Glucose and Cognition: An ERP Investigation of the Neuro-Cognitive Mechanisms Mediating the Glucose Facilitation Effect

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The ingestion of a glucose containing drink has been shown to improve performance on a variety of cognitive tasks (see Riby, 2004 for review). However, it has proven difficult to draw firm conclusions from this literature due to the diversity of methodologies that have been used. So, although evidence suggests that moderate increases in blood glucose enhance cognitive performance, there is debate as to whether glucose especially benefits memory functioning (e.g. Sünram-Lea et al., 2002). The aim of this research was to use the precision of event related potential methodology (ERPs) to examine further the neural correlates of glucose-mediated cognitive processes.

A total of 13 younger adults participated in the experiment. After an overnight fasting period, each participant attended two sessions (separated by approximately 1 week) each lasting two hours. Before administering cognitive testing participants received either glucose (25g) or saccharin drink (37.5mg). Afterwards, ERPs were recorded during a visual three-stimulus oddball paradigm (see Polich, 2004). This paradigm involves an individual discriminating between an infrequent target stimulus randomly embedded in a train of repetitive background or standard stimuli. Detection of the target results in a large P3b ERP component ('hippocampal/memory effect'). The infrequent presentation of a novel and irrelevant stimulus, randomly interspersed with the target and standard stimuli, generates a P3a response ('frontal lobe/attention effect'). These components were used as markers to establish whether the glucose effect was restricted to those neuro-cognitive processes related to memory.

Based on our behavioural work we would have expected glucose to moderate the magnitude and/or latency of the P3b only. However, glucose also interacted with attentional systems (P3a and the earlier P2). The preliminary data analyses are displayed in Figure 1.

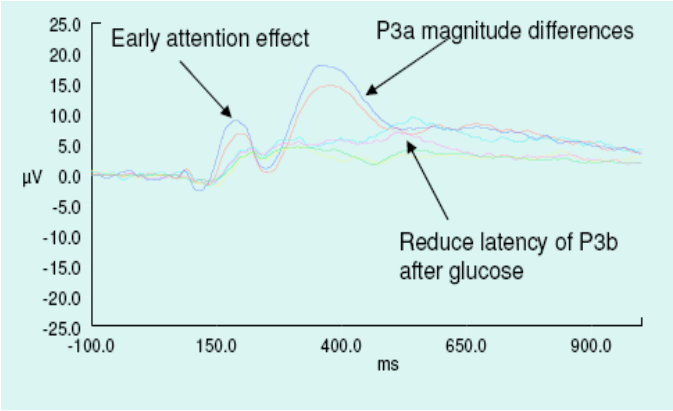

Figure 1.
Glucose Novel Stimuli Glucose Targets Glucose Non-Target
Saccharin Novel Stimuli Saccharin Targets Saccharin Non-Targets

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