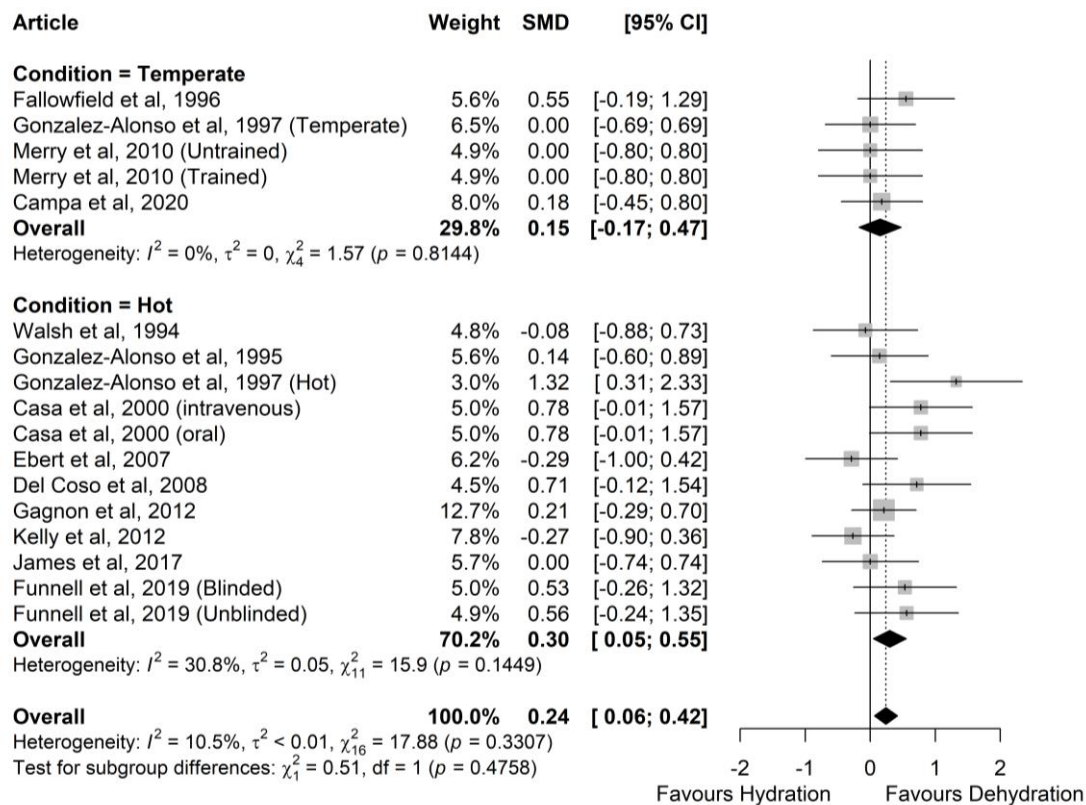


Figure 4. Comparison of the effects of prolonged exercise in hydrated vs. dehydrated status on the Respiratory Exchange Ratio. The upper part shows the studies performed in hot conditions ($\geq 28^\circ\text{C}$); The lower part shows studies performed in temperate conditions. Forest plot shows standardised mean differences with 95% confidence intervals. Squares represent the standardised mean difference for each study. The diamond represents the pooled standardised mean difference for all studies. SMD standardised mean difference, CI confidence interval, df degrees of freedom.

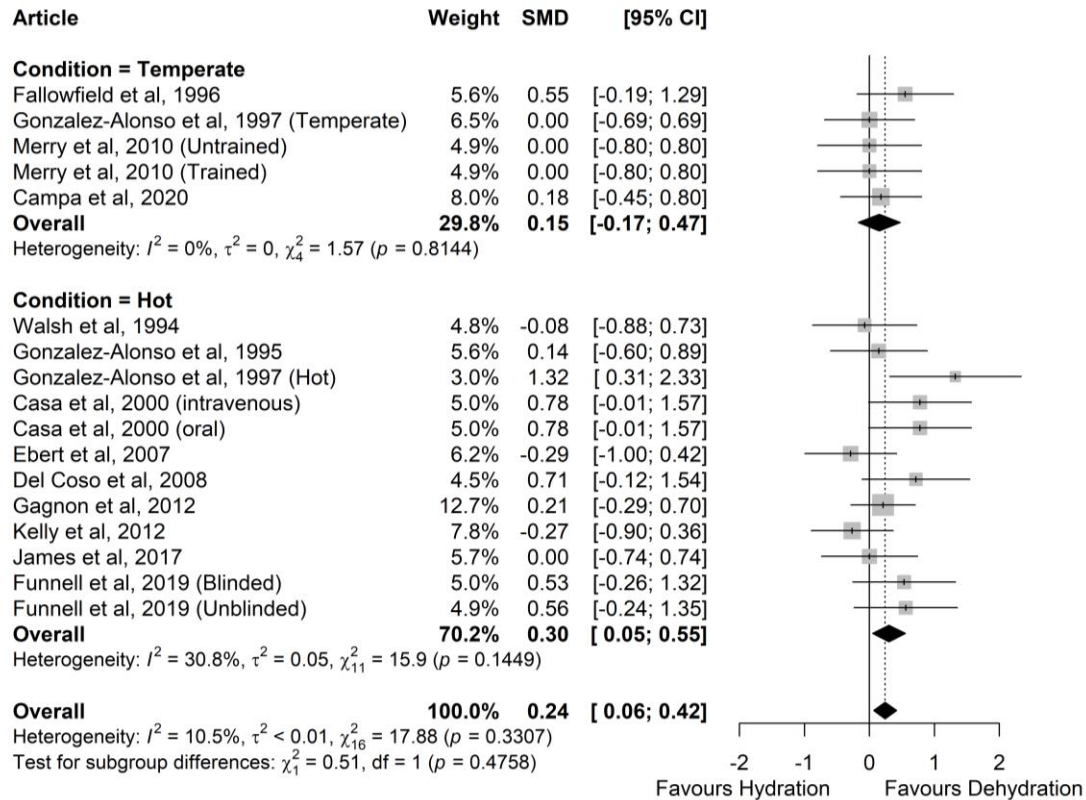


Figure 5. Comparison of the effects of prolonged exercise in hydrated vs. dehydrated status on carbohydrate oxidation. The upper part shows the studies performed in hot conditions ($\geq 28^\circ\text{C}$); The lower part shows studies performed in temperate conditions. Forest plot shows standardised mean differences with 95% confidence intervals. Squares represent the standardised mean difference for each study. The diamond represents the pooled standardised mean difference for all studies. SMD standardised mean difference, CI confidence interval, df degrees of freedom.