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**Glucose and Cognitive Performance: The Effects of Glucose on Memory and  
Sustained Attention**

Thesis presented in partial fulfilment  
of the requirements for the degree  
of Master of Arts in Psychology  
at Massey University

**KELLY RICHARDSON**

**2004**

## ACKNOWLEDGMENTS

Firstly, I would like to express my sincerest appreciation to my supervisor Dr John Podd for his commitment, encouragement, and understanding.

Secondly, I would like to thank Mr Malcolm Loudon for the extensive technical contribution he made to this study.

Thirdly, I would like to thank Crop and Food Research Limited and, in particular, Dr John Monro, for their support and assistance.

I would also like to thank McDonalds, The Square, Palmerston North, for their generous donation of resources.

I would also like to express my gratitude to my family for their ongoing and unwavering support.

Finally, I would like to acknowledge all of the people who volunteered time to participate in this study. Thank you.

## ABSTRACT

The effects of glucose on tasks of declarative memory, and sustained attention were examined. These effects were also investigated with regard to the age of the participant. Standard glucose and placebo conditions were run, and also a natural history condition to analyse the possibility of a placebo effect. Twelve young and twelve older adults participated in the study. Over three separate morning sessions, participants ingested either the glucose or the placebo drink, or nothing for the natural history condition, and completed the cognitive tasks. The between-group factor was age of the participant (young or older adult). The within-group factor was the type of drink ingested (glucose, placebo, or natural history). The effects of glucose on the sustained attention task were investigated over time, divided into 10 x 2 min periods. No effects of drink were found in regard to overall task performance for either age group. There was one main effect for period on one measure of the sustained attention task. There was also an associated interaction effect for this measure. Trends in the data pointed towards the possibility of the existence of a placebo effect. The placebo condition yielded consistently better performance than the other two conditions on most tasks. These results were discussed in light of the possible existence of a placebo effect, and the condition-specific effects of glucose.

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## PROLOGUE

The present study is one component of a broader spectrum of research, facilitated by Dr John Podd in collaboration with Crop & Food Research Limited, on the influence of nutrients on human performance. In the work presented here, the effects of glucose on declarative memory and sustained attention are examined.

A considerable amount of research has investigated the effects of glucose on human performance. Most of this research has focused on the effects of glucose on cognition, particularly memory. There are many inconsistencies within the data on glucose and cognition, the primary one being conflicting results between original studies and replication attempts.

The present study follows on from research by Culligan (2002) that examined the effects of glucose, fat, and protein on recall and mental arithmetic tasks. Culligan found no effects of the nutrients on performance.

The present study aimed to repeat the memory study conducted by Culligan (2002) who was unable to find any effects of glucose on paragraph recall. In addition, the effects of glucose on sustained attention were investigated to find out if the typical drop-off in performance over time could be halted or minimised. There has been very little research on the effects of glucose on cognitive performance other than memory.

## INTRODUCTION

In recent years, the idea that some foods are 'functional' has emerged. Functional foods are foods that grant additional health benefits, over and above the nutritional value derived from them (Bellisle et al., 1998). One such health benefit is improved cognitive performance. There has been a considerable amount of psychological research on the ability of certain foods to influence cognitive and physical performance, as well as psychological state (Dye, Lluch, & Blundell, 2000). For example, research by Smith, Kendrick, and Maben (1992) found that the ingestion of caffeine lead to improvements on most cognitive performance measures. Hindmarch, Kerr, and Sherwood (1991) found that alcohol impaired performance on most cognitive and psychomotor tasks. Kruesi and Rapoport (1986) write that simple sugars can cause disturbances in cognitive performance and mood. Lieberman, Corkin, Spring, Gowdon, and Wurtman (1983) report that carbohydrates can produce a temporary elevation in mood. Some studies have examined glucose as a functional food, showing that it can benefit cognitive performance. However, not all of these studies have been able to produce glucose effects. This may be because the effects of glucose are small, or that they only emerge under certain conditions.

This thesis begins by describing what glucose is, and how it works. Then, the importance of glucose to the brain is explained, and the effects of glucose on memory and possible mechanisms for this are examined. Following this, a discussion of the effects of glucose on sustained attention is presented. The effects of task difficulty are outlined and some of the inconsistencies in glucose research discussed. Next, the possibility that the glucose effect is a placebo effect is considered, and finally, a rationale for the present study is provided.