

The effects of glycaemic index of mixed meals on postprandial appetite sensation, cognitive function; and metabolic responses during intermittent exercise

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.....Mei Yi Wu

ABSTRACT

Glucose is the primary fuel for the brain and also important for exercising muscle. The purpose of the thesis was to investigate the effects of the glycaemic index (GI) of mixed meals on appetite, cognitive performances and metabolic responses during intermittent exercise in recreationally active adults.

Study one investigated whether a low GI (LGI) breakfast (GI = 42.5) could suppress appetite and reduce energy intake (EI) of 12 recreationally active females (28.2 ± 8.0 years) more than a high GI (HGI) breakfast (GI = 73.5). Area under the curve of the appetite score (AS AUC) following LGI breakfast was significantly greater than the HGI trial during the 60-min postprandial (pp) period (2568 ± 1027 vs. 2198 ± 821 mm·min, $p = 0.025$). The HGI breakfast facilitated a stronger appetite suppressing effect up to eight hours post breakfast than the LGI trial (18834 ± 3906 vs. 21278 ± 3610 mm·min, $p = 0.028$). The EI on the LGI trial day was significantly higher than on the pre-trial day ($2,215 \pm 576$ vs. $1,748 \pm 464$ kcal, corrected $p = 0.008$).

Fourteen recreationally active males (34.5 ± 8.9 years) in study two consumed the LGI (GI = 41.3) and HGI (GI = 74.3) breakfasts in the laboratory and then prescribed LGI and HGI meals in the free living environment. In line with study one, the AS AUC was significantly smaller following HGI than LGI breakfast over the 60-min pp period ($2,989 \pm 1,390$ vs. $3,758 \pm 1,290$ mm·min, $p = 0.027$). The HGI meals (GI = 76.9) suppressed appetite more than the LGI meals (GI = 39.6) over 12 hours on the trial day ($35,454 \pm 9,730$ vs. $41,244 \pm 8,829$ mm·min, $p = 0.009$) although energy balance was not different between trials.

Study three investigated whether following a LGI breakfast (GI = 42.2) providing 1 g CHO kg^{-1} BM could result in a better vigilance and attention than a HGI breakfast (GI = 72.4), and reduced lunch EI in 16 recreationally active males (24.4 ± 3.6 years). A significant trial x time effect in the interference time of the Stroop Colour Word Task (SCWT) ($p = 0.039$) showed that the LGI breakfast maintained the attentional performance up to 90-min pp. Both high pre-task glucose concentration ([Glucose]) at 15-min pp and low pre-task [Glucose] at 105-min pp in the HGI trial were associated with unfavourable outcomes in vigilance in the Rapid Information Processing Task (RIPT). The LGI pre-task [Glucose] returning back to fasting level at 60-min pp was associated positively with the response time. The pre-lunch AS was a significant predictor of the lunch EI per fat free mass which explained 21% and 26% of variance in the LGI and HGI trials respectively. No significant difference was found in the *ad libitum* lunch EI between trials.

Sixteen recreationally active males (27.8 ± 7.7 years) in study four consumed a LGI (GI = 42) and a HGI breakfast (GI = 72.8) providing $1.2 \text{ g CHO kg}^{-1}$ BM consumed 60 minutes prior to intermittent running on two separate mornings.

Better attentional performance at 150-min pp was found following LGI than HGI breakfast. The significant trial x time interaction in the SCWT ($p = 0.045$) showed the shortest interference time performed after the last exercise session in the LGI trial. The amounts of CHO and fat being oxidized were comparable between trials during three sessions of 16-min intermittent running with an average intensity of 65% $\dot{V}O_2$ max.

In conclusion, the pre-meal appetite sensation is more predictive of the subsequent meal EI than the pre-meal [Glucose]. The meal strategy for weight management in recreationally active adults may focus on greater appetite suppression by selecting HGI foods whilst maintaining healthy eating guidelines. Recreationally active males performing sports requiring high levels of vigilance and selective attention with low physical activity levels can benefit up to 60–90 min pp from the LGI breakfast. Their attentional performance can benefit from the LGI breakfast with moderate to high intermittent intensities in the late exercise period at 150–min pp. Recreationally active adults should consider the timing of meal consumption in relation to performing intermittent exercise, in order to maximize the advantages from the LGI or HGI breakfasts for cognitive performance or appetite suppression. They may be more liberal in pre-exercise food choices if substrate oxidation during intermittent running is only of their concern.

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