

Macronutrient composition of a snack and subsequent cognitive performance and postprandial metabolism in the morning

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The effect of a breakfast or morning snack with an “optimal” relation of macronutrients for overall cognitive performance was studied against a traditional carbohydrate-rich snack on overall performance in short-term memory, attention as well as reaction times in twenty-two healthy male students.

Subjects were tested in two sessions, separated by one week, for short-term changes in blood parameters, mood states, and objective cognitive functions, using a repeated-measures, counterbalanced cross-over design. Measurements were made after an overnight fast before and hourly during 3 h after test meal ingestion. Test meals were isoenergetic (1600 kJ) snacks of a carbohydrate-rich (CHO) muesli with a relation of carbohydrates:protein:fat of 76:11:13 in total energy, and a protein- and fat-rich (PRO/FAT) muesli with a relation of 27:39:34, respectively.

Some of the cognitive indices were significantly influenced by the type of test snack ingested. Overall, ingestion of the PRO/FAT snack resulted in better scores for attention and reaction times concomitant with less variation in glucose metabolism and a relatively high glucagon to insulin ratio (GIR) as well as a relatively low tryptophan (Trp) to the other large neutral amino acids (LNAA) ratio and a relatively high tyrosine (Tyr)/LNAA ratio. The CHO snack tended to result in better performance of short-term memory concomitant with large variation in glucose metabolism and a relatively low GIR as well as a relatively high Trp/LNAA and low Tyr/LNAA ratio. There was much variability in cognitive performance after the CHO snack while the PRO/FAT snack resulted in more stable cognitive performance accompanied with a more stable glucose metabolism as well as a relatively high GIR. Since the content of dietary fiber in the CHO snack was higher than expected, the glycemic load in the CHO snack was reduced. Therefore, changes in the Trp/LNAA and Tyr/LNAA ratio between test meals were presumably too small to significantly affect the synthesis of neurotransmitters and to result in more articulated cognitive differences between test meals. All in all the results of the study support the notion that a protein- and fat-rich snack in the morning results in more stable or for some cognitive functions better cognitive performance than a carbohydrate-rich snack.