

Feeding the Future Generation

“Does what we feed our children influence their behaviour and intelligence?”

The NUTRIMENTHE Project - Open Forum

Poster abstracts

Cristina Campoy¹, Elena Martin-Bautista¹, Jayne Evans², Emil Kazounis²; on behalf of NUTRIMENTHE Project Consortium.

¹Department of Paediatrics. School of Medicine. University of Granada, Spain.² Beta Technology, Doncaster, UK.

NUTRIMENTHE- the Effect of Diet on the Mental Performance of Children - Project overview

Background: There is evidence that early nutrition can influence later mental performance, cognitive development and behaviour. The idea that the diet of mothers, infants and children could have an influence on long-term mental performance, has major implications for public health practice and policy development, and for our understanding of human biology, as well as for food product development, economic progress, and future wealth creation.

Objective: The NUTRIMENTHE research project (7th EC Framework Programme, 2008-2013) will significantly improve our understanding and knowledge of the effect of diet on mental performance. NUTRIMENTHE will address these areas by bringing together a multi-disciplinary team of international scientists in key areas of nutrition and mental performance from major research centres across Europe.

Methods: The methodology used in the project is: a) epidemiologic studies to analyse the long-term effects of pre and early postnatal diet on mental performance and mental illness in children; b) follow up randomised clinical intervention trials of specific nutrients introduced during pregnancy, infancy and childhood c) assessment of n-3 LC-PUFAs quantitative requirements in children with restricted diets; d) quantitative assessment of the interaction between nutrition and genetic variation with regards to mental performance; e) development of a standard neuropsychological battery for the assessment of mental performance of children in Europe; f) development of clear and consistent European dietary recommendations for pregnant women, infants and children.

Results: Until now, an appropriate standard neuropsychological battery to improve a comparable methodology for cognitive assessment in EU children has not been fully developed. NUTRIMENTHE will bring quantification of the effects of prenatal maternal diet on foetal early programming and subsequently on later cognitive development, mental and behavioural disorders. Specification and understanding of the role and mechanisms of certain nutrients on early programming and genetic polymorphisms, and how these nutrients interact within the maternal, infant and childhood diet are also prime outcome measures for the project.

Conclusion: NUTRIMENTHE will significantly increase the overall knowledge in the applied area, including the quantification of effects of nutrition on mental performance and behaviour and the assessment of risks and benefits of differing nutrition at various age groups. From a wider European perspective, the project will increase the knowledge and awareness of parents, health professionals, teachers and food producers on how diet influences mental performance

and associated health claims whilst also developing a set of clear and consistent pan-European dietary recommendations for pregnant women, infants and children.

This work is funded by NUTRIMENTHE FP7 EU Project (contract n° 212652)

Claire Horton on behalf of the NUTRIMENTHE consortium

Beta Technology, Doncaster, UK.

NUTRIMENTHE- the Effect of Diet on the Mental Performance of Children - Project progress

There is evidence to suggest that diet can affect the mental performance (MP) of children. Nutrimenthe aims to improve understanding of this through epidemiological studies and randomised nutritional intervention trials of specific nutrients (including B-vitamins, minerals, protein and LC-PUFAs) introduced during pre natal and early post natal development with mental performance being assessed through a battery of neuropsychological tests harmonised for use by the Nutrimenthe project. Additionally, Nutrimenthe is assessing parents' knowledge of the role of diet on MP and is assessing the economic impact of improving MP through review of economic literature.

Results from epidemiological studies include:

- Fish eating in pregnancy was positively associated with levels of EPA & DHA in the mother during pregnancy and in the child at birth.
- Inadequate folic acid supplementation during early pregnancy is related to toddlers showing behavioural problems at 18 months.

Results from consumer and economic analysis include:

- Parents are concerned with balancing the provision of a healthy nutritious diet with satisfying their children's food preferences and are aware that developing good eating habits could have long term implications for health
- High treatment costs for lower mental development and mental disorders could be saved for society

Conclusions

The Nutrimenthe project will allow the assessment of:

- The effect of several nutrients on MP in children
- Consumer attitudes (parents and teachers) to diet and MP
- The cost impact to society of improving mental performance.

This work is funded by NUTRIMENTHE FP7 EU Project (contract n° 212652)

B. EGAN¹, B. BRANDS², E.GYÖREL³, JC LÓPEZ-ROBLES⁴, H. GAGE¹, M. RAATS¹, B KOLETZKO², T DESCİ³, and C. CAMPOY⁴,

¹Food Consumer Behaviour and Health Research Centre, University of Surrey, Guildford, Surrey, GU2 7XH, ² Dr. von Hauner Children's Hospital, Ludwig-Maximilians-University, Munich, Germany, ³Department of Paediatrics, University of Pécs, Hungary, ⁴ Department of Paediatrics University of Granada, Spain.

The role of diet in the mental performance of children- what do parents think?

Nutrition plays an important role in a child's development, including their mental performance. Ideally children should have a healthy, balanced diet as mental performance may be influenced by the nature of children's diets and the pattern of meal consumption.

Parents play a pivotal role in the establishment of children's food choices and eating habits however to date there is little published research on parent's perceptions of the effect of diet on children's' mental performance. The present qualitative study was conducted in four European countries, England, Germany, Hungary and Spain and participants were parents of children aged 4-10 years who were recruited through schools in the state sector. A semi-structured interview schedule was used to elicit parent's views on the effect of food on children's wellbeing and development in general and more specifically the mental effects of food. Additional questions addressed the possible effects of specific foods, meals and supplements as well as the impact of what children eat in school on their performance. Interviews were transcribed and thematically analysed using NVivo8.

The principal themes to emerge across the four countries included the effects of diet in terms of physical, mental and behavioural outcomes. A healthy balanced diet was perceived to have positive effects whereas foods with high sugar and/or fat content were perceived to have negative effects. Parents most often mentioned attention and concentration as the aspects of mental performance affected by particular foods. Parents also referred to tangible effects of foods being manifested by changes in a child's mood and behaviour. Establishing good eating habits in childhood was perceived as important as these habits would continue into adult life, with possible long-term effects on health.

This study is part of the NUTRIMENTHE FP7 EU Project (contract n^o 212652)

JC. López-Robles¹, H. Pascual¹, B. Egan², H. Gage², E. Györei³, B. Brands⁴, M. Raats², E. Martín-Bautista¹, D. Tamas³, B. Koletzko⁵, C. Campoy¹

¹Department of Paediatrics, University of Granada, Granada, Spain, ²Food, Consumer Behaviour and Health Research Centre, University of Surrey, Guildford, United Kingdom, ³Paediatrics, University of Pécs, Pécs, Hungary, ⁴Pediatrics, ⁵Paediatrics, Ludwig-Maximilians-University, Munich, Germany

TEACHER'S KNOWLEDGE ON WHAT AFFECTS CHILDREN'S MENTAL PERFORMANCE: SPANISH MODEL

Teachers have an indirect influence on food choices of children at school. They should be aware of the relevance of every type of food to the mental performance of humans in order to know what are the nutrients that help a better neurodevelopment for brain and behaviour. The study aimed to examine Spanish teachers' understanding of the factors influencing children's mental performance in a qualitative way. This study was conducted in Spain with 17 participant teachers of children aged 4-10 years old recruited in state elementary schools. They were asked, in open interviews, their opinion on what would they consider affecting the mental performance using different questions on the field of Physical, Mental and Social. A total of 12 questions, based on evidences from scientific literature, were asked. Responses were recorded, coded and group analysed using the Nudist-Vivo program version 8.0. A model of research sorted out from the interviews to give a general view about the study. Spanish data reveal that teachers perceive 'energy', 'caffeine and sugar' and 'no breakfast' as short term effects with a negative repercussion on concentration. Also, they explain that 'sleeping' have a direct repercussion on energy levels. Otherwise, long term effects came related to 'mental performance', 'mood-behaviour', 'physical development' and 'well-feeding'. This long term effects seem to have a repercussion in learning and concentration; and in a specific way, it's a positive effect from well feeding to concentration, mood and behaviour.

**This study is part of the NUTRIMENTHE FP7 EU Project (contract nº 212652)

JC. López-Robles¹, H. Pascual¹, B. Egan², H. Gage², E. Györei³, B. Brands⁴, M. Raats², E. Martín-Bautista¹, D. Tamas³, B. Koletzko⁵, C. Campoy¹

¹Department of Pediatrics, University of Granada, Granada, Spain, ²Food, Consumer Behaviour and Health Research Centre, University of Surrey, Guildford, United Kingdom, ³Paediatrics, University of Pécs, Pécs, Hungary, ⁴Pediatrics, ⁵Paediatrics, Ludwig-Maximilians-University, Munich, Germany

COMPARISON & SIMILARITIES IN 3 EUROPEAN COUNTRIES: TEACHER'S MODEL ON THE INFLUENCE OF NUTRITION IN CHILDREN'S MENTAL PERFORMANCE

To analyse what school teachers consider when teaching about nutrition to their students, it's important to know what factors they perceive to influence a child's cognitive development and mental performance. Teachers play a very important role in the development of children's food education: choices and eating habits for their future-health. The study aimed to examine teachers' understanding of the factors influencing children's mental performance in a qualitative way. The study was conducted in Spain, England and Germany and participants were teachers of children aged 4-10 years old recruited in state elementary schools. They were asked, with open interviews, what they thought that could affect the mental performance. A total of 12 questions, based on evidences from scientific literature, were asked. Responses were recorded, coded and group analysed using the Nudist-Vivo 8.0 program. A model of research sorted out from each one of the countries. The comparison of those 3 models extract from the interviews reveals that English teachers talk about 'Bad feeding practices' referring to sweet products while the Germans make a clear difference between fats and sugars, pointing out that fats have an influence in energy levels and school performance when, on the other hand, sugars have effects in hyperactivity and concentration. The Spanish teachers seem more focused on sugars and caffeine. The other significant difference comes from the breakfast's effects: Germans think that it produces short terms effects whereas Spanish differ between short-term (concentration) and long term (mental performance) influence.

**Study part of NUTRIMENTHE FP7-EU Project (contract nº212652)

JC. López-Robles¹, H. Pascual¹, B. Egan², H. Gage², E. Györei³, B. Brands⁴, M. Raats², E. Martín-Bautista¹, D. Tamas³, B. Koletzko⁵, C. Campoy¹

¹Department of Pediatrics, University of Granada, Granada, Spain, ²Food, Consumer Behaviour and Health Research Centre, University of Surrey, Guildford, United Kingdom, ³Paediatrics, University of Pécs, Pécs, Hungary, ⁴Pediatrics, ⁵Paediatrics, Ludwig-Maximilians-University, Munich, Germany

PARENTS KNOWLEDGE ON WHAT AFFECTS CHILDREN'S MENTAL PERFORMANCE

Parents have direct influence on food choices presented to their children at home. When analysing what parents consider when choosing food for their children it is important to know what factors they perceive to influence a child's cognitive development and mental performance. Parents play a very important role in the development of children food choices and eating habits which may in turn influence either positively or negatively children's future health. The present study aims to quantitatively examine parents' understanding of the factors influencing children's mental performance.

The study was conducted in Spain and participants were parents of children aged 4-10 years old recruited in state elementary schools. A card sorting task was developed and used to conduct interviews with a total of 50 parents. Parents were asked about five different groups of influencing factors: Biological, Educational, Social, Environmental and Psychological factors based on evidence from scientific literature. Mental performance was defined in terms of Attention, Learning, Mood and Behaviour. Parents were asked to rate the effect of 18 factors as strong, moderate or no effects on child's mental development in relation to each of the chosen aspects of mental performance.

Responses were recorded manually, coded and group analysed using Friedman test and Cronbach Alpha test with the SPSS version 15.0. Spanish data reveal that parents perceive the Environmental, Social and Educational group of factors as having most influence on children's mental performance.

**This study is part of the NUTRIMENTHE FP7 EU Project (contract nº 212652)

Dr. Margaret Anne Defeyter

Northumbria University

Young children have the ability to regulate intake both within meals and throughout the course of the day. However, by age five, children's ability to self regulate energy is subject to modification by social and environmental factors. The present study examines the influence of five to six- year-olds failure to conserve volume on their perceptions of portion size, hunger and satiety. This experiment was a between subjects design with one factor and two levels (wide and short cereal bowl vs. narrow and tall cereal bowl). Children were pseudo-randomly allocated to conditions according to age and BMI. Forty participants (45% male), with a mean age of 5.6 years (range, 5-6.3 years) were recruited from schools providing breakfasts in the North East of England. Children were individually tested on a Piagetian conservation of volume task by pouring a single size portion of cereal (Rice Krispies) into two same-size bowls. All children agreed that the bowls contained the same amount of cereal. The experimenter then poured the cereal from one bowl into a taller yet narrower bowl. At test, all children stated that the taller bowl contained a larger portion of cereal. Half of the participants were then given the cereal in the tall bowl to eat, and the remaining children were given the cereal in the short bowl to eat accompanied by 125ml of semi-skimmed milk. Thirty minutes following breakfast consumption, children were asked satiety questions using semantic differential scales. Despite having consumed exactly the same amount of cereal, children in the taller bowl condition perceived themselves as being more sated than those in the short bowl condition ($t(38) = 2.56, p < 0.05$). They was also a significant effect of bowl size on hunger, with children in the tall bowl condition reporting that they were significantly less hungry than children in the short bowl condition ($t(38) = 3.12, p < 0.01$). There was no significant effect of condition on thirst ($t(38) = 1.96, p > 0.05$). These results suggest that visual cues may play an important role in determining portion size, and perceptions of hunger and satiety.

Pamela L. Graham

Northumbria University

Recent research has suggested that a link may exist between school breakfast club attendance and improvements in children's social relationships, cognition, academic performance and nutritional status. Although it has been suggested that breakfast club attendance might help to smooth the transition between home and school in the morning, very little research attention has been paid to the potential impact of breakfast club attendance on children's behaviour. The current study employed an observational method to investigate whether children's behaviour altered across the duration of the breakfast club session. The behaviour of two-hundred-and-thirty-two children, aged between seven and eleven years, was observed during the first and last five minutes of seventy-five breakfast club sessions. All children consumed a breakfast meal upon entering breakfast club. Analysis revealed that the perceived level of classroom noise, the number of incidents of negative social interaction and children's level of excitability decreased significantly across the breakfast club session, while the number of incidents of positive social interaction significantly increased. The current findings provide support for previous anecdotal evidence, which suggests that breakfast club attendance might aid children's transition from home to school. Further research is now required to investigate whether improvements in children's behaviour across breakfast club sessions are a result of breakfast consumption or due to children spending time in a structured school environment.