

Plenary 1: Nutrition and Cognition

Nutrition and cognitive functioning: Issues and challenges for research

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There is increasing interest from scientists, the food industry and the general community in whether and how dietary intake can influence our cognitive performance and psychological well-being. While there are increasing numbers of publications on this topic, there are a number of issues that remain to be addressed before we can be confident that the effects we are finding are reliable and valid. The object of this paper is to identify these challenges and to offer suggestions for how they might be addressed. These challenges include: the accurate and sensitive measurement of cognitive performance and impairment based on current psychological theory, the identification of plausible mechanisms of effects of nutrition on brain function, the translation of mechanisms into hypotheses about the impact of nutrition on specific cognitive outcomes based on neuropsychological theory, small effect sizes and the consideration of clinical significance, the identification of the nature of effects – whether short-term or longer term and the implication this has for study design, and the characteristics of the sample.

The detection of nutritional effects on cognition requires an appreciation of the importance of selecting appropriate outcomes. Cognition is a multidimensional construct that can be assessed at different levels of analysis: the neuropsychological, cognitive abilities, and information processing levels. Each of these approaches has given rise to different cognitive constructs each of which can be assessed using standardized, reliable and valid measures. Therefore the selection of tests relies on plausible mechanisms by which nutrients impact on the brain and the likely effect these brain changes have on cognitive performance. If generalised effects are hypothesized, then a battery of tests designed to detect many different cognitive functions may be required. A second consideration is whether cognitive *performance* or cognitive *impairment* is to be the focus of the research. Commonly, researchers choose tests designed to detect cognitive impairment which are likely to produce ceiling effects in a non-clinical sample and therefore be unable to detect effects. Furthermore any impacts on cognition are likely to have secondary effects such as on everyday functioning, work performance or school performance, so the researcher needs to make decisions regarding whether these are also to be assessed.

The effects of dietary components on the brain have, with the exception of a few, typically produced small effect sizes. There are many influences on cognitive performance and the amount of variance predicted by nutritional variables is commonly low compared with other predictors. The question then, is whether trivial effects are of value and whether they justify the time and expense of studies requiring large sample sizes. Small effects may arise through inappropriately seeking longer-term effects when the actual effect is short-term. Therefore it is important to design research so that both can be detected if the type of effect is not known.

The nature of the sample may also influence the detection of nutritional effects on cognition. For example, the utilisation of samples of convenience, such as University students, may produce a lack of variability in the outcome measures making it difficult to detect effects. Samples that are likely to contain highly functioning participants may limit the detection of nutritional interventions due to ceiling effects on tests or by a limited benefit of the intervention. For those participants with cognitive impairment, improvements may not be possible from nutritional interventions. Instead, researchers should focus on the ability of nutritional intervention to maintain performance or reduce decline.