The role of omega-3 fatty acids, vitamins and minerals in cognition, mood and the perception of food.

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The role of omega-3 fatty acids, vitamins and minerals in cognition, mood and the perception of food.

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Prifysgol Abertawe

THESIS SUMMARY

This summary sheet should be completed after you have read the accompanying notes. The completed sheet should be submitted by you to your Head of School at the time of submission of your work and the supporting documentation.

Candidate's Surname / Family Name .....LONG.....

Candidate's Forenames .....SARA JAYNE.....

Candidate for the Degree of .....PhD (PhD, MPhil etc.)

Full title of thesis: The role of omega-3 fatty acids, vitamins and minerals in cognition, mood and the perception of food.....

Summary:

Previous research has suggested a role for nutrients in several aspects of psychological functioning. Based on this research the present thesis explored the role of omega-3 fatty acids, vitamins and minerals in cognition, mood and the perception of food. Divided into three sections, the first section of the thesis used qualitative methods to explore factors that affected food choice and the decision to consume a healthy diet (i.e. a diet high in omega-3, vitamins and minerals). In addition, factors that affected supplement use, specifically the factors that affected the use of omega-3 fatty acid, vitamin and mineral supplements were explored. From the data, two models were developed: one depicting factors that influenced food choice and healthy eating, and one depicting factors that influenced supplement use.

After the examination of the factors that affected food choice, healthy eating and the consumption of omega-3 fatty acids, vitamins and minerals, the importance of these nutrients in psychological health and cognition was explored in a double-blind, randomized controlled trial. Specifically the second section explored the effect of vitamins, minerals, and/or omega-3 fatty acids in mild psychiatric symptoms, stress, aggression, impulsivity, fatigue, hostility, anxiety, confusion, confidence, reaction time, memory and vigilance. A positive response was found to DHA with regard to aggression and response inhibition; in addition there was a trend for those taking only DHA to report feeling more clearheaded the taking of vitamins/minerals alone resulted in feeling more clearheaded. Supplementation with vitamins and minerals was found to significantly reduce stress. With the General Health Questionnaire the difference between the placebo and vitamins/minerals groups approached statistical significance. There was no effect of omega-3, vitamins and minerals of any cognitive domain (memory, reaction time and vigilance). Although it was concluded that on occasions either vitamins/minerals or DHA when tested alone had a positive effect on mood, stress and mild psychiatric symptoms, there was no synergistic interaction: rather on occasions the interaction between these supplements had negative consequences.

The third section explored the role of omega-3 fatty acids, vitamins and minerals in the perception of food, specifically the effects of enrichment, health claim and gender on three variables involved in consumer behaviour: the perceived healthiness, the desirability of supplementation and the likelihood of purchase of foods. The main findings were that i) health claims increased the perceived healthiness of unhealthy foods; ii) the likelihood of purchase increased mostly after the enrichment of healthy foods (which is consistent with some findings but not others), iii) males were more likely to purchase healthy, high protein products than females. Besides these findings there was no consistent effect of enrichment, health claim or gender on the 3 facets of consumer behaviour, suggesting that the effects on the 3 consumer variables should be considered individually. In addition, when examining the role of gender males and females should be considered separately.

DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

Signed.... .....(Candidate)

Date.....05.07.2013.....

STATEMENT 1

This thesis is the result of my own investigations, except where otherwise stated.

Signed... .....(Candidate)

Date.....05.07.2013.....

STATEMENT 2

I hereby give consent for my thesis, if accepted, to be available for photocopying and for inter-library loan, and for the title and summary to be made available to outside organisations.

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Acknowledgements:

I would like to thank everyone who helped me in any way, shape or form whilst producing my work: it has been a meandering, insightful and eye opening journey.

For my supervisor, Dave Benton, for providing continuous support throughout the progress of my work. Objective and insightful advice on tap.

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For anyone who helped me with data collection and analysis.

For anyone who has put up with my eccentric and very much 'out there' views: I'm sure they will come in hand eventually, in this, or another life.

Contents

i. Abstract

Diet and nutrition play a significant role in health and disease, for example micronutrients (vitamins and minerals) and omega-3 fatty acids have been implicated in development and health. Vitamins and minerals that are referred to throughout this thesis include vitamins retinol (A), thiamine (B1), riboflavin (B2), Niacin (B3), Pantothen acid (B5), pyridoxin (B6), folic acid (B9), cobalamin (B12), ascorbic acid (C), calciferol (D), phyllochinone (K), Biotin (H), sodium, potassium, calcium, magnesium, iron, zinc, copper, manganese, molybdenum, selenium, chromium, iodine and phosphorus. They are vital for development and function and can be found in fruits, vegetables, nuts, meats, whole grains and dairy products. Several vitamins and minerals, including B-vitamins, vitamins A, C, calcium, iron and copper play an important role in metabolic activities in the brain and without an adequate supply metabolism would be adversely affected. They have been associated with the prevention of cancer, cardiovascular diseases, stroke, diabetes, osteoporosis and atherosclerosis (Fleet et al., 2012; McGreevy and Williams, 2011; Jha et al., 1995; Huang et al., 2006). There is an extensive literature that points to the importance of vitamins and minerals in health and for this reason the first section of this thesis (section one of two) explored factors that affected food choice and the use of supplements containing vitamins, minerals and fatty acids. Vitamins and minerals have also been implicated in psychological health, and several randomized controlled trials in healthy populations have found that they may reduce aggression, stress, mild psychiatric symptoms, fatigue, as well other aspects of mood (Benton et al., 1995; Carroll et al., 2000; Schlebusch et al., 2000; Kennedy et al., 2010; Stough et al., 2011; Harris et al., 2011; Kennedy et al., 2011; Gesch et al., 2002; Zaalberg et al., 2011). Section two explored the effects of vitamins, minerals and fatty acid supplementation on several facets of mood, behaviour and cognitive performance.

Despite the importance of vitamins, minerals and omega-3 fatty acids in health, there are issues concerning current government dietary guidelines. These issues are explored in section two (chapter five). For example, the government has provided the public with Dietary Reference Values (DRVs), which are general guidelines for the optimal intake of nutrients including vitamins and minerals, however, there are concerns that some segments of the population are not getting adequate nutrition: there

are gender differences in nutrient consumption such that females sometimes have a higher level of deficiency than males: it has been reported that the percentage of males between the ages 19-34 below the Lower Nutrient Reference Intake (the bottom 2.5%) were for riboflavin (7% below LNRI), vitamin A (16%), and magnesium (9%). Women in this age bracket had even more nutritional deficiencies, for example riboflavin (12%), B-6 (7%), vitamin A (13%), iron (40%), calcium (7%) and magnesium (20%; Ruston et al., 2003).

Although there are no official guidelines for the consumption of omega-3 fatty acids, it has been suggested that for optimal functioning, 3-6% of total energy should be consumed as LA and 0.5-1% as ALA (Bezard et al., 1994). The UK Food Standards Agency (FSA) recommended around 1-2 portions of fish per week, which would provide around 450mg EPA plus DHA. The European Food Standards Agency (2004) recommended between 200-500mg EPA plus DHA per day, similar to the Scientific Advisory Committee on Nutrition/Committee on Toxicity (2004) who suggested the recommended intake should increase from 200mg to 450mg EPA plus DHA daily. Despite recommendations, there are concerns over whether enough omega-3 fatty acids are being consumed, especially in Westernized societies. The ratio of omega-3: omega-6 has been suggested to be an important factor in health - the ideal ratio has been debated, and a figure of 1: 4 has been proposed (Yehuda and Carrosa, 1993). The ratio of the two groups of PUFAs in the diet has, however, increased significantly from 1:2 at the beginning of the 1900s to around 1:10 at present (Tiemeier et al., 2003), and recent changes to the Western diet have resulted in many people being deficient in n-3 PUFAs.

Omega-3 fatty acids have also been implicated in development and health. There are two families of polyunsaturated fatty acids (PUFA), omega-3 (n-3) and omega-6 (n-6). Both families are considered essential fatty acids (EFAs) as they cannot be synthesized by the body and need to be obtained from dietary sources. Omega-6 fatty acids are found mainly in animal and vegetable oil; omega-3 FAs can be found in plant species such as flax, walnuts, leafy green vegetables, sunflower seeds and oily marine species including salmon, trout and herring. Vegetables largely provide the n-3 FA precursor alpha-linolenic acid, whilst marine species provide long-chain polyunsaturated fatty acids (LC-PUFAs) such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). DHA has been implicated in the development and functioning of the nervous

system and is the predominant fatty acid in the brain and retina (Singh, 2005). The need for LC-PUFAs is greater during development and their bio-availability is greater during early development (Bezard et al., 1994). Review papers have implicated omega-3 fatty acids in all-cause mortality, cardiovascular diseases, stroke, type 2 diabetes, obesity and cancers (Delgado-Lista et al., 2012; Wang et al., 2006; Mente et al., 2009; Nettleton at Katz, 2005; Donaldson, 2004). Reviews have also suggested a role for DHA and EPA in affective, psychological and degenerative disorders, including depressive disorders, suicidality, dementia, Alzheimer's disease and Parkinson's disease (Long, 2011; Appleton et al., 2010; Su et al. 2008; Stoll et al., 1999; Huan et al., 2004; Barberger-Gateau et al., 2002; Morris et al., 2003). LC-PUFAs have also been implicated in aggression, impulsivity and self-harm (Hamazaki et al., 1998; Benton, 2007; Hallahan et al., 2007). Given the evidence concerning vitamins, minerals and omega-3, section one of this thesis examined factors that affect food choice (including the consumption of fruits, vegetables, fish and seafood) and supplement use; section two examined the effect of vitamins, minerals and omega-3 fatty acids on mood, behaviour and cognitive performance.

A point to note before embarking on the thesis is related to the number of studies and the samples. To summarize, the first study was qualitative in nature and formed section one of this thesis (chapters one and two). For this study a mixed sample of males and females were recruited (n=15; i.e. data for chapters one and two were collected using the same sample using the same interview/focus group schedule). Chapters' three to five described an intervention study that examined the effects of vitamins, minerals and/or omega-3 on behaviour and cognition. Although an objective was to explore the effects of vitamins, minerals and/or omega-3 on several facets of mood, behaviour and cognition, during the initial design of the intervention study the predominant aim was to examine the effects of vitamins, minerals and/or omega-3 fatty acids on aggression and impulsivity. Given the higher prevalence of aggression and impulsivity among males it was decided that males would be recruited for the intervention study. Whilst reviewing the literature on vitamins, minerals and omega-3 on mood and behaviour, it became apparent that not only had these nutrients been implicated in aggression and impulsivity but also implicated in other psychological constructs, and therefore chapters three to five provide details on one intervention study that explored different areas of psychology. Data for the intervention study were

collected simultaneously (using a 2 hour test battery), however, the intervention study is presented in three separate chapters owing to the complexity of the data. For the final chapter (six) a meta-analysis was conducted using findings from previous literature and from the intervention study in the present thesis.

1) Section 1 – Factors involved in food choice, healthy eating, and supplement use

This section contains two chapters. In the first chapter we investigated, using qualitative methods, factors that influence food choice and the consumption of healthy foods containing vitamins, minerals and omega-3, such as fruits, vegetables, fish and fish products. We were particularly interested in factors that may promote or impede the consumption of a healthy diet, which could inform and guide public health policy. Given that some people may not gain adequate nutrition from the diet, an alternative method of incorporating vitamins, minerals and omega-3 in the diet would be through nutritional supplements. The second chapter investigated factors that may promote or impede the consumption of supplements containing vitamins, minerals and omega-3. An understanding of the factors that affect the consumption of a healthy diet, micronutrient and omega-3 supplements may aid public health policy and help highlight factors that can be targeted to enhance nutrient intake.

1.1. Chapter 1: Factors involved in food choice and healthy eating

1.1.1 Abstract

Background: Although conceptual models of the food choice process exist, there is currently no practical and targetable framework that can be used to direct public health policy during attempts to alter dietary habits. Instances where dietary habits may need to be altered include improving nutrient intake to prevent or reduce diseases, or reducing food consumption to prevent or reduce obesity.

Objectives: The present study aimed to firstly gain an in-depth understanding of factors that influence food choice, in particular factors that influence the consumption of healthful foods including fruit, vegetables, fish and seafood. The second aim was to gain an in-depth understanding of the factors that influence supplement use, in particular vitamins, minerals, and fish oil supplements. Since the findings are beyond the scope of one chapter they will be presented separately. The first chapter details factors that influence food choice.

Design: Data for this study were obtained using 7 semi-structured interviews and 2 focus groups.

Participants: A total of 15 Swansea University undergraduates participated; there were nine females and six males (aged 18-23). There were two focus groups; one of females and one of males, each consisting of four participants. Individual interviews were conducted with the remaining seven participants. The focus groups were recruited opportunistically; the remaining participants were recruited using the online Experiment Management System (EMS) of Swansea University and were granted credits for participation.

Analysis: Interviews and focus groups were recorded and transcribed. Transcriptions were subjected to Interpretive Phenomenological Analysis (IPA) by the primary researcher prior to independent analysis by another individual. After analyses the primary and independent researcher mutually agreed on a list of themes and super-ordinate themes.

Results: There were a total of 18 factors that influence food choice and healthy eating. These factors clustered together to produce 4 super-ordinate factors, namely

'Physiological influences'; 'Cognitive influences'; 'Socio-cultural influences'; and 'Lifestyle influences'.

Conclusions and implications: Each of 18 factors was actively involved in food choice. Health promotion activities should assess the extent to which every factor affects an individual/population when designing interventions aimed at improving dietary habits. Different factors will have differential effects depending upon the target population. As the present findings cannot be generalised beyond this student population, the applicability of this model to other populations requires further research.

1.1.2 Introduction

The importance of diet in physical and psychological health

Given that diet and nutrition play a significant role in health and disease, research into influences on healthy eating are important for informing and guiding nutrition policy. There is widespread interest surrounding what constitutes a healthy diet and the factors that promote or impede the consumption of a healthy diet (NHS Cancer Plan, 2000; Community Nutrition Education Co-operative, 1994). Dietary factors can mediate the risk and development of several major diseases including cancers, cardiovascular diseases, hypertension and late-onset diabetes (The Eurodiet Project, 2001; World Health Organisation 2003; Mokdad et al., 2004; Nicklas et al., 2003; Steffen et al., 2005). Public health campaigns advocate the consumption of fruits and vegetables since they have been shown to reduce the risk of cancers and cardiovascular diseases (Lambert, 2001), and increased consumption of fruits and vegetables has been suggested to be the most effective dietary method of cancer prevention (Dibsdall et al., 2002). In addition, obesity is one of the most challenging health and financial issues faced by public health organisations (Goel, 2006; Rashad & Grossman, 2004). Despite multi-factorial influences on obesity (for example genetics and physical activity), food consumption is a major predictor (Goel, 2006). Given this evidence, the study of factors that influence food choice and healthy eating is critical and does not only have implications for individual health and well-being but also for society in terms of costly and time consuming interventions.

With regard to psychological health, the role of essential fatty acids (EFA's), vitamins and minerals is less established, however, it has been suggested that these nutrients play a role in the healthy development and function of the brain. For example the omega-3 fatty acid docosahexaenoic acid (DHA) is the predominant fatty acid in the brain and retina (Tacconi, Calzi and Salmona, 1997; Singh, 2005), thus it has been suggested that DHA plays a critical role in the development and function of the brain and visual system. DHA has also been associated with cognitive functioning – low levels have been linked to neurodegenerative disorders such as dementia (Morris et al., 2003; Barberger-Gateau et al., 2002; Plourde, 2011). Fatty acids, including DHA and eicosapentaenoic acid (EPA) may be involved in mood and clinical affective disorders such as major depressive disorder (MDD), bipolar disorder (BD); post-partum

depression and suicidality (PPD; see Long, 2011 for a review; Appleton et al., 2010; Su et al. 2008; Stoll et al., 1999a; Huan and Hamazaki , 2010), as well as mood disturbances such as aggression, impulsivity, and self-harm (Hamazaki et al., 1998; Benton, 2007; Hallahan et al., 2007). Fish consumption is low in large sections of the population and low levels of fatty acids in the diet have become a cause for concern since they are essential and can only be obtained from dietary sources. The relative consumption n-3 and n-6 fatty acids raises concern as this ratio has increased from 2:1 at the beginning of the 20th century to around 1:10 at present, reflecting both an increase in total fat intake and a fall in the consumption of omega-3 PUFAs (Tiemeier et al., 1993).

A combination of fatty acids, vitamins and minerals has been found to reduce anti-social and aggressive behaviour in institutionalised males (Gesch et al., 2002; Zaalberg et al., 2010). A double-blind randomized controlled trial (RCT) by Schoenthaler (1997) found that vitamins and minerals significantly reduced delinquent behaviour in a population of juvenile offenders. A meta-analysis (Chapter 4) found that vitamin and mineral supplementation can reduce mild psychiatric symptoms, sub-clinical anxiety, stress, depressed mood, fatigue, and can enhance clearheadedness, however, there was no effect on sub-clinical depressed mood, anxious mood and confidence. In summary, omega-3 fatty acids have been implicated in aggression, anti-social behaviour, impulsivity and self-harm. Although omega-3 fatty acids may be beneficial for clinical affective disorders such as MDD and BD, their role in sub-clinical or non-clinical depressed mood is less well-established and it has been suggested that there is no effect of omega-3 on depressed mood (Long, 2011). Vitamin and mineral supplementation may reduce mild psychiatric symptoms, sub-clinical anxiety, stress, depressed mood, fatigue, and can enhance clearheadedness (as highlighted in the abtract). This evidence highlights the importance of dietary fatty acids and vitamins and minerals for healthy brain development and function.

Eating behaviour of university students

In addition to the prevention of major diseases, current dietary guidelines stress the importance of eating a diet that is low in saturated fat, salt and sugar, and high in fruits, vegetables, fish and whole grains (The Eurodiet Project, 2001; NHS Guidelines, 2012) since these dietary products contain the vitamins, minerals and essential fatty acids that

play a critical role in development as well as functioning (The Eurodiet Project, 2001). Eating patterns that are acquired during the developmental period, including adolescence and young adulthood, may have a long-term effect on health due to rapid growth and development. Unhealthy dietary habits during adolescence and early adulthood have been associated with diseases in later life such as coronary heart disease and osteoporosis (U.S. Department of Health and Human Services, 1988). There are several problems associated with the consumption of foods containing vitamins, minerals and omega-3 fatty acids in young age groups: although youths, young adults and higher education (HE) students are still in the developmental stages, the European Health and Behaviour Survey (1999) revealed that these age groups are particularly vulnerable to vitamin, mineral and EFA inadequacies and are considered high-risk groups for nutrient deficiencies since they often engage in poor lifestyle behaviours (Steptoe and Wardle, 2001; Steptoe et al., 2002; Share and Stewart-Knox, 2012; Shepherd and Dennison, 1996; Rugg-Gunn et al., 2007), including smoking, a lack of exercise and poor dietary behaviour. An early review of British and non-British data suggested that these populations have an increased intake of fast foods and foods that are high in fat and sugars with a comparable low intake of fruit and vegetables (Bull, 1992). In a cross-sectional survey study involving students (n=410) it was found that 66% of HE students did not consume the recommended 5-a-day of fruits and vegetables, which combined with other health-risk behaviours was associated with greater perceived psychological stress (Dodd et al.,2010). In support of this finding a large cross-sectional survey study in adolescents and school children (n=4320) suggested greater perceived psychological stress was associated with lower fruit and vegetable intake, more snacking, higher consumption of fatty foods and a reduced likelihood of breakfast (Cartwright et al., 2003). This association was independent of individual (gender, weight) and social (SES, ethnicity) factors. A questionnaire-based survey in adolescents aged 12-16 (n=84) revealed that the consumption of foods away from the home was linked to increased fat and total energy intake and reduced nutrient intake (Hejazi and Mazloom, 2009). An early and robust cross-sectional study (n=2376) revealed that adolescence and young adulthood was coupled with increased self-reliance, and behaviours acquired at this time are likely to be long-term. Ideally interventions to change lifestyle behaviours should occur before aged 18 whereby there is high consolidation of physical activity, food preference and smoking habits (Kelder et al., 1994), however, irrespective of exact age behaviour

change is more likely if it is targeted early on. There is a need to address the dietary habits of students since health-related behaviours acquired during this period are long-lasting and will have implications for health in later life. Evidence suggests that this is a neglected area (Dodd, 2010); providing a rationale for the present investigation of students' dietary habits.

Previous qualitative literature investigating food choice

Turning to previous qualitative research that have examined dietary habits in youths, a qualitative study by Harrison and Jackson (2009) used a constructivist approach to explore firstly the meaning that youths (n=13; aged 13-15) assigned to foods, and secondly barriers to the consumption of healthy foods. It was found that foods were categorized into healthy, unhealthy and an 'in-between' groups. Foods were linked to a variety of physical, social, and emotional meanings and it was suggested that foods hold multiple meanings for youths. Programs and policies aimed at increasing healthy eating ought to focus on positive associations related to healthy foods in combination with associations related to unhealthy foods(which should be acknowledged and self-strategies developed to recast associations).

A qualitative study by Chambers et al. (2008) used six focus groups (n = 43) to examine the effects of age and gender on food choice. Using thematic content analysis, it was found that most participants were aware of foods that contributed to a healthy diet and the importance of consuming a healthy diet. However, it was suggested that healthy eating messages were often contradictory and there was no credible overt source of information. There were a several differences among factors affecting food choice that depended on age and gender. Older participants (60+ years old) were more likely to make food choices based on health considerations whereas participants between the ages of 18–30 were less concerned with this link, and instead focused on issues of food preparation and knowledge, prices and time. Younger female participants said they had more energy when they ate healthier diets; however, very often their food choices related to concern with their appearance.

A recent qualitative study by Goh et al. (2009) involving 14 adolescent focus groups (n = 119), 8 parent focus groups (n = 63), and 28 interviews with community members (i.e., local experts knowledgeable about youth nutrition) explored adolescent, parent, and community perspectives on barriers to healthy eating. It was found that

participants described several barriers to healthy eating including neighbourhoods (e.g., lack of accessible nutritious food), schools (e.g., a lack of nutritious foods) and at the individual level (e.g., lack of nutrition knowledge).

Qualitative work using constant comparative analysis revealed a conceptual framework that characterized eating and drinking episodes as holistic and as having eight interconnected dimensions (food and drink, time, location, activities, social setting, mental processes, physical condition, recurrence (Bisogni et al., 2007). Thus the food choice process is multi-faceted and complex, resulting in an extensive variety of food choice behaviours, including several stages of food handling: acquiring food (personal growth and production, markets, institutions, or interpersonal exchanges; Yoo et al., 2006); preparing food (transforming raw materials by changing the form, temperature, and wetness/dryness of foods, Rozin, 1983); serving food (including choices of how and to whom to serve the food); eating; giving away food. Each of these stages involves storage, where foods, ingredients and apparatus are saved and protected between each stage (Sobal et al., 1998). In addition, cleaning up follows food preparation and involves additional food choices such as what to do with leftover food (Munro, 1995). This evidence illustrates how food behaviour is a multifaceted, situational process that involves multiple, interrelated decisions. That the food choice process is a frequent and continual aspect of everyday life illustrates its salience and the importance of understanding factors involved in a food choice.

Early research into factors that influenced food choice found that taste, health, socio-economic status (SES) and price are involved (Lewin, 1943; 1951). Subsequent research suggested the involvement of cognitive and motivational factors (Lau et al., 1984; Michela and Contento, 1986; Rappoport et al., 1993). More recently a review of qualitative research (Bisogni et al., 2012) coded, discussed, recoded, and analyzed papers reporting qualitative research studies related to participants' interpretations of healthy eating and found that studies emphasized a social constructionist approach, mostly using focus groups and/or individual, in-depth interviews for data collection. Healthy eating was explained in terms of food, food components, food production methods, physical outcomes, psychosocial outcomes, standards, personal goals, and as requiring restriction. Meanings ascribed to food choice were specific to life stages and life experiences (e.g. parenting, illness). Identity (self-concept), social settings,

resources, food availability, and conflicting considerations were barriers to a perceived healthy diet. Healthy eating was interpreted in complex and diverse ways that reflected personal, social and cultural experiences and environments.

Furst et al. (1996) provided a model of food choice that suggested that an individual's life course generates 5 major 'influences' on food choice (ideals, personal factors, resources, social contexts and the food context; see *Figure 1.1.1.*). 'Influences' inform the development of 'personal systems' (conscious 'value negotiations' and unconsciously operationalized 'strategies') that are used for making food choices. Value negotiations involved the evaluation of 6 factors (see *Figure 1.1.1.*). Strategies were developed over time and were used to simplify food choice. The relationship between these factors shows the process or pathway (illustrated by arrows) leading to the point of choice. The model's funnel shape demonstrates that a single food choice is caused by the mixing and separating of a wide variety of personal and environmental factors.

Furst et al., (1996, page 250) suggested that:

"The life course includes the personal roles and the social, cultural and physical environments to which a person has been and is exposed. A person's life course generates a set of influences: ideals, personal factors, resources, social framework and food context. These influences inform and shape people's personal systems, including conscious value negotiations and unconsciously operationalized strategies that may occur in a food-related choice situation."

Furst et al. (1996) aimed to gain an understanding of the complexity of the food choice process, providing an illustration of food choice within a working model (*Figure 1.1.1.*). They used constructionist perspectives to inductively explain how adults made food choices using in-depth qualitative interviews. During subsequent qualitative research their model was verified (Falk et al., 1996) and elaborated using additional components (Bisogni et al., 2007; Devine et al., 1998; Connors et al., 2001).

In support of Furst et al.'s model, it was developed using the perspectives of the public, which provided a broader (and more holistic) perspective than previous research that has investigated food choice. Furst et al. were the first to provide a theoretical framework for research and practice, using conceptual knowledge of the food choice

process to provide new insights into food choice from the point of view of the individuals making the food choices (Patton, 1990; Guba & Lincoln, 1989; Miles & Huberman, 1994). Furst et al. (1996) produced a list of important factors, however, although this provided a valuable contribution to the literature, there was no indication of the factors that were more or less important in the food choice process. In addition, the model provided by Furst et al. (1996) did not take account of individual differences in food choice. Different individuals/populations will have varying issues, and therefore factors that affect food choice will vary depending upon the time, the individual and the population. After Furst et al. there remained a gap in the literature such that a practical framework that takes account of individual/population differences was required.

An additional and more recent model by Sobal and Bisogni (2009; *Figure 1.1.2*) modified and updated previous work by Furst et al. (1996). Similar to Furst et al. (1996), Sobal and Bisogni suggested that life course, influences, and personal food systems are most of the major factors that people described as important in their food choice decisions, however, these factors were not an exhaustive list of everything involved in food decisions for everyone. Although influences and personal systems remains almost identical to the initial model, the authors elaborated on the life course to include exposure to events and experiences prior to present food choice decisions, as well as anticipations and expectations about future possibilities (Elder, 1985). Sobal and Bisogni suggested that the life course was not just the life cycle (such as growth, maturation, and aging) or progression through the life stages (childhood, adolescence, and adulthood), but also involved several dynamic processes that transcended cycles or stages, which included: trajectories, transitions/turning points, timing, and contexts (Sobal and Bisogni, 2009). "Food choice trajectories involve a person's persistent thoughts, feelings, strategies, and actions as she/he approached food choice" (Devine et al., 1998, pg 363). Transitions and turning points were defined as changes in the life course that resulted in shifts in food choice trajectories (Wethington, 2005). Food choice trajectories are changeable since they are modified due to individuals' events and experiences. Timing of events refers to the timing at which particular transitions or turning points happen (Elder, 1985; Wethington, 2005). Contexts referred to the environments in which lives are lived (Sobal et al.. 2006). Macro-level contexts include social, cultural, political, economic, and other conditions that affected

constancy and changes in food choice trajectories of individuals. Micro-level contexts include families, friends, schools, workplaces, communities, and other social and physical structures that shape food choice trajectories. Hence, each food choice is embedded within personal and historical time. Food choice scripts involve procedural knowledge held for food choices within a specific situation that is familiar to the individual. Scripts include expectations of, plans for acting in, and specific sequences of behaviour in a given situation (Blake et al., 2008). Scripts and strategies that are efficient become routines for food choice they provide predictability and comfort. In support of Sobal and Bisogni (2009), they acknowledged that food choice decisions are changeable, altering over historical time and individual time. The food choices of earlier generations were different to those faced today and will differ in new ways in the future (Belasco, 2006). Food historians have suggested that food systems have changed decisions and options over time (Grew, 1999). In addition people engage indifferent food choices as they undergo personal development and pass through situations and settings in the life course (Devine et al., 1998; Devine, 2005). The dynamism of food choice also occurs on a shorter temporal scale, with food choice decisions varying across the cycles of days, weeks, seasons and years.

Although the model by Sobal and Bisogni (2009) provided a more detailed model than Furst et al. (1996), there is still ambiguity: the model is complex and does not provide health promoters with a clear framework of specific and individualized factors that can be targeted during dietary interventions. Furst et al. and Sobal and Bisogni developed a model that broadly considered the range of factors involved in the food choice process, but besides complexity and ambiguity, their model had several other limitations (Sobal et al., 2006) . The breadth sought in the model does not focus on any particular influence or process. In addition the model was developed to explore food choices of individuals, and therefore may not apply very well to the inter-mixed decisions of families (Stratton and Bromley, 1999), social groups or cultures. The model was derived using US participants in the late twentieth century and may not be applicable to other cultures, places, and historical eras; in addition the generalisaability of the model has not been tested empirically, and the authors provide no direction or grounds on which to further test the model in different populations. The model is grounded in a constructionist approach and may not fully represent biological,

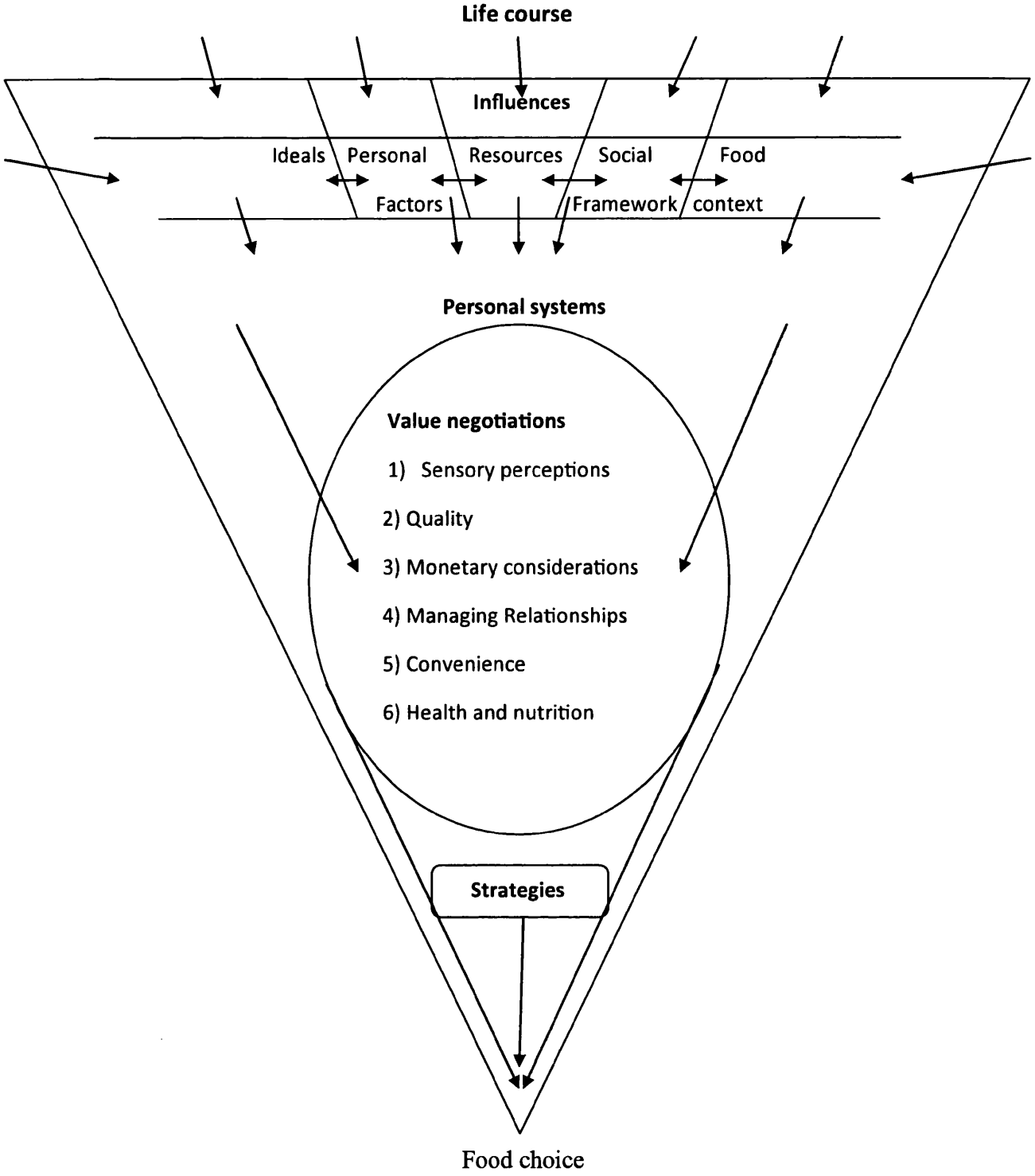


Figure 1.1.1. Conceptual model of the food choice process – Adapted from Furst et al. (1996; value negotiations are all interlinked and influence each other)

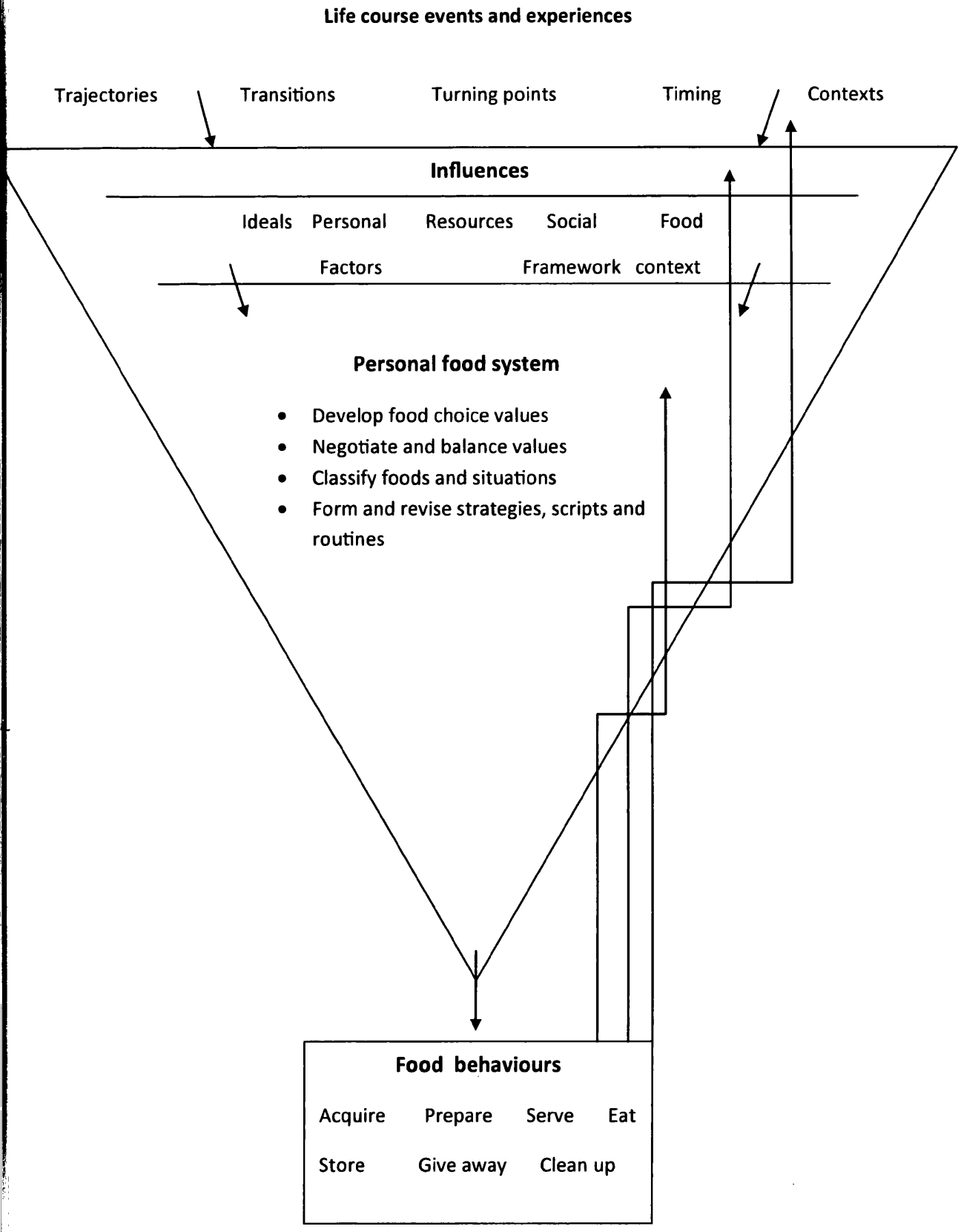


Figure 1.1.2. Conceptual model of the food choice process – Adapted from Sobal and Bisogni (2009)

behavioural, cultural, or social structural perspectives. Although Sobal and Bisogni (2009) acknowledge that food choice varies depending on individual and historical age, they do not state which events, experiences, influences and behaviours are more orless likely to influence food choice. The present attempted to provide a framework that can be applied to different populations to examine variations within and between populations.

Aims of the present study

The present study aimed to gain an in-depth account of beliefs, perceptions and experiences of food choice and supplement use (discussed in chapter two). Although a valuable contribution to the literature, the models by Furst et al. (1996) and Sobal and Bisogni (2009) are complex, general, and presented in such a way that there is ambiguity surrounding the food choice process. The present study aimed to simplify the food choice process by producing a distinct set of individual themes that are involved in food choice (and healthy eating). In turn this provided a practical and targetable framework to aid directors of public health during health promotion activities. This list of themes includes barriers and promoters of healthy eating as well as general factors affecting food choice. The themes are presented in a simple form so that health promoters can isolate and target specific factors for investigation.

1.1.3. Methods

Selection of qualitative method

Realism and idealism are two distinct categories of research that stem from debates about the fundamental origins of knowledge. Realist and idealist perspectives differ fundamentally not only in the belief about the origins of knowledge (epistemology) and being (ontology), but also in the kind of research methodology they adopt. Realists support quantitative and positivist methodology, believing in a separate reality that can be accurately measured and observed (Elliott et al., 1999; Giles, 2002). In contrast, idealists support qualitative methodology and believe in a subjective reality that is dependent upon an individual's life experience; including historical, social and cultural influences (Guba and Lincoln, 1989; Gergen, 1985; Blumer, 1969). Idealists maintain that reality is subjective, i.e. knowledge comes from subjective sense-making and perception. There are differences in the extremity of these distinct models, for example there is 'fundamental idealism', that disregards a separate reality altogether (Williams and May, 1996), or 'subtle realism' which recognises 1) a separate independent reality and 2) subjective differences in reality that are equally valid (Hammersley, 1992). This view is consistent with Heidegger's interpretative phenomenology. A Heideggeran perspective (Heidegger, 1985; Heidegger, 1998; Heidegger, 1962) suggests the existence of an independent reality (realism), however, owing to the social nature of humans, the meaning and nature of reality is shaped by social encounters. An exact and definite view of reality cannot be obtained given the influences of language, culture, expectations and assumptions (Larkin et al., 2006).

In order to explore the processes, views and experiences that influence food choice and supplement use, which require the investigation of the meaning and understanding of these phenomena, we could not a adopt positivist methodology. Therefore the qualitative approach was viewed as more appropriate. In contrast to finding significance in numbers as exists with positivist methodology, in qualitative research significance is sought in the richness of the accounts of participants through the common themes that emerge from the analyses. Qualitative research is more suitable for gaining a deeper understanding of a phenomenon from the perspective of the participant as opposed to gaining facts (quantitative), and can be used to examine unexplored areas, whereas quantitative methodologies can be used to verify and

support the findings of qualitative research. While quantitative methods may provide statistical information, studying at the individual level yields detailed causal accounts that can provide a more accurate reflection of the persons' attitudes, experiences and behaviour. Causal accounts of attitudes, experiences and behaviour are difficult to obtain through quantitative methodology. Furthermore, it been suggested that qualitative methods are more suitable for examining and understanding personal and social phenomena including eating behaviour and food choice (Dibsdall, Lambert and Frewer, 2002). The nature of qualitative research enables researchers to elaborate on processes occurring within more general psychological constructs, including healthful eating (Dibsdall et al, 2002).

Although there are different types of qualitative methodologies, for example Grounded Theory (GT), Discourse Analysis (DA), and Interpretative Phenomenological Analysis (IPA) each can be used to develop and revise understanding as opposed to verifying previous theories and imposing a priori conclusions (Elliot et al., 1999). We wanted to gain an understanding of the real meaning of factors that influence food choice and supplement use (i.e. a realist perspective). However, influences on food choice and supplement use may be subjective, i.e. there may be more than one interpretation of these factors. Therefore the research questions demanded a combination of realist and idealist perspectives, thus 'interpretative phenomenological analysis' (IPA) was viewed as the most appropriate method of analysis as it is suitable for researching a combination of realist and idealist phenomena (Smith, 1996). The idiographic and qualitative stance of IPA is concerned with the meaning that a phenomenon represents to an individual, and it has been suggested that idiographic methodology is a valid approach in psychology that can be used to establish universal laws (Harre, 1997). "The aim of IPA is to explore the participants' view of the world and to adopt, as far as possible, an 'insider perspective' of the phenomenon under study" (Smith, 1994; page 264). IPA was judged as most suitable for examining the beliefs, views and processes behind food choice and supplement use: in support, the IPA method has been used previously in health-related studies (see Smith, Jarman and Osbourn, 2000).

As a precautionary measure and for the purposes of data triangulation, data collection involved focus groups and individual interviews. There are certain benefits and limitations associated with focus groups and interviews, for example, focus groups can be used to examine social interaction, discussion and debate and to examine consensus

or lack of agreement among a group. Focus groups have been used successfully during previous studies that have explored factors associated with eating behaviour, for example, in previous studies of healthy eating results from focus groups were supportive of quantitative data from other studies (Brug, Debie, Assema and Weijts; 1995). A limitation is that group dynamics may negatively influence the focus group discussion, for example, individuals may be unwilling to discuss certain topics in the presence of others. Therefore individual interviews were also conducted, which provide a more intimate environment and allow individuals to discuss topics that they may not discuss in a group situation. For investigator triangulation the data were examined separately by a second party with MSc accreditations in qualitative methods. Subsequently both sets of analyses were examined for similarities and discrepancies and both parties collaborated to produce a common set of themes.

Participant recruitment

The study involved the recruitment of students from Swansea University. There were 15 participants in total, mean age 20.6 years. There were a total of eight undergraduate and postgraduate students recruited opportunistically for the focus groups; a male group consisting of four subjects and a female group of four subjects. The rationale behind segregating focus groups by gender was that it has been suggested that there are gender differences in food choice in general (for example, Chambers et al., 2008; Ares and Gambaro, 2007; Westenhoefer, 2005; Conner, 1994; Wardle et al., 2004) and in students (Boek et al., 2012). There may be responses in males or females that may not be discussed in the presence of the opposite sex, for example dietary restraint or dietary choices relating to appearance. Of the remaining 7 participants that were interviewed individually, 5 were female and 2 were male. Recruitment for the interviews involved criterion sampling methods - the study advertisement was purposefully vague, requesting individuals to participate in a study on factors that influence food choice and supplement use. Although no particular criteria were set regarding factors affecting food choice, the advertisement indicated a preference for individuals that had previously used supplements, however, this was said to be desirable and not exclusive. This form of semi-purposeful sampling allowed for recruitment of users and non-users of supplements (40% users, 60% non-users). The aim was to gain an understanding of the circumstances that encourage or discourage supplement use. The study was advertised on the Experiment Management System

(EMS) of Swansea University and the interview group was granted subject pool credits for participation in the study. Participants were informed that the study would involve participation in an interview with questions concerning factors affecting food choice in particular the consumption of healthy foods and factors associated with supplement use. Ethical approval was obtained from Swansea University Psychology Ethics Committee. Informed consent was obtained in writing (appendix 1) and informed participants that a mini portable Dictaphone with a built in microphone would be used to record the data. Participants were provided with an information sheet before beginning the study (appendix 1) and were debriefed when the interview or focus group ended (appendix 1).

Conducting interviews and focus groups

Data from the focus groups were collected in one of the teaching rooms in the department of psychology, Vivian Tower at Swansea University at the end of April 2010 and from interviews throughout April-May 2010. Interviews and focus groups were relaxed and informal to encourage discussion. An interview schedule was used to guide interviews and discussions (Appendix 2). Before going on to describe its content it is important to consider some key points. The schedule outlined areas of interest and served to facilitate and guide the course of the interview as opposed to dictating its proceedings. Smith and Osborn (2003, pg 62) pointed out that the aim of a schedule is to provide "a general area of interest and provide cues when the participant has difficulties, (and) the respondent should be allowed a strong role in determining how the interview proceeds." In line with the Smith and Osborn (2003) the schedule was not prescriptive but provided a general guide. If a participant raised something of interest and relevance that was not on the schedule, this was probed further. In contrast if participants did not respond openly, the schedule was used as a probe.

The same interview schedule was used for focus groups and interviews and covered two topics. Firstly there were questions surrounding factors affecting food choice. Initial questions were very open - 'what do you like to eat?' 'Why?' As the interview or focus group proceeded, the participants were asked about more particular matters such as fruit, vegetables, fish and seafood consumption. If the participant failed to mention these foods independently then prompts/probes were used to stimulate discussion, including questions such as 'how often do you consume fruit and

vegetables?' 'What are your reasons behind choosing to consume/not consume fruit and vegetables?' 'How often do you consume fish/seafood?' 'What are your reasons behind choosing to consume/not consume fish/seafood?' Such prompts were used in the absence of detail to try and encourage discussion surrounding the topic area. This 'funnel' methodology is in line with Smith and Osborn (2003). The second area of the interview schedule asked questions surrounding beliefs, perceptions and views surrounding dietary supplements, in particular vitamin, mineral and fish oil supplements, for example, 'What do you know about supplements?' 'Do you currently take any supplements?' 'Why?' Not only were questions asked about beliefs and perceptions surrounding supplements, but questions were also raised about the use of supplements and the circumstances under which the participant would or would not consider use, for example, 'would you ever consider taking supplements?' 'Why?' In instances where there was ambiguity or a lack of disucssion, this was not merely interpreted as a lack of knowledge about supplements, since ambiguity could indicate a misunderstanding. Therefore prompts were used, such as 'what are your views on fish oil supplements, such as cod liver oil, omega-3 and so on?' 'What are your views on vitamin and mineral supplements?' 'Would you ever consider taking any of these?' 'Do you think there in enough information to make an informed decision about which supplements may be beneficial?'

Analysis of data

Analysis of the data was performed manually (as opposed to using software) using the procedure set out by Smith and Osborn (2003). Recordings from interviews and focus groups were transcribed verbatim (transcripts for interviews and focus groups can be found in appendix E). Transcripts were subjected to the IPA methodology set out by Smith and Osborn (2003). It is possible to either analyse each case separately for themes without referring back to other analyses or to use previous cases in the analysis of subsequent cases. During the present study earlier transcripts informed subsequent analyses as this established similarities and amplifications across cases. However, we remained open and respected differences and contradictions between accounts. In line with the methodology set out by Smith and Osborn (2003), each stage of IPA, except when themes were finally confirmed, was completed separately by the principal investigator and an additional researcher in order to avoid cross-influence.

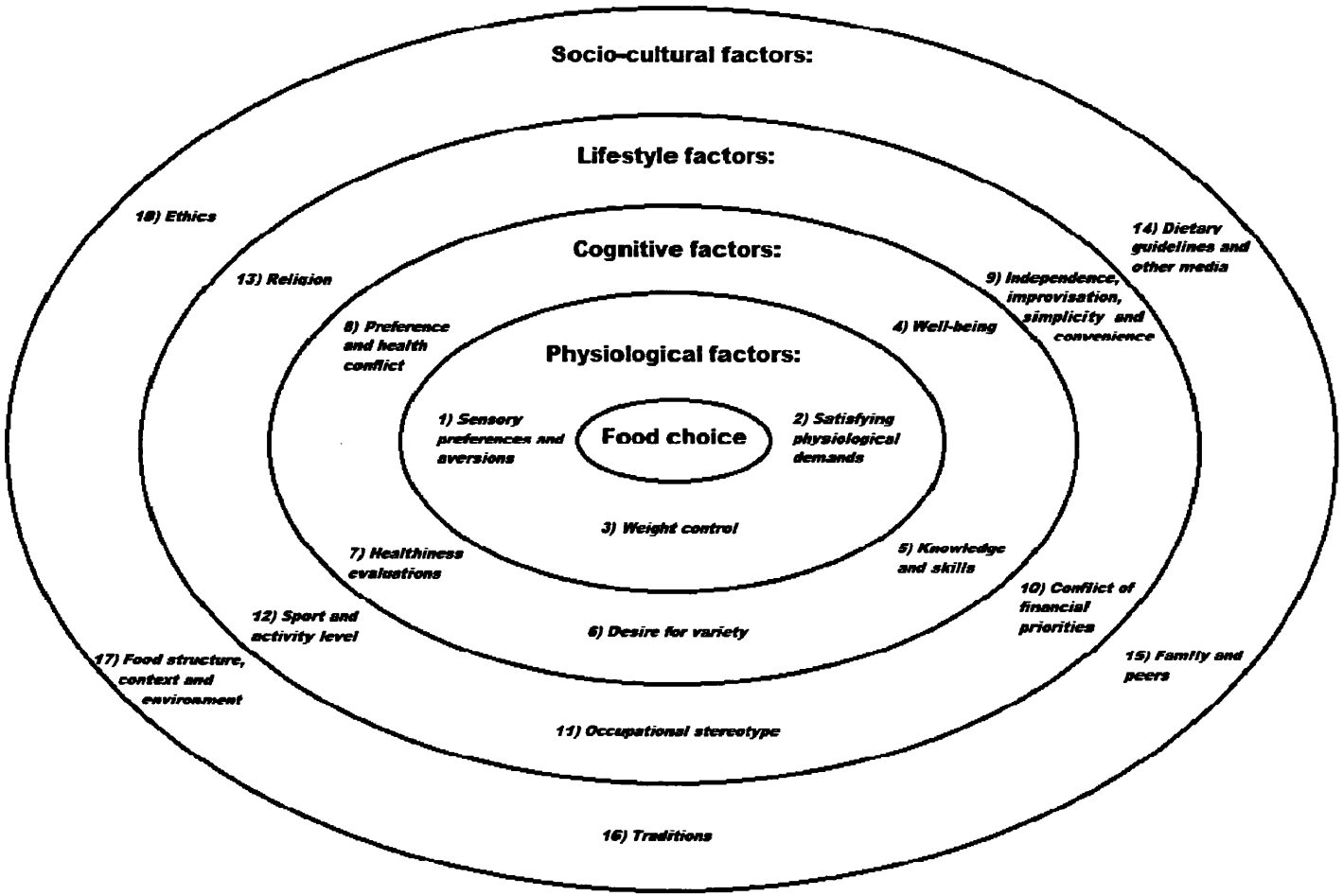
The exact steps of coding and analysis were as follows. The first stage of analysis involved transcription of 3.5 hours of audiotapes from interviews and focus groups, producing a total of 91 pages of transcripts. Two copies of the transcripts were produced to be analysed by the primary and secondary researchers. The second stage of analysis involved full analysis of each transcript before moving onto the next. Transcripts were analysed by highlighting potentially significant and issues. Potential themes were highlighted via inscription of the notes, such as individual words or short phrases, in the left hand margin. This was repeated several times with each transcript to ensure a thorough and rigorous analysis. For the third stage the researchers went back through the transcript and in the right hand margin initial notes were transformed to succinct expressions summarising the findings from the transcript. These 'emergent themes' required a more advanced degree of abstraction and phrases were selected that were abstract enough to allow theoretical relations within and across the data, however, the phrases were made clear enough to be traced back to the verbatim material. Fourthly, lists of emergent themes were produced and analysts looked for potential relationships between themes. This process is known as clustering and resulted in clusters of themes. Analysis of the first interview transcript (interviewee 1) revealed a total of three clusters. During the fifth stage each cluster of emergent themes was given a 'super-ordinate theme' title. A table of themes was created, containing three super-ordinate theme titles, emergent theme names and supporting verbatim extracts with page and line numbers. After this, subsequent cases were analysed. Interviewee 3 revealed a new cluster of themes and in the light of this, previous transcripts were reviewed. The fifth stage involved the reviewing and redrafting of tables by examining the analysis of individual cases and all cases in totality. This involved merging, reducing and deleting themes that did not have sufficient evidence or did not fit with the emergent structure. At the final stage the researchers discussed emergent and super-ordinate themes and the relationships and disparities between analyses. If relationships and differences existed they were discussed further until both researchers agreed upon an appropriate course of action, for example a change of theme title, omission or inclusion of a theme in the final write-up. After the discussion the final tables of themes and super-ordinate themes that had been produced were revised for each interview and focus group. These tables can be found throughout this chapter and contain four super-ordinate themes, lists of emergent themes and verbatim quotations, page lines and numbers.

1.1.4. Results and discussion:

In line with previous research, the present study found that food choice and healthy eating were affected by numerous personal and environmental factors (e.g. Furst et al., 1996; Sobal and Bisogni, 2009; Bisogni et al., 2012). Four super-ordinate factors emerged: 'physiological factors'; 'cognitive factors'; 'lifestyle factors' and 'socio-cultural factors' (See *Figure 1.1.3.*). Whereas 'physiological' and 'cognitive' factors were regarded as internal factors, 'socio-cultural' and 'lifestyle' factors were regarded as external factors. Internal factors affecting food choice tended to be relatively short-lasting and changeable, whereas external factors tended to be long-lasting and enduring. It is important not to oversimplify the distinction between internal and external factors since there was some overlap, for example lifestyle is at least in part a choice determined by individual cognitive patterns. Social factors such as upbringing and family may also influence lifestyle and physiology may determine the amount of food a person consumes and may therefore influence lifestyle. Thus external and internal influences on food choice were linked. Although there was complexity and inter-relations between food choice factors they were grouped into four super-ordinate factors based on their most dominant characteristics. Importantly, although the findings of the present study differed in some ways to a previous model of food choice (Furst et al., 1996), a similarity was that small-order factors (i.e. individual themes as opposed to super-ordinate factors) may not affect different people in the same way – certain factors may have a larger influence in specific populations.

Four sub-sections of results are presented that provide descriptive accounts of higher order super-ordinate factors and the small-order emergent themes. Each subsection is followed by a discussion of how each theme relates to the extant literature. Effectively, 1) food choice; and 2) the decision to eat healthy foods such as fruit, vegetables, fish and fish products are affected by a number of related internal and external factors, however, there are some factors that have more significance in than others. The results and discussions are presented in order of the strength of influence on food choice, determined by the frequency and depth of description provided during data collection. Therefore themes at the beginning of each sub-section had more weighting than themes presented at the end of the sub-section (for example, with regard to physiological influences, the most prevalent theme was 'sensory preferences and aversions', followed by 'satisfying physiological demands' and 'weight control'.

Figure 1.1.3. **The influence of physiological, cognitive, lifestyle and socio-cultural factors on food choice**



1.1.5. Physiological factors

There were 3 physiological determinants of food choice: 'sensory preferences and aversions', 'satisfying physiological demands' and 'weight control'.

Sensory preferences and aversions (Table 1.1.1)

This theme was one of the most prevalent and illustrated the favourable or unfavourable effects of foods on taste, smell, touch and sight. Participants talked of a lack of preference and consumption of fish owing to negative sensory perceptions. Several participants avoided fish due to this reason, and one participant explained: "I hate fish, I can't eat fish.... I know that it's good for you, but I just can't eat it, it's disgusting.... I just can't stand the taste or the smell, it's just urghh..." (Int. 4, 1:28-30; 3:78). Some individuals were indifferent or displayed minor distaste which resulted in avoidance of fish. These individuals spoke with ambiguity about storage, preparation and cooking methods, indicating that non-consumption may have reflected a lack of knowledge and skills as opposed to sensory preferences and aversions. Some participants, for example participant 6, explained that they did not have negative sensory perceptions but avoided consumption due to lack of skills.

In relation to healthy food choices, some individuals (for example, Int. 3) had a taste preference for fruits, vegetables and other natural foodstuffs and expressed distaste for foods that were processed. These participants were more likely to consume fruits, vegetables and fish than those who did not express a taste preference for healthy foods. This evidence suggests that taste is an important factor in determining whether healthy foods are consumed. Factors that affect taste need to be considered in interventions aimed at increasing fruits, vegetables and fish consumption. It was sometimes the case that physiology had a direct effect on preference, for example participant 2 described sweet foods as more palatable, explaining that she had a 'sweet tooth'. In this case it was perceived that physiology had a direct effect on sensory preferences.

Table 1.1.1.

"Sensory preferences and aversions" Participant/focus group	Quote
Interviewee 1	2:52-53; 3:86-87. [when making a food choice] "I duno just kind of like, what ever I fancy". 2:33. [about chocolate] "Because I suppose it tastes good." 3:95-97. "I'm not really a massive fan of fish. I never have been to be honest so....I duno cods alright and I'll just have that when I want it but apart from that I just generally choose not to eat it, I'd prefer to eat other stuff."
Interviewee 2	1:20-21. "I just – I've got a really sweet tooth. I like sweet things. Just, I get cravings for it now and again." 1:20-21; 3:64; 66. "I've got a really sweet tooth. I like sweet things."; "it's just what you fancy at the time really init?"..... "taste as well – you think of taste and what you fancy at that point. I think that." 2: 38-39; 41-42. –[about dislikes and influence of taste/texture] "I just don't like the taste, and the texture. Yeh. Really..... it makes you – you think of that when you go back to it. It's like whether you want to eat more of it or not." 2:41-42. [about the influence of taste and texture] "Yeh 'coz it makes you – you think of that when you go back to it. It's like whether you want to eat more of it or not." 2:31; 3:72. "I like most vegetables but not sprouts"; [talks of] "Sunday dinner, that's veg overload." 4:96-97. [about fish] "I just like it really. So....I just like the tas – I just – I particularly like shellfish but I like ermm, salmon as well, it's quite.....it's not really a healthy aspect it's just that I just enjoy eating it."
Interviewee 3	1:28. [about factors that guide food choice] "taste definitely, obviously. It's probably the first one." 1:17-19; 20-21; 3:88-90; 93. "I don't particularly appreciate the taste of sort of, processed food and stuff. I just generally prefer....natural, fresh stuff..."; "....microwavable meals – it's very rare I'll eat them because they just, yeh they don't taste very good"; [about reason's for consuming some vegetables] "partly taste as well obviously like – well not partly, in a big way taste like, I just really enjoy that kind of veg." 4:107. "Yeh, it stinks the house out as well..."

Interviewee 4	1:28-30; 3:78; 84-85; 87."I hate fish, I can't eat fish.... I know that it's good for you, but I just can't eat it, it's disgusting...."; [what puts you off fish] "I just can't stand the taste or the smell, its just urghh – it doesn't seem right I duno I hate it." 2:46-47. "if I do feel like it I might go out and buy maybe a chocolate bar."
Interviewee 5	4:109-100. ": Ermm it's again health. Ermm, I quite like seafood anyway, ermm and fish...." 1:16-17. "well I like the fruit because it's sweet ermm, sort of ermm, replacement for the sweets I ate when I was a child."
Interviewee 6	3:76-78. [reasons for consuming fruit and vegetables] "I just like the taste. Ermm.....that's pretty much it; I mean obviously you get all this crap in the media, 5 a day and all stuff like that. But I think a lot of that's – they pick five a day because it's a round number, rather than anything else." 3:78-81. [about factors influencing food choice] "mainly it's just the taste."
Interviewee 7	1:12-13. "I do like – really like fruit and vegetables so I always try and eat those." 1:18. [about healthful foods] "just 'coz they're better for you and I do like them as well..." 1:13-15. "I'm not that keen on fish either, I only really eat like tuna and fish fingers, so that's cod or whatever, Yeh."
Focus group 2 (females)	2:31; 4:89; 94-96. "I'm not a fan of fish, I've got to say. I only like cod... I can't stand the smell of fish... The smell. And the texture, I don't like it..." 1:26-29; 3:59-60; 7:182-184; 188; 17:477-479; 19:536-540. "I like the texture of chocolate, so when I'm eating chocolate like – only chocolate has that texture. So when I'm craving that texture I've got to have chocolate. And it tastes nice...."; " Like if I ate a salad or something, I'd probably go back for like either more or something else after. But if you ate a burger the bread fills you up straight away."

Satisfying physiological demands (Table 1.1.2.)

This involved satisfying and preventing hunger and eating to obtain a 'full feeling': for example interviewee 7 described her breakfast choice as being based firstly on how much her breakfast would fill her until lunch, and secondly the healthiness of the food. Participants in the male focus group talked of the negative physiological and cognitive consequences of hunger, and one participant explained how he based his breakfast decision around avoiding negative cognitive and physiological states "you get those like, stomach pains and it starts making noises [laughs] and going all over the shop..." (focus group 1, 6:187-188). Another interviewee described how he made food choices based on his 'gut instinct': "I wouldn't say there's necessarily a...particular way of doing it I just think, ooh I'd quite like this today... as far as I know there isn't a particular...strategy to picking what I want I just quite like the sound of something and then have it really. It's just gut instinct." (Int. 6, 1/2:30-34). Although it appears that this participant bases his food choice on preference, other factors may also play a role, such as physiological demands for certain nutrients.

Table 1.1.2.

"Satisfying physiological demands" Participant/focus group	Quote
Interviewee 2	2:44-46; 3:65-66. [important factors when making a food choice] "whether it fills you up a bit....if I just want a quick snack or something I'll eat something that isn't that filling.....if I'm busy for the rest of the night I'll eat something that's quite substantial"; "whether it will fill me a lot will – is part of it. Whether I want something just quite quick or whether I'm hungry or not..."
Interviewee 5	1:16-17; 2:41. "well I like the fruit because it's sweet....replacement for the sweets I ate when I was a child....all the meat and stuff I just like."
Interviewee 6	1/2:32-34; 41; 57-58; 3:80-81. "as far as I know there isn't a particular....strategy to picking what I want I just quite like the sound of something and then have it really. It's just gut instinct.... if I feel like it, then I'll have it.... It's the same with most food like it just depends on my mood." 1:13-14; 30-31; 2:41; 46-47; 57-58; 3:93-94. "I pretty much eat whatever interests me at the time... I wouldn't say there's necessarily a...particular way of doing it I just think, Oooh I'd quite like this today.... if I feel like it, then I'll have it.... usually I just pick stuff that.....stuff that I quite enjoy. I mean although I don't dislike foods I prefer some over others.... with most food like it just depends on my mood." 3:79-81. "if it tastes nice and.....doesn't like – say with greasy food one of the reasons I don't like it is I feel really sleepy after I eat it, and I don't really feel that with fruit. Fruit and veg you tend to have a lot more energy afterwards."
Interviewee 7	1:19-20; 2:50-51; 57. "you know the little cereals with loads of sugar and stuff in them? It just, doesn't really fill me up so – and like cereal bars and things, I can't eat them 'coz I just get really hungry...." "I usually have something like banana and like toast, just something that will fill me up and that I think is quite healthy."
Focus group 1 (males)	6:187-188. "you get those like stomach pains and it [stomach] starts making noises [laughs] and going all

	over the shop..."
Focus group 2 (females)	1:17-19; 3:59-60; 7:188; 15:414-419; 420-423. "I like chocolate and sweet stuff like that [agreement from P1]. I'd choose that over savoury stuff any day...."; 1:26-29; 3:59-60; 7:182-184; 188; 17:477-479; 19:536-540. "I like the texture of chocolate, so when I'm eating chocolate like – only chocolate has that texture. So when I'm craving that texture I've got to have chocolate. And it tastes nice...."; " Like if I ate a salad or something, I'd probably go back for like either more or something else after. But if you ate a burger the bread fills you up straight away."

Weight control (Table 1.1.3.)

Some participants voiced concerns about weight. This sometimes affected the type or quantity of food consumed, for example, interviewee 4 explained how she had previously eaten unhealthily but in an attempt to reduce her weight she tried to cut down on fattening foods and tried to get the recommended amount of each nutrient group. Although a participant in the male focus group was concerned about weight gain he ate healthily not only because of weight concerns but also for general health, fitness and sport.

Table 1.1.3.

"Weight control" Participant/focus group	Quote
Interviewee 4	1:9-10; 2:59-61. "Ermm (I'm) trying the get the recommended amount of carbohydrates, proteins, fruit and vegetables, I drink a lot of water just to keep my weight stable at the level I want it...."; "in the Summer I'm probably gona exercise and maybe just have soup and then a salad in the day and then I'll lose- I'll probably get down, my goal is maybe 9 and half, 10 stone."
Focus group 1 (males)	2/3:56-59; 3:78. 7:194-198. "I mean I think I, probably do [lowers tone]as everyone <u>does</u>, [I] get paranoid that I'm gona put on weight [laughs] again if I stop training, but err, no like, If I'm running a lot I tend to just eat what I can but I do enjoy being healthy – I feel a lot better in myself when I'm healthy." "It's that you don't put weight on." AS ABOVE. 7:214-216. "we were eating dessert every night, and I didn't – I didn't particularly think it was healthy, so I said why don't we save some money, save some calories, and only have them as a treat on weekends."
Focus group 2 (females)	14:396-399. 22:642-644. "Sometimes like you wana eat different to how you've eaten last week 'cause you stepped on the scales and you're a bit heavier or you look a bit bigger so you say ' oh right, in your mind your going to be good', or you set out to be good. So you go on a little – not diet but you say I'm gona eat more veg this week..." "I just think healthy eating means you're gona lose weight. That's – that's the only – that's what I do think though 'coz if you like, look at people they're like, 'oh I went on this diet and I only ate fruit and veg' and they've lost loads of weight. That's the only – that's what I do think of it."

1.1.6. Discussion of physiological factors

The most prevalent theme was 'sensory preferences and aversions'. Previous literature suggested that sensory preferences and aversions are paramount in determining food choices (American Dietetic Association, 1997; Furst et al., 1996; Sobal and Bisogni, 2009). Furst et al. (1996) and Sobal and Bisogni (2009) suggested that personal factors are specific attributes of a person that affect their food choices and food behaviours. Personal factors are bio-psychosocial (Bisogni et al., 2002) and include physiological factors (for example genetic predispositions to health and disease, sensory preferences and sensitivity to food tastes), as well as psychological factors (for example food preferences, personal dispositions), and social factors (e.g., gender roles, parent responsibilities). It was suggested that personal factors are changeable over time and allow the individual to be unique in their food choices, sometimes leading to people eating differently than their mealtime companions (Bove et al. 2003). Although the findings from Furst et al. and Sobal and Bisogni are different to the present findings in that some themes are grouped together into bio-psychosocial factors, in essence, previous work points to the large perceived influence of physiological factors.

A finding of the present study was that although individuals may have knowledge of what is healthy, this knowledge does not necessarily translate into healthy dietary practises if the food is perceived as unpalatable. Therefore, inconsistency in the 'knowledge-practise relationship' is partly mediated by 'sensory preference and aversions'.

Given the prominent role of sensory factors among discussants it is important that future health interventions that promote the consumption of healthy foods including fruits, vegetables and fish, create tasty and appealing options. Where there appears to be negative sensory aversions among this student population, particularly with fish and fish products, meal plans could emphasize other flavours and smells by including sauces and spices. Future research should include groups of individuals who express a minor distaste for fish and determine complimentary flavours that may increase consumption. 'Satisfying physiological demands was a very prevelant theme, and the importance of satisfying needs such as hunger when making a food choice has been reported elsewhere (Furst et al., 1996) and therefore future interventions and dietary guidelines must emphasize the satiating effects of fruits, vegetables and fish.

'Weight control' was a far less prevalent theme that affected few participants. During the present study 'weight control' was defined in terms of a desire to control weight due to an increase in fat. Some female participants in the present study associated healthy eating with weight control/loss as opposed to maintaining an ideal weight for health. This evidence is consistent with a study by Mooney and Walbourn (2001) who found that when compared to males, females tended to avoid certain foods due to weight and health (especially avoiding meat). A study by Marquis (2005) similarly found that females were significantly more motivated by weight concerns (as well as convenience, pleasure and price) than male students. This may reflect a lack of successful communication about the health benefits of fruits, vegetables and fish or alternatively gender differences in relation to the understanding of dietary information. Although there is previous research that suggests females respond better to nutrition intervention programmes (Eun-Jeong and Caine-Bish, 2009) it has been found that females place more emphasis on healthy eating for weight loss and appearance (Croll et al., 2001). This explains the present finding that females associate fruit and vegetables with weight loss.

Future health interventions must stress the health benefits to both men and women of including healthful foods such as fruits, vegetables and fish in the diet, which may help prevent females associating these foods primarily with weight loss and appearance. This reductionist attitude may lead to people of a healthy weight (particularly women) not getting an adequate amount of fruits, vegetables and fish in the diet. The association between fruit, vegetables and weight-loss may lead to problems for restrained eaters, who impose limitations on the diet by including mainly fruits and vegetables. Moreira, Almeida and Sampaio (2005) found that among high- as opposed to low-dietary restraint women there was a higher consumption of fruit and vegetables, lower consumption of pastry, sugar, and starchy foods. In contrast high-dietary restraint men displayed higher consumption of vegetable soup, fruit, milk, and eggs. Although fruits and vegetables are considered an essential component of a healthy diet, restricting the diet to mainly fruit and vegetables could have negative health consequences. Dietary guidelines and interventions must stress the importance of eating a healthy and well-balanced diet containing complex carbohydrates, proteins and fats as well as fruits and vegetables.

1.1.7. Cognitive factors

There were five cognitive determinants of food choice; 'well-being', 'knowledge and skills', 'desire for variety', 'healthiness evaluations' and 'preference and health conflict'.

Well-being (Table 1.1.4.)

Well-being has been defined as 'life satisfaction, optimism, self esteem, mastery and feeling in control, having a purpose in life, and a sense of belonging and support' (NHS, 2013; http://www.nhsinform.co.uk/mentalhealth). Elsewhere well-being has been defined as 'the presence of positive emotions and moods (e.g., contentment, happiness), the absence of negative emotions (e.g., depression, anxiety), satisfaction with life, fulfillment and positive functioning' (Centre for Diease Control and Prevention, 2013; http://www.cdc.gov/hrqol/wellbeing.htm). Although participants often referred to feelings, they often did so in the context of well-being (for example, interviewee 3 said: "[I] try and lead a healthy lifestyle, and I just enjoy it more to be honest."; "it makes me feel better to eat healthy food, like just makes me feel healthier"; interviewee 4 said: "I felt, disgust – like I just felt so tired all the time and ill, and like I got ill really easily, and now that I'm healthier I – my edu(cation) – like being able to concentrate in lectures and it just made me so slow, it was horrible so eating healthy it's just- makes you more focused and gives you a lot more energy, so....I just feel better when I'm not clogged up with crap."; focus group 1: "I do enjoy being healthy – I feel a lot better in myself when I'm healthy.") Therefore rather than categorising this theme as 'feelings', it was given the title well-being.

'Well-being'was perceived to influence food choice in a number of ways, for example several people talked of how food affected feelings. One participant talked of the beneficial effects of healthy foods on well-being: "I kind of like 'salady' foods more to be honest. I don't know why – I think they are just like - more – I duno they make me feel better when I eat them rather than like fatty foods like fish and chips and stuff like that." (Int. 1, 1:14-16). Interviewees 4 and 6 suggested that a poor diet containing processed and fatty foods resulted in lethargy and poor cognitive performance; essentially these foods were avoided and it was suggested that these foods had a detrimental effect on well-being. This evidence demonstrates the desire to eat healthily for well-being.

Keeping with this, foods that were perceived as unhealthy were eaten to reduce negative mood states; for example, in the female focus group, processed, fatty and sugary foods such as bread and chocolate were sometimes eaten to enhance well-being. Although a participant in the focus group referred to chocolate as a 'comfort food' and others said they would eat chocolate if they felt stressed, the female focus group pointed out that whilst these foods initially enhanced mood state, this was temporary - one participant described how she felt 'bad' after eating chocolate. In summary healthy foods were sometimes consumed to achieve a sense of well-being. In contrast if a person experienced a negative mood state they sometimes consumed perceived unhealthy foods to boost mood status; however, this phenomenon was reported only in the female focus group.

Table 1.1.4. Well-being

"Well-being" Participant/focus group	Quote
Interviewee 1	1:14-16. "But I kinda like 'salady' foods more, to be honest. I don't know why – I think they are just like - more – I duno they make me feel better when I eat them rather than like fatty foods like fish and chips and stuff like that."
Interviewee 3	17, 44-45, 93. "[I] try and lead a healthy lifestyle, and I just enjoy it more to be honest."; "it makes me feel better to eat healthy food, like just makes me feel healthier."
Interviewee 4	1:20-24. "I felt, disgust – like I just felt so tired all the time and ill, and like I got ill really easily, and now that I'm healthier I – my edu(cation) – like being able to concentrate in lectures and it just made me so slow, it was horrible so eating healthy it's just- makes you more focused and gives you a lot more energy, so....I just feel better when I'm not clogged up with crap."
Interviewee 5	1:20-21; 31. "I just generally – because it feels healthier it's tastier - It seems that way."; [asked about previously described eating habits] "It's a bit better for you."
Interviewee 6	3:80-81. [about greasy food] "I feel really sleepy after I eat it, and I don't really feel that with fruit. Fruit and veg you tend to have a lot more energy afterwards, so maybe that plays some sort of part in it." 1:13-14; 30-31; 2:41; 46-47; 57-58; 3:93-94. "I pretty much eat whatever interests me at the time ermm, I eat a lot of Mexican food, a lot of Spanish food, a fair bit of Italian and French as well.... I wouldn't say there's necessarily a.....particular way of doing it I just think, Oooh I'd quite like this today.... if I feel like it, then I'll have it.... usually I just pick stuff that.....stuff that I quite enjoy. I mean although I don't dislike foods I prefer some over others.... with most food like it just depends on my mood."
Focus group 1 (males)	6:180-181; 183; 8:244-245. "I always have eggs on toast with ketchup [laughs] and a cup of coffee. I find that if I don't have a really big breakfast I feel really down. If I don't have a cup of coffee in the morning.... I can't function if I haven't had a cup of coffee..." "I just eat out of boredom sometimes."

	2:49; 3:58-59. [about eating desserts] "No, my will power's gone pretty good now..." "I do enjoy being healthy – I feel a lot better in myself when I'm healthy."
Focus group 2 (females)	1:23-24; 2:40-41. "I'd feel better though, if I eat like 5 sandwiches I'd feel better than eating a bar of chocolate [laughs]. I don't know why.... And you don't feel bad eating loads of chicken rather than eating something else....it just seems healthier doesn't it, like don't seem as fattening." 3:61-68; 8:220-221; 16:444-445; 458-459. "I think it like, makes you feel better when you're eating it, and then afterwards you feel bad. I mean like, when you're eating it you're like...If I've had a stressful day I will get chocolate...I eat it when I'm sad usually or when I've got nothing else to eat...It's just quicker and cheaper...I think it's like - it's just a thing you do though init. Sit at the telly and it's like, oh let's go get some chocolate.... It's like a comfort food isn't it."

Knowledge and skills (Table 1.1.5.)

This was a prevelant theme that was mentioned throughout participant accounts. Whilst some participants had minimum nutrition knowledge, others were quite well-educated, that resulted in more healthy eating habits. Those who conveyed adequate 'knowledge and skills' were not adversely affected by themes such as 'sensory preferences and aversions', 'preference and health conflict', 'occupational stereotype', 'conflict of financial priorities', and 'independence, improvisation, simplicity and convenience'. These participants suggested that healthy eating took priority over other aspects of student life, however, knowledge of what was healthy was not perceived to lead to healthy dietary habits. This inconsistency in the knowledge-practise relationship sometimes caused cognitive dissonance, for example interviewee 1 said: "I usually have something (fruit and vegetables) like a few times a week or something but not every single day which is kind of bad" (Int. 1, 2: 56-58). Similar to other participants, this statement indicates that while she possessed knowledge of what was healthy, this did not translate into action. This was not attributed to a lack of skills, therefore, themes other than 'knowledge and skills' affected food choice and mediated the knowledge-practise relationship. Some themes are mentioned above.

Although some participants said that they had acquired from the family home adequate preparation and cooking skills, which resulted in more healthy dietary habits, on many occassions participants did consider that they possessed adequate skills. If participants perceived a limitation on their personal skills it created a barrier to the preparation and consumption of healthy foods. The following participant consumed foods that were: "easy to cook like 'coz I can't really cook that well. So stuff that doesn't take very long or doesn't take much effort....I'm really into pasta, errm pizza, things that are easy to make 'coz I'm not very good at cooking." (Int. 2, 1: 13-14; 17-18). Evidently skills may facilitate or inhibit the consumption of fish and vegetables, and may mediate the 'knowledge-practise relationship.'

Table 1.1.5.

"Knowledge and skills" Participant/focus group	Quote
Interviewee 1	2: 56-58; 3:91. "I usually have something like a few times a week or something but not every single day which is kind of bad"; [when asked how fish is eaten] "Ermm usually battered [laughs]" (indicates knowledge besides unhealthful choice).
Interviewee 2	1:17-18; 13-14. [likes foods that are] "easy to cook like 'coz I can't really cook that well. So stuff that doesn't take very long or doesn't take much effort"; "I'm really into pasta, errm pizza, things that are easy to make 'coz I'm not very good at cooking."
Interviewee 3	5:141-142. "I'd say I'm quite knowledgeable sort of about what you need in your diet. I wouldn't necessarily say I was that up on supplements specifically."
Interviewee 4	1:7-8. "I put on a lot of weight last year because I was eating fast food and junk, so this year – and before then I knew to eat healthily but I sometimes didn't."
Interviewee 5	1:11-14. "Ermm fruit, meat...decent oat cereal. .... all sorts of fruits, from mangos, kiwis, apples, oranges, bananas.... for evening meal, ermm some chicken – chicken breast, big chicken breast. Ermm some err, mixed vegetables, ermm and loads of pasta, stuff like that basically."
Interviewee 6	4:100-101. "I mean in terms of cooking fish, I don't really know how to do it so I don't really – I've never really got round to doing it..."
Focus group 1 (males)	4/5:123; 125; 127. [about a healthful diet] "It's important to have protein.... other things in it, like Zinc and stuff.... it's important for body function. You have to have protein for muscle repair and growth."
Focus group 2 (females)	11:301-305. "my Dad taught me how to cook when I was younger so when I came to uni I had all my pots and pans and stuff and my mum used to like err, send me home every week with like meat and fish to put in my freezer from the butchers so I would have food to cook rather than eating out. So when I look for food to buy it's always [ingredients]."

Desire for variety (Table 1.1.6.)

Several participants expressed a desire for variety, for example interviewee 6 explained: "I pretty much eat whatever interests me at the time ermm, I eat a lot of Mexican food, a lot of Spanish food, a fair bit of Italian and French as well. I – I like to vary what I eat I suppose.... It keeps it interesting I suppose. There's nothing worse than eating the same meal again and again, and again and again. And I find that most foods tend to be a bit more ermm....well I find a lot of British food tends to be really bland so I just get bored of it and try something else." (Int. 6, 1:14-15; 21-23). If participants ate healthily they spoke of how it became boring therefore it caused deviation to unhealthy foods, for example "every now and then I get some, some – loads of extra stuff.... Of course like anyone... you sort of deviate from that and get a pizza or something..." (Int. 5, 2:53-60; 69-70).

Table 1.1.6.

"Desire for variety" Participant/focus group	Quote
Interviewee 1	1:28. [Doesn't like]" Ermm [pause] pasta, because it's too plain really. Ermm, it's just a bit boring, that's....."
Interviewee 2	1:13-15. "I like a mixture of things really, I'm really into pasta, errm pizza, things that are easy to make 'coz I'm not very good at cooking. But erm, I also like sweet stuff then as well - like chocolate and sweets and crisps and things."
Interviewee 3	5:128-129. "being a vegetarian relying on like beans and things like that, like it's just, you know it's just a bit difficult."
Interviewee 5	2: 53-60; 69-70. "I always...choose (best) – not sure really I try and get a little bit of everything. Some fruit, some carbohydrates, and protein in there, as much as I can... I don't really deviate much, although every now and then I'll switch and I'll go from err a bit red meat in the week, and chicken, or some err, fish and some salmon or something. And then every now and then I get some, some - loads of extra stuff .... of course like anyone.... you sort of deviate from that sometimes and just go off and get a pizza or something...."
Interviewee 6	1:14-15; 21-23. "I pretty much eat whatever interests me at the time ermm, I eat a lot of Mexican food, a lot of Spanish food, a fair bit of Italian and French as well. I – I like to vary what I eat I suppose.... It keeps it interesting I suppose. There's nothing worse than eating the same meal again and again, and again and again. And I find that most foods tend to be a bit more ermm....well I find a lot of British food tends to be really bland so I just get bored of it and try something else."
Interviewee 7	1:10-13; 18-19. "I duno, like I tend to eat a lot of like tuna and pasta. I try and get like 5 fruit and veg and stuff, but I really like, like stuff like pizza and MacDonalds and everything as well, and take aways'. Ermm but I do like – really like fruit and vegetables so I always try and eat those." [about healthful foods] "I don't know really, it's just 'coz they're better for you and I do like them as well."

Healthiness evaluations (Table 1.1.7.)

Associations were made between foods such as fruit, vegetables, fish and their value in health, in fact positive evaluations in relation to health sometimes increased consumption. Although participants often said that fruit and vegetables were beneficial for health, they made particular reference to the beneficial effects of fish and in cases where fish was included in the diet, it was usually because of its perceived health properties. "Sometimes I eat mackerel as well 'coz it's supposed to be good for you, 'coz it's like oily fish." "I do really like tuna like as long as it's mixed with mayonnaise or salad cream or something, and ermm just 'coz you - it's – well you're supposed to eat it." (Int. 7, 3:79-80; 4:88-89). No-one indicated a strong preference for fish, again reiterating that it is mostly included in the diet for its health properties. Participants accepted it as an important part of a healthy diet and in a few cases the value placed on health was an important determinant of whether or not fish was consumed. However, if there was a strong sensory aversion, its' health properties did not appear to influence consumption: "I hate fish, I can't eat fish.... I know that it's good for you, but I just can't eat it, it's disgusting.... I just can't stand the taste or the smell, it's just urghh..." (Int. 4, 1:28-30; 3:78). The level of culinary skills also played a role and people who expressed a lack of skills tended not to eat it.

Some people made a negative evaluation of foods that are generally considered unhealthy, for example, when talking about foods that are unhealthy a participant said: "fast foods, or like if you're in McDonalds and things like that. Fatty foods, ermm really fizzy drinks, sugary stuff. Mmm, all that sort of stuff." (Int. 2, 7:184-185). Another participant said about eating fatty and processed foods: "[it] just made me so slow, it was horrible so eating healthy it's just- makes you more focused and gives you a lot more energy, so....I just feel better when I'm not clogged up with crap."; "I try and look at the calories for most things and the fat..... I just try and think if it's 'gona be a burger with chips it's not 'gona be good for me" (Int. 4, 1:20-24; 2: 40-44; 51-53). Apart from the detrimental effects of unhealthy foods on cognition and well-being, the evidence suggests that unhealthy foods are evaluated negatively due to public health campaigns, that is due to 'dietary guidelines and other media' that create pressure to eat healthily.

Table 1.1.7. Healthiness evaluations

"Healthiness evaluations" Participant/focus group	Quote
Interviewee 2	7:184-185. [bad for you] "....fast foods, or like if your in McDonalds and things like that. Fatty foods, ermm really fizzy drinks, sugary stuff. Mmm, all that sort of stuff."
Interviewee 3	1:13-14; 2:48; 1-2:29-40. "I'm very much for fresh food, I don't eat anything real frozen or anything. A lot of sort of fresh fruit and veg and I make most of my dinners like fresh...."; [definition of healthy] "fresh? [laughs] I keep saying fresh. Ermm....yeh just like, not processed." 4:123-124. [about fish] "I would choose to buy it because obviously it's a protein and obviously being mostly vegetarian I need a some more protein."
Interviewee 4	1:20-24; 2: 40-44; 51-53. [eating fatty, processed foods] "just made me so slow, it was horrible so eating healthy it's just- makes you more focused and gives you a lot more energy, so....I just feel better when I'm not clogged up with crap."; "I try and look at the calories for most things and the fat..... I just try and think if it's 'gona be a burger with chips it's not 'gona be good for me" 1:20-24. "I felt, disgust – like I just felt so tired all the time and ill, and like I got ill really easily, and now that I'm healthier I – my edu(cation) – like being able to concentrate in lectures and it just made me so slow, it was horrible so eating healthy it's just- makes you more focused and gives you a lot more energy, so....I just feel better when I'm not clogged up with crap."
Interviewee 5	4:112-113. [about deep fried fish] "I don't know it's just, it seems – it doesn't seem right [laughs]. You just – 'coz their just – they'll just deep fat fry it. And ermm, just with all the ermm, the rubbish it doesn't taste any good." 4:109-110; 116-117. [reasons for fish consumption] "again health. Ermm, I quite like seafood anyway, ermm and fish. Ermm I don't like going for breaded stuff..... I probably choose it for the - all the omega-3 and the oils and things like that. All this stuff you hear about, all the reasons you think or hear it's good for you."
Interviewee 6	1:25-26; 3:79-80. "I don't particularly like greasy food,

	particularly sort of your take away kebabs and all that sort of stuff. I hate that.... with greasy food one of the reasons I don't like it is I feel really sleepy after I eat it..."
Interviewee 7	3:79-80; 4:88-89. "sometimes I eat mackerel as well 'coz it's supposed to be good for you, 'coz it's like oily fish." "I do really like tuna like as long as it's mixed with mayonnaise or salad cream or something, and ermm just 'coz you - it's – well you're supposed to eat it." 1:9-10. ", I try and eat like healthy foods and stuff, like ermm, for breakfast I usually have ermm, well toast and stuff. Like whole meal bread and everything."
Focus group 1 (males)	1:7; 9; 2:37-40. "cheap healthy foods... I tend to eat alot of, err fish, so cheap cod fillets." "I eat alot of ermm vegetables, I'm trying to eat more fruit as well...I eat chicken and fish quite a lot as well and I'm trying to cut down on red meat. And like minced beef, I don't have that as often as I used to. I'd say that ermm, health is probably more important than price."
Focus group 2 (females)	1:14; 2:35-36; 41; 3:61-62; 5:123; 6:166; 7:174-178; 14:400-402; 21:597-599. "I don't like lamb as I said before, it's too fatty."; [about chicken] "it hasn't got no, really, fat on it. I know it's got it on the actual like, (thing – skin?) But you haven't got to eat it that way. Whereas if you got like, pork and lamb and stuff it's always got like, bone and fat on it or something on it. And that puts me off."; "I chose the worst on the list [laughs]. I think it was burger and chips and chocolate."

Preference and health conflict (Table 1.1.8.)

Owing to the association made between healthy foods and well-being, participants often sacrificed a preference for unhealthy food. For example, referring to factors that affect food choice, a participant stated: "taste definitely, obviously. It's probably the first one. And then sort of healthiness. Like we all like foods that are unhealthy obviously but [laughs] ermm, yeh that does come into it..." "I try and lead a healthy lifestyle, and I just enjoy it more to be honest...it makes me feel better to eat healthy food, like just makes me feel healthier." (1-17, 28-29; 2-44-45). Other participants ate healthy foods such as fruits and vegetables despite a lack of preference because of their health value, however, once again this was providing there was not an extreme sensory aversion. In contrast, some participants chose unhealthy foods despite knowledge of what was healthy due to the overriding influence of sensory preference. When the female focus group was given a list of healthy and unhealthy to choose from, one participant said: "I chose the worst on the list [laughs]. I think it was burger and chips and chocolate...I chose it because I'd want to eat it. That's about it really." "I think healthy eating is important but then again I don't actually eat that healthy really...." (Group 2, 6:166, 180; 23:665). Evidently, a 'preference and health conflict' may mediate the 'knowledge-practise relationship.' A person may choose to eat a food despite a lack of preference because of its health value. In contrast, a person may eat unhealthily despite knowledge about what is healthy, due to preference.

Table 1.1.8. Preference and health conflict

"Preference and health conflict" Participant/focus group	Quote
Interviewee 3	1:28-29. [about factors that influence food choice] ".....healthiness. Like (we all like foods that are) unhealthy obviously but [laughs] ermm, yeh that does come into it."
Interviewee 4	2/3:32-35. "Ever since I was little....there would be broccoli, peas, carrot, cabbage.... I always ate it, but broccoli was the worst and my Mum used to <u>always</u> put it on my plate and she <u>always</u> makes me eat at least two little pieces of broccoli. So I've always just eaten it, 'coz I know it's good for me so I do."
Interviewee 5	2: 42; 46-48. [about poor tasting foods] "I'll eat as much (of it) because I know it's good for you."; "Beetroot! Ermm I don't really like (it), or liver....sort of eating too much liver can err...it's bad for your cholesterol, but in good portions it's good for you. So liver and beetroot I know is really good for you but I don't like so ermm, but I try and eat it if I can."
Focus group 2 (females)	7:174-178; 180. [about choosing burger and chips, and why this is 'bad'] "Because there is so much fat in it. That's what I think anyway. Like if you're on a diet that would be the last thing you would eat wouldn't it really, out of the all the rest. Because like, obviously spaghetti [Bolognese] has got pasta which is generally ok as long as you have the right amount...it's like eating bread and there's loads of carbs, but with the burger and stuff. And then obviously chocolate is pretty bad for you when you could have fruit salad.... [I chose it] because I'd want to eat it [laughs]. That's about it really. 6:166; 23:655. "I chose the worst on the list [laughs]. I think it was burger and chips and chocolate." "Well no not really coz I think [healthy eating is] important but then again I don't actually eat that healthy really."

1.1.8. Discussion of cognitive factors

Although several participants suggested that healthy foods enhanced 'well-being', this was not always perceived to lead to an increased consumption of healthy foods or a decreased consumption of unhealthy foods. It was sometimes the case that processed, fatty and sugary foods were eaten to reduce negative mood states. This was in line with previous research by Willner et al. (1998) who found that cravings for sweet rewards were increased by depressive mood induction. During the present study participants talked of feeling guilty after consuming these foods, and this phenomenon of eating 'comfort foods' followed by feelings of guilt has been associated with dietary restraint and emotional eating, commonly found among adolescents and young adults, particularly females (LeBel, Lu and Dube, 2008). Future health interventions must advocate the consumption of a healthy and well-balanced diet and deter people from being restrictive, since restraint has been associated with poor dietary habits and potentially negative psychological and physiological consequences (Eunice, McCloskey and Keenan, 2009; Penas-Ledo et al., 2008; GoldSchmidt et al., 2008).

The message that adequate 'knowledge and skills' did not always result in improved dietary habits may be important to consider along with themes that may present barriers to the 'knowledge-practise relationship' including 'sensory preferences and aversions'; 'preference and health conflict'; 'occupational stereotype'; 'conflict of financial priorities'; 'independence, improvisation, simplicity and convenience'. Despite the influence of other themes on the knowledge-practise relationship, previous work has suggested that nutrition knowledge alone leads to healthier food choices in adults (Kreuter et al., 1997; Neuhouser, Kristal and Patterson, 1999; Matvienko, Lewis, & Schafer, 2001) adolescents (Tse and Yuen, 2009) and university students (Kolodinsky et al., 2007). Specifically more knowledge of dietary guidelines combined with public-awareness campaigns of a healthy diet may be useful in creating healthier dietary habits (Kolodinsky et al., 2007). Despite this evidence, other research suggests that simply increasing knowledge and awareness may not be effective in all circumstances (Brown, Dresen, & Eggett, 2005; Schnoll & Zimmerman, 2001), perhaps because of some of the barriers found during the present study (e.g. 'sensory preferences and aversions'; 'preference and health conflict'; 'occupational stereotype'; 'conflict of financial priorities'; 'independence, improvisation, simplicity and

convenience'). These factors must be addressed during interventions that aim to increase healthy eating.

An additional method would be to incorporate goal-setting into healthy eating campaigns, for example Schnoll & Zimmerman (2001) found that including self-regulation strategies of goal-setting and self-monitoring in a nutrition course increased self-efficacy in relation to the consumption of dietary fibre. Other campaigns with university students have found that a combination of promotion (in the form of newsletters and e-mails) and motivational interviews increased consumption of fruits and vegetables (Richards, Kattelmann, & Ren, 2006). The applicability of this method to fish and seafood requires further research.

We cannot ignore the implication from the present findings that there are gaps in the students' knowledge of what constitutes a healthy diet, for example the correct amounts of different food groups and micronutrients. The question of whether this gap in the knowledge of students applies to other populations requires further research, however, in students at least, this lack of knowledge may lead to a lower consumption of foods defined as healthy (Dickson-Spillmann and Siegrist, 2010). Before we consider factors that facilitate the 'knowledge-practise relationship' we should first consider whether the correct education is being delivered. Another method of increasing nutrient intake would be to create a meal plan that may overcome barriers such as 'a lack of knowledge and skills'. One meal plan intervention study positively influenced students' consumption of fruits, vegetables, and meat, and revealed gender differences in responsiveness to the meal plan. Males more favourably responded in comparison to females with regard to the consumption of meat and vegetables (Brown et al., 2005).

There were individual differences in the 'desire for variety', for example some people expressed a desire to include a variety of foods in the diet whilst others preferred to include a small range of foods. This may reflect individual differences in food neophobia i.e. the fear of trying new foods due to potential poisoning, however, humans need a wide variety of foods to obtain the necessary macro- and micro-nutrients for optimal functioning (Birch et al., 1999). Although Birch et al. (1999) suggested there are innate drives affecting preference and the desire for variety, some

individuals expressed an active and conscious decision to try different foods. Therefore 'desire for variety' was classed as a cognitive factor. Nevertheless, it is inevitable that this theme is affected by physiological as well as cognitive forces. Future health interventions must create enticing and novel recipes that may satisfy the 'desire for variety'.

With regard to 'healthiness evaluations', a positive evaluation of healthy foods was associated with an increase in consumption. Given this evidence it is important that health promoters stress the benefits of healthy foods such as fruits, vegetables and fish so that they are considered important to people. Health messages should be tailored specifically depending on the target population. For example, the present study suggests that when targeting student samples certain health messages will be influential, such as 'enhances sports performance'; 'helps maintain a healthy weight'; 'helps maintain a healthy appearance'. Further research is required is to examine the effect of different health messages in this as well as other populations. The positive evaluation made between fruits, vegetables, fish and health is in concordance with previous studies with adolescents (Croll, Neumark-Sztainer and Story, 2001). However, further research is required to examine the association between a positive evaluation and the consumption of healthy foods in university students.

A negative evaluation of so called 'junk foods' is in line with previous literature where students have described fatty or sugary foods, McDonalds and other fast foods as unhealthy (Croll et al., 2001). Participants in the present study suggested that young people eating unhealthy foods experienced a detrimental effect on mood and well-being and considered that the consumption of these foods on a regular basis affected physical health as well as mood and cognitive state, a phenomenon that has been reported elsewhere (Holloway et al., 2011; Afaghi, O'Connor and Chow, 2009; Rogers, 2001). Public health campaigns such as the UK '5-a-day' fruit and vegetables and the USA Food Guide Pyramid have targeted the reduction of these foods (EUFIC, 2009; USDA, 1992; 2005). A 'negative evaluation of processed, fatty and sugary foods' due to adverse effects suggests that health promoters should campaign for health warnings on certain foods that may pose a risk when eaten in large quantities over a long-period of time. A study by Whiting et al. (2010) examined barriers to healthy eating and supplement use using an econimcally depreived Canadian

population. Participants talked about barriers such as affordability, wholesomeness and moderation. During several focus group discussions participants talked about the denial of unhealthy foods more than the inclusion of healthy foods, for example, "Getting a variety of things and no excess of anything. No excess of salt, no excess of sugar, everything in moderation." Another commented, "A lot of vegetables and fruits and not much junk food." A third said, "Natural, unprocessed, no additives." This finding is consistent with the present results that when talking about healthy eating, participants made 'healthiness evaluations' including negative evaluations of processed, fatty and sugary foods.

Although previous studies have investigated influences on food choice in student populations, there has been less attention paid to the application of behavioural models, such as health belief model (HBM), to predict food choice and healthy eating. The HBM is an expectancy-value model that has been applied to several areas of public health (Rosenstock, 1974). According to the HBM, when a person perceives a threat from a disease (measured by perceived susceptibility and severity), and when perceived advantages of preventative measures are greater than perceived barriers, then a person is more likely to take preventive action. In essence, the HBM measures 'healthiness evaluations' and the extent to which they predict health related behaviours. Deshpande, Basil and Basil (2009) aimed to investigate how health beliefs impact on food choice in university students, in particular how health beliefs predict the likelihood of healthy eating. Contrary to the present findings, Deshpande, Basil and Basil (2009) found no significant effects on food choice of factors such price, taste, ease of preparation (i.e. convenience), efficacy (i.e. knowledge and skills). However, other research supports the present study, for example Horacek and Betts (1998) and Marquis (2005) found that food features such as price and convenience effect food choice and healthy eating. Although the study by Deshpande, Basil and Basil (2009) using the HBM found no significant effects of cost, efficacy, preferences and convenience on healthy eating, the results of the study suggested that a method of increasing healthy eating by using intervention campaigns would be to use a combination of increasing fear (i.e. highlight the negative consequences of eating an unhealthy diet among women and increasing perceived susceptibility to disease among men) and increasing efficacy, (i.e. the belief that one can consume a healthy diet). In summary this would affect healthiness evaluations by creating a negative evaluation of

fatty, processed and sugary foods. Previous research has suggested that this approach is successful (Witte, 1992).

A 'preference and health conflict' existed when participants had to sacrifice a taste preference in order to eat healthily. This theme sometimes led to a decrease in consumption of healthy foods and may mediate the 'knowledge-practise gap' in situations where the food is considered unpalatable. The finding that some healthy foods are considered unpalatable has been reported elsewhere, for example Croll et al. (2001) found that participants referred to healthy eating negatively due to factors such as taste, appearance and the social acceptability of certain foods.

1.1.9. Lifestyle factors

Five lifestyle factors emerged including 'Independence, improvisation, simplicity and convenience'; 'conflict of financial priorities'; 'occupational stereotype'; 'sport and activity level'; 'religion'.

Independence, improvisation, simplicity and convenience (Table 1.1.9.)

Associated with a student lifestyle, this theme had a negative impact on dietary habits. Student life was suggested to be a precursor to dietary 'independence, improvisation, simplicity and convenience': "I don't know like being a student it's kind of like what's in the cupboard....you're going out a lot more as well.....after a night out or something you don't really want to eat....you want just like simple foods that you can just make easily like bread and stuff like that....it's like the money as well you just kind of – just tend to go for cereal and stuff and spend money on clothes and stuff like that [laughs]." (Int. 1, 2:38-40; 46-50). This statement indicates an overlap with two other lifestyle themes, 'occupational stereotype' and a 'conflict of financial priorities'. These themes were closely intertwined and resulted in poor dietary habits. Apart from a student lifestyle, demands such as work and family (one participant had a young child) meant that the diet was given less priority, increasing the need for 'improvisation, simplicity and convenience'. Although there was often a need for 'improvisation, simplicity and convenience' mainly in participants who were new to student life, this was not exclusively the case. Some students, for example those involved in sport, made a conscious effort to maintain a healthy lifestyle. One participant talked of the independence that that student life gave her and how it improved her dietary habits. She felt that she had more control over her diet since she could not eat unhealthy foods if she did not buy them. This evidence creates the impression that independence had a positive effect on dietary habits, however, if students did not have the correct 'knowledge and skills' or possessed a need for 'simplicity, convenience and improvisation', independence had a negative effect on dietary habits.

Table 1.1.9.

"Independence, improvisation, simplicity and convenience" Participant/focus group	Quote
Interviewee 1	2:38-40. "so usually simple things like bread....and you just make up with whatever you can do."
Interviewee 2	1:17-18; 13-14. [likes foods that are] "easy to cook like 'coz I can't really cook that well. So stuff that doesn't take very long or doesn't take much effort"; "I'm really into pasta, errm pizza, things that are easy to make 'coz I'm not very good at cooking."
Interviewee 4	1:12-14. "It was my first year in uni and I just couldn't be bothered to go to Tesco. I've got a car as well so I can just drive to MacDonalds, it takes like 5 minutes so I just did that. And I had a boyfriend as well, we just both used to do it. Ringing dominoes, Chinese, it's just easy to do." 2:40-42. "'coz I'm in uni and I buy all my own food, if I don't buy chocolate bars and crisps and stuff, I can't eat them. So I always make sure I buy one type of cereal, and then I'll have chicken with wraps..."
Focus group 1 (Males)	2:33-36; 3:66-68; 6:191; 8:246-249. "....more recently we've been having errm, cheap oven food because we just haven't got the time to cook. So our diet has like, taken a turn for the worst [laughs] it's like pizzas and chips and nasty things....." "I had a steamer last year, and I went through a stage of using a steamer, but it just takes <u>too long</u>. I mean that's why I'm eating so much crap at the moment. Just pop it in the oven, 20-30 minutes."
Focus group 2 (Females)	1:8-9; 2:38; 10:272-274; 281-283; 11:292-295; 289. [about preferences] "Chicken, chicken all the time [laughs, agreement from P3]. Just because it goes with most things." "You can get like, chicken breast which you can cut up and put in anything." "I'd just make a sandwich 'coz it's easier. It's just laziness ....I wouldn't make a jacket potato because you've got to wait for it to cook, and I'd probably snack while I was waiting for it to cook whereas with a sandwich you'd make it straight away and eat it straight away."

Conflict of financial priorities (Table 1.1.10.)

A 'conflict of financial priorities' was an issue raised by several participants. Inter-linked with 'occupational stereotype', conflicts often arose when aspects of the student lifestyle, such as socialising and living costs, were assigned priority over the diet. Where there were attempts to consume a healthy diet, they were often modest - one interviewee explained that the reason behind her selection of fruits such as oranges and apples was that they were the cheapest. Another participant remarked on his frequency of fish consumption: "Not very often. I like it but it's expensive. Ermm, if I go out to a restaurant I might eat it a lot more.... if you go to the fishmonger or whatever it tends to be quite expensive so not very often." (Int 6, 4:99; 101-102). Issues of price and finances were central to this student population, and lack of finances often led to 'improvisation, simplicity and convenience'.

Table 1.1.10.

"Conflict of financial priorities" Participant/focus group	Quote
Interviewee 1	2:48-49. "it's like the money as well you just kind of – just tend to go for cereal and stuff and spend money on clothes and stuff like that [laughs]."
Interviewee 3	3:75-76; 83. "I'm kind of vegetarian. I only eat free range meat so I don't eat it often because it's too expensive..... I was gona' say being a student yeh. Hopefully in the future so like..." 2:59. [when asked about consumption of 'traditional fruits, for example apples and oranges, participant remarked] "Cheapest [laughs]" 4:97-99. "....probably the most fish I eat would be tinned tuna, again just because it's the cheapest. I probably would eat more if I could. Ermm, but I probably only eat it like, maybe twice a week at the most really."
Interviewee 6	4:99; 101-102. [about frequency of fish consumption] "Not very often. I like it but it's expensive. Ermm, if I go out to a restaurant I might eat it a lot more.... if you go to the fishmonger of whatever it tends to be quite expensive so not very often."
Interviewee 7	4:89-90. "well you're supposed to eat it [fish] ermm.....and also like I would rather eat fish than like actual animals, like when I was kind of trying to be vegetarian as well." 2:49. [factors guiding food choice] "depends like what I've – how much money I've got as well, like what I've bought."
Focus group 1 (Males)	1/2:26-29; 33-36; 9:267-268; 270-272. "I'm probably far less healthy than those two [P1 and P2]. Ermm, generally what's cheapest at the moment, coming towards the end of the term. But I do try and eat what's healthy, so I tend to have alot of frozen veg and that sort of thing, again sort of, pasta and rice and...." "I'd say cost is – does affect me. Especially at the end of the month. When you're starving yourself." "more recently we've been having errm, cheap oven food because we just haven't got the time to cook. So our diet has like, taken a turn for the worst [laughs] it's like pizzas and chips and nasty things. But before we were

	eating good stuff, so...." 1:16-18. "Don't really eat that many vegetables, but I try to bulk it out [the meal] with a lot of peas, and you know, cheap veg rather than buy fresh."
Focus group 2 (Females)	26:757-758. "I think it [price] is important because it distracts me from things if they are too expensive...yeh 'coz they have them pound things in Tescos and you're just like, 'yeh I'm 'gona get those'."

Occupational stereotype (Table 1.1.11.)

'Occupational stereotype' refers to the extent to which a particular occupation is associated with, or can influence an individuals' lifestyle. The 'occupational stereotype' involves the need for improvisation, simplicity and convenience whilst being on a budget. This often was perceived to have a negative impact on dietary habits and one participant explained that the student lifestyle meant having less money (a 'conflict of financial priorities') and relying on simple foods and improvising by "(making) up with whatever you can do." Other participants spoke of how student life had a negative impact on dietary habits and resulted in the consumption of unhealthy foods. For example, interviewee 1 said: "I don't know like being a student it's kind of like what's in the cupboard [laughs]....." (Int1, 2:38-40) …."you're going out a lot more [as a student] as well.....(after) a night out or something you don't really want to eat....you want just like simple foods that you can just make easily like bread and stuff like that....." (Int 1, 2:46-50).

Although this theme was related to 'conflict of financial priorities', individualswho placed a higher value on health tended to eat a healthier diet irrespective of food prices.

Table 1.1.11. Occupational stereotype

"Occupational stereotype" Participant/focus group	Quote
Interviewee 1	2:38-40. "I don't know like being a student it's kind of like what's in the cupboard [laughs]....." 2:46-50. "you're going out a lot more [as a student] as well.....(after) a night out or something you don't really want to eat....you want just like simple foods that you can just make easily like bread and stuff like that....."
Focus group 2 (Females)	11:289-295; 16/17:464-475. "I think like, I think being at uni you – I think you kind of pick up stuff really quick don't you. That's what I do. And it ends up being unhealthy because you havn't got the option to make it or – that's the thing, healthy things are always more expensive... It's laziness for me. It's laziness because at home, if I like try even try and go in the kitchen my mum's so like, 'no I'll do it' 'coz I'll make such a mess and she'll do it for me. Whereas in uni I've got like, no-one to do it for me so I'm like 'yeh, I'll just have a sandwich'.

Sport and activity level (Table 1.1.12.)

Sport was mentioned predominantly by males, and a higher activity level led to increased food consumption. One male participant for example, talked of how an increase in training intensity led to a conscious effort to increase energy consumption. This was particularly the case with healthy foods as opposed to unhealthy foods. As a male participant explained, he could not eat unhealthy or fatty foods because it would hinder his performance in an upcoming triathlon event.

Table 1.1.12. Sport and activity level

"Sport and activity level" Participant/focus group	Quote
Focus group 1 (Males)	2:54-56. "Well I suppose it does depend on training as well, I mean like if I'm... back into running and I'm running say, what 5, 10K a day I start to substitute then just eating calories, and getting anything I can just to get some energy...." 1:4-6. "I like eating healthy food at the moment because I've got a triathlon coming up, a sporting event, and I have to be in shape for it, and I can't be eating fat because it's not gona hinder me ...."

Religion (Table 1.1.13)

Religion was an issue raised by one participant who said that she was selective about what and where she on account of her religion. Although religion affected only one participant, the small number of participants suggests that religion may affect a larger number of people.

Table 1.1.13. Religion

"Religion" Participant/focus group	Quote
Focus group 2 (Females)	17:493-498. "I don't eat certain foods for religious reason's so I wouldn't feel comf – like I've stopped eating from chip shops because I've noticed that they heat the pork sausages up in the same pan that they heat the chips up with. So I only eat chips from places which I know don't mix the meat with the actual chips...."

1.1.10. Discussion of lifestyle factors

With regard to 'independence, improvisation, simplicity and convenience', in concordance with previous literature (e.g. Croll et al., 2001) the present study found that youths perceived healthy eating as time-consuming and effortful. When combined with the perceived need of students for easy, simple and convenient foods, this may have provided a psychological barrier to eating a healthy diet. This theme was closely inter-linked to an additional barrier to healthy eating, a 'conflict of financial priorities'. Income is one of the major determinants of health (Whiting et al., 2012) and healthy foods were perceived as more expensive. Students should be made aware of the importance of consuming a healthy diet.

Social marketing campaigns may help overcome barriers by targeting them in environments such as the campus dining area. For example, to target 'sensory preferences and aversions' meals could be made more attractive by including sauces with dishes high in fruits, vegetables and fish. Although there are few studies that have employed social marketing campaigns, one study by Buscher et al. (2001) assessed the effectiveness of a product and place intervention (by increasing availability and accessibility of fruits, vegetables, pretzels, and yogurt in the cafeteria) in combination with promotional point-of-purchase (POP) messages. The results showed an increase in the purchase of yogurt, pretzels, and fruit. The use of promotional messages that highlighted the positive qualities of products as opposed to the HBMs method of creating fear may have been behind the success of the intervention. Other features have been shown to be important for increasing healthy eating including attractive packaging (Belaski, 2001).

Some participants reported a negative impact of 'occupational stereotype' on dietary habits and this was partly due to unhealthy foods being more readily available at university, a finding supported by previous research (Croll et al., 2001). Similar to 'occupational stereotype', an individuals' life role, determined by an age cohort or generation, has been found to influence food choice (Furst et al., 1996). The current 'occupational stereotype' of students may have developed from present views on the student lifestyle, and overcoming the current unhealthy image is necessary in order to change poor dietary habits in student populations. Research is required to examine

specific health messages that would be most persuasive and successful in student populations so that an intervention can be designed that is tailored specifically for this population.

During the present study it was found that there was a perceived importance of healthy dietary habits and high energy intake during sport in males but not females, which has been reported elsewhere (Croll et al., 2001). Similar to other research (Croll et al., 2001) the present study found that females were more concerned about how the diet affected weight and appearance. These differences may be reflective of gender differences in food ideals and eating styles, and it is important that dietary campaigns take into account gender differences.

1.1.11. Socio-cultural factors

There were 5 socio-cultural factors, including 'dietary guidelines and other media', 'family and peers', 'traditions', 'food structure, context and environment' and 'ethics'.

Dietary guidelines and other media (Table 1.1.14.)

In some cases knowledge of dietary guidelines reportedly led to an attempt to increase consumption of healthy foods. People talked about dietary guidelines concerning fruit, vegetables, fish, salt, sugar and fat and although some participants' accounts were uninformed, most were aware of the '5-a-day' target set by the UK government. Some reported that they actively tried to reach this target, however, some did not reach it because of a perceived lack of knowledge and skills. One participant was unaware of basic dietary principles such as the standard daily calorie allowance. In contrast others expressed a high level of knowledge. There was some talk of scepticism and confusion attributed to scientists, media and dietary guidelines: "Yeh they're doing that ermm, dairy three a day now aren't they. Where you're supposed to have cheese or, milk or something like that. Or yoghurt, I think I saw it on TV...It's probably a marketing ploy isn't it, make you spend more money." (Group 2, 4:95-98); "you get all this crap in the media, 5 a day and all stuff like that. But I think a lot of that's – they pick five a day because it's a round number, rather than anything else.... I agree with the idea that people should be eating more healthy stuff.... but ermm, I think that fact that they picked five a day, I think it's just really 'coz it's a round number and it's something that people can always achieve." (Int. 6, 3:76-78). Participants in focus group 2 talked about guidelines concerning calorie, salt, sugar and fat allowances, claiming that although they were aware that imbalances of these nutrients can cause health problems, there was too much information to draw conclusions about a healthy or unhealthy diet. Furthermore, one participant remarked there are individual differences in requirements such that the guidelines did not account for and this was a further source of confusion.

Table 1.1.14.

"Dietary guidelines and other media" Participant/focus group	Quote
Interviewee 1	1:24-25. "I suppose it's like, everything you hear nowadays isn't it. Everything you hear is to do with like what foods are healthy and stuff."
Interviewee 2	3: 70; 85. "I try to eat at least one piece of fruit a day...."; "the fruit thing [eating it] is just 'coz it's healthy".
Interviewee 3	2:54. [frequency of consumption of fruit and veg] "probably four of five times a day? Ermm, yeh I'd say I get my five-a-day." 9:287-289; 291-292. "I didn't really feel that I was educated that well to some – what you sort of need in your diet really to be honest at school or anything. Like my Mum was always very like health conscious so I was brought up that way.... but like if I hadn't of been I don't think I'd have much of a knowledge at all to be honest [laughs] based on like education so....."
Interviewee 4	3.74-76. "It's just what they tell you to do, it's meant to be good for you it – I don't – I like the taste of fruit, I don't enjoy vegetables very much so I always make sure it's fruit and when you're trying to eat healthily, fruit and vegetables are what you're supposed to eat so I do try." 1:9-10; 3:71-72. "(I'm) trying the get the recommended amount of carbohydrates, proteins, fruit and vegetables, I drink a lot of water just to keep my weight stable...."
Interviewee 6	3:76-78; 83-86. "I mean obviously you get all this crap in the media, 5 a day and all stuff like that. But I think a lot of that's – they pick five a day because it's a round number, rather than anything else.... I agree with the idea that people should be eating more healthy stuff.... but ermm, I think that fact that they picked five a day, I think it's just really 'coz it's a round number and it's something that people can always achieve."
Interviewee 7	1:11; 3:69; 71. "I try and get like 5 fruit and veg and stuff..." [about fruit and vegetable consumption] "a couple of times a day. It's not always 5 but, usually around that.... just 'coz I like them and they're healthy and stuff as well."

Focus group 1 (Males)	3/4:87-98. "I think as well about what they tell you to eat as well [5-a-day]. I mean, like out there there's all these different studies and everything about...." "I get it quite often. It is quite easy if you have a banana and a piece of fruit as a snack, that's one of your five per day. And in a meal, you can easily get three pieces." 4:95-98. ": Yeh they're doing that erm, dairy three a day now aren't they. Where you're supposed to have cheese or, milk or something like that. Or yoghurt, I think I saw it on TV...It's probably a marketing ploy isn't it, make you spend more money."
Focus group 2 (Females)	18:504-505; 510; 512; 514-515. "I'd rather know exactly what's in my food, and like the amounts like you were saying about salt and things – I'd like to know how much salt is in my food....because too much salt is bad for you...." "Because they [salt, sugar etc] can cause problems with your health. And there's kind of like, so much warning these days and stuff like that, that it's kind of drilled into your head to have a look [at labels] really." 11:309-316; 19:547-551. "I do look at like, salt intake and stuff like that but it doesn't bother me that much. I'll only look at it if that week I say to myself like, 'oh, I'm gona be good this week.' But it really doesn't bother me. Like some of the stuff [on the labels] I really don't understand..." "I know, I don't' understand it. I don't even know how many calories you're supposed to have in a day I don't think. So if I see like 600 [kcal] I'm like 'oh, I think I'm allowed that yeh [laughs] I think I'm allowed it!" "There's too many things to juggle aren't there? You've got like, 6% of your salt intake – agreement] but there's like, 10% of your sugar or.....And then as well what you think is going to be healthy…it's not. Like, you might as well just have a burger and chips." 19:536-540. "I don't believe that like, calories are the main thing. I think it's what you eat for your body 'coz they always tell you oh, you need to eat 2000kcal or else it's bad for you but some people have a higher metabolism so they need to eat more and some people have got slower ones so they need to eat less, and then some people have got health problems so they need to eat more of something or less of something."

Family and peers (Table 1.1.15)

Familial influences on eating habits were perceived to extend from childhood to adulthood and varied widely from being positive to negative. For example, an overweight participant in focus group 2 talked about over-eating and claimed that the family contributed to this in childhood by making her eat all of her meals. Another participant discussed her poor dietary habits, suggesting they were the result of a lack of healthy foods provided by her parents during childhood. A more positive familial influence was mentioned by a participant in focus group 2 whose family reduced the accessibility of 'junk food'. Others talked of how a health orientated family could have a positive influence on eating habits, for example, interviewee 2 commented on how she consumed a lot of vegetables because her parents prepared her meals for her. This evidence demonstrates the magnitude of familial influence on food choice, showing how family can have both a positive and negative influence on dietary habits. A participant in focus group 2 also talked of familial influences on 'food structure, context and environment': "I duno... I've never - maybe it's the way I've been brought up. Like if you have a hot meal, you have like a pudding or cake and ice-cream. I guess fruit salad could have been one of them but my mum bakes so its gona be a cake. But if you had like a small lunch then you'd have – then you'd have a chocolate bar or yoghurt." (Group 2, 7:195-198). The influence of 'family and peers' is inter-linked with 'food structure, context and environment'.

The influence of peers was considered negative, particularly when individuals lived away from home. One participant described that when spending time with her housemates she consumed foods that she would not normally consume: "like all us girls will just be in the house I'm like, oh who's cooking what? And then everyone will be like, I'm cooking chilli con carnie, and you're like, oh go on then I'll have some as well. So it's kind of like a bad situation, whereas if you're on your own you'd probably be like, oh maybe I'll try and cook something decent for once..." (Int. 1, 3:76-80). Another participant mentioned how living with students had increased her food intake and negatively affected her dietary habits by increasing the consumption of foods she would not normally eat: "when you're round your friends as well I don't know what it is but you eat more. And I found that when I came to uni – my family we never used to eat out. It's only recently because the parties have got boring that we've started going out for food for people's birthdays. So like, when I came to uni it was

like, 'ok shall we go out for food?' 'shall we go out for lunch?' 'shall we go out for dinner?' 'shall we go out for breakfast?'" (Focus group 2, 16:464-468).

Table 1.1.15.

"Family and peers" Participant/focus group	Quote
Interviewee 1	3:77-80. "And then everyone will be like, I'm cooking chilli con carnie, and you're like, oh go on then I'll have some as well. So it's kind of like a bad situation, whereas if your on your own you'd probably be like, oh maybe I'll try and cook something decent for once."
Interviewee 2	3: 85-86. "[i eat veg] coz – well with me it's – my parents make my food for me so....it's what's there. That's why I eat it, 'coz it's there basically."
Interviewee 3	9:288-289. "Like my Mum was always very like health conscious so I was brought up that way."
Interviewee 5	2: 36-37; 41. "err school meals when I was younger ermm....the rice was really, always really cold and disgusting and the custard was always cold, I remember just..... it was separate but it was all cold and really bad tasting and it put me off forever."
Interviewee 7	2:42-43. [about being a vegetarian] "everyone in my house like eats a lot of red meat and they all – they were all just like, what are you doing? And they were all like, I don't know, they didn't really help so."
Focus group 2 (Females)	14:384-391. [about over-eating] "I reckon that's the parents I do. 'Coz they're like, sit there and don't move..." 16:449-457. "I eat better when I'm living with my Mum because like she does it all for me..." "I duno when I'm at home if I'm proper pigging out, you can see that them like 'oh, is that another biscuit' and it puts you off [agreement] I'm like, no I'm putting it back now." 7:195-198. "I duno... I've never - maybe it's the way I've been brought up. Like if you have a hot meal, you have like a pudding or cake and ice-cream. I guess fruit salad could have been one of them but my mum bakes so It's gona be a cake. But if you had like a small lunch then you'd have – then you'd have a chocolate bar or a yoghurt." 16:464-468; 17:473-475; 25:720-722. [about being at uni] "It's like if someone eats it makes you 'wana eat....'coz if your round people"...."Yeh and if you're making a salad aswell and they're making like, some hefty solid meal then you're like, 'can I have some of

	that instead?' 3:66-67; 5:126-127; 131; 16:446-448. "I think it's like; it's just a thing you do though init. Sit at the telly and its like, oh let's go get some chocolate." "I think it's from an early age I do. I think my mum didn't – she even admitted to me that she didn't feed me enough good things [laughs] she used to just me there and chuck whatever in front of me." 5:126-127. "I think it's from an early age I do. I think my mum didn't – she even admitted to me that she didn't feed me enough good things [laughs] she used to just me there and chuck whatever in front of me." I was gona say as well ermm, when your round your friends as well I don't know what it is but you eat more. And I found that when I came to uni – my family we never used to eat out. It's only recently because the parties have gotton boring that we've started going out for food for people's birthdays. So like, when I came to uni it was like, 'ok shall we go out for food?' 'shall we go out for lunch?' 'shall we go out for dinner?' 'shall we go out for breakfast?"

Traditions (Table 1.1.16.)

Participants talked of how British traditions influenced their eating habits not only by determining the actual contents of meals but also by determining the times of day that food is consumed. Interviewee 2 explained how she ate cereals and toast in the mornings, sandwiches and fruit for lunch and a main meal at dinner time. This suggests that social cues and traditions influence food choice, closely interlinked with 'food structure, context and environment'. Another participant categorized foods in terms of cultural origin and talked of how he sometimes ate Mexican, Italian or Spanish dishes. Although this evidence demonstrates the influences of cultural traditions on food choice such that certain foods are eaten together depending on how they have been categorized, only a minority of participants talked of preparing foods in this way. The majority of participants had financial constraints and wanted simple and easy foods that did not fall into any particular category, demonstrating that in this student population, 'independence, improvisation, simplicity and convenience' tended to over-ride 'traditions'.

Table 1.1.16.

"Traditions" Participant/focus group	Quote
Interviewee 2	2:47-48; 52-53; 3:72-73; 88. "for like breakfast you eat cereals and toast and things, but lunch is sandwiches and things. But for my evening meal then I'll have quite a big meal with my family"; "....with my main meal I'll eat vegetables. Like ermm, potatoes and carrots and peas and stuff. But Sunday then with the Sunday dinner, that's veg overload."
Interviewee 6	1:13-14; 30-31; 2:41; 46-47; 57-58; 3:93-94. "I pretty much eat whatever interests me at the time ermm, I eat a lot of Mexican food, a lot of Spanish food, a fair bit of Italian and French as well.... I wouldn't say there's necessarily a.....particular way of doing it I just think, Oooh I'd quite like this today.... if I feel like it, then I'll have it.... usually I just pick stuff that.....stuff that I quite enjoy. I mean although I don't dislike foods I prefer some over others.... with most food like it just depends on my mood."
Focus group 1 (Males)	7:207-209. "she loves to make pies and stuff so she'll make an apple pie. Or a crumble (possibly) it's always traditionally stuff, so....nasty stuff I guess [laughs] lot's of sugar. It tastes nice!"
Focus group 2 (Females)	7:195-198. "I duno... I've never - maybe it's the way I've been brought up. Like if you have a hot meal, you have like a pudding or cake and ice-cream. I guess fruit salad could have been one of them but my mum bakes so It's gona be a cake. But if you had like a small lunch then you'd have – then you'd have a chocolate bar or a yoghurt." 20:567-573. [about Italian health and lifestyle] "...they don't snack in places like that either....they've got like a totally different culture. Like we are - we snack don't we...It's 'coz we've got vending machines, like everywhere...Yeh...it's so easy.....It's encouraging isn't it. When you're walking past and your hungry it's just like, 'oh just pick that up on the way.'"

Food structure, context and environment (Table 1.1.17.)

This theme illustrated how food choice is influenced by time of day, different contexts and different environments. An example of a food structure would be eating breakfast, lunch and dinner at regular pre-determined intervals throughout the day. Although most participants food structures' varied slightly, a typical food structure was described by one participant at breakfast lunch and dinner: "it's just....your just used to it, it's just like a set structure. It just – yeh it's just one of those set structures that you're used to really"; "time of day obviously, plays a part in it..." (Int. 2, 2: 59-60; 3:67). This participant had a rigid food structure, however, in comparison there were participants who ate when they felt hungry therefore relying on internal cues as opposed to external cues. Context was perceived to influence food choice differentially depending on whether a person is with friends, family or a partner. Level of workload (i.e. context) was also believed to have an influence of food choice. A participant in focus group 1 remarked how he ate foods such as biscuits and coffee when writing essays and although the common consensus was that more was eaten during periods of high workload another participant said he did not snack if he was busy and had a lot of work on. Environment can have a varying effect on food choice – eating habits at home were repeatedly different to eating habits at a restaurant, as described by interviewee 7, who stated that dietary habits were less healthful outside of the home.

Table 1.1.17.

"Food structure, context and environment" Participant/focus group	Quote
Interviewee 2	2: 59-60; 3:67. [about personal eating habits] "it's just....your just used to it, it's just like a set structure. It just – yeh it's just one of those set structures that you're used to really"; [about factors guiding food choice] "well time of day obviously, like you said, plays a part in it..."
Interviewee 7	2:53-55. [about lunch and dinner] "depends where I am as well, like if I'm out I'll get ermm....like a pasty or something, but then I'll make sure I have ermm, like a cooked dinner later on.....ermm.....I don't know I just try and eat like regularly, depending on where I am."
Focus group 1 (Males)	8:235-245. "if I'm writing essays it's terrible – I'll just sit there eating..." "I'm terrible. I'll go through so many cups of coffee and biscuits like, anything like that..." "I find I snack a lot more if I'm...like if I'm busy I won't snack. If I'm doing stuff I won't snack at all but if I'm sitting around doing nothing I just eat out of boredom sometimes" 7:200-201. "I buy those little pots from Tesco's that you put in the microwave for 30 seconds. I always have pudding." 8:227-234. "I'll try and eat a good, big meal, but ermm, I'll always have a pudding at the end of it..... I don't think it's a problem [weight gain] so much having a pudding. I think it's more, this isn't picking at anyone at all, but you (tend to not have pudding) but then during the day if your snacking, your kind of – you might as well just have a big proper dinner, you know have a main course and a pudding and then cut out the snacks or rubbish during the day rather than just say cut out the pudding but still snacking throughout the day. It's this whole eating in moderation culture that we've built up that people just can't quite grasp the hang of. So, I don't know, I tend not to snack during the day. But yeh, I'll have a bigger meal in the evening. And that includes a pudding."
Focus group 2 (Females)	13:353-357. "I don't like buying ready meals and stuff because I feel like, like my Mum would really shake

	her head at me. Even though I love ermm – some of the lasagnas' that are readymade are like so nice....I've made lasagnas before and it doesn't taste as nice as those ones. But it's just the fact that in my mind like with my culture, buying things like that is a bit wrong...like buying what you can easily make, which is gona be cheaper anyway." 3:67-70. "I think its like; it's just a thing you do though init. Sit at the telly and its like, oh let's go get some chocolate....It's like you wouldn't sit there and go, oh let's go and have a salad [laughs] let's go and eat some carrots."

Ethics (Table 1.1.18.)

'Ethics' refers to: the methods by which animals and fish are farmed and killed: vegetarianism; food production methods; and how food production and consumption can affect the environment. One participant described her choice to become a vegetarian in the terms of animal welfare and beneficial effects of vegetarianism on the environment: "I just didn't really agree with killing animals, like I wouldn't do it myself and ermm, also like it's supposed to be healthier and better for the environment as well. I think it's like that stuff with like methane and with the cows and I don't know it's supposed to reduce like global warming..." (Int. 7, 2:31-34). Another interviewee considered herself to be vegetarian as she only ate responsibly farmed meat, which owing to the financial constraints of being a student she could barely afford. A participant in the male focus group talked about the how he 'preferred to eat ethical food' but how ethical foods are generally more expensive and 'if push came to shove, [he] wouldn't lose sleep over it...'. Hence a 'conflict of financial priorities' negated the importance of ethics. Although 'ethics' was mentioned in several accounts, it was not a prevailing issue in this student population presumably because of the price of organic foods and because not all participants were aware of the issues.

Table 1.1.18.

"Ethics" Participant/focus group	Quote
Interviewee 3	3:74-76; 4:124-125. "I only eat free range meat so I don't eat it often because it's too expensive.... fish is obviously a lot more responsibly farmed, if it is farmed ermm than factory farmed animals, so I would eat fish."
Interviewee 7	2:31-32. [about vegetarianism] "I was before for a while yeh, 'coz I just – I just didn't really agree with killing animals, like I wouldn't do it myself and ermm, also like it's supposed to be healthier and better for the environment as well."
Focus group 1 (Males)	9:273-275; 287-291. "I prefer to eat ethical food, but then I'm not bothered. If push came to shove, I wouldn't lose any sleep over it..." " you've got to strike a balance between ethical and cheap....cheap usually wins." "...ethical is generally more expensive" 9:273-275. "I try and be quite ethical though, like I don't – I try to buy as much British grown food as possible rather than food that's come from abroad and in season food as well rather than stuff that's come out of a green house when it shouldn't be grown at that time of year."

1.1.12. Discussion of socio-cultural factors

With regard to 'dietary guidelines and other media', Furst et al. (1996) and Sobal and Bisogni (2009) found food choices were influenced by 'ideals'. Similarly the present study found that participants talked of eating "the right way", i.e. eating healthy foods by following 'dietary guidelines and other media'. The ideals generated in Furst et al.'s and Sobal and Bisogni's model (described previously) were probably determined by dietary guidelines and other media, as well as social influences such as family. The present findings provide a more clear description of ideals and how they may arise than that described in previous models. Overlapping with a 'conflict of financial priorities', it was sometimes the case that dietary guidelines could not be met owing to financial restraints – a factor mediating the 'knowledge-practise relationship'. Despite knowledge of dietary guidelines, another factor that may mediate the 'knowledge practise relationship' and contribute to less healthy eating is a lack of urgency among adolescents concerning future health, a phenomenon that has been reported elsewhere (Story and Resnick, 1986). Despite efforts by some participants to adhere to dietary guidelines and eat a healthy diet, similar to the present findings a qualitative study by Whiting et al. (2010) highlighted problems associated with sources of information. Whiting et al. found that sometimes the media influenced healthy eating in a negative way: "I think we get a lot of information from magazines and the ads on TV and everything and we are not quite sure what is right." As with the present study, the ability to access information was viewed negatively in that it was suggested by participants that there were not enough sources: "I can't afford to pay for some sort of a specialist. Then I've just fallen back and I'm still not getting the help that I need and I don't know where to get it from."

In line with findings from previous research (Furst et al., 1996; Sobal and Bisogni, 2009) which suggested that social factors are the system of relationships of individuals that may constrain or facilitate food choice decisions, the present study found that social influences such as 'family and peers' affected food choice of this student population throughout their lifespan to date. Eating generally occurs in a social setting which involves the negotiation and management of many peoples' interests (Sobal, 2000), and in these instances food choices are made by groups and not just on an individual level. The present finding of a positive influence from the family and

negative influence from peers has been reported elsewhere: Croll et al. (2001) found that youths associated healthy eating with the family and unhealthy eating with peers. In addition, Sobal and Bisogni (2009) suggested that some relationships provide opportunities for making healthy food choices, such as supportive families (Bove, 2006).

In this instance the influence of family and peers overlapped with 'food structure, context and environment'. Some participants pointed out the strong influence of the family during childhood, and this is important since the family plays a role in determining early preferences and eating habits that persist in later life (Birch 1999). In contrast, peers have more of an effect on food choices during adolescence and early adulthood (Croll et al., 2001). Although healthy eating is critical during the developmental period, many adolescents and young adults may eat less healthily to conform to social norms (Neumark-Stainzer, Story, Perry and Casey, 1999). The influence of peers depends largely on exposure and more exposure will result in a heavier influence that may have long-term effect on dietary habits - in support of this, research has demonstrated that several exposures to novel foods are required in order to develop a preference (Birch 1999). This evidence demonstrates the importance of tailoring messages so that they target groups of youngsters and students as opposed to targeting these populations on an individual level.

The influence of 'traditions' has been noted elsewhere (e.g. Furst et al., 1996; Sobal and Bisogni, 2009). Previous research has suggested that similar to 'traditions', cultural 'ideals' refer to the learned system of rules, maps, and plans shared by a particular group (Spradley, 1987), which provide the standards used as starting points to assess and judge food behaviours as "right," "normal," "inappropriate," or "unacceptable." For example, similar to the findings in the present study, ethnicity is one of the most important factors that are reported to influence food choice (Falk et al., 1996; Devine et al., 1999). 'Traditions' overlaps with 'family and peers' since the influence of the family and peers is determined by wider social and cultural norms.

With regard to 'food structure, context and environment', the present finding that 'contexts' can affect food choice was supported by Sobal and Bisogni (2009), who referred to contexts as broad environments that affect food choices, including social as well as physical environments. For example, social institutions produce economic

conditions, government policies, and mass media; all of which influence food choices. Physical conditions include climate, physical structures, and other objects that affect food choices (e.g. infrastructure, food storage and display, and eating utensils). The present findings suggested that classification systems are employed in order to simplify the food choice process according to categories that are developed based on the characteristics such as the food structure, the contexts, or personal experiences of the individual (for example 'sensory preferences and aversions (Furst et al., 1996; Falk et al, 1996; Sobal and Bisogni, 2009). Given the plethora of factors that may be involved making a food choice, a classification system is necessary to determine what is edible, what to consume where, when, and with whom. Sobal and Bisogni (2009) suggested that classification systems ranged in scope from those that are culturally and socially recognized to those that are more narrowly personally operational, vary between individuals, and may be applied situationally (Falk et al., 2001; Blake et al., 2007; Furst et al., 2000). Specific foods or eating situations may be bound together, presenting varying characteristics that can be utilised for classifying foods or situations (Lancaster, 1991). For example, classification may categorize oranges in terms of fruit, snack, healthy food, source of fiber, sweet food. These findings from Furst et al. (1996) and Sobal and Bisogni (2009) are similar to the present finding of 'food structure, context and environment'. Health promoters should consider that there are individual differences in the impact of 'food structure, context and environment' - whilst some people relied on external cues such as time of day, context and environment, others relied on internal cues to guide food choice. There may be individual differences in the extent to which people are affected by external cues. Although Birch (1999) suggested that genetic influences may predispose humans to eating a healthy well-balanced diet, whether or not these habits are adopted depends on environmental factors such as child-feeding practises and food availability. Given the widespread availability of high-fat and –sugar foods in Westernized countries this inevitably creates a problem and may increase obesity as well as other diet-related health problems.

With regard to ethics, other research has reported the influence of animal rights as well as factors such as health, mood, price/convenience and religion on food choice in an adolescent population (Share and Stewart-Knox, 2012).

1.1.13. General discussion:

Factors that influenced food choice in this student population (in order of the weighting/strength of influence on food choice, determined by the frequency and depth of description) included physiological factors such as 'sensory preferences and aversions', 'satisfying physiological demands' and 'weight control'; cognitive factors such as 'well-being', 'knowledge and skills', 'desire for variety', 'healthiness evaluations' and 'preference and health conflict'; lifestyle factors such as 'independence, improvisation, simplicity and convenience', 'conflict of financial priorities', 'occupational stereotype', 'sport', and 'religion'; and socio-cultural factors such as 'dietary guidelines and other media', 'family and peers', 'traditions', 'food structure, context and environment' and 'ethics'. These interacting themes influenced the 'knowledge-practise relationship' and healthy eating.

Health promoters who aim to improve healthy eating, at least in students, should take into account the multifaceted nature of influences on food choice as illustrated in *Figure 1.1.3.* Similar to the present study, Furst et al. (1996) and Sobal and Bisogni (2009; see *Figure 1.1.2.*) suggested that influences on food choice decisions include a wide range of physical, psychological, and social factors that are inter-related and affect each other during the process of making decisions about what, when, where, with whom and how much to eat. Concentrating on a particular factor without considering the potential effect of the others may not produce desired results. The present study differed from previous studies in that it provided a clear illustration of individual themes that can be assessed before creating a dietary intervention. The possibility that the present model (*Figure 1.1.3.*) applies to other populations requires further research. Similar to the present study, Furst et al. (1996) and Sobal and Bisogni (2009) emphasized the importance of considering the viewpoints of the people whom an intervention intends to serve. Researchers can determine the extent to which the present model affects this student population and design an intervention based around the results.

By assessing the extent to which each factor affects a specific person or population, it may be possible to predict factors that affect food choice. For example, a conflict of finanacial priorities may be less prevalent in a non-student population but more prevalent in a population with low income. By anticipating specific factors that affect

a population (e.g. finances) it is possible to design interventions that may overcome barriers to healthy eating (e.g. cheaper on campus meals for students). However, caution must be exercised when generalising the findings to other populations at this early stage. The applicability of this model to other populations requires further research.

In the present study, participants perceived healthy eating as consuming more fruit, vegetables, fish and whole grains, and less sugary, fatty and fast foods. Healthy eating was also described in terms of cognitive and physiological benefits, such as enhancing cognitive performance, improving sports and preventing illness - this finding is consistent with previous qualitative studies with adolescents (Croll et al., 2001) and adults (Martinez-Gonzalez, Lopez-Azpiazu, Kearney, Kearney, Gibney, and Martinez, 1998; Povey, Conner, Sparks, James and Shepherd, 1998). Although the majority of people had knowledge of what was healthy, not all participants adhered to a healthy lifestyle, suggesting that there are barriers that prevent healthy dietary habits.

All of the themes in the present study either promoted or inhibited the 'knowledge-practise relationship', and the finding that there was inconsistency in this relationship has been reported elsewhere in adolescent samples (Croll, Neumark-Sztainer and Story, 2001; Adams, 1997). No combination of factors affected two people in the same way. Some factors affected an individual more or less, however, the fact that certain themes were mentioned repeatedly suggests they play a common role in the food choice process and healthy eating. Although not mentioned by everyone, there were themes that prevailed in this population of students for example the present population was highly affected by 'occupational stereotype', a 'conflict of financial priorities' and 'independence, improvisation, simplicity and convenience'. Other populations may be more or less affected by these themes. It could be hypothesized that with the exception of physiological factors, there will be a different combination of prevailing factors in other populations. For example an older and more financially secure population may be less affected by a 'conflict of financial priorities' but more affected by lifestyle related themes such as 'occupational stereotype'.

During the present study some participants (particularly females) voiced concerns about a high intake of foods high in fat (e.g. fast foods) and a low intake of healthy foods (fruits, vegetables and dairy). There were also erratic eating behaviours in the

present population and collectively these phenomena have been reported elsewhere (Neumark-Sztainer, Story, Resnick and Blum, 1998; Bull, 1992; Heald, 1992). Concerns about the diet and altered eating patterns may be due to some of the present themes such as 'weight control', 'well-being', 'desire for variety', 'sport', 'dietary guidelines and other media', 'food structure, context and environment.' This area requires further research.

In contrast to participants who voiced concerns about a high intake of fat and a low intake of healthy foods, other participants were less concerned about diet. Consistent with the differences in attitudes found in the present study Horacek and Betts (1998) reported four clusters of influences on students' dietary habits including internal (hunger and taste) and external cues (friends and media), budget and health. This suggests that whilst some people are influenced by cues, others are differentially influenced by money and/or health. Previous studies have suggested that some adolescents show little concern for healthy eating (Croll et al., 2001). These differences may reflect age as the views of older participants may be more developed than younger participants who may find it difficult to maintain a healthy lifestyle due to recent independence. The data imply that future public health campaigns should include healthy foods that are accessible and easy to prepare whilst fitting in with the student lifestyle. Messages should focus not only on the long-term benefits of healthy eating but also on the short term-benefits, such as those related to age and body-shape, which may be more persuasive to younger samples.

House, Su, and Levy-Milne (2006) investigated in university students the perceived benefits associated with eating a healthy diet. It was found that healthy eating was perceived as providing a healthy appearance (in terms of weight, skin, body); providing positive feelings, i.e. well-being and preventing disease. Although the study by House et al. (2006) was conducted in a focus group of 15 students (9 of whom were studying to become nutritionists), there were similarities with the present study involving students as well as studies conducted in general adults (Steptoe, Pollard, & Wardle, 1995). Astudy by Horacek and Betts (1998) investigated influences on food choice in a population of students and similarly highlighted the importance taste, time sufficiency, convenience and budget. Elsewhere in adult populations research has highlighted the importance of taste, cost, nutrition, convenience, pleasure, and weight

control on food selection, respectively, (Glanz, Basil, Maibach, Goldberg, & Snyder 1998). The influences highlighted by Horacek and Betts (1998) may well act as barriers to healthful eating in a student population, and this is similar to the present study e.g. 'sensory preferences and aversions', 'need for improvisation, simplicity and convenience' and 'conflict of financial priorities'. Elsewhere research has found other factors that are linked to poor dietary habits in university students, including higher perceived stress (Cartwright, Wardle, Steggles, Simon, Croker, & Jarvis, 2003) and low self-esteem (Huntsinger & Luecken, 2004).

A qualitative study by Whiting et al., (2010) highlighted 5 emergent themes that were barriers to healthy eating. Some of the barriers from Whiting et al. (2010) were described as individual, for example knowledge (food preparation skills, not sure which foods are needed) and health (mental health issues, physical limitations, allergies). Other barriers from Whiting et al. were income (higher cost of healthful foods); accessibility (need to travel to store, nearness of fast foods, lack of storage/cooking facilities for foods); preferences (eating is social, others influence food choices and fear of unsafe or allergenic foods, which was affected by family. Similar to the present findings, it was suggested by participants that a lack of skills and knowledge, for example in cooking or reading labels, and a lack of nutrition information resources, created barriers to healthy eating. As with the present study, participants in Whiting et al. (2010) were not sure which information was correct, indicating that there was no verified and specific source for people to consult for dietary information. The themes for barriers to healthful eating that emerged from focus groups—preferences, knowledge, accessibility, health concerns, and income—are consistent with the present findings.

1.1.14. Implications for research and practice

Each factor from the present study had an influence on food choice and healthy eating in this student population. The themes were perceived to have either a positive or negative influence on the decision to eat healthily, suggesting that researchers should examine the extent to which each theme affects different populations - this will enable health practitioners to tailor interventions to specific groups. For example, although this group was particularly affected by a 'conflict of financial priorities' and

'occupational stereotype', other groups such as the retired middle-class, may be less affected by these themes. Although the factors affecting food choice in the present study closely reflect a student population and therefore cannot be generalized, the applicability of this model to other populations requires further research. Health messages should be tailored specifically depending on the population, for example, the present study suggests that when targeting this student sample health messages such as 'enhances sports performance'; 'helps maintain a healthy weight'; 'helps maintain a healthy appearance' may be influential. Further research is required to examine the effect of different health messages in differing populations.

It has been found that youths and young adults are particularly vulnerable to poor dietary habits, making them a high-risk group for nutrient deficiencies. Public health campaigns are more likely to effectively reach youths by involving them in the development and delivery of nutrition messages. Healthy eating information is available widely but there is no nationwide campaign that aims to change the dietary habits of youths in a way that has been well-received. Future research should focus on factors that influence the 'knowledge-practise relationship' such as the factors mentioned in the present study.

Overall, a strength of this study is the quality and detail of the information that was gathered using qualitative interviews and focus group methodology. We decided to use both methods for data triangulation. Focus group methodology has the benefit of targeting specific groups to gain an in-depth understanding of issues surrounding eating behaviour. Furthermore, they provided a social setting that allowed discussion between members of the group.

The purpose of including two researchers in the analysis was for investigator triangulation, a form of validity check that aims to eliminate biases created from producing one account of the data. It also aims verify that the analyses have been conducted systematically (Smith, 1995), i.e. that the analysis has been conducted using a consistent procedure. In an attempt to maintain the validity, data collection and analysis was carefully planned and executed carefully. A problem with qualitative research is that it is difficult to recreate the subtleties that occur during data collection, for example nuances and atmosphere – comments must be taken in context.

Nevertheless the present study produced rich and detailed data that helped create a description of factors affecting food choice and healthy eating.

Qualitative research suggests that the individual constructs a reality during sense-making within a social, historical and cultural context (Gubaand Lincoln, 1989; Gergen, 1985; Blumer, 1969) and therefore reality is a subjective phenomenon. This results in multiple versions of reality that depend upon experience and interpretation. If this is true then it must remembered that there is a subjective element to food choice – it is possible that the factors that affect food choice during the present study are applicable only to this population. The extent to which the factors highlighted during the present study are applicable to other populations requires further research.

In summary, the present study identified 4 super-ordinate factors (and 18 underlying themes) that are involved in the food choice process. The findings framework of food choice and healthy eating that can be targeted by health professionals during interventions aimed at producing dietary changes. Different populations should be assessed against the framework to determine the extent to which they are affected by each theme, after which individual themes can be isolated and addressed for change.

1.2. Chapter 2: Factors effecting supplement use

1.2.1 Abstract

Objective: To gain an in-depth understanding of the factors that influence supplement use, in particular vitamin, mineral, and omega-3 fatty acid supplements. The study was designed to aid future nutrition education programmes and health promotion activities.

Design: Data for this qualitative study were obtained using 7 semi-structured interviews and 2 focus groups.

Participants: A total of 15 Swansea University undergraduates participated, aged 18-23. There were nine females and six males. There were two focus groups, one of females and one of males, each consisting of four participants. Individual interviews were conducted with the remaining seven participants. The focus groups were recruited opportunistically. The remaining participants were recruited using the online Experiment Management System of Swansea University and were granted credits for participation.

Analysis: Interviews and focus groups were recorded and transcribed. Transcriptions were subjected to interpretive phenomenological analysis (IPA) by the primary researcher prior to independent analysis by another individual. After analyses the primary and independent researcher mutually agreed on a list of themes and super-ordinate themes.

Results: There were a total of 12 themes that influenced supplement use. These factors clustered together to produce 3 super-ordinate factors: 'Personal factors'; 'Barriers; and 'Socio-cultural factors'.

Conclusions and implications: Each theme is actively involved in supplement use. Campaigns aimed at improving nutrient intake should address each factor individually when creating interventions. Different factors will have differential effects depending upon the target population. Although the present findings cannot be generalised beyond the present student population, the applicability of this model to other populations requires further research.

1.2.2. Introduction

The potential importance of supplements

Chapter 1 reviewed the literature that highlighted the importance of promoting healthy eating in adolescent and youth samples. Although a healthy diet has been implicated in both physiological and psychological development and function, young populations face barriers that may prevent them from consuming a healthy diet, for example, it has been found that youths and young adults in higher education (HE) engage in poor lifestyle behaviours and display spontaneous eating patterns such as an increased intake of fast foods and foods that are high in fat and sugars with a comparable low intake of fruit and vegetables (Steptoe and Wardle, 2001; Steptoe et al., 2002; Heald, 1992; Bull, 1992). The consumption of foods away from home (e.g. at university) has been associated with increased fat/total energy intake and a reduced nutrient intake (Hejazu and Mazloom, 2009; Kolodinsky et al., 2007). Given that youths and HE students may be vulnerable to poor dietary habits, it is important to firstly raise awareness surrounding physiological and psychological health issues associated with a poor diet; and secondly to improve nutrient intake. Although previous public health campaigns have aimed to increase dietary intake of fruits, vegetables and fish, they are not always successful. The consumptions of these foods may be mediated by factors highlighted in the previous section, including physiological factors ('sensory preferences and aversions'; 'satisfying physiological demands'; 'weight control'); cognitive factors ('well-being'; 'knowledge and skills'; 'desire for variety'; 'healthiness evaluations'; 'preference and health conflict'); lifestyle factors ('independence, improvisation, simplicity and convenience'; 'conflict of financial priorities'; 'occupational stereotype', ;'sport, and 'religion'); and social factors ('dietary guidelines and other media'; 'family and peers'; 'traditions'; 'food structure, context and environment'; 'ethics'). Inconsistencies in the 'knowledge-practise gap' (the relationship between knowing what is healthy and engaging in healthy eating) may be attributable to imbalances among the aforementioned factors. Certain factors that affected food choice were more prevalent in this student population, for example 'occupational stereotype', a 'conflict of financial priorities' and 'independence, improvisation, simplicity and convenience'. Although these factors can be targeted to improve dietary habits, it may be the case that some individuals will not benefit from nutrition campaigns, such as those with a 'conflict of financial priorities', those with

'sensory preferences and aversions' to certain foods (including fruits, vegetables and/or fish), or those with a need for 'improvisation, simplicity and convenience'. In such cases, a convenient method of improving nutrient status without altering the diet would be to use supplements. In addition to factors mentioned above that may prevent the consumption of a healthy diet, an additional reason that supplements may be beneficial is because recent evidence has shown a tendency for people to over-estimate the consumption of healthy foods including fruits and vegetables (Black and Cole, 2001), which may consequently render some people nutrient deficient. Therefore the aim of the present chapter was to explore the factors surrounding supplement use.

Current literature on frequency and reasons for supplement use

A 2008 report by the Food Standards Agency (FSA; McHugh and Moon, 2008) aimed to gain an insight into the frequency of, and key drivers behind, supplement use. The sample was weighted to ensure it was a representative sample of the population with regard to age, sex, social class, number of adults, working status and region. Although the authors were primarily interested in the consumption of vitamin and mineral supplements, the report also contained information about omega-3 fatty acid supplements. It was found that 31% of the sample currently used vitamin and mineral supplements and an additional 9% had done so in the previous 12 months. Approximately 43% claimed to have never taken supplements. These people were more likely to be male (51%) and in a lower socioeconomic class (49%; C2,D,E). Supplement users were more likely to be female, in social class A or B, aged 55>, and more likely to have poor self-reported health. Of those who were using supplements or had done in the previous 12 months, 16% took them most days and nearly 3 out of 10 people (29%) took a supplement almost every day. The most commonly used supplements were multivitamins (36%), cod liver oil (35%) and vitamin C (24%).

With regard to supplement use in specifically adolescent populations, Gardiner et al. (2008) reported that 27% of American adolescents (aged 11-19) had used one or more dietary supplements in the previous month, with vitamin and mineral supplements being the most commonly used (16%), followed by vitamin C (6%). However, a problem with this study is that it did not examine the use of fish oil supplements. Supplement use in adolescence was more common among those who used prescription medications (33% as opposed to 24% non-prescription users), a finding that has been

supported elsewhere (Ball, Ketesz and Moyer-Mileur, 2005). Supplement use in adolescents has also been shown to be higher among athletes (Wilson et al., 2006; Gardiner, Dvorkin and Kemper, 2004; Dorsch, 2005) and higher in those with illnesses such as asthma, ADHD, cancer, inflammatory bowel disease, headache and cystic fibrosis (Ball, Ketesz and Moyer-Mileur, 2005; Cala, Crismon and Baumgartner; Heuschkel et al., 2002; Orhan et al., 2003). With regard to the relationship between supplement use and demographics, adolescents from a lower household income were less likely to use dietary supplements (21% <$15,000 compared with 35% $65,000). Supplement use was higher among non-Hispanic whites (32%) than any other racial category (15% on-Hispanic blacks; 19% Mexican American; all others 22%). In this sample of adolescents, no gender differences were observed (Gardiner et al., 2008). A limitation of the Gardiner et al. (2008) study is that the study did not ask about the reasons for supplement use or the impact of use on health status, therefore it did not provide reasons for supplement use. Although Gardiner et al. (2008) did not examine reasons behind supplement use, this area has been explored elsewhere. For example O'Dea (2003) found that 48.7% of students from a lower-middle class background consumed supplements, and reasons for supplement use included 'health', 'prevention of illness', 'sports performance'; 'parental control'; 'energy'; 'poor diet'; 'to do something positive for self' (that is well-being). Quotes from these participants included 'keeps me healthy'; 'keeps me fit for sports'; 'Mum gives them to me'; 'they are good for you'; 'feel like you are doing something good for yourself'; 'I don't get enough fresh foods'. Notably, a limitation of the study by O'Dea (2003) is that omega-3/fish oil supplements were not mentioned – it is unclear whether this was due to the lack of questions about omega-3 fatty acids (focus groups were used to gather data with a semi-structured interview schedule) or due to the lack of use of omega-3/fish oil supplements.

The problem with most data on dietary supplement use is that they are survey based, and the possibility cannot be discounted that responders may differ in terms of supplement use to non-responders, of which there are usually many. For example, in a survey by Harrison et al. (2004), of 21,923 people only 15,465 completed the survey, leaving 29.5% that may have had different attitudes towards supplements. Furthermore, survey based information does not allow us to determine factors that may promote or impede the use of supplements. Although Gardiner et al. (2008)

highlighted some themes behind supplement use, the participants were younger than university students (11-19) and lived at home with parents. The present study aimed to elaborate on the themes highlighted in Gardiner et al. and to examine factors that may promote or impede supplement use in a university student population.

Whiting et al. (2010) commented that so far, there has been no consideration of whether supplements are accessible for those who are most likely to need them. The 'inverse supplement hypothesis' (Harrison et al., 2004) suggests that people who are at risk of nutritional deficiencies are the least likely to take supplements. On the other hand, supplement users are likely to have adequate nutritional intakes from food, and therefore beneficial effects of supplements are least likely to occur in the latter group, yet most likely in the former. Whiting et al. (2010) used focus groups and thematic analysis to investigate barriers to the consumption of a healthy diet and supplement use among groups at risk of nutrient deficiencies, for example, those with a low income, mainly female, with fair to poor health status. The results showed that there were 5 barriers to supplement use – personal or individual barriers were knowledge, health, accessibility, and preferences, while a family barrier was income. The objective of the study was to elaborate on previous literature that has examined reasons behind supplement use, using qualitative methodology to explore factors that may promote or impede the use of vitamin, mineral and omega-3 supplements.

1.2.3. Methods

See 1.3 of previous chapter for 'selection of qualitative method (1.3.1)'; 'participant recruitment' (1.3.2); 'conducting interviews and focus groups' (1.3.3) and 'analysis of data' (1.3.4). Tables of themes can be found through-out this chapter. The interview schedule for investigating supplement use was the same one used in the previous chapter. The schedule began by asking general and vague questions such as 'what do you know about supplements?' 'Do you/would you consider using supplements? Why?' The schedule proceeded with a funnel methodology asking more specific questions (if the participants did not provide answers to the questions earlier on in the interview), such as 'What are your views of taking vitamin and mineral supplements?'

1.2.4. Results and discussion

The present study found that supplement use was affected by three inter-related super-ordinate factors: 'Personal factors'; 'Barriers' and 'Socio-cultural factors'. *Figure 1.2.1.* illustrates the factors that influence supplement use. Three sub-sections of results are presented that provide descriptive accounts of higher order super-ordinate factors and the small-order emergent themes. Each sub-section is followed by a discussion of how each theme relates to previous literature. Effectively, the use of supplements containing vitamins, minerals and omega-3 fatty acids was affected by a number of inter-related factors. However, some factors were more prominent and significant than others therefore the results and discussions are presented in order of the strength of the influence on supplement use, determined by the frequency and depth of description provided during data collection.

1.2.5. Personal factors

Although cognitive and physiological factors were initially categorized separately, they were later merged into one super-ordinate theme since they were closely related. There were 7 personal factors that affected supplement use, including 'obtaining essential nutrients for an inadequate diet'; 'ill health'; 'positive evaluation of supplements for health and well-being'; 'good for brain development and function'; 'perceived control over health'; 'life period'; and 'physical appearance'.

Obtaining essential nutrients for an inadequate diet (Table 1.2.1.)

This theme was mentioned in most accounts. It was apparent participants used supplements to compliment an inadequate diet or to obtain a nutrient that was not present in the diet. Although using supplements to either compliment the diet or to obtain essential nutrients lacking from the diet could be presented as two separate themes (as they were in the first instance), this theme was merged based on evidence that complimenting the diet and obtaining nutrients not present in the diet were closely interlinked, for example, whilst interviewee 5 said "if sometimes they (people) don't get ermm, all the right food that they need....then that can be a back-up for them", he also pointed out that "I think they've got health benefits ....with a balanced diet with your meals.... if you don't and you rely on them too much I think they can be quite negative, quite bad for you". Interviewee 5 also said: "I wouldn't....stop ...eating fish and then start taking those....obviously if I – if I had the choice I'd just eat fish."; "if you're using supplements to supplement your vitamin – your intake of vitamin C instead of eating fruit, ermm that would be really bad for you." Hence, whilst he said that supplements could compliment the diet but should not be used to replace obtaining nutrients from dietary sources ("I think they've got health benefits .... with a balanced diet with your meals.... if you don't and you rely on them too much...."), in cases where the nutrient could not be obtained from the diet it was ok to use supplements to obtain the nutrient. Hence, supplements could be used to compliment the diet (but not replace it).

Interviewee 1 also talked of how although supplements should not be used as a replacement for food, if a nutrient was not obtained through the diet then supplements were useful. Likewise, other participants said they would take supplements if believed they were lacking a nutrient (interviewees 3, 4, 5, 6, 7, group 2) and interviewee 3 said she would advise others to do the same. Interviewee 5 described supplements as a 'back-up' for an inadequate diet. To summarize, in all cases, using supplements for 'obtaining essential nutrients' only occurred if the participant believed that the diet was inadequate. This not only suggests that those who are concerned over health are more likely to engage in supplement use, but that if a person was unaware that the diet was deficient, for example due to a lack of knowledge, then they would not engage in supplement use. Therefore, individuals without dietary awareness may be less likely to use supplements.

Figure 1.2.1. Factors affecting supplement use

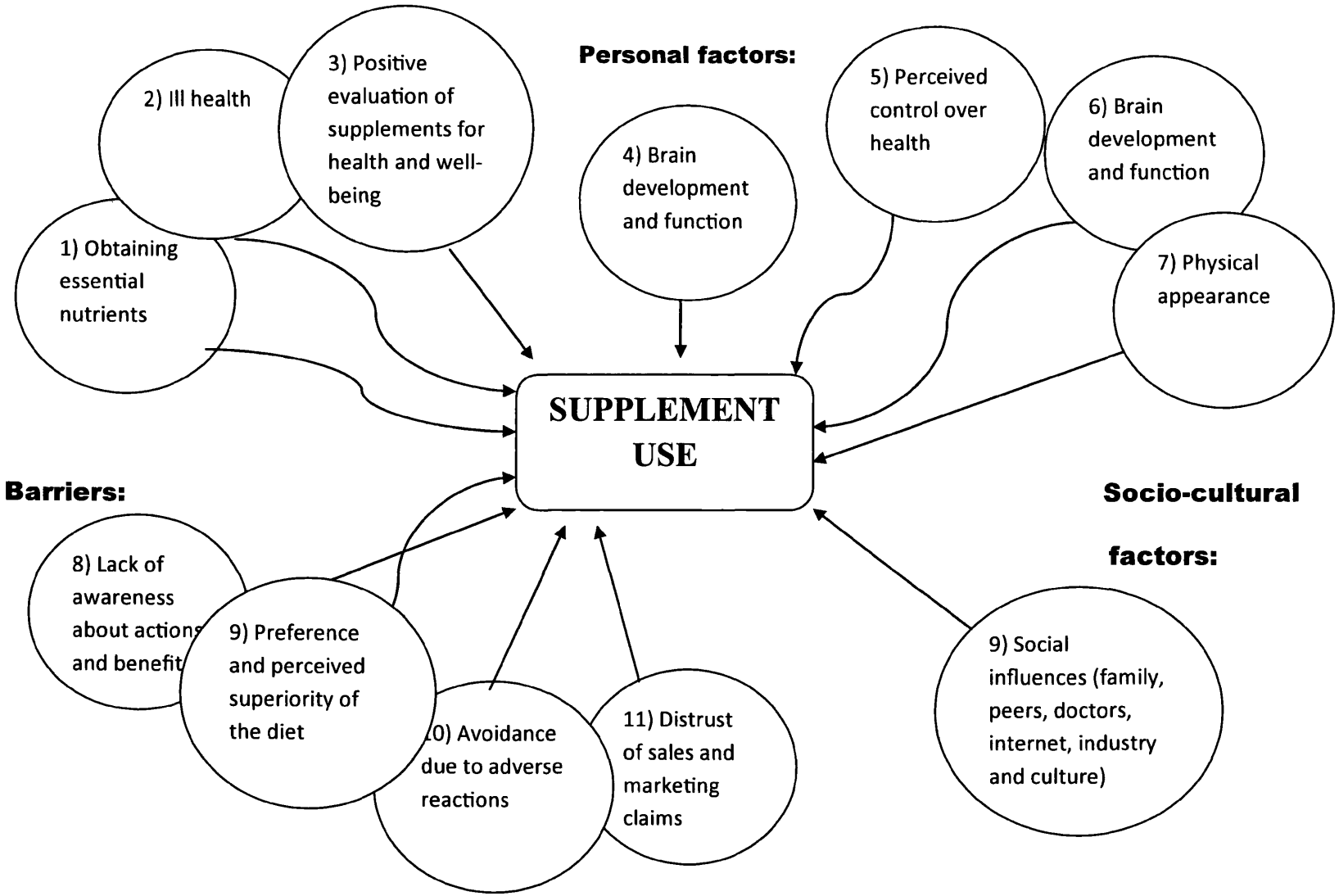


Table 1.2.1. Obtaining essential nutrients for an inadequate diet

"Obtaining essential nutrients for an inadequate diet" Participant/focus group	Quote
Interviewee 1	5/6:167-169. "it says that your not meant to use it [supplements] as like, you know instead of. But I suppose then if your not then at least your getting something even if it is like the tiniest amount. I suppose you should try and eat like, as healthy and as good of it as possible just to keep you going really." 5:162-164. "well yeh I suppose they have health benefits 'coz it's like, if you're not getting enough your natural like daily irons and stuff I suppose supplements are kind of, I don't know, a way to get those...." 4:101-103. "I duno some people say that [they] like account for not eating vegetables and stuff like that but I don't think they do, I think they just kind of help with like your daily diet and stuff." 4:124. "I suppose if you don't eat much fish and stuff it's probably good to like, get something from somewhere."
Interviewee 3	6:189-190; 6-7:194-196; 208-209; 10:305-306. "Like you know if I haven't had a lot of time to necessarily like eat a lot of veg and stuff I'll think I should probably take some vitamin C...."; "I would take it and I would advise other people to take it if they feel like they were lacking in something...."
Interviewee 4	3:77-78; 4:123; 5:129-131; 6:182; 185-187. [asked about frequency of fish consumption; supplement use] "I don't, just supplements. I can't eat it at all..... Because I don't have any fish in my diet and I know that it's meant – it's good for you."; "they're obviously not as good as the real thing but.....as far as just trying to get it into my diet I –I just give it a go, it's only one tablet a day so I just take it."; "fish oil for me, I – I just can't put it in my diet any other way so I'll take them. Whether it's doing me any good or not, I don't know, hopefully it is."
Interviewee 5	6:192-193. "if sometimes they (people) don't get ermm, all the right food that they need....then that can be a back-up for them." 5:153-154; 7:226-228. "I've never considered them an actually replacement for food. Ermm I always make

	sure I have a balanced diet as well, ermm and then have those as well, just an extra.... yeh I think they've got health benefits .... with a balanced diet with your meals.... if you don't and you rely on them too much I think they can be quite negative, quite bad for you." 5:153; 160-161; 7:233-234. "I've never considered them (supplements) an actual replacement for food.... I wouldn't....stop ...eating fish and then start taking those....obviously if I – if I had the choice I'd just eat fish."; "if you're using supplements to supplement your vitamin – your intake of vitamin C instead of eating fruit, ermm that would be really bad for you."
Interviewee 6	4:110-111; 5:133-134; 6:172-174. "I don't really know much about them. I know some people take them if they're not taking in enough of whatever the vitamin is or...." 6:170-172. "I think they should be supplements, taken as supplements as opposed to instead of something [agreement]. If – if you're short on whatever for whatever reason then ok, they should be taken. But I think it would more be an extremity as in ermm....for some reason you can't get a certain type of fruit, or you can't get a certain vitamin, or you can't get a certain type of whatever it is you need [agreement] and so that would be when supplements should be taken..." 6:172-175. "[if] for some reason you can't get a certain type of fruit, or you can't get a certain vitamin, or you can't get a certain type of whatever it is you need [agreement] and so that would be when supplements should be taken, rather than.....say not eating this kind of food because you can take this supplement instead."
Interviewee 7	4:93-94; 4:108-109; 117; 5:123; 133-134. "I do take like those cod liver oil ones as well 'coz I don't eat a lot of fish.... I just take the cod liver oil ones 'coz I don't eat a lot of fish and I don't think I've got like, enough stuff that you get from them." "I think they're [supplements] a good idea if you don't get them from eating...like vegetables and stuff."
Focus group 2 (Females)	28:796-798. "Some things I don't eat because I don't like it so I have to have – Like I don't like milk so I need calcium somewhere along the line [agreement from P1] and cheese and cheese all the time isn't really doing anything for me."

Ill health (Table 1.2.2.)

This theme was mentioned in over half of the accounts. Interviewee 3 had a wide knowledge of diet and supplements owing to ill health in adolescence. Although she was in good health now, she said that she kept vitamin C at home in case she was feeling 'under the weather'. She also said she would go back to taking supplements if she was feeling unhealthy. Interviewees 4, 5, 7 and focus group 2 also mentioned they would take supplements if they were unhealthy, however, usage was not consistent. Some participants made reference to the immune system and unhealthy bones when giving reasons for supplement use.

Table 1.2.2. Ill health

"Ill health" Participant/focus group	Quote
Interviewee 3	5:143-146; 155-157; 6:188-189; 193-195. "...I used to take a lot of supplements actually, a few years ago because I was quite unwell for quite a period of time and they didn't know what was wrong, so they sort of said you know, try all of these different supplements, and I ended up taking a whole range of supplements...."; "I have like – as I said I have like vitamin C in the house but I suppose it's only a thing I'll take if I'm feeling under the weather..... if I was feeling unhealthy I'd be more inclined to look into something like that."
Interviewee 4	6: 162-163; 173-174. "I've got lots of spots or my nails are really week or my hair or something – just something like that, I go to Holland and Barratt."; "....evening primrose oil; maybe I'll take around my period to help with it but I don't take them consistently."
Interviewee 5	6:193-194; 196-198. [reasons for supplement use] "to ermm, ward off some illnesses as well, to help their immune system. Or ....if they – if they've got funny bones maybe..."
Interviewee 7	5:121. [reasons for supplement use] "[if] they don't have like, a very healthy diet or if they've got health problems or..." 4:92-93; 5:121. "...like I take iron tablets 'coz I did think that I was anaemic, but apparently I'm not now but I'm still taking them." [Reasons for supplement use] if they don't have like, a very healthy diet or if they've got health problems."
Focus group 2 (Females)	28:790-791; 29:819-820; 831. "I've got a low immune system so I have to take vitamins for everything, but I take what I need.... For me they're good 'coz I have a cold nine times out of the month and like they help me get over my colds quicker."

Positive evaluation of supplements for health and well-being (Table 1.2.3.)

A 'positive evaluation of supplements for health and well-being' was mentioned in nearly all accounts (interviewees 1, 2, 3, 4, 5, 7 and group 1). Although this theme could have been presented in terms of the effects of feelings on supplement use (for example, interviewee 1 said: "I suppose it's just helps a long with a balanced diet really doesn't it? Just to make you feel....more healthy I suppose" and interviewee 6 said: "I get the feeling a lot of it is.....err sort of – like a feel good thing – if you eat this vitamin you will feel good. Whether you – whether it changes or not, you might believe that you feel good and therefore take more of it, sort of – it's more advertising than doing stuff"), well-being has been defined as 'life satisfaction, optimism, self esteem, mastery and feeling in control, having a purpose in life, and a sense of belonging and support' (NHS, 2013) and 'the presence of positive emotions and moods (e.g., contentment, happiness), the absence of negative emotions (e.g., depression, anxiety), satisfaction with life, fulfillment and positive functioning' (Centre for Diease Control and Prevention, 2013). Although participants often referred to feelings, they often did so in the context of health and well-being. Therefore this theme was presented in terms of health and well-being as opposed to 'feelings'.

Despite a positive evaluation of supplements for health and well-being, participants often gave vague descriptions about physiological effects of supplements: "I think if you want it [information about supplements] then yeh, you go and look for it 'coz then you know what's right for you to take but I suppose like for me I'm just happy to think – at least thinking I'm getting a decent diet and that it's kind of, I don't know... that it's kind of helping somehow...." (Int. 1, 5:140-141). This vague description is consistent with other accounts and illustrates that supplements are perceived as beneficial even when there is a lack of knowledge about their actions. With regard to omega-3 supplements, although descriptions of physiological effects were vague (interviewee 1, 3, 4, 5, 7) some participants had knowledge about beneficial effects for the brain and joints (interviewees 1 and 2). Some participants used supplements despite a lack of knowledge of physiological effects due to a 'positive evaluation', for example, participant 7 was asked about health benefits of supplements: "ermm, I'm not really sure, like they're supposed to [have benefits] aren't they? But – I think they do" (Int. 7, 5:133-134). Participant 1 said: "I suppose you just, you're doing it and it's like, oh at least I'm doing something [for health]" (Int 1. 4:127-129). Demonstrating the

positive evaluation of supplements in relation to well-being, one participant described supplement use as a "feel good thing" (Int. 6. 5:130-134). Users often got a sense of security from taking supplements, as if they were a safeguard and prevented malnutrition. This was the case even where participants consumed a healthy diet (e.g. interviewees 5 and 6), suggesting that those who are concerned about health actively try to eat healthily are more likely to use supplements.

Table 1.2.3. Positive evaluation of supplements for health and well-being

"Positive evaluation of supplements for health and well-being" Participant/focus group	Quote
Interviewee 1	5:140-141. "I suppose it's just helps a long with a balanced diet really doesn't it? Just to make you feel....more healthy I suppose."
Interviewee 2	5: 131; 6:153. "I think they're good, I've heard that they're good for like the brain and that...."; "they're good for ermm, joints and stuff aren't they." 5:127; 7:187-188; 199-206. [about use of vitamins and minerals] "I'm hoping they're good!"; "I think they do have health benefits....but I couldn't really say because I don't know a great deal about it"; "well I guess if you hear it enough [media and marketing] you kind of get convinced really." 4:98-118. [when asked about supplements] "I don't really know to be honest..... I'd give a blank - well I know the word but I can't think of what it is really..... they like...oh....are they vitamins and stuff or like?"
Interviewee 3	7:199-202. "I don't know that much about them or what they do to be perfectly honest....my Mum takes ermm cod liver oil and she's always found it useful for whatever she wants it to be useful for [laughs] ermm, but yeh I don't really have much knowledge of the fish oils to be honest." 9-10:296-300. "I'd say that in the right circumstances they have health benefits....if you take them on a daily basis your body is more used to it whereas if you take it ermm, like as a one off, like as an addition to a healthy diet then I think it's probably more helpful."
Interviewee 4	6:181-182. [asked if supplements have health benefits] ": I think that they do, but I don't know why. It's really strange now that you asked me about it; I don't know why I do. But...if you can't get it in your diet normally then maybe it is a good idea to take some." 5: 5: 129-131; 138-139. "some of them; water retention, evening primrose oil; sort of help with certain things and I do, I do like to take them."; "they're obviously not as good as the real thing but.....as far as just trying to get it into my diet I –I just give it a go, it's only one tablet a day so I just take it and it can't be doing much harm so..."

Interviewee 5	5:160; 162-163; 165-166; 6:192-194. [views on fish oil supplements] "Ermm, positive, I think it's good for you....I think they're a good thing to be – to have.... just to make sure you get a bit of everything."; [views on some vitamins and minerals] "positive....in – in a way I'd say it's probably good.... it can be a bad thing to take them – to take some really really....strong multi-vitamins and then completely stop afterwards...." 5:149-152; 160. [about usage] "well I don't really need to because.... I've usually got enough vitamin C and this that and the other. But I like to...(kind of have) all my bases covered. So....if there's any chance I'm not getting something from what I'm eating (and) I've over-looked something, I've got – I've got tablets." 5: 140-141. [about previous supplement use] "And they had ermm, ermm what was it called? They had all these funny little, ermm funny little things in them, which I couldn't – I couldn't – can't remember..."
Interviewee 6	5:130-134. "I get the feeling a lot of it is.....err sort of – like a feel good thing – if you eat this vitamin you will feel good. Whether you – whether it changes or not, you might believe that you feel good and therefore take more of it, sort of – it's more advertising than doing stuff. But again, if you're not taking in the right amount of vitamins or if you're not making the vitamins yourself..."
Interviewee 7	4:111-112; 114-115. "Ermm yeh I think they're like, a good idea.....yeh. I don't really know like much about them, I just take them. I don't know..." [about omega-3 supplements] "well it gives you that omega-3 oil doesn't it, or like the special – I don't know – I don't know really, it's just....." 4:117-118. "Ermm, I think they're a good idea if you don't get them from eating...like vegetables and stuff. Errm, but also like if you take too many then it's bad for you isn't it, I think. 4:111-112; 114-115. "Ermm yeh I think they're like, a good idea.....yeh. I don't really know like much about them, I just take them. I don't know..." [about omega-3 supplements] "well it gives you that omega-3 oil doesn't it, or like the special – I don't know – I don't know really, it's just....." 5:131. [about benefits associated with supplement use] "Ermm, I'm not really sure. Like they're supposed to aren't they? But – I think they do."
Focus group 1 (Males)	10:317-319. "Protein, I just take it as red that it does

	work, and I keep buying it. It becomes a habit after a while, to buy them."
Focus group 2 (Females)	29:819-821. "For me they're good 'coz I have a cold nine times out of the month and like they help me get over my colds quicker. Whereas like Beacham's and stuff like that might not help but I need to keep taking vitamins so I can get over it quicker."

Good for brain development and function (Table 1.2.4.)

Some participants talked of supplement use for healthy brain development and function and made references to omega-3 supplements, for example participant 1 said: "omega-3 helps the development of your brain and like, natural stuff – I don't know, natural stuff going on and....just a natural oil or something. I'm not quite sure." (Int 1, pg 5:135-137). Interviewees 2 and 4 talked vaguely of the beneficial effects of omega-3 for the brain, with one interviewee stating that she had been advised to take them by school to help with revision. This evidence suggested that while knowledge of the effects of omega-3 fatty acids was not considered great, the participant believed that they may be helpful (but not essential) in brain development and function, particularly as far as cognition was concerned (e.g. exams and assessment).

Table 1.2.4. Brain development and function

"Good for brain development and function" Participant/focus group	Quote
Interviewee 1	5:135-137. "Omega-3 helps the development of your brain and like, natural stuff – I don't know natural stuff going on and....just a natural oil or something. I'm not quite sure."
Interviewee 2	5:131-132; 147-148. ", I think they're good, I've heard that they're good for like the brain and that...."; "....in school we were told to take them 'coz they help aid with revision and stuff. But I don't know whether that's true." 4: 120-121. "Well I've just –been told to take 'em 'coz ermm....like I've been getting lots of ulcers and stuff. I've been run down so I've been told to take them to make make....to boost my immune system or something."
Interviewee 4	4:119-120. "Err omega-3, they say they're good for the brain and exams as well so I always take them around exam time....."
Focus group 1 (Males)	11:329-331. "I used to, when I was an undergraduate, always get cod liver oil tablets. Ermm, as to take for exam periods, just because it's something, my Mum always used to do when I was little. Like, for GCSE's cook me loads of fish." 11:335-336. "It's like – the public, a public thing, they perceive fish to be good for your brain don't they..."6:192-193. "if sometimes they (people) don't get ermm, all the right food that they need....then that can be a back-up for them."

Perceived control over health (Table 1.2.5.)

It was generally agreed that the diet was the preferred method of obtaining nutrients and supplements should only be used to gain something that cannot be obtained from the diet (6:170-172. "I think they should be supplements, taken as supplements as opposed to instead of something. If – if you're short on whatever for whatever reason then ok, they should be taken. But I think it would more be an extremity as in ermm....for some reason you can't get a certain type of fruit, or you can't get a certain vitamin, or you can't get a certain type of whatever it is you need [agreement] and so that would be when supplements should be taken..."). However, as opposed to replacing something in the diet (as suggested by participant 5), even when the diet was healthy some users still took supplements for 'perceived control over health'. Participants talked about media pressure to eat a healthy diet and supplement use was a shorthand method of including essential nutrients so that participants felt as though they were adhering to guidelines. Supplements were sometimes used as a safeguard for good nutrition during times requiring dietary compromise, for example, participant 3 in the female focus group explained how she used supplements during a trip to Kenya when she may not have been able to get the correct nutrient balance. Others compromised and used supplements when they did not like a particular food such as fish. Results described in the first chapter of this section imply that university life was accompanied by dietary improvisation and, therefore that supplement use may benefit some university students.

Table 1.2.5. Perceived control over health

"Perceived control over health" Participant/focus group	Quote
Interviewee 1	4:124-125; 127-129; 132. "I suppose if you don't eat much fish and stuff it's probably good to like, get something from somewhere"; "I suppose you just, your doing it and it's like, oh at least I'm doing something". 4:127-129. "I don't know they just kind of....oh like the media especially like all you hear is about how like all your diets- and how you eat and it's like a big part of life obviously. So I suppose you just, your doing it and it's like, oh at least I'm doing something."
Interviewee 2	7:206-207; 9:270-274. "...if some one's feeling sort of low on something and they're gona need a boost like it [supplements] can help...."; "I went to Kenya last year I wasn't particularly aware of what I would be eating....I thought like the food I would be eating was pretty..... I took some supplements then as sort of a prep – a preparation rather, for like you know, I might not have a very balanced diet so in order to make up for that I would have taken supplements."
Interviewee 4	5: 129-131; 135. "....they're obviously not as good as the real thing but.....as far as just trying to get it into my diet I –I just give it a go, it's only one tablet a day so I just take it and it can't be doing much harm so..."; "I would prefer to like fish and to eat it, but that's as close as I can get."
Interviewee 5	5:150-152; 163; 6:192-193. "I've got enough fruit really. I've usually got enough vitamin C and this that and the other. But I like to...(kind of have) all my bases covered. So if there's – if there's any chance I'm not getting something from what I'm eating (and) I've over-looked something, I've got – I've got tablets.... they're a good thing to be – to have. Ermm just to make sure you get a bit of everything."
Interviewee 6	5:136-137. "....to be honest I don't think I've ever really needed them, so if you don't need them, don't take them."
Focus group 2 (Females)	28:792-794; 828-830. "I'd say that you should be able to get everything you need from food unless like you say you've got a low immune system and then you

	need a boost and that's fine, but like the rest of the time I'd say like, you know you should be getting it from your food...".

Life period (Table 1.2.6.)

Some participants made reference to life periods that may require extra and supplement use. For example, participant 3 stated that although she would not use supplements now that she was fit and healthy, she would consider using them during pregnancy and old age. Other times when supplements may be used was during periods of ill health or strenuous exercise (interviewees 5 and 6).

Table 1.2.6. Life period

"Life period" Participant/focus group	Quote
Interviewee 3	9:279-281. "....perhaps it's something I'd consider during pregnancy for instance like it's probably something I'd do. Ermm, or when I get older, like sort of older older, maybe I would. But I wouldn't (be taking them) at this point in my life if I'm fit and healthy."
Interviewee 5	4:119-121; 123-124; 126; 5:156-158; 7:191. "I've just started – I've just gone and got myself some protein shake, ermm whey protein shake and ermm, some vitamin - multivitamins and cod liver oil tablets..... And once I start doing some proper exercise again I'll start taking those daily"; [times when usage is beneficial] "if they're doing lots of exercise and they're on the go quite a lot.... as well if sometimes they don't get....all the right food that they need...(and to) ward off some illnesses as well, to help their immune system.
Interviewee 4	7:206-207; 9:270-274. "...if some one's feeling sort of low on something and they're gona need a boost like it [supplements] can help...."; "I went to Kenya last year I wasn't particularly aware of what I would be eating....I thought like the food I would be eating was pretty..... I took some supplements then as sort of a prep – a preparation rather, for like you know, I might not have a very balanced diet so in order to make up for that I would have taken supplements."
Interviewee 6	4:118-121; 5:139-141. [about non-use] "it's never really occurred to me. I always thought if you're taking supplements it's usually 'coz you're not taking in enough of something and I think I tend – tend to have more of a balanced diet, ermm....to be honest I always just thought supplements were something that...if your....having a problem with taking - eating certain foods or something.... if it was recommended to me for - as in – if I was, I don't know ermm, if I was in ill health and someone – and a doctor said, ok I think you should be taking these 'coz sort of whatever reason, then I would take them, but other than that I probably wouldn't bother."
Focus group 2 (Females)	29:822. "Yeh if you need it I think it is vital obviously, but I don't think you should put it in your body if you don't need it at the beginning."

Physical appearance (Table 1.2.7.)

Occasionally, a female participant would mention the use of supplements in relation to physical appearance, for example for hair, nails and skin (interviewee 4, group 2).

Table 1.2.7. Physical appearance

"Physical appearance" Participant/focus group	Quote
Interviewee 4	5:138-139; 153-155; 6: 162-163; 166. "sometimes if you go into Holland and Barrett they can give you some good information about what, what's best to take..."[if] I've got lots of spots or my nails are really week or my hair or something – just something like that, I go to Holland and Barratt."
Focus group 2 (Females)	30:853-857. "yeh and it's really good for your skin.... yeh it keeps it moisturized."

1.2.6. Discussion of personal factors

These data suggested that with regard to 'obtaining essential nutrients for an inadequate diet', using supplements may occur if the participant believed that the diet was inadequate. This suggests that if a person was unaware that the diet was deficient, for example, owing to a lack of knowledge, then they would not be motivated to use supplements. Therefore, individuals without dietary awareness are unlikely to use supplements. This is consistent with the survey finding by McHugh and Moon (2008) that only 8% of non-users agreed that vitamin and mineral supplements were necessary to ensure they stayed healthy, compared with 25% of supplement users. In support, more than half (51%) of non-users strongly disagreed that they needed a vitamin and mineral supplement to stay healthy compared to 13% of users. Consistent with the present finding that supplements were viewed as a 'back-up' for an inadequate diet or when a nutrient was lacking, previous literature suggested that people believed taking supplements could improve the diet, especially a diet low in nutrients, by 'making up' for bad dietary choices (O'Dea, 2003). This phenomenon has been coined 'dietary/health insurance' for individuals who believe they are not getting adequate nutrients from dietary sources (Whitney and Rolfes, 1999). 'Dietary/health insurance' has been reported in adults (Whitney and Rolfes, 1999) as well as in adolescence (O'Dea, 2003). Similar to the present findings and those of O'Dea (2003) and Whitney and Rolfes (1999), other evidence suggests that supplements may be used to compensate for an unhealthy diet, perceived or otherwise (e.g. de Jong et al., 2003).

This evidence can be viewed in one of two ways - that supplements may be used to overcome unhealthy lifestyle behaviours including a poor diet (Landstrom, Hursti Magnusson; 2009), or that supplement use is more likely in those who engage in healthy lifestyle behaviours. Evidence from van der Horst and Siegrist (2011) showed that not all supplement users ate a healthy diet, in fact a large percentage of supplement users actually had unhealthy dietary habits. van der Horst and Siegrist (2011) also found that those who were very healthy, engaged in supplement use, with the latter finding supporting the 'inverse supplement hypothesis', i.e. those who use supplements engage in more healthy lifestyle behaviours. However, that people who consumed an unhealthy diet engaged in supplement use contradicted this hypothesis. Van der Horst and Siegrist (2011) found that those with a moderately healthy diet were least likely to use supplements. Hence, the results show that there are different consumer groups

with different dietary patterns: firstly, consumers or non-consumers; secondly, those who engage in dietary behaviours that are healthy, moderate or unhealthy.

With regard to ill health, it was found that Interviewee 3 had a wide knowledge of diet and supplements due to ill health in adolescence. Participants 4, 5, 7 and group 2 mentioned they would take supplements if they were unhealthy. McHugh and Moon (2008) examined reasons behind the use of high strength supplements (including fish oil supplements) and found that although 22% of high strength users said that there was no particular reason for doing so, 12% reported using supplements if they felt run down or when they were about to get a cold or flu. An additional 12% said that it made them feel better. McHugh and Moon (2008) found that those in very poor health (40%) were more likely to take a vitamin and mineral supplement, and those in excellent health (47%) were most likely to have never taken a supplement. Further support for the use of supplements during 'ill health' comes from a qualitative study by O'Dea (2003), who found that one of the main benefits perceived in supplement use was health and the prevention of illness. In line with the present findings, no participants in O'Dea (2003) discussed the potential use of dietary supplements, including vitamin and mineral supplements, to prevent diseases such as cardiovascular disease (CVD) and cancers. Instead participants in the present study and O'Dea (2003) tended to focus on the short-term benefits of supplement use, including the prevention of colds and minor illnesses. In line with the present study, O'Dea (2003) found that some adolescents recognised the importance of foods in the long-term prevention future illness, and participants believed immunity could be boosted by dietary factors – this finding is related to 'preference and perceived superiority of diet'. Nevertheless, as with the present study, adolescents attached more importance to short-term factors such as appearance, energy levels and fitness (O'Dea, 2003). Contrary to the findings by McHugh and Moon (2008), Gardiner et al. (2008) found that adolescents reporting very good/excellent health (28%) were more likely to use supplements than those reporting good (24%) or poor/fair health (17%). An explanation for discrepancy between findings is that different populations were used. The results of Gardiner et al. (2008) raise the following questions: Does the use of dietary supplements cause good health? Or, are healthy adolescents more likely to use dietary supplements? This area requires further research. Whiting et al. (2010) found that 16 out of the total 73

participants took supplements for disease prevention; in addition 6 used supplements due to current ill health. These findings are consistent with the present study.

With regard to a 'positive evaluation of supplements for health and well-being' it was found that supplements were perceived as beneficial, especially when used in conjunction with a healthy diet. In support, research by McHugh and Mood (2008) found that when asked about reasons for the use of vitamin and mineral supplements, the main response was general health/well-being (57%). O'Dea (2003) suggested that a theme for supplement use in adolescents was well-being, with participants stating that they used vitamin and mineral supplements because they liked doing something positive for themselves: "I just like to, you know, feel like I'm doing something good for myself...better than just junk food...I like to feel proud that I've done something good for myself." With regard to a 'positive evaluation of supplements for health', a focus group study in a younger population of adolescents has found that supplements, including omega-3 and vitamins and minerals, are taken for several health-related reasons including the prevention of illness (related to the above theme 'ill health'), for better immunity and to rectify a poor diet (O'Dea, 2003). Despite this, participants in the present study gave vague descriptions about the perceived physiological effects of supplements, suggesting that more information should be provided on the actions and benefits of supplements to enable potential users to make more informed choices.

With regard to 'good for brain development and function', the present study found that some, but not many participants talked of supplement use for healthy development and function, particularly the use of omega-3 for healthy brain function. This is in line with previous research that has found a reason behind supplement use to 'keep the brain in condition' (McHugh and Moon, 2008). No participants talked of the role of vitamins and minerals in the brain. This evidence highlights a 'lack of awareness about actions and benefits of supplements', which is a barrier to supplement use as highlighted below.

Some participants took supplements for 'perceived control over health'. Supplements were sometimes used as a safeguard for good nutrition during times requiring dietary compromise. 'Perceived control over health' was related to, but independent from 'life period', since some people paid particular attention to health during certain life periods. The finding that some participants would consider using supplements during

pregnancy, old age, ill health or strenuous exercise is supported by Whiting et al. (2010) where it has been found that there are age differences in the most commonly used supplement, for example, 50% of supplement users aged >55 years used cod liver oil, whereas only 25% aged <55 used cod liver oil. This evidence suggests that individuals in younger age brackets do not perceive a great need to take fish oil supplements. As with the present study, Whiting et al. (2010) found that some participants used supplements during certain 'life periods', for example during childhood or pregnancy.

Occasionally, a female participant would mention the use of supplements in relation to physical appearance, for example, for hair, nails and skin, and this finding is consistent with a previous study that found that adolescents attached more importance to short-term factors such as appearance, energy levels and fitness (O'Dea, 2003). A recent study found that 19% of people used supplements for a specific benefits such as strong nails, shiny hair, and supple joints (McHugh and Moon, 2008). The perceived and actual benefits of supplement use in physical appearance require further research.

1.2.7. Barriers

Four barriers to supplement use were identified, including: 'lack of awareness about actions and benefits', 'preference and perceived superiority of diet'; ' avoidance due to adverse reactions'; 'distrust of sales and marketing claims'.

Lack of awareness about actions and benefits (Table 1.2.8.)

Despite a 'positive evaluation of supplements for health and well-being', 'lack of awareness about actions and benefits' was a prominent theme mentioned in all but one account. For example, interviewee 1 said: "I suppose if you looked into it there probably would be [information available], but like on the surface you don't really – you kind of hear that it's good, and this is what you should take and I suppose you just listen to - I don't know – I'm quite influenced I guess about what other people say and stuff so I'm more likely to just go ahead and take them whereas – I don't know I suppose if you looked into it you'd probably know better like, what you wanted and what was good/best for you and stuff." (Int. 1, 5:144-148). Some participants (e.g. participant 2) explained that there were several sources of information about foods that are bad for you, however, almost all participants agreed that there was not enough information concerning the potential actions and benefits of supplements (1, 2, 3, 4, 5, 6, 7, group 1). Another participant (3) said she felt that she was not provided with adequate dietary information at school to make informed dietary choices. Labels on supplement packets were also described as inadequate (p 4) and whilst there was information about the active components, there was minimal information about their actions and potential benefits. This theme demonstrates the need for more education and awareness concerning nutrients, food groups and the potentially beneficial effects of supplements. Although the aim of the present study is not to advocate supplement use per se, an increase in public awareness of the potential benefits of supplements could increase supplement use if and when it is required.

Table 1.2.8. Lack of awareness about actions and benefits

"Lack of awareness about actions and benefits" Participant/focus group	Quote
Interviewee 1	5:144-148. "I suppose if you looked into it there probably would be [enough information], but like on the surface you don't really – you kind of hear that it's good, and this is what you should take and I suppose you just listen to - I don't know – I'm quite influenced I guess about what other people say and stuff so I'm more likely to just go ahead and take them...."
Interviewee 2	6:173-175; 7:180-182; 195. "There's nothing...like you get, you get told all the things that are bad for you but you don't really get – get told a lot about what's good for you [agreement] like I couldn't tell you a lot about supplements and things like that"; [about sources of information for dietary supplements] "I couldn't tell you to be honest....ermmm [pause] you get stuff on the back of food don't you?" 6: 162-172. "I may try them just to see if they help in any with anything, but I don't know really.... well if someone I know had been taking them and said that they'd helped them in so and so way then possibly if they - if I thought that was good then I'd try and take 'em."
Interviewee 3	9:286-288. ".....I don't think it's something you're really...educated about if you see what I mean [agreement] I didn't really feel that I was educated that well to some – what you sort of need in you diet really to be honest at school or anything."
Interviewee 4	5:151-153. "as far as what's on the bottle they just say to just take one a day and then a big list of chemical things that are in it. They don't really say much about what its gona actually do for you, I just know from what my mother has said."
Interviewee 5	6:201-202. "there's no real information given to me. But ermm if you look – use the internet (and) ermm, look through stuff on the internet, you can usually find an unbiased opinion."
Interviewee 6	4:110-111; 118; 5:143-145. [when asked about knowledge of supplements] "Very little. I don't really know much about them. I know some people take them if they're not taking in enough of whatever the

	vitamin is or....if they've.....yeh I don't really know much at all...it's never really occurred to me[to use supplements].... my Mum was on about taking some sort of fish oil supplements to help you concentrate or to make you better at studying or something like that but again I get the feeling a lot of that's pretty....wishy washy I suppose"
Interviewee 7	5:128-129. "Ermm, I think there is [information] if you're like interested and want to find out about it, 'coz I suppose there's a lot on the internet and stuff, but ermm, you could go into like Holland and Barratt and ask I suppose. But I don't think people really know unless you're like really interested in finding out. I wouldn't really have a clue."
Focus group 1 (Males)	11:335-337; 350-354; 12:372-274; 383; 387-389. "...here we are, we're just being told that you need to take a certain amount of omega-3, and vitamin C, A, B, and all that jazz. It's like, at which point do you actually need to? At what point is it beneficial to you – how do you know you're not just being ployed into some marketing scheme?" "Unless there was a documentary on some prime time (TV programme) about some person who turned their life around then (no).....it depends how much it costs really doesn't it."

Preference and perceived superiority of diet (Table 1.2.9.)

This theme was mentioned in most accounts, with the diet perceived as superior to supplements. Participants described how nutrients should be obtained from the diet as opposed to supplements, which should only be used when it is not possible to do so (interviews 2, 3, 5, groups 1 and 2). Other participants said that although the diet was perceived as superior, they still took supplements just in case, for example: ".....they're [supplements] obviously not as good as the real thing but - as far as just trying to get it [nutrients] into my diet I –I just give it a go...." "it's more chemically...to get it into to a little tablet like that they obviously – you know it – it just can't be as good [emphasis] as the actual fish that it comes from. It's all manmade." (Int. 4, 5:129-131; 133-135; 137-138, 139-141). A participant in group 1 who was opposed to supplement use said that if faced with a nutrient imbalance, the thought of taking supplements would not even enter his mind and instead he would consider how he could improve his diet. To summarise, some participants suggested that nutrients should be obtained from the diet and although some people were against supplement use to obtain nutrients, others used supplements if they were not getting a nutrient from the diet, or if they wanted a safeguard for good nutrition in the event that the diet was inadequate. Hence, we have three perspectives for consideration: those who are opposed to supplements; those who use supplements to obtain a nutrient they do not get from the diet; those who use supplements as a general safeguard for good nutrition.

Table 1.2.9. Preference and perceived superiority of diet

"Preference and perceived superiority of diet" Participant/focus group	Quote
Interviewee 2	6:157-158. "if they [supplements] do good then great...but...it should – technically people should try and get it from food I guess but if you can't then taking things like that is a good idea."
Interviewee 3	6:164-166; 167-169; 7:195-196; 303-305. "....from my perspective I wouldn't take supplements unless I felt like I was needing something extra like I prefer to try and get everything I need from like, just the food I eat and just from the diet I eat"; ".....I wouldn't wana rely on taking supplements on a daily basis like, I think the best vitamins and nutrients and stuff you can get is just from fresh food."
Interviewee 4	5:129-131; 133-135; 137-138, 139-141. [about supplements] ".....they're obviously not as good as the real thing but.....as far as just trying to get it into my diet I –I just give it a go.... – it's more chemically...to get it into to a little tablet like that they obviously – you know it – it just can't be as good as the actual fish that it comes from. It's all manmade".
Interviewee 5	5:153-154; 160-162. "I've never considered them an actual replacement for food.... I wouldn't, ermm stop taking fish – eating fish and then start taking those.... obviously.... if I had the choice I'd just eat fish...but....I can't fit everything in my freezer."
Interviewee 6	4:125-128. [about fish oil supplements] "I don't really have much of a opinion on it – I think My Mum used to force feed me those things when I was a kid [laughs] but ermm, I, I don't know if it made any difference or not, or nothing that I've noticed. I mean providing you're eating enough of the right stuff anyway I think – they're on(ly) – they're literally just (like) they're supplements."
Focus group 1 (Males)	12:362-364; 374-381. "I just don't think supplements are any substitute for a healthy diet [agreement]. I have used supplements in the past, but I figure if I can get more from fruit and veg for less money – so I just get it from a balanced diet now." "I automatically think of how I can improve my diet rather than consider supplements [agreement] it never even enters my

	mind." 12:362-364. "I just don't think supplements are any substitute for a healthy diet [agreement]. I have used supplements in the past, but I figure if I can get more from fruit and veg for less money – so I just get it from a balanced diet now."
Focus group 2 (Females)	28:794-795; 29:828-830. "you know you should be getting it from your food. It's not as good from supplements as what it is from your food... ; I mean I get a lot of colds and stuff but I don't take vitamins but I find that if I increase my fruit consumption then I don't get as many colds. But then I don't need to take supplements I just increase my fruit so..."

Avoidance due to adverse reactions (Table 1.2.10.)

Some participants avoided supplements because they believed that they may cause adverse reactions, for example, interviewee 2 and a participant from focus group 2 said that they were put off using supplements due to an adverse reaction in the past. Others described how supplement use could be negative if they were used continuously and then stopped abruptly, resulting in a bad reaction similar to withdrawal symptoms (Interviewees 3, 5, 7 and group 2). In summary, despite a 'positive evaluation of supplements for health and well-being', some participants said that they should be taken in moderation, and taking them on a regular basis and stopping abruptly would be bad for the body.

Table 1.2.10. Avoidance due to adverse reactions

"Avoidance due to adverse reactions) Participant/focus group	Quote
Interviewee 2	5:132-145. ".....I'd be put off them 'coz after having them before I had an allergic reaction to something."
Interviewee 5	5:166-169; 6:173-178; 7:227-228. "it can be a bad thing to take them – to take some <u>really really</u> strong vitamins....and then completely stop afterwards, because your body sort of....goes into withdrawal from....lack of ermm nutrition even – even if your on a balanced diet." [usage should be] "with a balanced diet with your meals. Ermm if you don't and you rely on them too much I think they can be quite negative, quite bad for you."
Focus group 2 (Females)	29:822-824. "Yeh if you need it I think it is vital obviously, but I don't think you should put it in your body if you don't need it at the beginning [agreement] 'coz you just 'gona miss it if anything if you stop taking it your body probably 'gona react when if you don't – if it's not used to it then it's not going to." 28:814. "I used to take something before but it didn't react very well with me so I just didn't take it again...."

Distrust of sales and marketing claims (Table 1.2.11)

Interviewees 5, 6, and focus group 1 talked negatively about the sales and marketing claims surrounding supplement use. Participants described how the majority of information on the actions and benefits of supplements was biased, coming mainly from the companies that sell supplements. There was a lot of skepticism, particularly among male participants, concerning claims about the value of some supplements. Interviewee 6 said: "I find it hard to see how oil can help me concentrate better if you see what I mean... I'm kind of cynical about that." (Int. 6, 5:150-151, 153). The media were also blamed for causing confusion by providing contradictory messages about nutrients that may be beneficial or harmful, for example the male focus group discussed the influence of the media stating that "you're led to believe everything's good for you, then everything gives you cancer [laughs, agreement]. You never quite know who to believe." (Group 1, 11:339-342).

Table 1.2.11. Distrust of sales and marketing claims

"Distrust of sales and marketing claims" Participant/focus group	Quote
Interviewee 5	6:201-203; 7:237-238. [about sources of information] "there's no real information given to me. But ermm if you look – use the internet (and) ermm, look through stuff on the internet, you can usually find an unbiased opinion. Although the amount of biased opinions [agreement] quite outweigh the unbiased."; [about best sources] "not the websites which sell the supplements.... probably forums, ermm exercise forums."
Interviewee 6	5:131-132; 147...150-151; 153. "Ermm I think it's a lot of marketing.... I find it hard to see how oil can help me concentrate better if you see what I mean.... I'm kind of cynical about that."
Focus group 1 (Males)	11:351-354. "we're just being told that you need to take a certain amount of omega-3, and vitamin C, A, B, and all that jazz. It's like, at which point do you actually need to? At what point is it beneficial to you – how do you know you're not just being ployed into some marketing scheme?" 11:339-342. "Your led to believe everything's good for you, then everything gives you cancer [laughs, agreement] you never quite know who to believe...." "Yeh it depends who you believe basically doesn't it because there are always contradictory messages."

1.2.8. Discussion of barriers

Despite a 'positive evaluation of supplements for health and well-being', 'lack of awareness about actions and benefits' was a prominent theme mentioned in all but one account. Nearly all participants suggested that there was not enough information concerning the actions and benefits of supplements, therefore it is unlikely that people have enough dietary information to make informed dietary choices. Closely related to 'socio-cultural influences', a recent survey study found that 47% of people had never been given advice or looked up information about the supplements that they should or should not take (McHugh and Moon, 2008) and it could be suggested that this is due to a lack of readily available information. Consistent with the present finding, O'Dea (2003) reported that adolescents did not know the benefits and actions of supplements. O'Dea (2003) found that parents provided supplements to adolescents without providing awareness of actions or benefits: "I don't know why she gives them to us. She was just handing them around and all the kids had one. I don't know what type they were, but they were nice". People also talked about the inadequacy of labels on supplement packets, with minimal information on the actions and benefits of supplements. McHugh and Moon (2008) found that 31% of users said that they never looked at the labelling information of vitamin and mineral supplements. Only 20% of participants that had used supplements in the previous 12 months looked at the dosage information and full list of ingredients; whereas 17% looked at the Recommended Daily Allowance (RDA). Surprisingly, 51% did not correctly understand the term RDA. This theme demonstrates the need for more education and awareness on nutrients, food groups and the potentially beneficial effects of supplements. This could potentially increase supplement use if and when it is required. An additional barrier identified in Whiting et al. (2010) was 'knowledge' (or lack thereof). Participants talked of how there were too many choices and how they were unsure if they needed supplements ("I kind of look down that aisle as I walk through the grocery store and go 'some day I should look into that, but not today.' "; "I don't know how they help me."; "...Vitamins and minerals from the supplement. Is it the same as the vitamins from vegetables and fruit?"). This barrier is highly similar to that identified in the present study: 'lack of awareness about actions and benefits'.

With regard to 'preference and perceived superiority of diet', some participants during the present study suggested that nutrients should be obtained from the diet as opposed

to supplements. Although some people were against supplement use to obtain nutrients, others used supplements if they were not getting a nutrient from the diet, or if they wanted a safeguard for good nutrition in the event that the diet was inadequate. Hence, the results produced three categories of people: those who were opposed to supplements; those who used supplements to obtain a nutrient they perceived that they did not get from the diet; those who used supplements as a general safeguard for good nutrition. Consistent with the finding from the present study that the diet was perceived as superior, a recent survey it was found that 90% of people agreed with the statement 'eating healthy is important to me' (McHugh and Moon, 2008). Whilst 44% of people stated that most people need vitamin and mineral supplements, 51% said that most people do not need them. Hence 51% believed that they get enough nutrients from the diet. A problem with this is that actual dietary intake in McHugh and Moon (2008) was not provided, so it is unclear whether people had adequate nutrient intake or demonstrated a lack of knowledge and were therefore ignorant about the recommended adequate intake. 51% of people disagreed that vitamin and mineral supplements are necessary for good health, and whilst 37% said that they were necessary for good health, 67% said that they are conscious about what they eat with regard to health, again suggesting that people consider their diet more than the need to take supplements.

A survey study by O'Dea (2003) when examining influences on supplement use suggested that participants believed immunity could be boosted by dietary factors. Adolescents recognised the importance of foods as opposed to supplements in the long-term prevention of illness and consistent with the present findings this has been supported by other research (Nowak and Crawford, 1998). With regard to the finding that some people used supplements as a safeguard, a consistent study was by Harrison et al. (2004) who provided evidence for the 'inverse supplement hypothesis', suggesting that supplement use was higher among healthy people who engaged in healthy dietary behaviours. Although this finding has been supported elsewhere (van der Horst and Siegrist, 2011), the latter study found that people with a moderate diet were least likely to use supplements, and people with a healthy (20.6% of users) and unhealthy diet (31.4%) were most likely. In the event that supplements are used by people who are unable to obtain a nutrient from the diet, this may be beneficial, however a person must have knowledge about what constitutes an adequate diet to

make an informed decision about using supplements. Despite this in the previous chapter we highlighted that not everyone has knowledge of what constitutes a healthy diet. The finding that people who use supplements as a safeguard for good nutrition suggests that supplement users are least likely to need them (van der Horst and Siegrist, 2011), since supplement users usually have better diets indicating a better micronutrient and nutrition status (e.g. Harrison et al., 2004; Rock, 2007). Hence, it is important to raise awareness not only about what constitutes a healthy diet, but also about the potential benefits of supplements if nutrients cannot be obtained from the diet.

With regard to 'avoidance due to adverse reactions', previous research (McHugh and Moon, 2008) has found that 50% of people who had used supplements in the past 12 months were aware that taking a high number of vitamin and mineral supplements could result in unintentional consumption of high levels and subsequently cause adverse side effects. 31% were partially aware of potentially adverse side effects, whereas 15% were not at all aware. 71% of people disagreed that "it's not dangerous to exceed the stated daily dose", however, this leaves 29% of people who did not think it was dangerous to exceed the stated daily dose. Furthermore, 17% people did not think it was dangerous to take as many vitamin and mineral supplements as they wanted. 50% of people said that they did not know enough about safe or unsafe quantities. This is consistent with the present finding since although some people talked of potential adverse reactions, the majority of participants did not mention it. Contrary to the present study, O'Dea (2003) suggested that adolescents were not aware of, or at least did not discuss negative or potentially dangerous side effects of vitamin and mineral supplements. This is despite the fact that some vitamins and minerals are known to be toxic in large doses (DiPalma and Ritchie, 1977; Fumich and Essig, 1983).

The fact that not all participants in the present study mentioned negative or adverse side effects demonstrates a general lack of awareness and is reflective of poor knowledge of dietary supplements. Another possibility is that some people ignore the perceived risks of supplements in favour of perceived benefits. The first barrier highlighted by Whiting et al. (2010) was preferences (unable to tolerate forms such as pills, nausea after using supplements - "I wouldn't even consider to take vitamins due

to I can't take a tablet or capsule"). Although no participant during the present study talked about negative effects whilst taking supplements, a few participants mentioned adverse side effects after taking supplements. Therefore, a barrier to consumption highlighted in the present study; 'avoidance during adverse reactions' is similar to Whiting et al.'s (2010) 'preferences'. A fourth personal barrier was 'health concerns', where people talked negatively about supplement effects: "I didn't notice any difference from when I was taking vitamins when I was pregnant and then when I got off them."; "I mean, we could be doing harm to our body, too, by taking all this stuff." Although this barrier is consistent with some of the present findings, 'i.e. avoidance due to adverse reactions', some participants during the present study made a 'positive evaluation of supplements for health and well-being.', which is contrary to what participants in Whiting et al. suggested.

With regard to 'distrust of sales and marketing claims', some participants talked negatively about claims surrounding the actions and benefits of supplements suggesting that the majority of information came from the companies that sell supplements. Furthermore, participants pointed out that there are often contradictory messages provided by sales, marketing, scientists and the media. Previous literature reported that 78% of people suggested that not all internet sources of supplements are safe, with 54% stating that not all supplements sold in this country are safe (McHugh and Moon, 2008). This evidence highlights distrust of the supplement industry. In future, health promotion activities should provide a credible and reliable source of information to which potential supplement consumers can gain access.

1.2.9. Socio-cultural factors

There was one social/cultural factor that influenced supplement use. Although merged into one factor, 'social influences' were multifaceted.

Social influences and availability (family, doctor, internet, peers, sales, culture) (Table 1.2.12.)

If family members used supplements or provided advice on supplement use, the likelihood of supplement use was perceived more likely (Interviewee 1, 2, 4, groups 1 and 2), potentially due to the availability of supplements. This suggests that interventions could target the family as a means of increasing supplements use. The family doctor was also another persuasive source of information if the participant had health problems (interviewee 2, 3, 6 and 7). One participant said that there was no 'real information' provided to him; however, the internet was a source of 'unbiased information' (Int. 5, 7:237-240), this is consistent with other accounts (interviewee 5, 6 and 7). Health professionals, such as dietary experts, fitness instructors, and health shops (interviewee 5, 6 and 7) were also mentioned as credible sources of information. When asked about reasons for supplement use, some participants (interviewee 1, group 2) who had heard about beneficial effects of supplements for health talked vaguely about sources of information from which health information came. This suggests that there is no prevailing source of information about the use and benefits of supplements and therefore it could be suggested that marketing campaigns are not effectively reaching this population.

Table 1.2.12. Social influences and availability (family, doctor, internet, peers, sales, culture)

"Social influences and availability (family, doctor, internet, peers, sales, culture)" Participant/focus group	Quote
Interviewee 1	4:112-113; 119-120. "I used to take cod liver oil, like when I was little just like 'coz my Dad takes it, so....I suppose I always had it"; "....cod liver oil - I don't know I just [laughs] my Dad just kind of made me take it when I was little so I suppose just kind of from that."
Interviewee 2	5:123. [takes supplements after advised by] "Ermm parents and the doctor..." 4:119-121; 5:123. "Well I've just –been told to take 'em 'coz ermm....like I've been getting lots of ulcers and stuff. I've been run down so I've been told to take them to make make....to boost my immune system or something....[advised by] parents and the doctor."
Interviewee 3	5: 144-145 "....I was quite unwell for quite a period of time and they didn't know what was wrong, so they sort of said you know, try all of these different supplements..."
Interviewee 4	5: 150; 6:163-164; 176. "I got most of my information from my Mum..."; "general stuff my Mum tends to know. I don't know how, but it makes sense what she says, I've never really questioned it...." 6:176. [asked about any pressure to take supplements] "No. If they –if my Mum says, oh, oh you've got this – take this, then I'll do it...."
Interviewee 5	6:201-202; 7:237-240. "there's no real information given to me. But ermm if you....use the internet (and) ermm, look through stuff on the internet, you can usually find an unbiased opinion." 7/8:243-244. [about best sources of information] "probably forums and just other people, ermm like trainers, people in the gym [agreement] ermm and other people taking the supplements really, they're in the know really."
Interviewee 6	4:120-122; 5:139-141. "to be honest I always just thought supplements were something that…if

	your....having a problem with taking - eating certain foods or something like that then maybe it's recommended by a doctor or by a friend.... I was in ill health and someone – and a doctor said, ok I think you should be taking these 'coz sort of whatever reason, then I would take them, but other than that I probably wouldn't bother." 6:177-178. [about sources of information] "....the internet, I'd guess? I'd have no idea. Ermm, I suppose if you were gona look into it, maybe speaking to....I don't know a dietary expert or a fitness instructor or someone who's more likely to know a bit about that sort of stuff."
Interviewee 7	5:138-139. "Ermm, the internet I suppose, or like health shops. Ermm...or like doctors if you ask them, dieticians...."
Focus group 1 (Males)	11:330-331. "Ermm, I (used) to take for exam periods, just because it's something, my Mum always used to do when I was little. Like, for GCSE's cook me loads of fish. Just because I was a lazy person and didn't wana cook anything." 11:328. ": I don't take any (supplements). I used to, mainly 'coz my ex did." 11:335-337. "It's like – the public, a public thing, they perceive fish to be good for your brain don't they, this whole omega 3 thing. I mean, I don't know if it's true or not, but it's in everything now isn't it. Like, feed yourself omega-3 and you'll be super brainy."
Focus group 2 (Females)	27:789-791. "I've got a medicine bag. My Mum – well Caribbean's, are well into like...bush teas they call them. So I've only like – I've been brought up on herbal teas, vitamins for everything 'coz I've got a low immune system so I have to take vitamins for everything, but I take what I need..."

1.2.10. Discussion of socio-cultural factors

The finding that there were strong familial influences on supplement use is consistent with previous research that found that 52% of households with children under 16 currently gave them vitamin and mineral supplements, 76% of which were child supplements whilst 20% were adult supplements (McHugh and Moon, 2008). A study by O'Dea (2003) has also found familial influences on supplement use in a population of adolescents, with usage by parents increasing the likelihood of supplement use in adolescents. This evidence suggests that interventions could target the family as a means of increasing usage, a point that should be considered in future health interventions. In support of the finding that there was no prevailing source of information about the actions and benefits of supplements, a recent study reported that 47% people had never been given advice or actively searched for information about which supplements may or may not have been beneficial (McHugh and Moon, 2008). Consistent with the present finding, of those who had received advice relating to supplement use, 21% received it from their GP. Of people who used supplements, 49% got them from a supermarket, 45% from a high street chemist and 29% from a health food shop, 3% from an online website. 31% of supplement users said that they never looked at the labelling information of vitamin and mineral supplements. With regard to the internet as a source of information, 78% of people suggested that not all internet sources of supplements are safe, with 54% stating that not all supplements sold in this country are safe.

1.2.11. General discussion

The results and discussion above suggest that supplement use is affected by 3 inter-related super-ordinate themes that yielded a total of 12 perceived underlying themes, including personal factors ('obtaining essential nutrients for an inadequate diet'; 'ill health'; 'positive evaluation of supplements for health and well-being'; 'good for brain development and function'; 'perceived control over health'; 'life period'; and 'physical appearance'); barriers ('lack of awareness about actions and benefits', 'preference and perceived superiority of diet', ' avoidance due to adverse reactions' and 'distrust of sales and marketing claims'), and socio-cultural factors ('social influences and availability').

Although O'Dea (2003) advocated the consumption of a healthy diet as opposed to the use of supplements, this is not always practical due to the constraints on healthy eating that were reported in the first part of this study. For example, students are faced by multiple barriers to the consumption of a healthy diet, for example 'sensory preferences and aversions', 'knowledge and skills', 'preference and health conflict', 'independence, improvisation, simplicity and convenience', 'conflict of financial priorities' and 'family and peers'. Students are particularly vulnerable to poor dietary habits and in this instance it may be more practical to use supplements to obtain nutrients that are not present in the diet. Omega-3 and vitamin and mineral supplements may be a safeguard and a preventative measure against poor nutritional status. Personal factors, barriers and socio-cultural factors should be addressed during interventions that aim to improve nutrient consumption. With regard to socio-cultural factors, although social influences were multi-faceted, the present study found that there was no prevailing source of information that participants considered credible and accessible. Therefore, future health promotion activities should provide a credible and reliable source of information to which potential supplement consumers can gain access. The extent that the above themes extend to other populations requires further research.

Consistent with the present findings, previous research has found that reasons behind supplement use include feeling run down (12%), cold and flu (12%), well-being (12%), prevention of illness (9%), doctor advice (5%), no particular reason (22%), as well as illnesses such as arthritis, osteoporosis, joint/flexibility problems, bone

strength, anaemia, pain relief, bad diet, age, stress and energy levels (McHugh and Moon, 2008). Some researchers advocate the use of dietary supplements to protect against malnutrition (Fairfield and Fletcher, 2002; Fletcher and Fairfield, 2002) and it has been suggested that the use of multivitamin and mineral supplements may reduce the risk of chronic diseases including CVD (Holmquist et al., 2003; Rimm et al., 1998). However, the use of vitamin and mineral supplements causes a certain amount of concern since a high intake of dietary supplements may cause adverse side effects (Palmer et al., 2003; Coppens, da Silva and Pettman, 2006; Hackcock, 1997). There are several problems associated with overconsumption, including problems with the absorption of other micronutrients; neurological disturbances; gastrointestinal irritations; liver and kidney toxicity (e.g. Coppens et al., 2006; Hathcock, 1997). Previous research has suggested that although adolescents use nutritional supplements for their perceived physiological benefits, they may not know about the potentially harmful effects of supplements (O'Dea, 2003). This suggests that there is a lack of awareness about the potential harmful effects. Future health interventions must inform people about safe limits in supplement use. A general point is that students are educated and above average intelligence, if this population does not understand the actions of supplements then it is unlikely that less educated people will understand. Conversely, it is possible that nutritional knowledge may increase with age. Future interventions must provide more information regarding the benefits and potential disadvantages of supplement use. Interventions should be targeted towards those with unhealthy lifestyle and dietary behaviours, since it has been shown that people who engage in unhealthy lifestyle behaviours are less likely to use supplements (Harrison et al., 2004). Furthermore, the present study suggested that there is not enough information available about the functions and benefits of dietary supplements and some people have misguided beliefs. Dietary interventions that provide more information will help people make more informed dietary choices.

A problem associated with supplement use is that people who are most likely to use supplements are the least likely to need them. For example, Harrison et al. (2004) found that although 35.5% of adults use dietary supplements, supplement users were more likely to engage in health-related behaviours, for example, supplement users were more likely to be physically active. The use of vitamin, mineral and/or antioxidant supplements was associated with higher consumption of fruits and

vegetables, and the use of omega-3 supplements was associated with higher consumption of fatty fish. Similarly McHugh and Moon (2008) found that supplement users were more likely to consider the health implications of what they ate, actively look for information on how to stay healthy and believe that they need vitamins and mineral supplements to stay and feel healthy. In addition these users were more likely to buy organic, wholemeal and unrefined foods and consistent with these findings previous literature has demonstrated that supplement users are more likely to participate in healthy lifestyle behaviours and have better diets in terms of disease prevention (Kirk et al., 1999; de Jong et al., 2003). Harrison et al. (2004) found that those who are most likely to benefit from supplement use, such as those with a history of CVD or with CVD risk factors were less likely to use supplements. Evidently people who engage in supplement use are probably least likely to need supplements, therefore it is important that public health interventions that aim to improve nutrient intake raise awareness about the benefits of supplements to those who have poor diets and engage in poor lifestyle behaviours.

The present study has provided a valuable contribution to the literature since few studies have used qualitative methods to examine supplement use. Connors et al. (2003) advocated the use of quantitative behavioural models such as the Theory of Planned Behaviour (TBP) to examine supplement use, suggesting that a person is more likely to engage in behaviour if intention (determined by attitudes toward the behaviour, including perceived social pressures) is high. Connor et al. (2003) showed that supplement use was higher in those who perceived more social pressure, suggesting that increasing awareness of the actions and benefits of healthy diet/supplements through media and public health campaigns may lead to increased consumption of foods and supplements containing omega-3, vitamins and minerals.

A problem with TBP and other health models is that they do not account for barriers to consumption, for example the barriers to supplement use highlighted during the present study. Specific health behaviours, such as healthy eating and supplement use, benefit from examination using qualitative methods, which help to gain an all-rounded and detailed view of factors that affect a specific behaviour. As a result, the findings from qualitative studies can be used by health promoters to design specific interventions tailored to specific populations.

An additional strength of this study is that it is not always possible for a person to obtain all the nutrients that are required for healthy functioning from the diet. In this case, identifying factors that affect supplement use provides a convenient and easy method of increasing nutritional status. This study has provided quality and detailed information from interviews and focus groups using both methods to ensure data triangulation. The purpose of including two researchers in the analysis was for investigator triangulation, a form of validity check that aims to eliminate biases created from producing one account of the data. Investigator triangulation also aims to verify that the analyses have been produced systematically (Smith, 1995). Although there was a small sample size, qualitative work does not aim to gain a representative sample but rather to produce an in-depth account of a phenomenon.

A possible limitation of this study is that one interview transcript was used for investigating food choice and supplement use: it may be that discussions on food choice and the consumption of fish, fruit and vegetables primed responses for later discussions on supplement use, particularly the use of supplements containing omega-3, vitamins and minerals. However, a point to consider is that even though earlier discussions may have primed responses on supplement use, as can be seen from the interview schedule (Appendix D), although at the beginning participants were given freedom to discuss any form of supplements, towards the end of the interview transcript questions were asked on specific types of supplements including omega-3, vitamin and mineral supplements. Therefore, whether or not earlier discussions on foods containing omega-3, vitamins and minerals influenced the discussion on supplement use is to some extent arbitrary. There are possible limitations and benefits associated with the use of focus groups and interviews: as highlighted in chapter 1, focus groups can be used to examine social interaction, discussion and debate and to examine consensus or lack of agreement among a group. A limitation is that group dynamics may negatively influence the discussion, for example, individuals may be unwilling to discuss certain topics in the presence of others. Therefore individual interviews were conducted to provide a more intimate environment and allow individuals to discuss topics that they may not discuss in a group situation. A fimal limitation is that although a theoretical model was produced that demonstrated influences on supplement use, at present this model only applies to the present student population. Generalizability to other populations requires further research.

1.2.12. Implications for research and practice

Each factor from the present study be addressed in interventions aimed at improving nutrient status. The themes had either a positive or negative influence on supplement use. For example most personal factors increased the likelihood of supplement use whilst barriers negated supplement use. As with factors affecting food choice, researchers must focus on the extent to which each theme effects different populations - this will enable health practitioners to tailor interventions to specific groups. However, in contrast with factors affecting food choice, the factors affecting supplement use are likely to be more generic. There are obvious exceptions to this; for example 'life period', 'ill health' and 'physical appearance' are likely to vary considerably in different populations. However, other personal factors such as 'obtaining essential nutrients', 'positive evaluation of supplements for health and well-being', and barriers such as 'lack of awareness about actions and benefits', 'preference and perceived superiority of diet', ' avoidance due to adverse reactions', 'distrust of sales and marketing claims',and 'social influences' are likely to remain fairly constant in different populations. Although factors affecting supplement use reflect this student population, they are not limited to it. The validity of this claim requires further research.

As highlighted in the present and previous studies (Whiting et al., 2010; Harrison et al., 2004), due to a 'lack of awareness about actions and benefits' selecting an appropriate supplement for health and knowing the actions and benefits of a supplement, as well as the composition, is difficult (Centre for Science in the Public Interest, 2008). Those with additional barriers to supplement use such as income, time, and accessibility issues face an even greater challenge. Although supplements should not be used to replace a balanced diet, there may be circumstances under which they are beneficial, for example for groups with financial issues, as well as groups who may not be able to consume certain nutrients though the diet. With regard to implications for practise, health promoters should aim to increase awareness of and improve access to supplements that may be required for health purposes. In addition, health advisors should aim to improve healthy eating and supplement use by continuously advertising evidence-based, accurate nutrition messaging via the media.

In summary, the present study highlighted 3 super-ordinate themes and 12 potential underlying themes that influenced supplement use. Each theme is actively involved in supplement use. Campaigns aimed at improving nutrient intake should address each factor individually when creating interventions as different factors will have differential effects depending upon the target population. Although the present findings cannot be generalised beyond the present student population, the applicability of this model to other populations requires further research. The last point is that the present findings are not advocating supplement use in the general populations, neither are they advocating supplement use in those that lead a healthy lifestyle including healthy dietary behaviours. Rather, the present study highlights that factors that are involved in supplement use for health promoters in situations where individuals or groups of individuals may be at risk of nutrient deficiencies.

2. Section 2: An introduction to the influence of vitamins, minerals and omega-3 fatty acids on behaviour

The second section aimed to consider whether supplementation was in fact beneficial, in particular whether it influenced aspects of mood and cognition. Section one highlighted the importance of maintaining a healthy diet, including consuming adequate amounts of vitamins, minerals and omega-3. There is a literature to suggest that these nutrients may be involved in some aspects of behaviour, for example stress, aggression, mild psychiatric symptoms, impulsivity, cognitive performance and several aspects of mood such as depression, anxiety, fatigue and clearheadedness. This section is divided into 3 chapters concerning a double-blind, randomized, placebo-controlled trial that investigated the role of vitamins, minerals, and/or omega-3 fatty acids in mental health, mood and cognition. We assessed mild psychiatric symptoms, stress, aggression, impulsivity, fatigue, hostility, anxiety, confusion, confidence, reaction time, memory and vigilance. Given the complex interaction between nutrients in the body, as well as examining the individual effects of either vitamins and minerals OR omega-3 fatty acids, we also explored the possibility that there would be a synergistic action between vitamins, minerals and omega-3. Chapter three explores the effects of micronutrients and omega-3 on aggression and impulsivity. Chapter four details the effects of supplementation on several aspects of mood including anxious mood, fatigue, depressed mood, confusion, hostility, confidence and mild psychiatric symptoms (assessed by the General Health Questionnaire; GHQ) and stress. Chapter five explores the effects of supplementation on 3 aspects of cognition – memory, reaction time and vigilance.

2.3. Chapter 3: The effects of vitamins, minerals and omega-3 on aggression and impulsivity

2.3.1. Abstract

Although a series of well designed studies have reported that supplementation with vitamins / minerals and omega-3 fatty acids reduce the incidence of aggressive behaviour, to date the relative contribution of these nutrients has not been considered. In addition the studies that have reported a positive response to supplementation have monitored behavior in the real world, for example prisons. A second aim was to establish the value of theoretically based laboratory measures that will allow this topic to be studied more economically. In a sample without a history of aggressive or impulsive behaviour, a positive response was found to DHA in a paper and pencil measure of actual aggressive behavior and using a performance measure of the ability to inhibit an already initiated behaviour (impulsivity). It was concluded that aggression and impulsivity can be conveniently studied in a sample without a history of anti-social behaviour, using standardized, sensitive laboratory based measures. No evidence was found of a synergistic interaction between vitamins / minerals and DHA.

2.3.2. Introduction

There is a series of well designed studies that have reported, in those with a history of anti-social behaviour, that supplementation with vitamins / minerals, omega-3 fatty acids, or both, reduces the incidence of aggressive behaviour. Although there is evidence that all these nutrients have a role, to date the relative contribution of fatty acids and vitamins / minerals has not been considered, nor has the possibility of a synergistic interaction between these nutrients. The first major objective was to consider the relative contribution of vitamins / minerals and/or omega-3 to aggression and impulsivity. In addition the topic has usually been examined under real-life conditions, such as a prison, making the question both expensive and difficult to study. Although measures of actual behaviour, such as the incidence of rule violation, have proved to be sensitive to supplementation questionnaire measures have not. The second major objective was therefore to consider whether such phenomena can be studied in a sample without a history of anti-social behaviour, using standardized, sensitive laboratory based measures.

Gesch et al. (2002) in a double-blind randomized-controlled trial (RCT) found that the disciplinary record of 231 young offenders, over the age of 18 years, improved following a multi-vitamin / mineral supplement and fatty acids (1260mg linolenic acid; 160mg gamma linolenic acid; 80mg eicosapentaenoic acid (EPA); 44mg docosahexaenoic acid (DHA)). Relying on the recording of instances of behaviour that led to disciplinary action, a reduction on average 26% was associated with taking the active supplements rather than the placebo. The greatest reduction occurred in more serious violent offences. Zaalberg et al. (2010) replicated the study using 221 young Dutch prisoners who received nutritional supplements for one to three months containing multi-vitamins / minerals and essential fatty acids (400mg DHA; 400mg EPA; 100mg gamma linolenic acid), or alternatively a placebo. Again the incidence of aggressive and rule-breaking behavior decreased, this time by 34%. A role for omega-3 fatty acids in aggressive behavior has been supported by the findings that 1.5-1.8g DHA per day prevented a rise in extra-aggression (aggression directed towards others) during times of mental stress (Hamazaki et al., 1996).

A previous well designed double-blind placebo controlled study examined 62 imprisoned juveniles, many of whom had a history of behaving aggressively

(Schoenthaler et al., 1997). Over a three month period the incidence of violence was 28% less in those who consumed a multi-vitamin / mineral supplement rather than a placebo. Using blood samples vitamin status was assessed at baseline and after three months, and in those whose vitamin status did not significantly alter during the study there was no change in the incidence of violence: there were 39 violent acts during the baseline period and 37 while taking supplements. In contrast in those whose vitamin status improved during the study there were 131 violent acts during the baseline period but only 11 while consuming the supplements. The argument offered was that if there was an improvement in vitamin status then it must have been initially poor and hence supplementation had been beneficial.

As there are 3 double-blind RCTs (above) that have considered those with a history of violence or crime it is relevant that a similar finding has been reported in a sample not so selected. The official school disciplinary record during a four month intervention was examined for school children who had been disciplined at least once in an eight-month period and took a placebo or multi-vitamins / minerals (Schoenthaler and Bier, 2000). If the active tablets had been taken the children were disciplined significantly less than when a placebo was consumed; on average once compared with 1.9 times. They suggested that the incidence of "impulsive misconduct" declined in those taking vitamins / minerals. This latter evidence suggests that vitamins and minerals, as well as DHA, may in particular individuals reduce aggressive and anti-social behaviour.

In summary although there are four well designed studies that have found that supplementation with vitamins / minerals and/or omega-3 decreased the incidence of anti-social / aggressive behaviour, and one that found supplementation may prevent aggression in a normal population, there has been no attempt to examine the relative contribution of vitamins, minerals and fatty acids. Given the intense recent interest in fatty acids some have assumed that this is the active ingredient. This is a plausible suggestion as a meta-analysis that integrated eight studies that had that related fatty acid supplementation to violence and aggression found that the incidence of aggression was significantly less in those taking the PUFA supplements (Benton, 2007). However this cannot be the complete answer as some studies did not include fatty acids (Schoenthaler et al., 1997; Schoenthaler and Bier, 2000) and Gesch et al. (2002) included fatty acids in a quantity much smaller than the studies that the meta-analysis

found significantly decreased aggression (Benton, 2007). The Zaalberg et al. (2010) study did, however, include fatty acids in an amount and form that could possibly decrease aggression, and the study involving a non-violent population used only DHA (Hamazaki et al., 1996). Thus there is a possibility that both nutrients contribute to the reduction of aggressive / anti-social behavior, and there may be a synergistic interaction between vitamins, minerals and fatty acids as nutrients do not act in isolation.

It may well be important that four studies that have reported a positive response to supplementation assessed behaviour in the real world rather than using more theoretically based laboratory measures. Gesch et al. (2002) also used questionnaires to monitor dimension such as emotional control, anger and aggression. Zaalberg et al. (2010) similarly obtained questionnaire based measures of aggression and social dysfunction. However, although supplementation changed behavior in no instance were questionnaire measures influenced. This is contrary to Hamazaki et al. (1996) who found that DHA prevented a rise in aggression directed towards other people using a paper and pencil measure of aggression. An approach that has not been taken in this area is to use laboratory based measures of impulsivity that are likely to be more sensitive than questionnaires and have been reported to be associated with a range of anti-social and impulsive behaviors including Attention Deficit Hyperactivity Disorder (ADHD), Conduct Disorder, disruptive behavior disorders and aggression (Oosterlaan, Logan and Sergeant, 1998; Wodushek, and Neumann, 2003; Marsh et al., 2002; Bjork et al., 2000; Mathias et al., 2002 Dougherty et al., 1999 Dougherty et al., 2003).

Impulsivity is a multi-faceted construct with a range of different measures that consider different dimensions. Dougherty et al. (2003) developed a series of tests that assess aspects of impulsivity that are to a large extent independent: tests that examine the ability to inhibit a response once it has been initiated, the ability to tolerate a delay to get a greater reward, and the ability to judge the speed that time is passing. Nutritional supplements have been found to influence measures of actual behavior and it therefore seemed possible that this type of performance test might prove susceptible to supplementation. It may be relevant that performance measures of impulsivity offer a measure of actual behavior and that often the relationships between questionnaire and behavioral based measures of impulsivity have often been reported to be non-

significant (Krishnan-Sarin et al., 2007; Reynolds, Penfold and Patak, 2008; Reynolds et al., 2004) or at the best low (Lane et al., 2003).

Thus the aims were to examine the relative influence of DHA and/or vitamins / minerals on aggressive and impulsive behaviour and to see if a paradigm could be developed to allow the topic to be examined in a normal population in a laboratory situation.

2.3.3. Methods

Participants

Two hundred male students were recruited, following a circular email (the advert can be found in appendix F), if they had not taken omega-3 or vitamin and mineral supplements during the previous six months and did not regularly consume fish or seafood. They gave written informed consent (appendix G) and were paid £60 for taking part in the study that was approved by the local ethics committee. The mean age was 20.9 years. Participants were randomized to condition using computer generated random numbers.

Procedure

Baseline measures of aggression, impulsivity, cognition and mood were assessed, although presently only the aggression and impulsivity measures are reported. Randomly and under a double-blind procedure participants were then allocated to one of four conditions; 1) Vitamins and minerals / DHA; 2) DHA / placebo; 3) Vitamins and minerals / placebo; 4) Placebo / placebo. After consuming the supplements for 12 weeks the test battery was again administered.

Compliance

In order to assess compliance it was initially decided that biochemical measures of vitamin, mineral and omega-3 status would be employed at baseline and at follow-up. Not only would this have enabled the researchers to assess compliance but it also would have been possible to examine whether a change (if any) in nutrient status correlated with a change in mood and behaviour. Due to constraints on resources it was not possible to assess biochemistry and therefore compliance was assessed by contacting participants via text message at approximately 4 and 8 weeks to ask of they were complying with instructions. If they responded they expressed compliance and therefore this was perceived as positive compliance. If participants did not respond after three occasions, they were not contacted for the follow-up. A limitation was that this method of self-reported compliance may have been biased, however, owing to restraints on resources such as time and money this was the only suitable method of

assessing compliance. Combined participants that indicated compliance but did not respond when contacted at follow-up, there was a drop-out rate of n=29.

Supplements

DHA

Each active capsule weighed on average 506.5mg and contained the following: 14:0 mysteric (0.1%, 0.5mg); 16:0 palmatic (1%; 4.6mg); 16:1 hexadecenoic (0.4%, 1.8mg); 16:2 hexadecadienoic (0%, 0mg); 17:0 heptadecanoic (0.2%; 1.0mg); 16:3 hexadecatrienoic (0%, 0mg); 18:0 stearic (3%, 13.1mg); 18:1 oleic (5.4%, 23.4mg); 18:0 cis-vaccenic (1%, 4.2mg); 18:2 linoleic (0.8%, 3.4mg); 18:3 γ-linolenic (0%, 0mg); 18:3 α-linolenic (0.3%, 1.4mg); 18:4 octadecatetraenoic (0.4%, 1.7mg); 20:0 icosanoic (0.7%, 2.8mg); 20:1 icosenoic (2.7%, 11.6mg); 20:2 (n-9) icosadienoic (0.4%, 1.8mg); 20:3 (n-9) icosatrienoic (0%, 0mg); 20:3 (n-6) icosatrienoic (0.2%, 0.9mg); 20:4 (n-6) arachidonic (2.2%, 9.3mg); 20:3 (n-3) icosatrienoic (0.3%, 1.1mg); 20:4 (n-3) icosatetraenoic (0.7%, 2.8mg); 20:5 (n-3) icosapentaenoic (7.7%, 32.1mg); 22:0 (n-3) docosanoic (0.4%, 1.7mg); 22:1 (n-11) cetoleic (2.2%, 9.3mg); 22:1 (n-9) erucic (0.5%, 2.1mg); 22:4 (n-6) docosatetraenoic (0.5%, 2.0mg); 22:5 (n-6) docosapentaenoic (4.1%, 16.9mg); 22:5 (n-3) docosapentaenoic (2.9%, 11.9mg); 24:0 tetracosanoic (0.4%, 1.5mg); 22:6 (n-3) docosahexaenoic (54.9%, 224.2mg); 24:1 tetracosenoic (1.7%, 6.8mg); minor components (4.9%); Alpha tocopheryl Acetate (0.75mg); Mixed tocopherols (1.5mg).

Each placebo capsule weighed on average 496.7mg and contained the following 14 fatty acids: 14:0 mysteric (0.6%, 3.0mg); 16:0 palmitic (28%; 130.7mg); 16:1 hexadecenoic (0.2%, 0.7mg); 17:0 heptadecanoic (0%; 0mg); 18:0 stearic (3.7%, 16.7mg); 18:1 oleic (41.2%, 187.5mg); 18:1 (n-7) cis-vaccenic (1.2% 5.5mg); 18:2 linoleic (21.2%, 96.5mg); 18:3 α-linolenic (2.2%, 9.7mg); 20:0 icosanoic (0.4%, 1.8mg); 20:1 icosenoic (0.4%, 1.8mg); 22:0 (n-3) docosanoic (0.3%, 1.1mg); 22:1 docosenoic (0.1%, 0.5mg); 24:0 tetracosanoic (0.1%, 0.5mg); minor components (0.4%); Alpha tocopheryl Acetate (0.76mg); Mixed tocopherols (1.5mg). The placebo capsule contained saturated and unsaturated fatty acids that did not fall into the omega-3 group (with the exception of alpha-linolenic acid, which formed 2.2% of the placebo; icosenoic acid, which formed 0.4%). Although critics may argue that a placebo

consisting of lipids should not be used, it must be noted that substances such as water would have enabled participants to break the blind.

Participants were instructed to take three of these capsules each day for 12 weeks.

Multi-vitamins / minerals

The use of a multivitamin/mineral reflected the underlying hypothesis that widespread minor deficiencies of micro-nutrients can have a cumulative impact and that deficiencies of minerals such as iron occur commonly. The hope was to consider the effect of a wide range of vitamins and minerals with the objective to consider the possibility of a cumulative influence

Each active tablet contained vitamins A (800μg); B (several B vitamins, see appendices); C (120mg); D (5μg); E (18mg); and K (30μg), as well as several minerals including Calcium (162mg); Phosphorus (125mg); Magnesium (100mg); Potassium (40mg); Chloride (36.3mg); Iron (2.1mg); Iodine (100μg); Copper (500μg); Manganese (2mg); Chromium (40μg); Molybdenum (50μg); Selenium (30μg); and Zinc (5mg).

Participants were instructed to take one of these capsules each day for 12 weeks.

Measures

Picture Frustration Task (Appendix 17)

The Rosenzweig Picture Frustration test (Rosenzweig, 1976; appendices) contains 20 cartoon pictures portraying two people in a frustrating situation. Each picture contains two speech bubbles. One was already filled with speech that was intended to be provoking and the participant responded by writing the first thing that came to mind in the second bubble. The responses were placed into one of four categories by somebody blind to the supplements that had been consumed: 1) Extra-aggression: an aggressive response directed towards another person. 2) Intra-aggression: a response involving self-directed guilt, fault or blame. 3) Inner-aggression: a response involving

frustration or hostility that was not directed to anybody. 4) Neutral: a non-aggressive response.

Buss-Perry Aggression Scale (Appendix 18)

The Buss-Perry Aggression Questionnaire (Buss and Perry, 1992) is a 29-item self-report measure that assesses four aspects of aggressive behaviour: physical aggression, verbal aggression, anger and hostility. Participants were provided with statements about temperament and are required to rank each statement using a 7-point Likert scale ranging from 1 (extremely uncharacteristic of me) to 7 (extremely characteristic of me). Examples of items include "If I have to resort to violence to protect my rights, I will" (physical aggression); "I often get into arguments" (verbal aggression); "I flare up quickly but get over it quickly" (anger); "I sometimes feel that I have gotten a raw deal out of life" (hostility). In addition these four scores were added to produce an overall score.

GoStop Impulsivity Paradigm (Instructions in Appendix 19)

The GoStop Impulsivity Paradigm (Dougherty, Mathias and Marsh, 2003) measures the ability to inhibit an already initiated response. Participants attended to a number of five digits presented on a computer screen. A first number appears on screen for 500ms followed by a 500ms blackout. A second number then appeared on the screen followed by a 500ms blackout. If these two consecutive numbers were identical the mouse button had to be pressed before the second number disappeared from the screen. However, the response had to be with-held when a "Stop" signal appeared; that is the second number was identical but changed from black to red. The time when the 'Stop' signal was presented varied from trial to trial, occurring 50, 150, 250, and 350ms after the stimulus onset. With the 'Stop' trials each 50, 150, 250, or 350ms delay occurred on 18-20 occasions during the 11.5 minute session. In addition if the two numbers were different then no response was required. Thus there were three types of trials; 'Go' (40 trials); 'Stop' (40 trials); 'Novel' (80 trials). The measure reported is the total percentage of inhibited responses when the responses to each of the four delays were added.

TIME (Instructions in Appendix 20)

The ability to predict the timing of events is disrupted in impulsive individuals such that time seems to pass more slowly (Barratt and Patton, 1983); thus the TIME Paradigm (Dougherty, Mathias and Marsh, 2003) assesses the perception of time. A button was clicked to start the test and clicked again to stop the timer after it was estimated that a minute had passed. Participants were awarded points for more accurate estimations allowing them to improve performance during the next trial. The measure reported is the mean time estimation of five trials. The mean 'view time' is the time between trials, the time between stopping and starting the timer, that has been used to indicate the effort being expended by the subject.

Single Key Impulsivity Paradigm (SKIP; instructions in Appendix 21)

SKIP assesses the ability to tolerate a delayed reward (Dougherty et al., 2003). During this task the longer a subject waits the higher the reward; that is a greater number of points are earned. The mouse was clicked to begin the task after which each additional click resulted in a reward. Each time the participant clicked, two counters appeared displaying the most recent reward and the cumulative reward over a 20 minute test session. Thus it was possible for the subject to infer that responses emitted at a faster rate earned smaller rewards, and responses emitted at a slower rate earned larger rewards. The three output measures were the total number of responses (that assessed the participant's ability to wait for later and larger rewards, i.e. less responses indicated lower impulsivity); the longest delay between responses (the ability to wait for a larger reward); and the average delay between responses for the entire session.

Statistical analysis

Change scores were calculated by subtracting performance after supplementation from that at baseline. The data were analysed using a two-way analysis of variance; DHA / placebo X Vitamins and minerals / placebo as between participants' factors. Distributions were normal and therefore did not require any data transformation. Missing cases on any scores on output measures were assessed, and where appropriate

average values were used. Gesch et al. (2002) and Zaalberg et al. (2010) were used during power analyses to estimate the sample required to get their effect size.

2.3.4. Results

Buss-Perry Aggression Scale and PF-Study

Table 2.3.1. summarizes the questionnaire measures. Neither the Buss-Perry total score nor any of the sub-scales were significantly affected by supplementation. In contrast, the Extra-aggression scale of the Picture-Frustration test was significantly affected by the consumption of DHA ($F(1, 169) = 4.01$, $p<0.05$). The taking of DHA resulted in a lower incidence of Extra-aggression. Similarly there was a trend for Intra-aggression to lessen after DHA ($F(1, 169) = 3.21$, $p=0.06$). The vitamin / mineral supplement failed to significantly influence these measures although there was again a trend for scores to be lower after their consumption when Extra-aggression was examined ($F(1, 169) = 3.26$, $p=0.06$).

Measures of impulsivity

Table 2.3.2. reports the influence of supplementation on the performance measures of impulsivity. As can be seen, with all parameters on no occasion was there a significant main effect of either DHA or vitamin / mineral consumption, or an interaction between these factors. It seemed, however, possible that the failure to find an influence of supplementation may have reflected the use of a sample where the baseline level of impulsivity was low, making a beneficial response difficult to demonstrate. To consider this possibility the baseline scores were divided into halves: those who had initially higher and lower levels of impulsivity. The prediction was that supplementation would selectively benefit those with an initially greater tendency to be impulsive.

With each measure arbitrarily a 50 / 50 split was created to the extent that the distribution allowed this to occur. As with the GoStop task a split could potentially be made with each of the four delays it was decided to create the two groups using the 350ms condition as it has been suggested to be the most sensitive measure (Dougherty et al., 2003). The GoStop measures were then analyzed using a five way analysis of variance with three between subject factors, DHA / placebo, Vitamins and minerals / placebo and displaying at baseline either high or low impulsivity. The four durations of delay, and the scores at baseline and after supplementation, were entered as repeated

Table 2.3.1. – Changes in questionnaire measures of aggression depending on supplementation

The data are mean changes (SEM) from baseline to 12 weeks after supplementation. The F values for the influence of vitamin / mineral and DHA supplementation are presented and also the interaction between these factors

	Placebo	Vitamins / Mineral	Placebo	DHA	F Values	
PF Intra-aggression	-0.11	-0.01	0.01	-0.13	Vit/Min	(1,169) =1.38, n.s
	(0.06)	(0.06)	(0.06)	(0.06)	DHA	(1,169) = 3.21, p=0.07
					Vit/Min X DHA	(1,169) = 0.09, n.s
PF Extra-aggression	-0.11	-0.79	-0.08	-0.83	Vit/Min	(1,169) = 3.26, p=0.07
	(0.26)	(0.27)	(0.27)	(0.26)	DHA	(1,169) = 4.01, p<0.05
					Vit/Min X DHA	(1,169) = 1.25, n.s
PF Inner-aggression	-0.79	-0.56	-0.70	-0.62	Vit/Min	(1,169) =.33, n.s
	(0.14)	(0.15)	(0.14)	(0.14)	DHA	(1,169) = 2.35, n.s
					Vit/Min X DHA	(1,169) = 0.66, n.s
PF Neutral	1.22	1.33	0.99	1.57	Vit/Min	(1,169) = 0.05, n.s
	(0.32)	(0.33)	(0.33)	(0.32)	DHA	(1,169) = 1.59, n.s
					Vit/Min X DHA	(1,169) = 0.08, n.s

Table 2.3.1. *continued*

BP Total	**-2.14**	**-2.89**	**-1.82**	**-3.21**	**Vit/Min** (1,167) = 0.80, n.s
	(1.88)	**(1.93)**	**(1.92)**	**(1.89)**	**DHA** (1,167) = 0.27, n.s
					Vit/Min X DHA (1,167) = 1.70, n.s
BP Physical	**-0.29**	**-0.98**	**-1.02**	**-0.25**	**Vit/Min** (1,167) = 0.50, n.s
	(0.68)	**(0.70)**	**(0.69)**	**(0.68)**	**DHA** (1,167) = 0.63, n.s
					Vit/Min X DHA (1,167) = 0.02, n.s
BP Verbal	**-0.34**	**-0.96**	**-0.51**	**-0.78**	**Vit/Min** (1,167) = 0.83, n.s
	(0.47)	**(0.48)**	**(0.48)**	**(0.47)**	**DHA** (1,167) = 0.16, n.s
					Vit/Min X DHA (1,167) = 0.10, n.s
BP Anger	**-0.07**	**1.20**	**1.00**	**0.03**	**Vit/Min** (1,167) = 0.61, n.s
	(1.01)	**(1.03)**	**(1.03)**	**(1.01)**	**DHA** (1,167) = 0.26, n.s
					Vit/Min X DHA (1,167) = 0.33, n.s

Table 2.3.1. ***continued***

BP hostility	**-0.88**	**-1.09**	**-0.64**	**-1.32**	**Vit/Min**	(1,167) =.04, n.s
	(0.72)	**(0.74)**	**(0.73)**	**(0.72)**	**DHA**	(1,167) = .44, n.s
					Vit/Min X DHA	(1,167) = 2.88, n.s

Table 2.3.2. – Changes in performance measures of impulsivity depending on supplementation

The data are mean changes (SEM) from baseline to 12 weeks after supplementation. The F values for the influence of vitamin / mineral and DHA supplementation are presented and also the interaction between these factors

	Placebo	Vitamins / Minerals	Placebo	DHA	F Values	
GoStop inhibition 50ms	9.25	4.77	7.94	6.09	Vit/Min	(1,168) =.1.54, n.s
	(2.52)	(2.58)	(2.57)	(2.54)	DHA	(1,168) = 0.26, n.s
					Vit/Min X DHA	(1,168) = 0.49, n.s
GoStop inhibition150ms	9.67	6.17	6.64	9.19	Vit/Min	(1,168) = 0.76, n.s
	(2.81)	(2.87)	(2.86)	(2.83)	DHA	(1,168) = 0.40, n.s
					Vit/Min X DHA	(1,168) = 1.78, n.s
GoStop inhibition250ms	4.50	4.24	4.21	4.53	Vit/Min	(1,168) = 0.01, n.s
	(2.43)	(2.48)	(2.46)	(2.44)	DHA	(1,168) = 0.01, n.s
					Vit/Min X DHA	(1,168) = 2.83, n.s
GoStop inhibition350ms	0.11	0.54	2.02	-1.37	Vit/Min	(1,168) = 0.02, n.s
	(2.01)	(2.01)	(2.04)	(2.02)	DHA	(1,168) = 1.39, n.s
					Vit/Min X DHA	(1,168) = 1.72, n.s

Table 2.3.2. *continued*

GoStop total response	**-4.68**	**-3.14**	**-4.16**	**-3.67**	**Vit/Min**	(1,168) = 0.46, n.s
	(1.59)	**(1.62)**	**(1.61)**	**(1.6)**	**DHA**	(1,168) = 0.05, n.s
					Vit/Min X DHA	(1,168) = 2.41, n.s
TIME estimation	**-1.00**	**-0.64**	**-1.23**	**-0.41**	**Vit/Min**	(1,168) = 0.20, n.s
	(0.56)	**(0.57)**	**(0.57)**	**(0.56)**	**DHA**	(1,168) = 1.01, n.s
					Vit/Min X DHA	(1,168) = 0.08, n.s
TIME view time	**-0.83**	**-1.13**	**-0.93**	**-1.02**	**Vit/Min**	(1,168) = 0.18, n.s
	(0.50)	**(0.51)**	**(0.50)**	**(0.50)**	**DHA**	(1,168) = 0.02, n.s
					Vit/Min X DHA	(1,168) = 0.01, n.s
SKIP total responses	**-50.82**	**-39.76**	**-39.13**	**-51.44**	**Vit/Min**	(1,168) = 0.03, n.s
	(42.8)	**(43.77)**	**(43.50)**	**(43.07)**	**DHA**	(1,168) = 0.04, n.s
					Vit/Min X DHA	(1,168) = 0.16, n.s

Table 2.3.2. ***continued***

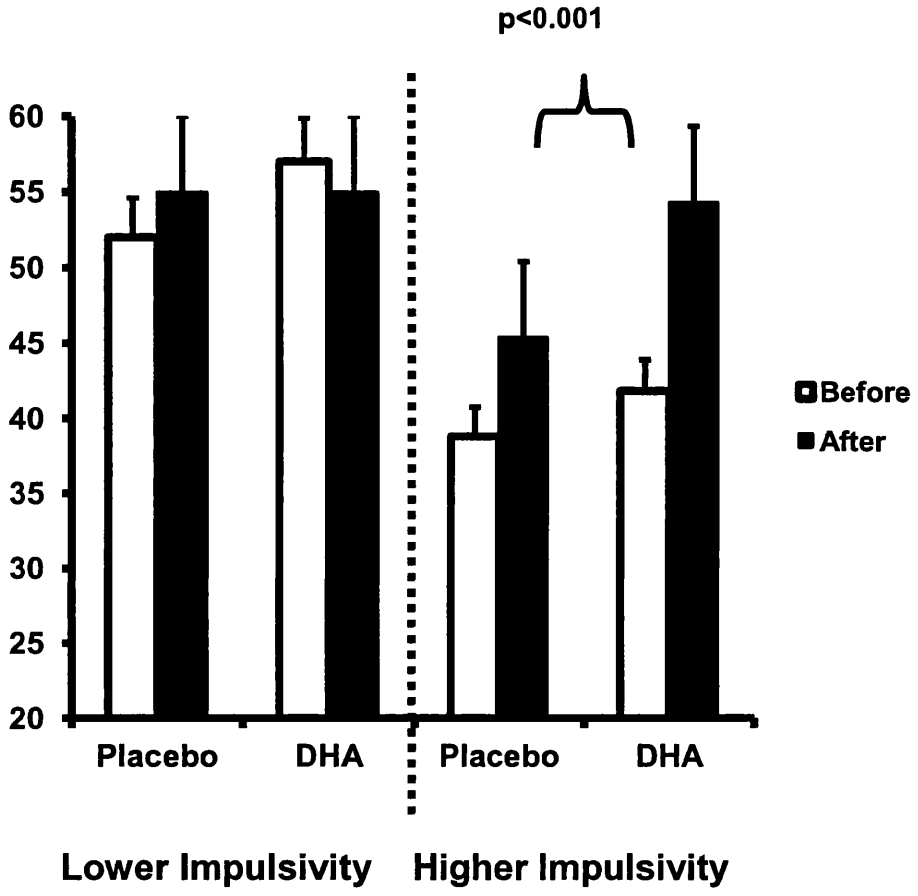
SKIP IRT mean	**50.83**	**75.92**	**30.99**	**95.76**	**Vit/Min**	(1,167) = 0.26, n.s
	(34.55)	**(35.15)**	**(34.93)**	**(34.76)**	**DHA**	(1,167) = 1.73, n.s
					Vit/Min X DHA	(1,167) = 0.05, n.s
SKIP longest delay	**105.18**	**190.28**	**84.5**	**210.96**	**Vit/Min**	(1,168) = 2.14, n.s
	(40.72)	**(41.65)**	**(41.39)**	**(40.98)**	**DHA**	(1,168) = 4.71, n.s
					Vit/Min X DHA	(1,168) = 0.01, n.s

measures factors. When the percentage of inhibited responses was examined there was a three way interaction; DHA / placebo X Before / after supplementation X Initial higher / lower impulsivity ($F(1,164) = 4.06$, $p < 0.05$) that is illustrated in *Figure 2.3.1*. In more impulsive individuals, post-hoc analysis found significantly less impulsivity after DHA consumption than at baseline and ($p<0.001$). Although impulsivity also decreased over time in the placebo condition ($p<0.02$), it was to a lesser extent than with DHA. At baseline there was no significant difference between scores of the groups who were subsequently to consume either a placebo or DHA, although at follow-up there was a significant difference between DHA and placebo ($p<0.02$). Those who had taken DHA were less impulsive than those who had the placebo. In the group who displayed lower impulsivity at baseline at no stage did those taking the placebo or DHA differ. Thus when compared to placebo, DHA selectively decreased impulsive responding in those with an initially higher level of impulsivity. However, neither the influence of vitamins / minerals ($F(1,164) = 0.53$, n.s) nor the interaction with DHA ($F(1,164) = 0.22$, n.s.) achieved statistical significance.

The results with the TIME and SKIP paradigms are presented in *Table 2.3.3*. Neither the higher nor lower impulsivity groups were affected by supplementation on any measure of the TIME paradigm. The only SKIP measure that was significantly affected by supplementation was the longest delay. There was a significant interaction Vitamins and minerals / placebo X Before / after supplementation X Initial higher / lower impulsivity ($F(1, 164) = 6.0$, $p<0.04$). In the initially more highly impulsive group there was a significant difference between baseline and follow-up scores for both the placebo ($p<0.001$) and vitamins and minerals ($p<0.001$) conditions, suggesting scores improved irrespective of supplementation. There was no significant difference between longest delay scores at baseline or follow up. In the lower impulsivity group there was no significant difference between baseline and follow-up in the placebo condition or the vitamin / mineral condition. There was no significant difference between scores at baseline, however, scores were significantly different at follow up ($p<0.03$), with significantly better scores after supplementation with vitamins and minerals. In non-impulsive individuals supplementation with vitamins

and minerals increased the time to respond, that is it reduced this measure of impulsivity. This finding is to some against the hypothesis since we would expect the higher impulsivity group to respond to supplementation as opposed to the lower impulsivity group.

Figure 2.3.1. The influence of DHA on the inhibition of responding in those with higher and lower baseline impulsivity (as assessed using the GoStop impulsivity paradigm)



Data are the percentages of trials where a response was not made when they were to be inhibited reported as a mean +/- S.E.M. That is a higher score indicated lower impulsivity

Table 2.3.3. –Means and standard errors (baseline and follow-up) of impulsivity test scores after separating into high-score and low score groups (with vitamins and minerals, DHA and sub-group group as between subjects' factors)

	Placebo		Vitamins / Minerals		Placebo		DHA		F values
TIME estimation	63.87	61.05	63.4	61.62	63.71	61.35	63.56	61.32	DHA x Group x Time (1, 164) =0.83, n.s
(Less impulsive)	(0.53)	(0.48)	(0.53)	(0.47)	(0.52)	(0.47)	(0.54)	(0.48)	**Vit x Group x Time** (1, 164) = 0.89, n.s
TIME estimation	57.17	60.01	57.48	59.86	57.31	59.13	57.35	60.73	**Four way interaction** (1,164) = 0.0, n.s
(More impulsive)	(0.79)	(0.71)	(0.86)	(0.76)	(0.86)	(0.77)	(0.79)	(0.71)	
TIME View time	11.97	9.06	10.92	8.51	11.94	9.49	10.94	9.48	DHA x Group x Time (1, 164) =.0.00, n.s
(Less impulsive)	(0.52)	(0.66)	(0.47)	(0.59)	(0.48)	(0.61)	(0.51)	(0.61)	Vit x Group x Time (1, 164) = 0.20, n.s
View time	4.98	5.66	5.16	5.73	4.87	5.70	5.27	5.69	**Four way interaction** (1,164) = .63, n.s
(More impulsive)	(0.44)	(0.56)	(0.53)	(0.76)	(0.51)	(0.65)	(0.46)	(0.58)	
SKIP Total responses	11.67	47.28	11.26	65.95	11.14	60.61	11.79	52.62	DHA x Group x Time (1, 164) = 0.01, n.s
(Less impulsive)	(48.15)	(47.70)	(49.73)	(49.27)	(48.15)	(47.70)	(49.73)	(49.27)	Vit x Group x Time (1, 164) = 0.01, n.s
SKIP Total responses	392.58	247.40	300.52	165.83	390.82	250.39	302.28	162.83	Four way interaction (1,164) = 0.11, n.s
(More impulsive)	(49.81)	(49.35)	(49.78)	(49.32)	(51.21)	(50.74)	(48.34)	(47.89)	

Table 2.3.3. *continued*

SKIP IRT	**7.34**	**89.04**	**7.97**	**153.43**	**6.67**	**78.33**	**8.63**	**164.14**	DHA x Group x Time (1, 163) = 0.10, n.s
(Less impulsive)	**(29.40)**	**(43.92)**	**(27.15)**	**(40.55)**	**(28.26)**	**(42.22)**	**(28.33)**	**(42.32)**	Vit x Group x Time (1, 163) = 1.03, n.s
SKIP IRT mean	**181.98**	**206.26**	**220.01**	**208.25**	**225.98**	**205.91**	**176.01**	**208.61**	Four way interaction (1,163) = 0.02, n.s
(More impulsive)	**(27.09)**	**(40.48)**	**(30.54)**	**(45.63)**	**(29.22)**	**(43.65)**	**(28.52)**	**(42.60)**	
SKIP Longest delay	**593.16**	**544.61**	**619.47**	**731.88**	**631.10**	**650.36**	**581.53**	**626.12**	DHA x Group x Time (1, 164) = 1.39, n.s
(Less impulsive)	**(30.63)**	**(47.25)**	**(37.05)**	**(57.14)**	**(32.69)**	**(50.43)**	**(35.24)**	**(54.35)**	Vit x Group x Time (1, 164) =).62,p<0.04
SKIP longest delay	**113.54**	**432.05**	**105.83**	**346.07**	**96.20**	**297.21**	**123.16**	**480.91**	Four way interaction (1,164) = 1.12, n.s
(More impulsive)	**(36.56)**	**(56.39)**	**(31.20)**	**(48.13)**	**(35.94)**	**(55.43)**	**(31.92)**	**(49.23)**	

2.3.5. Discussion

Although vitamins, minerals and DHA modulate aggressive and delinquent behaviour (Gesch et al., 2002; Zaalberg et al., 2010; Schoenthaler et al., 1997; Schoenthaler and Bier, 2000; Benton, 2007) until the present study the relative contributions of fatty acids and vitamins/minerals had not been considered. Although supplementation did not significantly affect any of the Buss-Perry scales, this is a self-report measure and self-report measures poorly predict real-life aggressive behaviour (Gesch et al., 2002; Zaalberg et al., 2010). However, the taking of DHA resulted in a significantly lower incidence of Extra-aggression in the Picture Frustration Test, and there was also a trend for Intra-aggression to decrease (*Table 2.3.1.*). Although a paper and pencil test, the Picture Frustration Test asks for samples of behaviour and thus is different in nature from the Buss-Perry test. Whereas the Picture Frustration test measures the 'state' of the individual at a particular time, the Buss-Perry test measures an enduring 'trait' that is expected to be less susceptible to subtle changes.

This finding that DHA decreased a measure of aggressive behaviour (*Table 2.3.1.*) is consistent with other findings. There is epidemiological evidence of an association between lower hostility and both DHA and total fish consumption (Iribarren et al., 2004). A correlational study reported lower levels of total n-3 fatty acids and DHA, and an elevated n-6: n-3 ratio in aggressive rather than non-aggressive cocaine addicts (Buydens-Branchey and Branchey, 2006). Consistent with the importance of the n-6:n-3 ratio, n-6 levels have been found to be higher in violent subjects (Virkkunen et al., 1987). Intervention studies have found that supplementation with n-3 FA, particularly DHA, EPA, or a combination of both, can reduce aggression, anger, tension, irritability and anti-social behaviour (Gesch et al., 2002; Zaalberg et al., 2010; Benton, 2007; Buydens-Branchey and Branchey, 2006; Fontani et al., 2005; Hamazaki et al., 2002; Zannarini and Frankenburg, 2003). Together this evidence suggests that a higher intake of n-3 FA may be associated with less aggressive behaviour. However, the present finding that DHA intake reduced aggression (*Table 2.3.1.*) is not found in all studies (Hamazaki et al., 2002; Hamazaki et al., 1998;; Hallahan et al., 2007) and inconsistencies between findings may reflect the use of different quantities and types of n-3 FA, or may be influenced by the type of placebo. Alternatively, it has been proposed that n-3 FAs prevent aggression only in the presence of a stressor (Hamazaki et al., 2002; Hamazaki et al., 1998). It may be relevant that in the present study

subjects were tested at the time leading up to the end of year examinations, events that can reasonably be expected to induce stress. This hypothesis requires further research. A question for further study is the potential role that may be played by EPA in reducing anti-social and aggressive behaviour (Zannarini and Frankenburg, 2003). In fact both the quantity and types of n-3 FA warrant further examination. Although there are reports that a multi-vitamin/mineral supplement without fatty acids decreases aggressive behaviour (Schoenthaler et al., 1997; Schoenthaler and Bier, 2000), the present study failed to find a significant effect of micro-nutrients. Despite this, with Extra-aggression, supplementation approached significance ($p=0.07$) and it is possible that the present study was under-powered in this respect. An alternative explanation for a lack of statistical significance is that previous positive studies with vitamin / mineral supplements may have used participants who were deficient in micro-nutrients at baseline (Schoenthaler et al., 1997; Schoenthaler and Bier, 2000), and participants during the present study may have had adequate nutritional status. However, a previous study of a similar sample to the present study used biochemical methods to establish vitamin status (Benton, Haller and Fordy, 1997). Ascorbic acid, cyanocobalamin, alpha-tocopherol, folic acid retinol tended to be adequate, although with riboflavin and pyridoxine the status of a substantial minority was either borderline or deficient. The thiamin and biotin status of a minority was also marginal. Therefore it is perhaps unlikely that the vitamin status of the present sample was universally good. In the absence of the assessment of dietary status such matters can only be the subject of speculation and future work needs to relate the nutritional status of the subjects to the response to supplementation.

A potential explanation for the discrepancy between the present findings of DHA reducing aggression and those studies whereDHA has not reduced aggression is that supplementation may prevent individuals with a predisposition to behave aggressively from doing so in stressful situation. In support of this view it has been found that DHA can reduce aggressive behaviour in the presence of a stressor (Hamazaki et al., 1996), a possibility warranting further investigation. Another possible explanation is the supplementation reduces some facets of aggression but not others.

A major question posed was whether there was evidence of a synergistic interaction between DHA and vitamins / mineral supplementation. There was, however, no evidence of either an additive or synergistic interaction with any measure of aggression

(*Table 2.3.1.*) or measures of impulsive behavior (*Table 2.3.2.*). Surprisingly it has been found when examining mood and stress that taking the two types of supplements together was less beneficial, and sometimes even detrimental influence, than when they were taken separately (Chapter 4). Clearly there is much to be established about the interaction between supplements.

The possibility that performance measures of impulsivity might prove particularly sensitive to dietary manipulations was also considered although the initial analyses found no measure to be significantly affected (*Table 2.3.2.*). Given that the present sample had no history of impulsive behaviour this was perhaps not surprising and therefore the halves of the population that were more or less impulsive were distinguished. With the GoStop measure the initially more impulsive half of the sample benefited from DHA (*Figure 2.3.1.*), but not from vitamins and minerals nor a combination of both supplements. Thus DHA selectively decreased impulsive responding in those with an initially higher level of impulsivity. In contrast neither the TIME nor SKIP paradigms were influenced by supplementation. This is not necessarily a surprise as although impulsivity is widely used as an explanatory concept there is often a failure to recognize its multi-faceted nature and to consider the details of the underlying mechanisms. In fact the laboratory based measures used in the present study, more specifically the GoStop and SKIP tasks, have been found to be sensitive to clinical disorders with elements of impulsivity including Conduct Disorder (CD) and Oppositional Defiant Disorder (ODD; Bjork et al., 2000). Adolescents with Disruptive Behavior Disorder have been found to perform the GoStop and SKIP tasks badly, although the GoStop measure was the more sensitive (Dougherty et al., 2003). Response inhibition, as measured with the GoStop task, was found to be impaired in children with ADHD and CD (Oosterlaan, Logan and Sergeant, 1987). Using a similar response inhibition task Wodushek and Neumann (2003) found that adults with high level of ADHD symptoms performed the task less well. Women on parole with a history of childhood aggression performed laboratory measures of impulsivity less well; in particular the GoStop task (Mathias et al., 2002). Similarly women who rated themselves as impulsive were less able to withhold responses in the GoStop test (Marsh et al., 2002). Thus the finding that DHA selectively influenced the GoStop measure potentially has wide implications. An obvious question is whether DHA would benefit individuals with such diagnoses.

In summary there are various well designed studies that find that both DHA and vitamins / minerals decrease aggressive and anti-social behaviours in real-world situations. To help the future examination of this topic an attempt was made to establish a paradigm that could be more easily used. In a sample without a history of aggressive or impulsive behaviour a positive response was found to DHA in a paper and pencil measure of actual behaviour (*Table 2.3.1.*) and using a performance measure of the ability to inhibit an already initiated behaviour (*Figure 2.3.1*). It was concluded that aggression and impulsivity can be conveniently studied in a sample without a history of anti-social behaviour, using standardized, sensitive laboratory based measures. No evidence was found of a synergistic interaction between vitamins / minerals and DHA although the latter decreased aggression and improved the ability to withhold an already initiated response in a subset of individuals with impulsive tendencies.

In terms of potential biochemical mechanisms that may be responsible for changes to behaviour, including changes to aggression and impulsivity (amongst aspects of mood and psychological functioning), we must consider the basic biology of omega-3 fatty acids and their role in the brain. Omega-6 and omega-3 FAs compete for access to the same enzymatic sites. If dietary n-6 is high then the incorporation of n-3 fatty acids into the phospholipid fraction of the cell membrane will be reduced. High levels of n-3 in the diet may enhance membrane fluidity and flexibility by reducing levels of n-6 and cholesterol. Cholesterol is known to stiffen the cell membrane and reduce permeability (Fontani et al., 2005a). Mazza et al., (2007) suggested that the changes in the cell membrane that result from increasing the n-3 PUFA content of the diet may potentially enhance neurotransmission by facilitating communication between cells. Alternatively n-3 PUFAs may enhance neurotransmission by acting as secondary messengers in signal transduction: phospholipases release n-3s from cell membrane phospholipids, freeing n-3s for signalling processes (Mazza et al., 2007). Hence there are several mechanisms by which fatty acids may affect cell functioning which may in turn be responsible for changes to behaviour.

With regard to animal evidence, in rats an association has been reported between n-3 dietary deficiencies and impaired sensory, motor and motivational behaviours (Wainright, 1997; Reisbick and Neuringer, 1997). In Caenorhabditis elegans, a soil

living roundworm, it has been found that n-3 depletion resulted in low levels of serotonin (5-HT) and choline, suggesting that LC-PUFAs may play an essential role in neurotransmission in this creature (Lesa et al., 2003). In humans serotonin (5-HT) has been implicated in the modulation of attention, motivation and affect (Steckler and Sahgal, 1994; Krakowski, 2003). Specifically 5-HT has been implicated in several human pathologies and personality traits, including depressive disorders, suicide, aggression, impulsivity and other anti-social behaviours and violence (Brown and Linnoila, 1990; Krakowski 2003; Surtees et al., 2006). A positive relationship has been found between levels of EFAs and metabolites of 5-HT and dopamine (DA) in the cerebrospinal fluid (CSF) of healthy individuals (Hibbeln et al., 1998). In particular higher levels of DHA have been associated with higher levels of 5-HT. In violent and/or depressed subjects, levels of DHA were negatively correlated with CSF hydroxyindole acetic acid 5-HIAA (a metabolite of 5-HT), suggesting that lower DHA and reduced 5-HT status co-exist in violent or depressed individuals. A review of the literature that relates PUFA status and monoamine (MA) neurotransmission concluded that n-3 PUFAs may have beneficial effects on neuronal composition, neurochemical signalling and cognitive functioning (Heinrichs, 2010). Omega-3 FAs were found to regulate neurotransmission by two mechanisms - through the modulation of membrane fluidity and by enhancing the release of monoamine (MA) neurotransmitters (Heinrichs, 2010). Epidemiological and developmental evidence has supported a role for PUFA status in firstly the regulation of MA mediated systems and secondly cognitive and affective behaviours, including depressive disorders, suicide, aggression and impulsivity (Brown and Linnoila, 1990; Krakowski 2003; Ferguson et al., 2005; Surtees et al., 2006). In intervention studies higher levels of brain 5-HT and DA have been reported in piglets fed on a diet containing adequate rather than low levels of n-3 PUFAs (Owens and Innis, 2000). Hence, this evidence suggests that DHA, the omega-3 fatty acid administered during the present study, may have exerted positive effects on aggression and impulsivity through the modulation of membrane fluidity and by enhancing the release of neurotransmitters,

Alternatively, there have been suggestions that the immune system may be involved in the aetiology of psychiatric disturbances and that PUFAs may modulate these processes (Simopolous, 2002). EFAs are precursors for eicosanoids that are involved in inflammation, immune system responses and act as messengers in signal

transduction. In the brain, eicosanoids may influence physiological processes such as synaptic plasticity, membrane excitability and neurotransmitter release (Phillis et al., 2006). It has been suggested that the n-6 eicosanoinds are pro-inflammatory and thus have negative health consequences: associations have been made with cardiovascular disease, rheumatoid arthritis, bowel disease and other inflammatory and immuno-modulatory diseases that have been linked to depression (Simopoulos 2002). Elevated levels of total n-6 FAs, and also an elevation of the n-6: n-3 ratio, may cause over-production of n-6 eicosanoids (Simopoulos, 2002). In contrast animal studies and clinical interventions have suggested that n-3 eicosanoids are anti-inflammatory, inhibiting the effects of n-6 eicosanoids (Simopoulos, 2002). Therefore, omega-3 FAs may be beneficial in the treatment of disorders associated with inflammation and the immune system, including depression, stress and behavioural manifestations such as hostility and anger.

Chapter 4: The effects of vitamins, minerals and omega-3 on anxious mood, depressed mood, fatigue, confusion, hostility, confidence, stress and mild psychiatric symptoms

2.4.1. Abstract

The effects of either DHA or vitamins/mineral supplementation on aspects of mood were contrasted and the possibility of a synergistic interaction between DHA and vitamin/mineral supplementation considered. In a group of young adult males (using the same sample as the previous chapter), those who consumed only DHA for three months felt more energetic whereas those who consumed both supplements felt more tired after supplementation ($p<0.001$). The taking of vitamins/minerals alone resulted in feeling more clearheaded than if both supplements had been taken ($p<0.05$). Similarly there was a trend for those taking only DHA as opposed to those taking both DHA and vitamins/minerals to report feeling more clearheaded ($p=0.06$). With regard to stress, supplementation with vitamins and minerals was found to significantly reduce stress in comparison to the placebo group, where scores increased ($p < 0.007$). With the General Health Questionnaire the difference between the placebo and vitamins/minerals groups approached statistical significance ($p = 0.07$). It was concluded that while on occasions either vitamins/minerals or DHA when tested alone had a positive effect on mood, stress and mild psychiatric symptoms, there was no suggestion of a synergistic interaction: rather on occasions the interaction between these supplements had negative consequences.

2.4.2. Introduction

The present study explored the effects of vitamins/minerals and/or omega-3 FA (specifically docosahexaenoic acid; DHA) on stress, mild-psychiatric symptoms and aspects of mood. For the first time the possibility was considered of a synergistic interaction between DHA and vitamins/minerals. Although randomized controlled trials have found that supplementation with vitamins/minerals improves level of stress and aspects of mood (i.e. non-clinical affect) including anxiety, agreeableness and energy (Benton et al., 1995; Carroll et al., 2000; Schlebusch et al., 2000; Kennedy et al., 2010; Stough et al., 2011; Harris et al., 2011; Kennedy et al., 2011), other studies failed to find significant effects (Cockle et al., 2000; Haskell et al., 2010). Literature on this topic is limited; in fact recent reviews have concluded that there are insufficient published trials to allow meta-analysis (Soh et al., 2009; Kaplan et al., 2007). More recently multi-vitamins/minerals supplements were reported to benefit mood, particularly feeling vigorous and less stressed (Kennedy et al., 2010; Stough et al., 2011; Harris et al., 2011; Kennedy et al., 2011). The General Health Questionnaire (GHQ; Goldberg and Williams, 1988) was developed to assess the incidence of psychiatric symptoms in the general population with the aim of identifying those who need to see a psychiatrist. There is a literature that suggests that multi-vitamins/minerals decrease the mild-psychiatric symptoms assessed by the GHQ or a similar measure (Benton et al., 1995; Carroll et al., 2000; Schlebusch et al., 2000; Kennedy et al., 2010; Harris et al., 2011), although, one study failed to report an influence (Haskell et al., 2010).

The influence of DHA supplementation on mood and mild psychiatric symptoms is less established. While taking a placebo for three months resulted in a significant rise in hostility (+58%), the taking of taking DHA decreased hostility (-14%; Hamazaki et al., 1996). DHA supplementation over a two month stressful examination period resulted in a significant reduction in the levels of plasma norepinephrine (NE), whereas there was a trend for the levels of epinephrine (EP) to rise. In contrast the levels of NE in the placebo group remained the same although there was a trend for EP to decrease (Hamazaki et al., 2000). It was suggested that low levels of plasma EP and high NE are maladaptive, whereas high plasma EP and low NE (similar to the effect associated with taking DHA) may improve adaptation to chronic psychological stress (Hamazaki et al., 2000; Christensen and Schultz-Larsen, 1994). Taken together these findings

suggested that DHA may inhibit negative emotional responses during stressful life periods.

In the context of psychiatric symptoms a recent review suggested that low levels of n-3 fatty acids (particularly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), may be involved in the aetiology of affective disorders. In support of this position several randomly controlled trials have reported that supplementation with n-3 FA reduced depressive symptoms (Long, 2011). Although the role of n-3 FA in non-clinical mood has not yet been ascertained they may not be as effective for mild/moderate cases of depression (Long, 2011; Astorg et al., 2008; Appleton et al., 2006). A recent study failed to find that DHA supplementation influenced the mood of young female adults (Benton et al., 2012), although as highlighted in chapter 3 DHA has been reported to decrease aggressive responding and impulsivity. As of yet the literature on the influence n-3 FA supplementation on the mood of the general populations is insufficient to draw any conclusions. In particular there is a need to consider methodological differences, for example variations in the length of the intervention period, the quantity and type of omega-3 FA and the aspects of mood that are examined.

In summary, there are reports that vitamins/mineral supplementation plays a role in the regulation of some but not all aspects of mood, stress and mild psychiatric symptoms. However, the evidence for the effects of DHA on mood, stress and mild psychiatric symptoms is more limited. The first aim of this study was to examine and contrast the effects of either DHA or vitamins/mineral supplementation on the mood of a sample of the general population. Secondly for the first time the possibility of a synergistic interaction between DHA and vitamin/mineral supplementation was examined.

2.4.3. Methods

See section (3.3.) for details on participants, procedure and intervention.

Measures

Profile of Mood States (Appendix 22)

The Profile of Mood States Bi-Polar Form (POMS; Lorr and McNair, 1984) is a 72-item self-report questionnaire that measures six dimensions of mood: (1) Composed - Anxious; (2) Energetic - Tired; (3) Elated - Depressed; (4) Clear-headed - Confused; (5) Agreeable - Hostile; and (6) Confident-Unsure. Participants were presented with a list of words or phrases and had to rate on a scale of 0-3 (0 'not at all', 3 'a lot like this') how much they had felt like this in the past week including today. There were twelve words for each mood dimension – six positive and six negative. The dependant measures subjected to statistical analysis were the scores for the six dimensions on a scale ranging from -18 to +18.

Visual analogue scales (Appendix 23)

A visual analogue scale measured 7 dimensions of mood, including the six basic dimensions of the POMS with the addition of a stressed / unstressed dimension. Participants were required to rate how they felt "right now" on a 100 millimetre line. Scores ranged from 0 -100. This measure of immediate mood was filled in on three occasions while performing a demanding test battery that measured various aspects of cognition. Measures were taken before testing began, after one and after two hours.

General Health Questionnaire (Appendix 24)

The GHQ is a 30-item self-report questionnaire that was developed to detect in a community sample those who would benefit from seeing a psychiatrist (Goldberg and Williams, 1988). The participant responds to various statements concerning mental health by rating themselves on a four point scale that ranges from 'better / healthier than normal'; 'same as usual'; 'worse / more than usual' to 'much worse / more than usual'. These were scored using a scale 0-1-2-3, as the responses varied from positive to negative, resulting in an overall score that potentially ranged 0-30 with a higher score indicating a greater incidence of psychiatric problems.

As the GHQ adds together questions associated with a range of psychiatric problems, to consider the influence of diet on more specific aspects of behaviour the factor structure of the questionnaire was examined. Although a review by Goldberg and Williams (1988) found that the majority of factor analyses of the GHQ yielded five subscales (depression, anxiety, social dysfunction, sleep problems and somatic symptoms), as the present study was interested in psychological problems a four-factor solution was adopted by excluding somatic symptoms. Based on the factor analysis of the GHQ by Chan (1985) scores for depressive symptoms (the sum of items 20, 23, 24, 25, 26, 27, 29); anxiety (items 14, 15, 19, 21, 22, 23, 28); sleep problems (items 2 and 3) and problems of social function (items 4, 5, 6, 7, 8) were calculated.

Perceived Stress Scale (Appendix 25)

The Perceived Stress Scale (Cohen, 1983) is a 10-item self-report questionnaire that assesses the degree to which situations in one's life are perceived as stressful. The participant is required to answer questions about the extent to which they have had stressful thoughts and feeling during the last month. For example: "In the last month, how often have you been upset because of something that happened unexpectedly?" The participant responds on a 5-point scale ranging from 0 = Never to 4 = Very Often. An overall score was produced by summing all items.

2.4.4. Results

Profile of Mood States (POMS)

Table 2.4.1. reports the changes in POMS ratings after supplementation. With ratings of being energetic/tired there was a significant interaction between the consumption of DHA and vitamins/minerals ($F(1,169) = 5.73$, $p<0.02$). Post-hoc analysis found a significant difference between those taking DHA and those taking both DHA and the vitamins/minerals ($p < 0.01$). Those who took only DHA felt more energetic whereas those who consumed both supplements were more tired after supplementation (*Figure 2.4.1.*).

Similarly with ratings of feeling clearheaded/confused there was a significant interaction between the consumption of vitamins/minerals and DHA ($F(1,169)$ 10.44, $p<0.002$; *Figure 2.4.2.*). The taking of vitamins/minerals alone resulted in feeling more clearheaded than if both supplements had been consumed ($p < 0.05$). Those taking DHA alone, rather than both DHA and vitamins/minerals, just failed to achieve statistical significance difference ($p=0.06$) with taking DHA alone associated with feeling more clearheaded. With the rating of composed/anxious, elated /depressed, agreeable/hostile and confident-unsure in no instance was either the DHA or vitamins/minerals main effect, or the interaction between these supplements, statistically significant (*Table 2.4.1.*).

General Health Questionnaire (GHQ)

When the response to the full GHQ test was considered the interaction between the consumption of DHA and vitamins/minerals reached significance ($F(1, 167) = 4.07$, $p<0.05$; *Figure 2.4.3*), however, post-hoc analysis revealed no significant differences between the four experimental groups. The difference between the placebo and vitamins/minerals groups did, however, approach statistical significance ($p = 0.07$). With the anxiety sub-scales of the GHQ the interaction DHA X vitamins/minerals achieved significance ($F(1,168) = 3.98$, $p<0.05$; *Figure 2.4.4.*). Again post-hoc analysis failed to reveal significant differences between particular groups although the greatest difference was between those who took the placebo as opposed to vitamins/minerals. Similarly the interaction DHA X vitamins/minerals was significant ($F(1,168) = 6.62$, $p<0.02$) when the depression sub-scale was examined (*Figure*

Table 2.4.1 – Changes in measures of mood and psychiatric symptoms following supplementation

The data are mean changes (SEM) from baseline to 12 weeks after supplementation. The F values for the influence of vitamin / mineral and DHA supplementation are presented and also the interaction between these factors

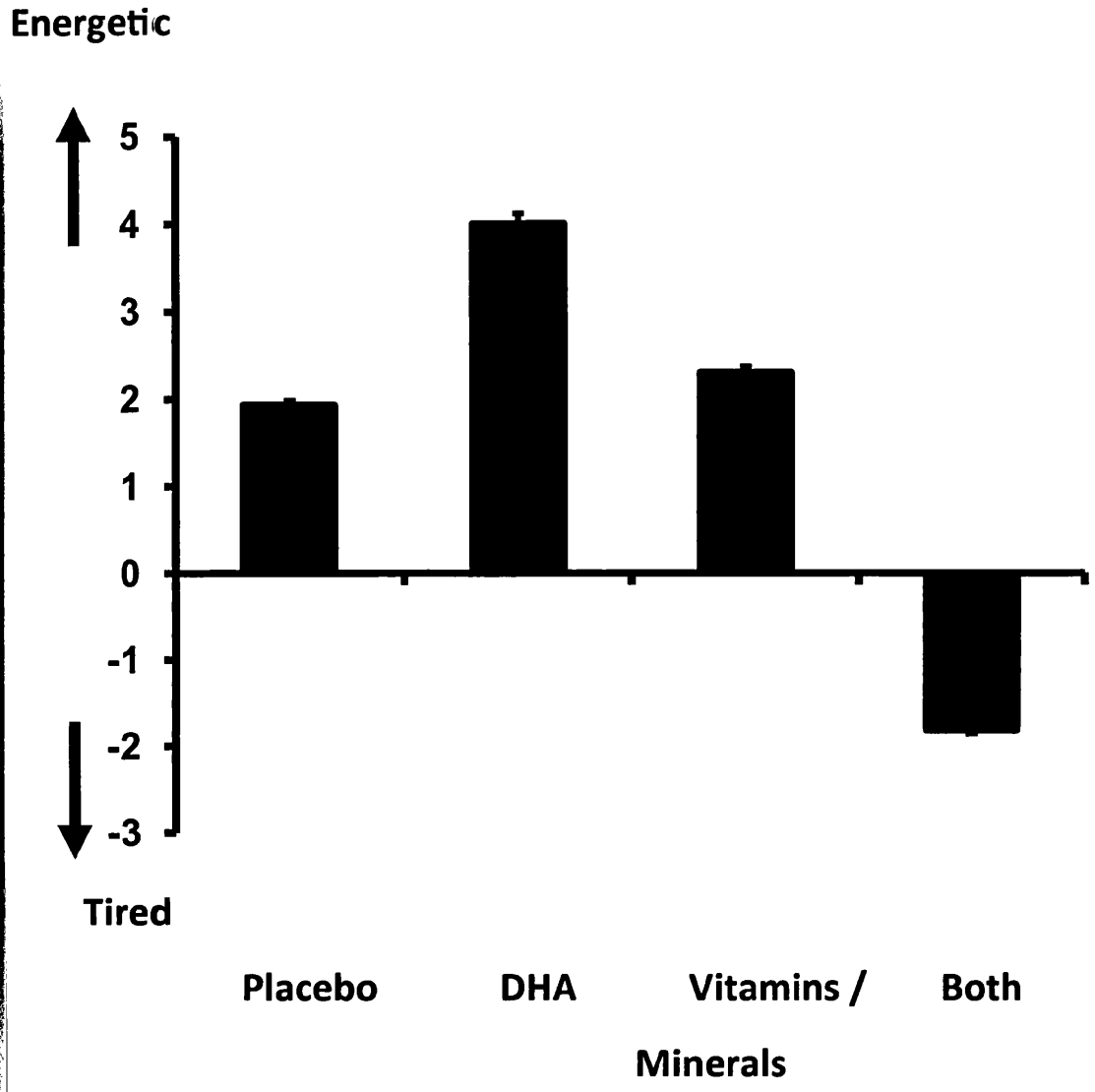
	Placebo	Vitamins / Minerals	Placebo	DHA	F Values	
POMS	2.96	0.25	2.12	1.01	Vit/Min	(1,169) = 4.43, p<0.04
Energetic / Tired	(0.90)	(0.93)	(0.92)	(0.91)	DHA	(1,169) = 0.62, n.s
					Vit/Min X DHA	(1,169) = 5.73, p<0.02
Composed / Anxious	-9.56	-11.39	-9.86	-11.1	Vit/Min	(1,169) = 0.90, n.s
	(1.34)	(1.38)	(1.37)	(1.35)	DHA	(1,169) = 0.41, n.s
					Vit/Min X DHA	(1,169) = 1.50, n.s
Elated-Depressed	0.47	1.79	1.07	1.19	Vit/Min	(1,169) =1.54, n.s
	(0.74)	(0.76)	(0.76)	(0.75)	DHA	(1,169) = 0.01, n.s
					Vit/Min X DHA	(1,169) = 0.66, n.s
Clearheaded-confused	2.10	1.82	2.28	1.65	Vit/Min	(1,169) = 0.08, n.s
	(0.71)	(0.73)	(0.73)	(0.72)	DHA	(1,169) = 0.37, n.s
					Vit/Min X DHA	(1,169)=10.44,p<0.002

Table 2.4.1. *continued*					
Agreeable-hostile	1.07	1.89	1.34	1.62	Vit/Min (1,169) = 0.86, n.s
	(0.62)	(0.64)	(0.63)	(0.62)	DHA (1,169) = 0.10, n.s
					Vit/Min X DHA (1,169) = 1.50, n.s
Confident-unsure	1.58	1.87	1.70	1.75	Vit/Min (1,169) = 0.09, n.s
	(0.65)	(0.67)	(0.66)	(0.65)	DHA (1,169) = 0.12, n.s
					Vit/Min X DHA (1,169) = 1.96, n.s
GENERAL HEALTH	-1.18	-4.05	-2.76	-2.47	Vit/Min (1,167) =2.31, n.s
QUESTIONNAIRE	(1.32)	(1.35)	(1.35)	(1.32)	DHA (1,167) = 0.02, n.s
					Vit/Min X DHA (1,167) = 4.07, p<0.05
Anxiety	-0.09	-0.99	-0.24	-0.85	Vit/Min (1,168) =1.82, n.s
	(0.47)	(0.48)	(0.47)	(0.47)	DHA (1,168) = 0.85, n.s
					Vit/Min X DHA (1,168)= 3.98,p<0.05

Table 2.4.1. *continued*

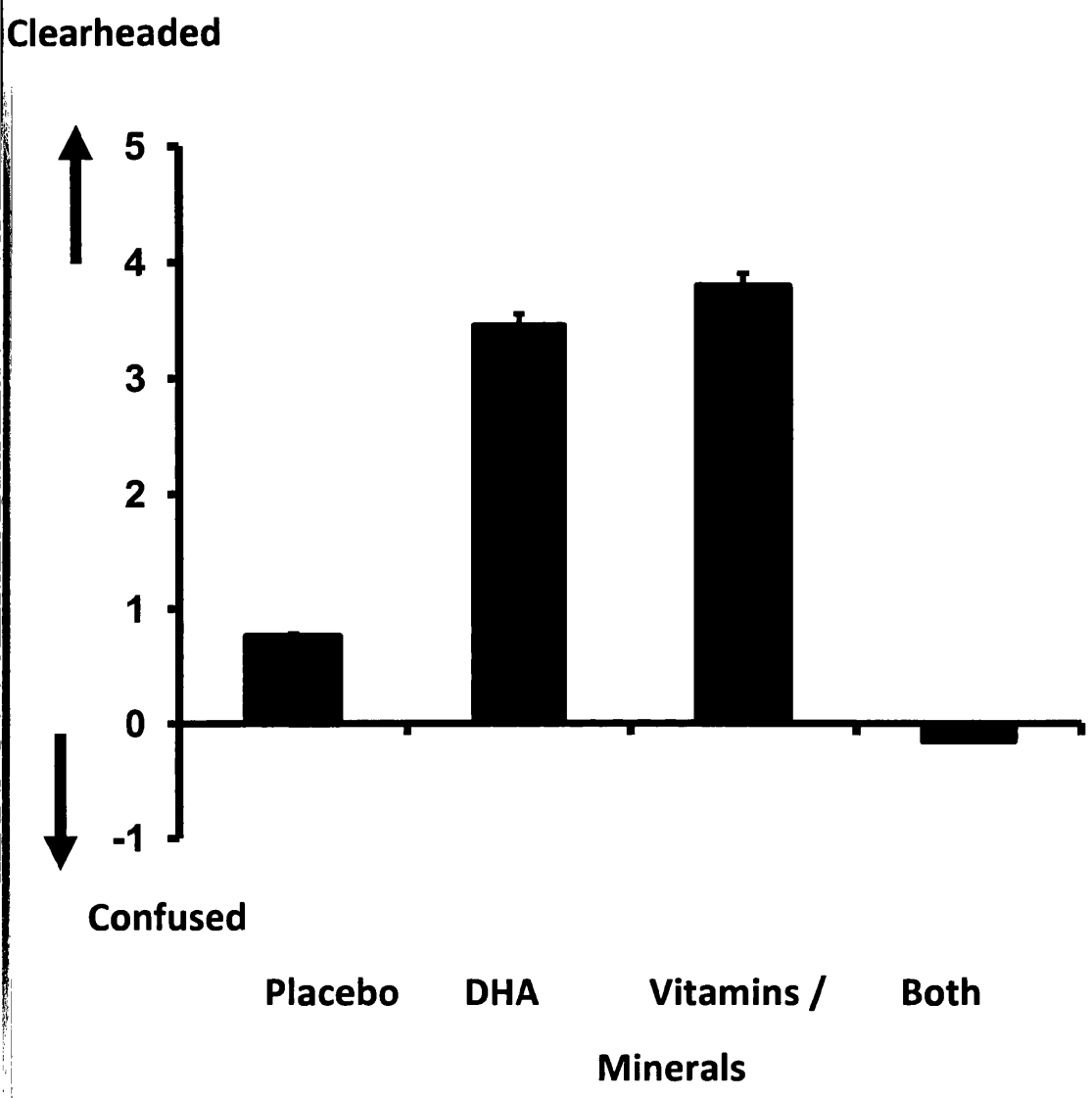
Depression	**-0.32**	**-0.72**	**0.79**	**-0.25**	**Vit/Min** (1,168) = 0.61 n.s
	(0.35)	**(0.36)**	**(0.36)**	**(0.35)**	**DHA** (1,168) = 1.15, n.s
					Vit/Min X DHA (1,168) = 6.62, p<0.02
Sleep	**0.06**	**-0.04**	**0.06**	**-0.04**	**Vit/Min** (1,168) = 0.14 n.s
	(0.18)	**(0.19)**	**(0.19)**	**(0.18)**	**DHA** (1,168) = 0.13, n.s
					Vit/Min X DHA (1,168) = 0.07, n.s
Social functioning	**-0.28**	**-1.00**	**-0.92**	**-0.35**	**Vit/Min** (1,169) = 3.30, n.s
	(0.28)	**(0.29)**	**(0.28)**	**(0.28)**	**DHA** (1,169) = 2.04, n.s
					Vit/Min X DHA (1,169) = 0.81, n.s
Perceived Stress Scale	**1.07**	**-0.69**	**0.08**	**0.30**	**Vit/Min** (1,168) =4.93, p<0.03
	(0.55)	**(0.57)**	**(0.57)**	**(0.55)**	**DHA** (1,168) = 0.08, n.s
					Vit/Min X DHA (1,168) = 6.26, p<0.02

Figure 2.4.1. – The influence of supplementation on feeling Energetic / Tired



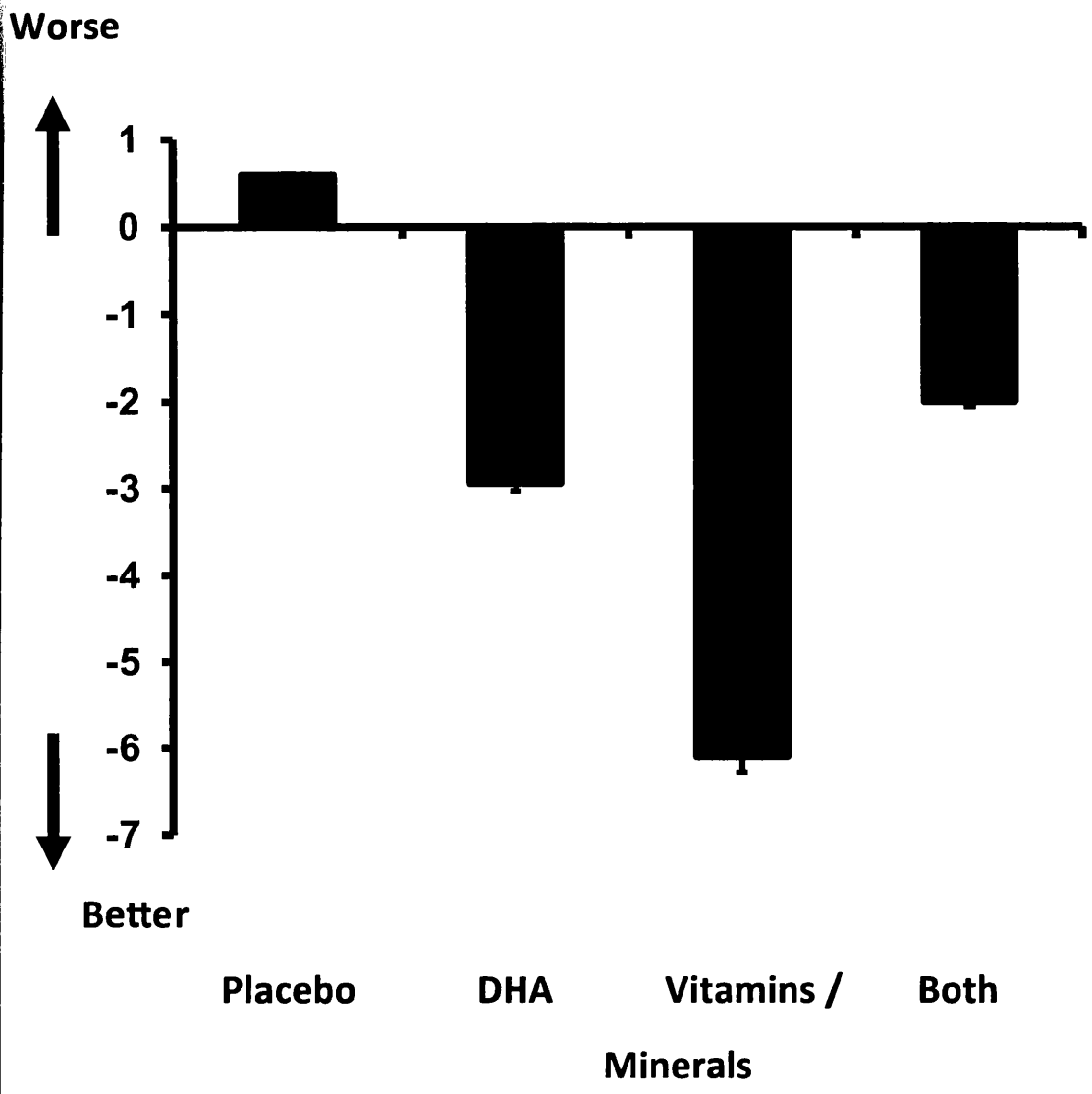
The data are mean changes over the study +/- SEM. A positive score indicated feeling more energetic at the end rather than the beginning of the study and a negative score that you felt more tired. Those taking only DHA were significantly different from those taking both DHA and vitamins and minerals.

Figure 2.4.2. – The influence of supplementation on feeling Clearheaded-Confused



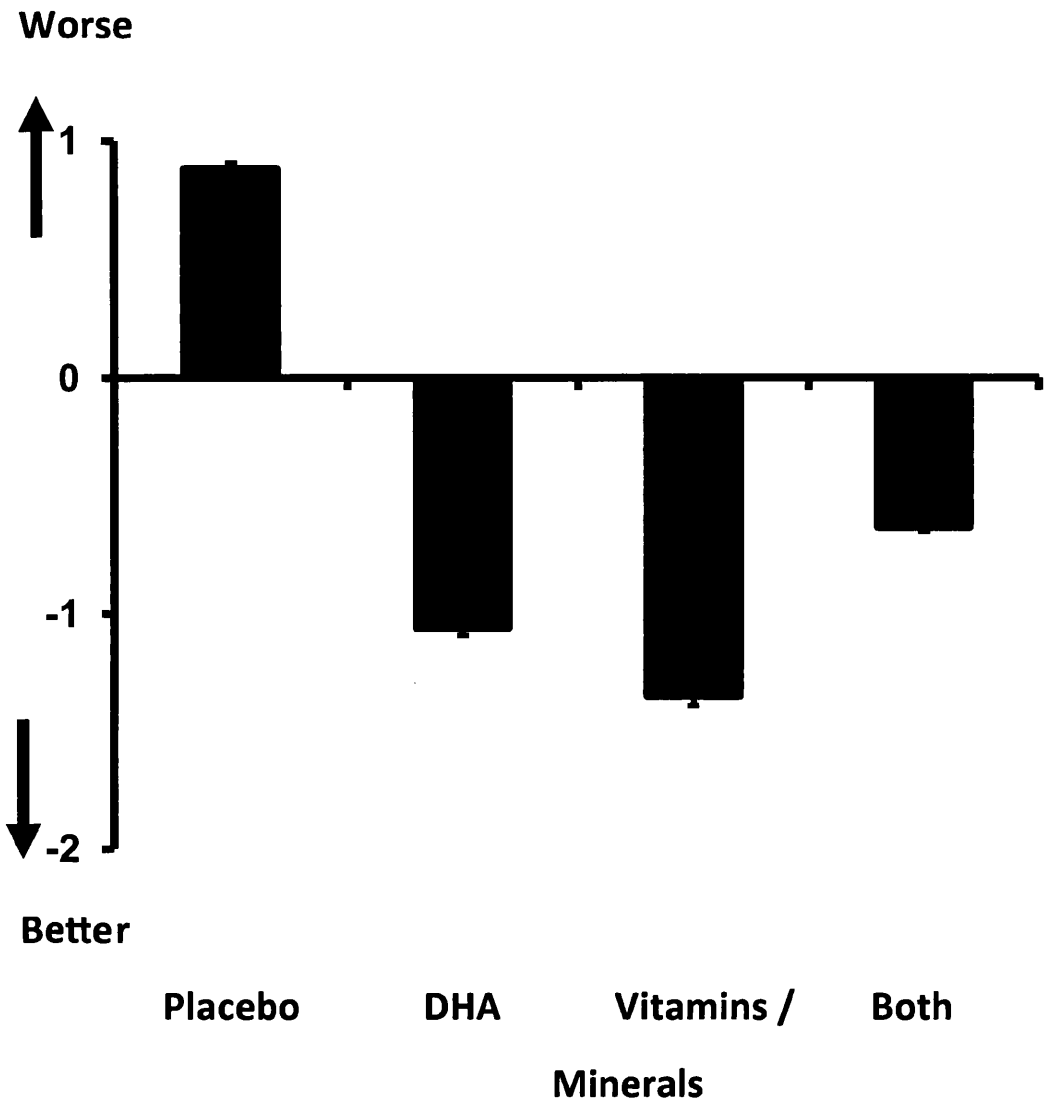
The data are mean changes over the study +/- SEM. A positive score indicated feeling more clearheaded at the end rather than the beginning of the study and a negative score that you felt more confused. Those taking only Vitamins and minerals were significantly different from those taking both DHA and vitamins and minerals ($p<0.05$) with the vitamins and mineral when taken alone resulting in feeling more clearheaded. The difference between the consumption of DHA alone and both supplements just missed significance ($p=.06$).

Figure 2.4.3. – The influence of supplementation on the General Health Questionnaire



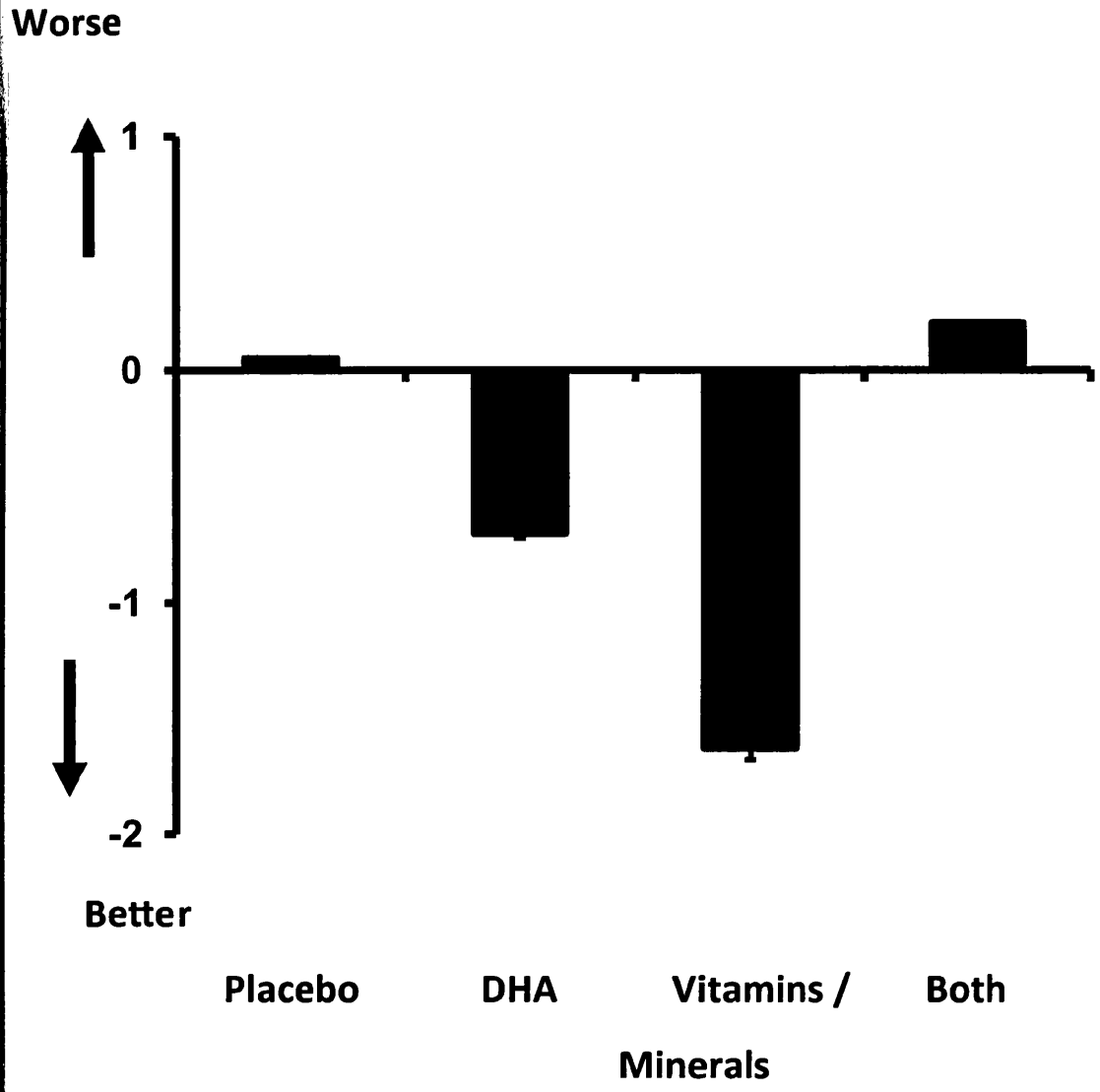
The data are mean changes over the study +/- SEM. A positive score was associated with more, and a negative score with fewer, psychiatric symptoms. The difference between the placebo and Vitamin / mineral groups approached significance (p = .07).

Figure 2.4.4. – The influence of supplementation on anxiety



The data are mean changes over the study +/- SEM. A positive score was associated with more, and a negative score with fewer, anxiety symptoms.

Figure 2.4.5. – The influence of supplementation on depression



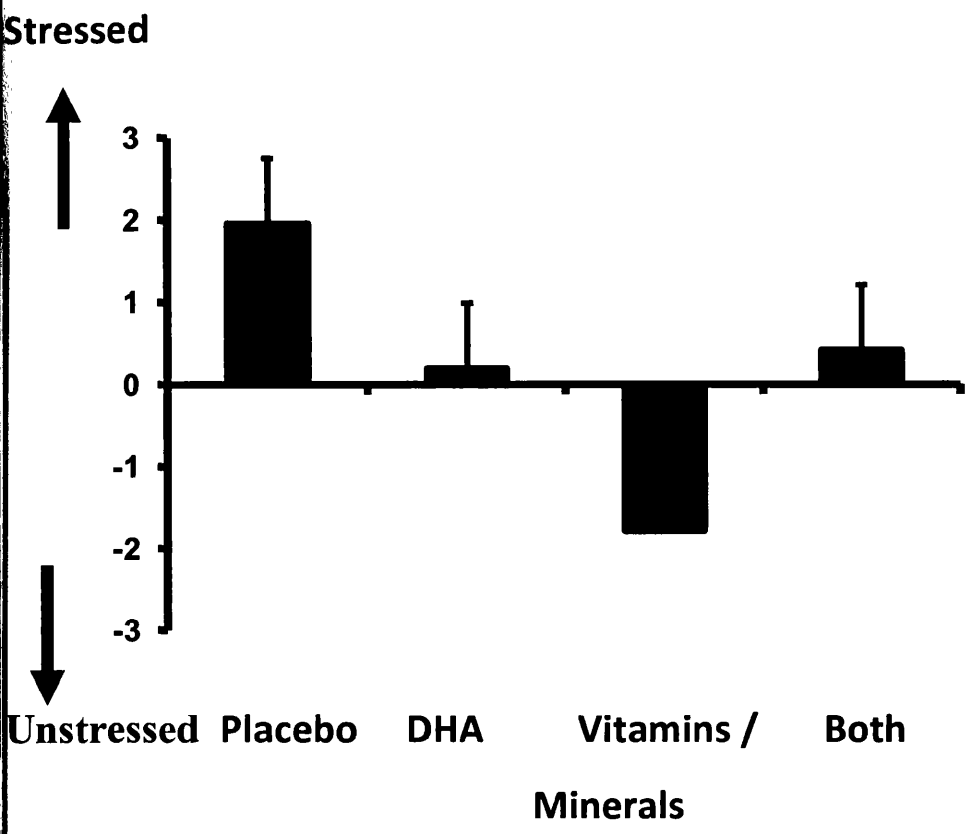
The data are mean changes over the study +/- SEM. A positive score was associated with more, and a negative score with fewer, depressive symptoms.

2.4.5.). Although post-hoc tests failed to find statistically significant differences between different groups the taking of vitamins/minerals was associated with the greatest improvement and a combination of both active supplements the least.

Perceived Stress Scale (PSS)

The consideration of the Perceived Stress Scale resulted in a significant interaction between the consumption of DHA and Vitamins / minerals ($F= (1,168) = 6.26$, $p<0.02$). Post hoc analysis revealed a significant difference between the Placebo / placebo group and the Vitamin & mineral / placebo group ($p < 0.007$): during the study stress scores increased in the placebo group yet decreased when Vitamins / minerals had been consumed (*Figure 2.4.6.*).

Figure 2.4.6. – The influence of supplementation on Perceived Stress



The data are mean changes over the study +/- SEM. A positive score was associated with more, and a negative score with less stress. There was a significant difference between the placebo and Vitamin / mineral groups (p = .007).

2.4.5. Discussion

A major aim of the study was to examine the possibility of a synergistic interaction between fatty acid and vitamin/mineral supplementation. Given the enormous complexity of the brain, and as nutrients do not function in isolation it seemed possible that joint consumption of both types of supplement would be particularly beneficial. During the present study this prediction was not supported and a novel and unexpected finding resulted. The consumption of both multi-vitamin/mineral and DHA supplements negatively influenced aspects of mood. The taking of DHA resulted in increased energy, whereas taking both supplements resulted in feeling more tired (*Figure 2.4.1*). There was also a trend for vitamins / minerals to enhance energy, however, this association did not reach significance. Similarly with the clearheaded/confused ratings the consumption of vitamins/minerals alone resulted in feeling more clearheaded than if both supplements had been consumed (*Figure 2.4.2.*). Those differences between those taking DHA alone, rather than a combination of DHA and vitamins/minerals, just failed to achieve statistical significance difference ($p<0.06$) when the clearheaded/confused scale was examined.

With the measures from the GHQ the vitamin/mineral supplement tended to have the most positive influence. The difference between the placebo and vitamins/minerals groups approached statistical significance ($p = 0.07$). With the anxiety sub-scale the largest difference was between those taking the placebo and vitamins/minerals. Similar to the mood ratings, with the depression sub-scale of the GHQ the taking of vitamins/minerals was associated with the greatest improvement, whereas the combination of both active supplements was associated with the least. The effect of supplementation was, however less with the GHQ than with the POMS. Although the pattern of responses was similar with both tests, differences between groups did not achieve significance with the GHQ suggesting that the trial may have been under powered in this respect. Consistent with this suggestion, previously there have been a series of positive findings: randomly controlled trials have reported that multi-vitamin/mineral supplementation positively influenced the mental health of those without overt psychiatric symptoms, as assessed by the GHQ or a similar measure (Benton et al., 1995; Carroll et al., 2000; Schlebusch et al., 2000; Kennedy et al., 2010; Harris et al., 2011). A review concluded that n-3 FAs may be helpful in the treatment of clinical depression although the failure to find an influence of DHA on the GHQ

may reflect the use of a non-clinical population (Long, 2011). Alternatively this finding may reflect the lack of eicosapentaenoic acid (EPA) in the supplement presently use: it has been suggested that EPA is the n-3 FA that particularly influences mood (Long, 2011).

With regard to the stress measure there was an interaction between the different types of supplement (*Figure 2.4.6.*), although if anything a combination of DHA and vitamins/minerals had less ability to reduce stress than the latter supplement by itself. The finding that multi-vitamin and minerals supplementation decreased perceived stress appears to be a robust phenomenon as it replicates several previous studies. After twenty-eight days of supplementation significant reductions in anxiety and perceived stress were reported (Carroll et al., 2000). Similarly a B-vitamin complex/mineral supplement decreased ratings of stress (Kennedy et al., 2010; Schlebusch et al., 2000). Measured in a work situation a vitamin B complex was found to decrease reports of 'personal strain' (Stough et al., 2011). In healthy older males a multi-vitamin/mineral supplement reduced scores on a stress scale (Harris et al., 2011).

A positive effect of vitamin/mineral supplementation has previously been found in well designed trials: measures of stress, anxiety, agreeableness, energy and clearheadedness have been reported to be beneficial (Benton et al., 1995; Carroll et al., 2000; Schlebusch et al., 2000; Kennedy et al., 2010; Stough et al., 2011; Harris et al., 2011; Kennedy et al., 2011), although an association between micro-nutrient supplementation and mood has not always been reported (Cockle et al., 2000; Haskell et al., 2010).

You can only speculate about which vitamins and minerals were important in these responses. Benton et al. (1995; 1997) suggested that thiamine plays an important role in the regulation of mood and the beneficial effect of thiamine has been reported for fatigue, well-being, sociability, sensitivity, clearheadedness, composure and energy (Schmidt et al., 1991; Heseker et al., 1990; Benton et al., 1997). The homocysteine hypothesis provides an alternative explanation - a recent review suggested that elevated homocysteine, a marker for B-vitamin deficiency, is associated with depressed mood and anxiety (Folstein et al., 2007). Folstein et al. (2007) suggested that there is strong evidence for an association between homocysteine and depression, vascular disease and disturbed neurotransmission. One study found that in patients

with clinical depression and elevated homocysteine there was markedly lower 5-HIAA, a serotonin metabolite (Bottiglieri et al., 2000). As B-vitamins regulate homocysteine, that in turn plays a role in neurotransmission (particularly serotonin); you can speculate that they modulate mood and psychiatric functioning. Some intervention studies have found that B-vitamins reduced symptoms of depression (Taylor et al., 2004; Fava et al., 1997), although others have not (Ford et al., 2008). Similarly minerals may be influential (Kaplan et al., 2007) as it has been reported that iron supplementation can improve lassitude, concentration and mood (Balin et al., 1992); whilst selenium has been reported to improve symptoms of depression, anxiety, fatigue and hostility (Benton, 2002; Benton and Cook, 1991; Hawkes and Hornbostel, 1996) although not in all studies (Rayman, 2006).

The question arises as to the nutritional status of the sample as this will interact with the nature of the supplements. No assessment was made of the dietary status of the present sample although previously a similar sample was examined and biochemical methods were used to establish vitamin status, and it was found that participants were deficient or borderline in several vitamins including riboflavin, pyridoxine, thiamine and biotin (Benton et al., 1995). Students living away from home have been found to have poor dietary habits (highlighted in chapter 1; Steptoe and Wardle, 2001; Steptoe et al., 2002) and consistent with the possibility of an inadequate intake of micro-nutrients was the beneficial response to vitamin/mineral supplementation on several aspects of mood, stress and mild psychiatric symptoms (*Figures 2.4.2. – 2.4.6.*). In the absence of the assessment of dietary status such matters are uncertain and future work needs to relate the nutritional status of the subjects to the response to supplementation.

The most striking finding in the present study was that sometimes the combination of supplements was ineffective, even detrimental (*Figures 2.4.1., 2.4.2., 2.4.5.* and *2.4.6.*). You can only speculate about the possible mechanisms that need to be subject to further research. One possibility is that as iron is involved in lipid peroxidation, and as DHA is highly susceptible to oxidation (Mazza et al., 2007), these nutrients interact. McAnulty et al. (2010) looked at the influence of n-3 fatty acids, and the anti-oxidants selenium and vitamins A, C and E, on the oxidative stress associated with exhaustive exercise. Supplementation with n-3 fatty acids increased F2-isoprostanes, a marker of oxidative stress, an effect attenuated by the micro-nutrients. Das (2008) reported that

folic acid increased the blood levels of EPA and DHA. Thus there is a range of mechanisms by which vitamins and minerals can interact with fatty acid metabolism of which the above examples are only a few. The precise mechanisms that underlie the present findings concerning mood are, however, unclear. The conclusion is that while on occasions either vitamins/minerals or DHA, when tested alone, had a positive effect on mood there was no suggestion of a synergistic interaction: rather on occasions the interaction had negative consequences.

Chapter 5: The effects of vitamins, minerals and omega-3 on cognition (memory, reaction time and vigilance)

2.5.1. Abstract

Although a series of well designed studies have reported that supplementation with vitamins / minerals and omega-3 fatty acids can improve cognitive performance, the evidence is inconsistent. To date no study has examined the relative contribution of omega-3 fatty acids or vitamins and minerals, therefore the first aim was to examine the role of omega-3 fatty acids, particularly DHA, or vitamins and minerals in cognitive performance. The second aim was to examine the possibility of a synergistic action between omega-3, vitamins and minerals. The present study found no evidence for a role of either DHA or vitamins and minerals in cognitive performance. No evidence was found of a synergistic interaction between vitamins / minerals and DHA.

2.5.2. Introduction

The objective of the present chapter was to disucss the findings from the intervention study (chapters 3 and 4), an aim of which was to examine the effect of supplementation with DHA, vitamins and minerals on domains of cognitive performance, including reaction time, vigilance, immediate and delayed memory. An additional aim was to examine the possibility of a synergistic action between DHA, vitamins and minerals.

A diet deficient in vitamins and minerals has been linked to cognitive impairment, (see Parigi et al., 2006, for a review), however, given the distinction between cognitive decline/impairment and cognitive performance, the present review excluded studies that have examined the former. Although there is a literature on vitamins and minerals and cognitive decline, the role of these nutrients in enhancing cognitive performance in cognitively healthy adults is less established. A recent meta-analysis (Grima et al., 2012) of randomized controlled trials (RCTs) summated the effect of micronutrients on cognitive performance in cognitively healthy adults (>18y). Trials were excluded if they included populations with traumatic brain injury; cognitive impairment; dementia; chronic neurological or psychiatric conditions; supplements containing less than 3 vitamins/minerals; studies that were limited to 3 or more B-vitamins since these are biologically similar (Eilander et al., 2010). Ten trials (see studies 1-10 in *Table 2.6.1.*) were considered appropriate for review (n=3200). Memory and idea production were found to be the most investigated cognitive abilities (n=8 and n=3, respectively), however, due to small sample sizes meta-analyses could not be performed on other cognitive abilities, including and mental speed (n=2), reasoning ability (n=1), number facility (n=2), visual perception (n=3; analysis not performed due to heterogeneity of tests). The results suggested that micronutrients were effective for improving free immediate memory recall (SMD 0.24, CI: 0.06-0.43, $p<0.01$), but not delayed memory recall or idea production.

During the above review the authors stated that "no study has objectively reviewed the efficacy of multivitamins to enhance cognitive performance in adults. Thereby the aim of the current review was to systematically examine the literature and to quantify the effects of multivitamin supplementation on cognitive performance through meta-analysis." (Grima et al., 2012; pg 2). Later whilst describing the participants, it was

Table 2.5.1. – **Studies investigating the effects of vitamins and minerals on cognitive performance**

Investigator	Design	Duration (weeks)	*n*	Medications	Participant characteristics	Male (M)/female (F) / both (B)	Age	Results
1. Smith et al. (1999)	R, DB, PC	52	205	No vitamins or meds	No clinical disease or mental illness	B	67	//RA; // IFR; //VP; //RT
2. Cockle et al. (2000)	R, DB, PC	24	139	No meds or N	Healthy older adults; no clinical disease or mental illness	B	70	+RT
3. Wouters-Wesseling et al. (2005)	R, DB, PC	26	101	No restrictions	Frail older adults; not independently living; >75% with MMSE scores over 24	B	83	// IP; +IFR; // DFR
4. McNeill et al. (2007)	R, DB, PC	52	910	No vitamins, minerals or fish oils	Limited exclusion criteria; participants considered well enough to participate by doctor	B	72a	// IP
5. Gariballa and Forster, (2007)	R, DB, PC	6	445	No N	Hospitalized acutely ill patients; no severe disease or mental illness	B	76	//GC
6. Kang et al. (2009)	R, DB, PC	277	702	No vitamins	CVD or 3 coronary risk factors	F	65+	// IP; // DFR
7. Chan et al. (2010)	R, SB, PC	12	115	Meds, no N	Healthy, no dementia or clinical memory impairment	B	18-86	// IFR; // DFR
8. Haskell et al. (2010)	R, DB, PC	9	226	No dietary supplements	Healthy adults; no clinical disease or mental illness	F	36	+ NF; +V
9. Kennedy et al. (2010)	R, DB, PC	4	224	No meds, no N	Healthy adults; no clinical disease or mental illness	M	39	+ NF; // V

10. Summers et al. (2010)	R, DB, PC	16	113	No meds	No clinical disease or mental illness	B	62	+ IFR
11. Kennedy et al. (2011)	R, DB, PC	4	198	No meds or supplements	Healthy adults; no clinical disease or mental illness	M	30-55	// RT

R=randomized; DB=double-blind; SB= single blind; PC= Placebo controlled; N=nutraceuticals; meds= medications; NS= not specified; CVD= cardiovascular disease; MMSE= Mini Mental State Examination; a=median age; RA=reasoning ability; IP= Idea production; NF= number facility; VP= visual perception; V=vigilance; RT= reaction time; IFR= immediate free recall; DFR= delayed free recall; - = negative effect; + = positive effect; // = non-significant effect.

Adapted from Grima et al. (2012)

suggested that "to reduce heterogeneity, studies conducted in cognitively intact adults (>18 y) were considered appropriate for review." Despite the pre-requisite of including only cognitively intact adults, of 10 studies 1 used hospitalized patients albeit without a history of dementia or psychiatric illness (Gariballa and Forster, 2007) and a second study involved patients with cardiovascular diseases (CVDs) or 3 coronary risk factors (Kang et al., 2009). It could be suggested that hospitalized patients and patients with CVD cannot be expected to perform at a normal level of cognitive function. CVD and coronary problems are known to have a high rate of co morbidity with disorders such as depression (Moretti et al., 2011; Davidson and Korin, 2010). In turn depression and other diseases/disorders such as hypertension, insomnia, and diabetes have been associated with cognitive impairment (Salminen et al., 2012). It is not clear whether the population employed by Kang et al. (2009) were free from depression – there were no inclusion/exclusion criteria concerning depression. An additional problem was that studies containing 3 or more B-vitamins were to be excluded, yet Kang et al. (2009) administered a combination of folate, B-6 and B-12 – an exclusion criterion of Grima et al. was that no studies administering a combination of 3 or less B-vitamins was to be included. Another study included in the review (Wouters-Wesseling et al., 2005) employed frail older adults (75% with MMSE scores of 24 or more) that were not living independently – this population could not have been expected to be cognitively intact adults. In addition a fourth study was single-blinded.

These issues raise concern over the reliability of the meta-analysis. The majority of studies employed older adults (n=7), therefore the generalisability of the findings to cognitive performance in younger, cognitively healthy adults is questionable. It is perhaps important that when examining effect sizes for individual studies, for memory and idea production the largest effect sizes were observed in studies including populations that may have displayed cognitive impairment – effect sizes are presented in order of magnitude for the following studies with idea production (Wouters-Wesseling et al., Kang et al., 2009; McNeill et al., 2007), immediate free recall (Wouters-Wesseling et al., 2005; Summers et al., 2010; Smith et al., 1999; Chan et al., 2010) and delayed free recall (Wouters-Wesseling et al., 2005; Kang et al., 2005; Chan et al., 2010).

Despite its limitations, the meta-analysis by Grima et al. (2012) provided a clear message that several aspects of cognitive performance are under-researched. Where there was enough literature to warrant meta-analysis, it was inconsistent (*Table 2.5.1.*). There have been suggestions that supplementation can enhance some aspects of cognitive performance in healthy populations, including reaction time (RT; Cockle et al., 2000), number facility (Haskell et al., 2010; Kennedy et al., 2010), vigilance (Haskell et al., 2010) and immediate free recall (Summers et al., 2010). However, other studies have suggested that micronutrients are not beneficial to areas of cognitive performance including RT (Smith et al., 1999; Kennedy et al., 2011) and vigilance (Kennedy et al., 2010; see *Table 2.6.1.* for an overview).

Epidemiological and correlational evidence for the relationship between omega-3 fatty acids and cognitive performance is scarce, however, a 6-year longitudinal study reported no association with fish/n-3 consumption, at least in older adults (Van de Rest et al., 2008). The role of DHA in enhancing cognitive performance in young adults is even more limited. A recent cross-sectional study reported that young male adolescents (aged 18; n=3972) who at age 15 consumed fish more than once per week, compared to those who ate fish less than once per week, had higher scores for combined intelligence, verbal performance and visuospatial performance (Aberg et al., 2009). The association between fish consumption and the 3 intelligence scores was the same regardless of level of education, ethnicity, BMI, parents' education, residential area, frequency of physical exercise and socioeconomic status. The authors suggested that this was the first study to demonstrate a relationship between cognitive performance and fish consumption in a young male population. It was concluded that frequent fish intake at age 15 was associated with significantly better cognitive performance at age 18. However, it is well-known that epidemiological and correlational studies, although informative, cannot infer causality.

A RCT in older adults (n=485, >55 years) found that 900mg/d of DHA over a 24 week period significantly improved learning and immediate and delayed verbal recognition, but not working memory or executive function (Yurko-Mauro et al., 2010). Despite this positive finding, it must be noted that participants displayed an MMSE score of >26 and had self-reported mild memory complaints. The Mini-Mental State Examination (MMSE) cut-off score is 24 and it has been suggested that dementia can be clinically diagnosed accurately in many individuals who score between 24 and 27

(Folstein, Folstein and McHugh, 2000); therefore these data cannot be generalized to cognitively intact adults. Only two RCTs have assessed the effect of omega-3 supplementation on cognitive function in cognitively healthy older adults (Dangour et al., 2010; van de Rest et al., 2008). Dangour et al. (2010) conducted a 2-year RCT and found that supplementation with 200mg EPA plus 500mg DHA/d did not produce significant changes, however, it was concluded that negative results may have been due to the relatively short intervention period (Dangour et al., 2010). Van de Rest et al. (2008) found benefits for attention after 26weeks of supplementation with 226-1093mg EPA and 176-847mg DHA, but only in a subgroup of individuals carrying the ApoE4 allele, suggesting there may be individual differences that account for variation in responsiveness to supplementation with omega-3 fatty acids. With regard to younger adults, a placebo controlled trial by Fontani et al. (2005) supplemented a group of healthy volunteers (n=49; 22-51 years) with 800mg DHA + 1600mg EPA for 35 days and found that over time supplementation with omega-3 was associated with decreased (improved) RT in a sustained attention task, but not with choice RTs. However, there were several methodological flaws associated with this study, for example a small sample size and lack of double blinding. Although the authors concluded that there was a positive influence of n-3 supplementation on cognitive functions, it is unclear whether these changes over time were observed in the placebo group as well as the omega-3 condition, or whether there were statistically significant differences between the n-3 and placebo conditions at baseline or follow-up.

Most reports from RCTs in young adults are negative, for example although it has been found that supplementation for 12 weeks with either 450mg DHA + 90mg EPA or 300mg EPA + 200mg DHA was linked with increased cerebral blood flow in healthy young adults (n=159; aged 18-35), cognition was not affected (Jackson et al., 2012). Another RCT found no significant effects of 1740mg EPA + 250mg DHA on cognitive performance in healthy students after one month (n=54), however, the n-3 PUFA group made fewer risk-averse decisions (Antypa et al., 2008). An RCT by Benton et al. (2012) reported that supplementation with 400mg DHA for 50days in females (n=285) did not produce significant effects on mood, immediate/delayed memory, RT, vigilance or visual acuity. Hamazaki et al. (1996) administered 1500-1800mg DHA for 3 months to healthy students (n=41) and found that although it prevented increases in aggression towards others during times of mental stress (university examinations), it

did not enhance cognitive performance on the Stroop task and other measures of cognitive performance.

The possibility was considered that there may be a beneficial response to a short-term intervention in young adult males. It is possible that cognitive performance may be enhanced in the short-term by providing an optimal intake for the healthy brain. The present study therefore aimed to investigate the effects of DHA on cognitive performance in young and healthy adult males. We also aimed to explore the effects of vitamins and minerals on domains of cognitive performance, including immediate and delayed free recall memory, reaction time and vigilance. Finally, we aimed to explore the possibility that there would be a synergistic action between omega-3 and vitamins and minerals.

2.5.3. Methods

See section (2.3.3., page 159) for details on participants, procedure and intervention.

Measures

Recall of Words List (Appendix 24)

Two lists of 30 words were used; one for baseline testing and the other for follow-up. Each list contained 15 abstract and 15 concrete words with six letters and two syllables, chosen to be high in imagery, concreteness and frequency of use. They were presented at the rate of one word per second using a tape recorder. Immediately after presentation subjects wrote down as many words as possible **(immediate memory task)**. Approximately 40 minutes later, following the other unrelated computer tests, subjects recalled as many words as possible **(delayed memory task)**. The dependant measure for the memory task was number of correct.

Reaction time

The reaction time procedure was based on that of Jensen (1987). A panel of eight lamps were arranged in a semicircle 5.5 inches from a central button (the home key). Participants placed the index finger on the home key, and following a warning tone one of the eight lamps lit up. The subject was required to respond as soon as possible by pressing the corresponding lamp. Decision time (DT) is the time taken to lift the finger from the home key after a lamp has ignited. There were 5 X 20 trials – these included a practice run (20 trials), and simple and choice decision times for each of 1, 2, 4 and 8 lamps (20 trials each). The primary dependant measure for the reaction time test is decision time. An additional dependant measure is movement time, which is reaction time – decision time.

Rapid Information Processing Task

A computer generated a series of digits at the rate of 100 digits per minute for 10 minutes. The numbers appeared in white on a black screen. Subjects pressed the space bar when they detected target sequences of three consecutive odd or three consecutive even digits. Five target sequences were presented each minute. The dependant measures were the number of correct and incorrect responses per minute.

Analysis

Univariate ANOVA was conducted on change scores (baseline scores subtracted from follow-up scores). Immediate and delayed memory recall, reaction time, and vigilance were dependent variables; and vitamins and minerals and DHA as between subjects' factors.

2.5.4. Results

Table 2.6.2. contains the mean and standard error of change scores for immediate and delayed memory recall, decision time and vigilance. On no occasion did supplementation with vitamins and minerals, DHA, or both have a significant effect on reaction time, vigilance or memory. In conclusion, the present study found no effect of vitamins, minerals and/or DHA on memory, reaction time and vigilance over a 3 month period.

Table 2.5.2. –Means and standard errors of change scores for cognitive performance. F values are from one-way ANOVA's of change scores.

	Placebo	Vitamins / Mineral	Placebo	DHA	F Values
Immediate memory	**-.95**	**-.88**	**-.94**	**-.89**	**Vit/Min** (1,169) =.03, n.s
	(.30)	**(.31)**	**(.31)**	**(.30)**	**DHA** (1,169) = .02, n.s
					Vit/Min X DHA (1,169) = .31, n.s
Delayed memory	**-.46**	**-1.2**	**-.35**	**-1.31**	**Vit/Min** (1,169) =1.03, n.s
	(.51)	**(.52)**	**(.52)**	**(.51)**	**DHA** (1,169) = 1.76, n.s
					Vit/Min X DHA (1,169) = .16, n.s
Decision time	**11.67**	**8.60**	**10.03**	**10.24**	**Vit/Min** (1,167) =.30, n.s
(Lamp 8)	**(3.90)**	**(4.05)**	**(3.97)**	**(3.98)**	**DHA** (1,167) = .01, n.s
					Vit/Min X DHA (1,167) = 2.37, n.s
Vigilance	**-.32**	**- .35**	**-1.04**	**.37**	**Vit/Min** (1,168) =.01, n.s
	(.87)	**(.89)**	**(.88)**	**(.87)**	**DHA** (1,168) = 1.29, n.s
					Vit/Min X DHA (1,168) = .85, n.s

2.5.5. Discussion

The present study found that supplementation with micronutrients or DHA had no effect cognitive performance. In addition, there was no synergistic action between micronutrients and DHA on any cognitive domain. The different facets of cognitive performance that were examined during the present study (reaction time, vigilance, and immediate and delayed memory) will be discussed individually. Firstly, the role of micronutrients in cognitive performance will be discussed, followed by the role of DHA. With regard to reaction time, although the finding that micronutrient supplementation had no effect is consistent with Smith et al., 1999 and Kennedy et al., 2011, other research has reported a positive effect in older people (Cockle et al., 2000). Given that 3 out of 4 studies were negative, it is possible that the findings from Cockle et al. (2000) were due to chance. Alternatively it is possible that the findings from Cockle et al. were owing to the age of the population. At this stage it is too early to draw conclusions.

The present study found that supplementation had no effect on vigilance – again, previous literature is inconsistent with one study finding an effect of supplementation (Haskell et al., 2010) whereas another study found no effect (Kennedy et al., 2010). This discrepancy may reflect that identical vigilance tasks were used in Kennedy et al. and the present study, whereas Haskell et al. (2010) used a different task. The vigilance task used in the present study may not have had enough sensitivity to detect subtle nutrient induced changes to vigilance. Alternatively, the discrepancy may reflect that Kennedy et al. and the present study used young male populations, whereas Haskell et al. (2010) used a female population. It is possible that females may be more susceptible to supplementation; at present it is too early to draw conclusions but this suggestion warrants further investigation.

The final facet of cognitive performance that was examined was memory, in particular immediate and delayed free recall (IFR and DFR). Two previous studies reported significant improvements to IFR after micronutrient supplementation (Wouters-Wesseling et al., 2005; Summers et al., 2010), however, consistent with other research the present study found no evidence of the effects of micronutrients on IFR (Smith et al., 1999; Chan et al., 2010) or DFR (Wouters-Wesseling et al., 2005; Kang et al., 2009; Chan et al., 2010). Taken together these data suggested that micronutrient

supplementation does not affect delayed free recall (four studies finding non-significant results), however, it may be beneficial for immediate free recall (as suggested by 2 of 5 studies). Of the two studies that reported an effect on IFR, one involved a population that were at risk of cognitive impairment (Wouters-Wesseling et al., 2005), and notably, referring back the meta-analysis by Grima et al. (2012), this study produced the largest effect size. This evidence suggested that supplementation with micronutrients may be beneficial to immediate memory recall, but only in those with cognitive deficits. Given inconsistencies among methodology and results, the role of micronutrients in IFR among cognitively impaired and cognitively intact adults requires further research.

Although we found no significant effect of micronutrient supplementation on RT, vigilance and memory, this is not to say that supplementation does not affect cognitive performance per se. It is possible that the incongruence between study findings may reflect heterogeneity of tests, differences in the supplement content, variation between populations, and differing length of intervention (see *Table 2.6.1.)*. Furthermore, we examined 3 facets of cognitive performance – RT, vigilance and memory. Other facets of cognitive performance that require further investigation include general cognition, reasoning ability, number facility, and visual perception. Although these areas of performance were highlighted in the meta-analysis by Grima et al. (2012), there were insufficient trials to warrant meta-analysis.

The present study found no effect of DHA on memory, reaction time or vigilance. The literature pertaining to omega-3, particularly DHA on cognitive performance is less established than the literature on micronutrients and cognitive performance. However most data from intervention studies are consistent with the present finding that supplementation with omega-3 fatty acids had no effect on cognitive performance in young adults (Jackson et al., 2012; Benton et al., 2012; Hamazaki et al., 1996).

Although one study reported an effect of n-3 supplementation on cognitive performance (Fontani et al., 2005), due to the methodological and statistical flaws (for example, no comparison was made between the treatment and placebo groups), caution must be taken when interpreting the findings. Alternatively, it is possible that discrepancies between Fontani et al. (2005) and other studies reflect the type of test used. Fontani et al. (2005) employed measures of sustained attention and reaction

time that were different from those used during the present study, in addition Hamazaki et al. (1996) found no effect on the Stroop task and a task to detect symptoms of dementia in a normal population adapted for this age group. These tasks were also different in nature from those used in the present study, suggesting the possibility that there is a lack of effect on several cognitive domains other than reaction time, vigilance and memory. Antypa et al. (2009) found no effect of supplementation on cognitive reactivity, attention, response inhibition, facial emotion recognition and memory, however, there was an effect on risky decision-making, which is a facet of impulsivity. Antypa et al. (2009) is therefore supportive of the finding in chapter 3 that DHA may reduce impulsivity. Although the aforementioned studies show considerable heterogeneity of tests, other studies have used identical or similar tests to the present study. Benton et al. (2012) employed identical tasks to the present study and found no effect on immediate or delayed memory, RT and vigilance. Similarly, Jackson et al. (2012) used an identical vigilance test, similar immediate and delayed recall tasks (but not free recall, prompts were used) and measures of simple and choice RT. Although the nature of the memory and RT tasks were slightly different to the present study, Jackson et al. (2012) found no effect on any of these cognitive domains. The latter two studies combined with the present findings suggest that supplementation with omega-3 over a 3 month period does not affect reaction time, vigilance and immediate and delayed memory in young healthy males. The findings from Hamazki et al. (1996), Antypa et al. (2009) and Jackson et al. (2012) suggested that omega-3 supplementation does not affect other cognitive domains including cognitive reactivity; attention; response inhibition; facial emotion recognition; memory picture recall; face recall; verbal fluency; numeric working memory; alphabetic working memory; spatial working memory; working memory; telephone number working memory; delayed picture recognition; the Stroop task. However, owing to a small number of studies, further research should be conducted to examine the role of omega-3 with these cognitive tests.

Discrepancies between studies may reflect differences in dose/type of omega-3 fatty acids. Fontani et al. (2005), who reported beneficial effects of supplementation, administered 800mg DHA + 1600mg EPA, whereas Jackson et al. (2012) administered comparably lower doses (450mg DHA + 90mg EPA or 300mg EPA + 200mg DHA). Antypa et al. (2009) administered a relatively high dose of EPA but a low dose of

DHA (1740mg EPA + 250mg DHA). Benton et al. (2012) administered a relatively low dose of DHA (400mg DHA); and Hamazaki et al. (1996) administered a relatively high dose of DHA (1500-1800mg). The present study administered 1000mg of DHA. The latter three studies suggest the possibility that EPA is required to produce a significant effect, however, if this were the case then we would expect an effect on cognition in the study by Antypa et al. (2009) that used the highest dose of EPA. Alternatively, it may be that combinations of EPA and DHA at higher doses comparable to those in Fontani et al. (2005) are required to produce beneficial effects. The effect of different doses on cognitive performance requires further investigation.

It is unlikely that the lack of positive findings in the RCTs mentioned above are the result of variability of length of intervention period, since although Jackson et al. (2012) used the shortest intervention period, Fontani et al. (2005) used a relatively short intervention period (35 days) in comparison to the other studies. However, owing to the heterogeneity of tests the possibility arises that different cognitive domains require different lengths of intervention period to produce a response to supplementation. Similarly, different cognitive domains may also require different doses of PUFA before beneficial effects are achieved. It may be the case that different cognitive domains should be considered separately when deciding the length of intervention period, the correct dose and type of PUFA.

It is surprising that there is a widespread belief that the consumption of n-3 fatty acids enhances brain function. A website advocating the use of omega-3 stated: 'Fish oil supplements are literally like membrane material for the brain (http://4mind4life.com/blog/2008/02/06/50-ways-to-boost-your-brain-power/ http://www.localharvest.org/blog/20618/entry/top_ten_brain_and_longevity). The 2 primary components of EPA and DHA each act to strengthen both the emotional centre of the brain and boost focus. There is an increase in overall brain activity after taking fish oil for awhile'. A list of the ten best foods and supplements for brain health stated that: 'A lack of n-3 has been shown to diminish intellectual performance'. It is important that the public are not provided with misconceptions, as although to date the literature is minimal, the findings are mainly negative.

With regard to a lack of positive findings for micronutrients and DHA during the present study and previous studies, an explanation is that micronutrient and n-3 levels

may not have been below the level that would render participants susceptible to cognitive performance deficits, and under these circumstances supplementation may not have been necessary. For example, an animal study supports the idea of a threshold effect and incorporation of n-3 into cells, and only if n-3 fatty acids fell below this level was performance adversely affected (Jensen et al., 1996). Although a threshold for omega-3 has not yet been established in humans, a study found significant effects of a fish oil supplementation in under-nourished children (assessed by means of nutrient levels below current guidelines) compared to well-nourished children (Dalton et al., 2009). It is important to point out here that these effects were observed in children, who have different demands for PUFAs during development.

Another possibility for the lack of positive findings is the absence of performance decrements at baseline. For example, it has been found that supplementing older adults with DHA significantly improved learning and immediate and delayed verbal recognition in individuals with an MMSE score of >26 and self-reported mild memory complaints (Yurko-Mauro et al., 2010). However, two RCTs in cognitively healthy older adults (Dangour et al., 2010; van de Rest et al., 2008) reported no effect of supplementation on cognitive performance. Although several studies have reported a relationship between cognitive decline and n-3 intake in older adults (Cole, Ma and Frautschy, 2009) older adults may be vulnerable to cognitive deficits despite a lack of an apparent performance decrement. Furthermore, older adults are known to not only differ in the capacity for cognitive performance, but also for nutritional requirements, when compared to young adults (Bjorkegren and Svardsudd, 2001; Green and Miller, 1999; Moreiras et al., 1996). These issues may explain a lack of effect in younger cognitively intact adults.

An alternative explanation for the lack of positive results may be owing to the study sample of young healthy male students. Firstly, it is possible that certain aspects of cognition (including cognitive performance) are not sensitive to short-term dietary interventions, however, other aspects of cognition (cognitive decline/impairment) may be sensitive. The influence of vitamins, minerals and omega-3 fatty acids on these distinctive aspects of cognition requires further research. Secondly, it is important to consider the fact that the present study was focused on young healthy students: there may be implications for studying cognitive function in this population.

In conclusion, the present findings combined with other recent reports suggest that vitamins, minerals and DHA do not significantly affect reaction time, vigilance, immediate or delayed memory in cognitively intact healthy young male students. Although supplementation with micronutrients and DHA is unlikely to produce beneficial effects on RT, vigilance and memory in the absence of cognitive or dietary deficits, their role in other aspects of cognitive performance is under-researched, including general cognition; reasoning ability; number facility and visual perception; cognitive reactivity; attention; response inhibition; facial emotion recognition; memory picture recall; face recall; verbal fluency; numeric working memory; alphabetic working memory; spatial working memory; working memory; delayed picture recognition; the Stroop task. The role of micronutrients and DHA in these cognitive domains require further investigation. With regard to micronutrients, the result of previous research is mixed, particularly when we consider immediate free recall. At this stage we can speculate that although there is a lack of positive results supporting the effects of micronutrients on reaction time, vigilance and delayed free recall, micronutrients may play a role in enhancing immediate free recall. Negative findings have been reported during a meta-analysis for delayed free recall and idea production (Grima et al., 2012). With regard to DHA, given the aforementioned evidence it is unlikely that there is a role for omega-3 fatty acids in cognitive performance in young adults without a dietary or cognitive deficit. If the area is pursued it is important that researchers consider the effects of different types and doses of omega-3 on different cognitive domains. It is possible that a much longer period of intervention is required to produce benefits on cognitive performance in young adults. Given the finding from Van de Rest et al. (2008), that a subgroup of individuals carrying the ApoE4 allele responded positively to supplementation, it is important that future studies assessing n-3 and cognitive performance take ApoE status into account since this preliminary evidence suggests that there may be individual differences that account for variation in responsiveness to supplementation with omega-3 fatty acids.

Chapter 6: The effect of vitamin and mineral supplementation on mood, stress and mild-psychiatric symptoms - a meta-analysis (details available in press, Human Psychopharmacology)

2.6.1. Introduction

Given the previous findings from chapter 4, for the first time we conducted a meta-analysis to determine the effect of vitamins and minerals on mood, stress and mild psychiatric symptoms. The previous finding that micronutrients may affect several facets of behaviour is not surprising if we consider that an adequate micronutrient status is essential for neurological health, however, although multi-mineral and vitamins are widely consumed, received wisdom is that "most people can get all the vitamins and minerals they need by eating a balanced, varied diet" (NHS guidelines, 2012). Yet although the criteria used to define nutritional adequacy do not include psychological measures, it has been argued that these are likely to be the most sensitive means available when assessing nutritional status (Benton, 2012). Mood, cognitive functioning and behaviour reflect the summated activity of millions of biochemical processes; such that minor dietary inadequacies, responsible for only a small percentage decline in the efficiency of a single enzyme, could cumulatively influence functioning. If such an analysis has merit, and diet does not provide an optimal intake of micro-nutrients, then micro-nutrient supplementation would be expected to benefit psychological parameters such as mood. Thus the influence of multi-vitamin/mineral supplementation on mood was considered using meta-analysis.

The role of micronutrients in clinical disorders of mood has received increased attention, and as highlighted previously, B-vitamins have been purported to play a role in anxiety and depression. In addition the role of B-vitamins in the regulation of homocysteine has been proposed as a potential mechanism by which B-vitamins may be linked to depressed and anxiety (Folstein et al., 2007; Taylor et al., 2004; Fava et al., 1997), however, not all studies support this (Ford et al., 2008; Malouf and Grimley, 2003; Taylor et al., 2003). Notably the literature on this topic is scarce and requires further research.

The role of other vitamins and minerals is less established although as previously highlighted, there are suggestions that some minerals are influential (Kaplan, 2007; Balin et al., 1992; Benton, 2002; Benton and Cook, 1991; Hawkes and Hornbostel, 1996), although not in all studies (Rayman et al., 2006). Thus there is some evidence that supplementation with at least some micro-nutrients can influence mood although data are inconsistent. Owing to the complex interaction between nutrients in the body, rather than considering a limited range of micro-nutrients, or a specific nutrient, wide ranging multi-vitamin / mineral supplements were considered in the general population. The question is particularly relevant as multi-vitamin / mineral supplements are those most commonly taken by the general population (chapter 2).

As highlighted in the previous section, students, a sample of the general population rather than those with a clinical problem were examined as they offer a homogeneous sample and it was known that the topic had been considered in several studies. Arguably those with clinical complaints might also benefit but there is not, as yet, a sufficient body of data to allow meta-analysis of those with specific complaints. In addition there are many aetiologies for disorders such as depression, only a minority of which are related to the diet. Thus any dietary benefit, in those with a clinical complaint with a nutritional basis, is likely to be masked by a lack of response in those with the disorder but no dietary problem.

It was decided to consider wide ranging multi-vitamin / mineral supplements rather than specific nutrients. Although earlier reviews have concluded that there are insufficient published trials to allow meta-analysis (Kaplan et al., 2007; Soh et al., 2009), more recently multi-vitamins / minerals supplements have been reported to benefit various dimensions of mood (Kennedy et al., 2010; Stough et al., 2011; Harris et al., 2011; Kennedy et al., 2011; chapter 4), although other studies have failed to find a significant effect (Haskell et al., 2010). These recent publications now allow meta-analyses of this area, we believe for the first time. The aim of the current study was to systematically examine and quantify the effects of multivitamin / mineral supplements on aspects of stress, mood and mild-psychiatric symptoms in samples of the general population.

2.6.2. Methods

Article searching

Medline (PubMed), Web of Knowledge and PsychINFO were searched up to February 2012 for randomized controlled trials (RCTs) by combining terms relating to the nature of intervention ('vitamin', 'mineral', 'supplement'), and terms relating to mood ('mood', 'behavior', 'depression', 'depressed', 'anxious', 'anxiety', 'fatigue' (not 'cancer' or 'tumor'), 'stress' (not oxidative), 'well-being', 'mental health' and 'confusion'. Searching in Medline was limited to human studies, all adult samples (18+), in the English language, RCT's, clinical trials, meta-analysis. Searching in Web of Knowledge was limited to journal articles written in English.

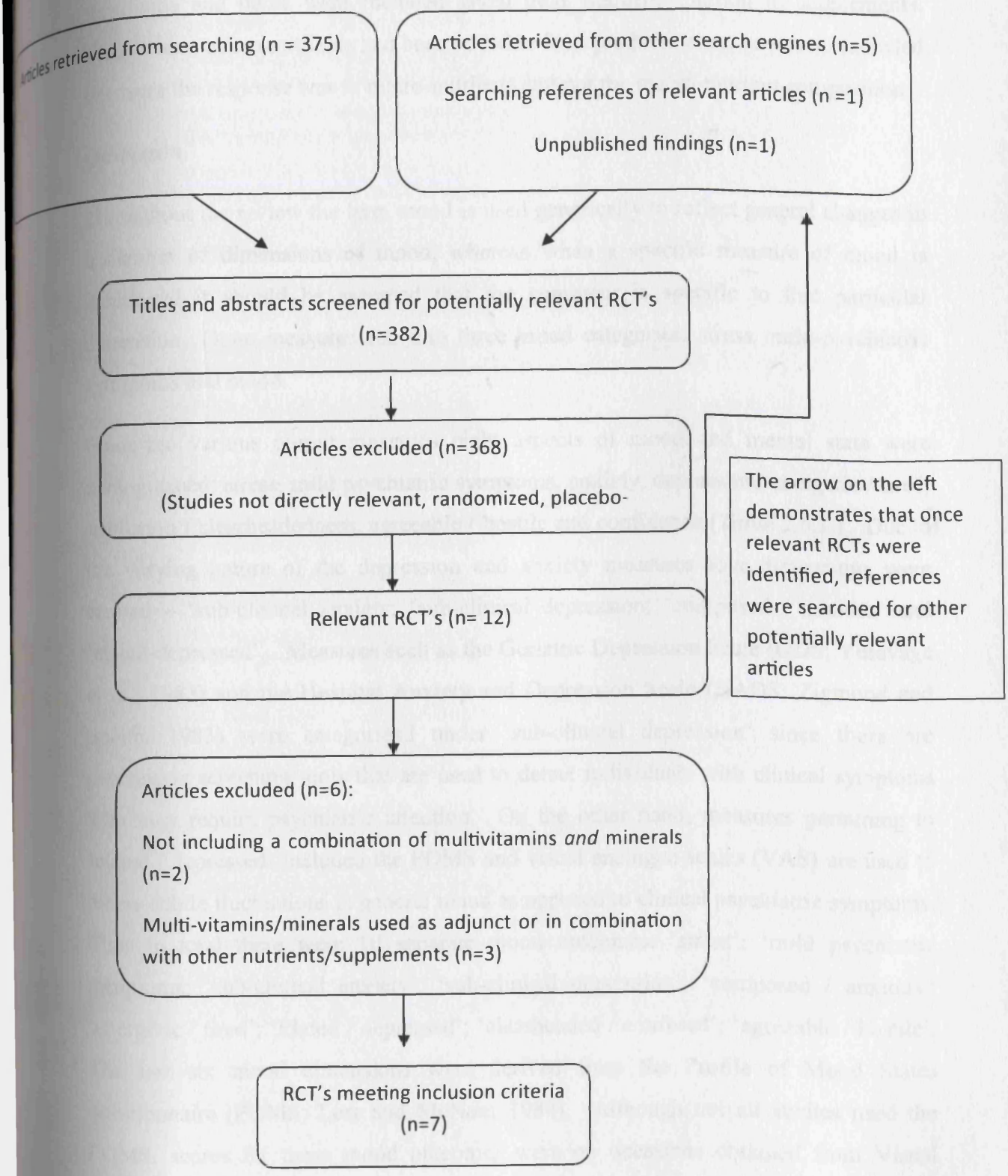
Trial selection

To be considered for inclusion the trials had to be randomized, double-blind and placebo controlled. Another prerequisite for inclusion was that the trial reported the effects of vitamin and mineral supplements, as a mono-therapy, with mood and/or mild psychiatric symptoms as the primary or secondary outcome measure. The intervention period must have been at least 28 days. *Figure 2.6.1.* shows the selection process for the inclusion of trials. Only studies involving healthy adults (aged 18 to 69 years) were included: that is trials that included clinical or sub-clinical populations were excluded.

Interventions

Trials must have supplemented participants daily with a multivitamin and mineral supplement, defined as a supplement containing ≥4 vitamins and minerals. Such a definition was arbitrary but was intended to exclude studies of single nutrients and studies of two or three B vitamins that had aimed to decrease homocysteine levels. The effects of up to three B vitamins on mood had been previously reviewed with negative conclusions (Malouf and Grimley, 2003; Taylor et al., 2003). The requirement that both vitamins and minerals should be included reflected the underlying hypothesis that widespread minor deficiencies of micro-nutrients can have a cumulative impact and that deficiencies of minerals such as iron occur commonly. The hope was to consider studies with as wide a range of ingredients as possible and in the event no study included offered less than ten vitamins or three minerals, consistent

Figure 2.6.1. **– Selection of trials for inclusion in meta-analysis**



with the objective to consider the possibility of a cumulative influence of wide-ranging sub-clinical deficiencies. Multivitamins / minerals combined with small quantities of flavonoids and herbs were included given their frequent addition to supplements. Trials where micro-nutrients had been added to food products were, however, excluded to ensure the response was to micro-nutrients and not the macro-nutrient composition.

Outcomes

Throughout the review the term mood is used generically to reflect general changes in a number of dimensions of mood, whereas when a specific measure of mood is mentioned it should be assumed that the comment is specific to that particular dimension. These measures fell into three broad categories: stress, mild-psychiatric symptoms and mood.

From the various output measures eight aspects of mood and mental state were distinguished; stress, mild psychiatric symptoms, anxiety, depression, energetic / tired, confusion / clearheadedness, agreeable / hostile and confidence (*Table 2.6.1.*). Due to the varying nature of the depression and anxiety measures four dimensions were created – 'sub-clinical anxiety; 'sub-clinical depression; 'composed / anxious' and 'elated-depressed'. Measures such as the Geriatric Depression Scale (GDS; Yesavage et al., 1983) and the Hospital Anxiety and Depression Scale (HADS; Zigmond and Snaith, 1983) were categorized under 'sub-clinical depression' since these are psychiatric screening tools that are used to detect individuals with clinical symptoms who may require psychiatric attention. On the other hand, measures pertaining to 'elated / depressed' included the POMS and visual analogue scales (VAS) are used to assess subtle fluctuations in general mood as opposed to clinical psychiatric symptoms. Thus in total there were 10 separate mood outcomes: 'stress'; 'mild psychiatric symptoms; 'sub-clinical anxiety', 'sub-clinical depression'; 'composed / anxious'; 'energetic / tired'; 'Elated / depressed'; 'clearheaded / confused'; 'agreeable / hostile'. The last six mood dimensions were derived from the Profile of Mood States questionnaire (POMS; Lorr and McNair, 1984). Although not all studies used the POMS, scores for these mood outcomes were on occasions obtained from Visual Analogue Scales (VAS) or measures such as the Chalder Fatigue Scale (CFS; Chalder et al., 1993).

Table 2.6.1. – Randomized, double-blind placebo-controlled trials investigating the effects of multi-vitamins and minerals on mood

	Investigator	Population	Type and dose	Duration (days)	Outcome measure/s	Stress	Mild psychiatric symptoms (e.g. GHQ)	Anxiety	Depression	Composed / anxious	Energetic / tired	Clearheaded confused	Agreeable
1.	Carroll et al. (2000)	Healthy male adults (n=80; 40 +40; students aged-18-42; mean 25)	Multivitamins (Berocca ® with calcium, magnesium and zinc)	28	GHQ-28; HADS; PSS; VAS	+	+	+	ns	+	+ (VAS; 0.06)	NA	NA
2.	Schlebusch et al. (2000)	Highly stressed (but healthy) adult employees (n=300 M & F; mean age 37; placebo: 149; vits: 151)	Multivitamin (Berocca ® with calcium and magnesium)	30	HARS; PGWS; BSI; VAS	+	+ (PGWS)	+	NA	NA	NA	NA	NA
3.	Kennedy et al. (2010)	Healthy male adult employees (n=215; age 30-55; placebo: 107; vits: 103)	Multivitamins (Berocca ® with calcium, magnesium and zinc)	33	POMS; GHQ-12; PSS	+	+	ns	ns	ns	+	(0.07)	ns
4.	Haskell et al. (2010)	Healthy adult females (n=216; age 25-50; placebo: 110; vits: 106)	Multivitamins and minerals (Supradyn®)	63	POMS; SF-36; CFS; STAI; VAS	NA	ns (SF-36)	NA	NA	NA	+ (VAS)	NA	NA
5.	Stough et al. (2011)	Healthy adult employees (n=60; mean age 42.2; M & F; placebo: 18; vits: 42)	Multivitamin and minerals (Executive B ® Active)	90	PSQ-OSI-R; POMS	+	NA	ns	+	+	ns	+	ns

6.	Harris et al. (2011)	Healthy male adults (n=50; age 50-69; placebo: 25; vits: 25)	Multivitamins and minerals (Swisse Men's Ultivite®)	56	GHQ-60; DASS; PSS-14; POMS; VAS	ns (+total DASS scores)	+ (GHQ)	ns	ns	ns	+ (VAS)	ns	ns
7.	Long and Benton (2012)	Young male adults (n=173; mean age 20.9; placebo: 89; vits: 84)	Multivitamins and minerals (Centrum 50+)	84	POMS; PSS-10; GHQ-30	+	+ (0.07)	ns	ns	+	ns	+	ns

*ns – non-significant; + - positive effect of supplementation in comparison to placebo; NA – not applicable, i.e. not investigated in study.

SSC – Stress Symptoms Checklist; HARS - Hamilton Anxiety Rating Scale, PGWS - Psychological General Well-Being Schedule; BSI – the Berocca Stress Index; VAS – visual analogue scale (measuring mood, i.e. anxious, depressed, tired, tense, unable to concentrate, during particular times of day); PSQ-OSI-R – Personal Strain Questionnaire of the Occupational Stress Inventory-Revised; POMS; Profile of Mood States Questionnaire; GHQ-28 – General Health Questionnaire-28 items; HADS - Hospital Anxiety and Depression Scale; PSS – Perceived Stress Scale; GHQ-60 – 60-item General Health Questionnaire; DASS – Depression Anxiety Stress Scale; PSS-14 - 14-item Perceived Stress Scale; GDS – Geriatric Depression Scale; SF-36 - Medical outcome study quality of life Short-Form 36; CSF – Chalder Fatigue Scale; BL-VAS – Bond-Lader Visual Analogue Scales (16 individual scales that assess 3 dimensions of mood – alertness, calmness and contentment); SE-VAS – State/Energy Visual Analogue Scales (assesses subjective stress, concentration, mental stamina and physical stamina); STAI – state trait anxiety inventory.

The other outcomes ('Stress'; 'Mild psychiatric symptoms; 'Sub-clinical anxiety' and 'sub-clinical depression') were determined from measures that are generally used as psychiatric screening tools. For example several studies used the General Health Questionnaire (GHQ; Goldberg and Williams, 1988) which assesses 'Mild psychiatric symptoms'. Measures such as the Geriatric Depression Scale (GDS; Yesavage et al., 1983) and the Hospital Anxiety and Depression Scale (HADS; Zigmond and Snaith, 1983) were categorized under 'Sub-clinical depression'. Hence, if separate studies employed different tests that measured the same construct the scores were included in the same analysis.

Data handling and statistical analysis

Baseline and follow-up means, standard deviations and sample sizes for the placebo and active arms were extracted. Where a study produced data for multiple time points, only baseline and end-point data were used. If means, standard deviations and sample sizes were not accurately reported or could not be obtained by contacting authors then the trial was removed from the analysis. If standard errors were reported then standard deviations were calculated. Some studies used both males and females (Kennedy et al., 2010; Stough et al., 2011) but did not provide separate data for males and females. Therefore when analyzing gender differences these studies were removed from the analysis. Quantitative analysis was performed using Comprehensive Meta Analysis version 2 (Biostat; http://www.meta-analysis.com/index.html). In all cases, a random effects model was used to compute the mean effect size (StandardMeanDifference; SMD) presented as Hedges's g. Q-value's were used to assess heterogeneity.

2.6.3. Results

Of the 378 studies found 12 were RCTs and seven fulfilled the full inclusion criteria and are outlined in *Table 2.6.1.* The eight trials in total studied 1094 healthy adult participants. Four trials employed males (n=518), with only one study using a female population (n=216). Two trials used a mixture of males and females (n=360). The length of intervention period was between 28 and 90 days. *Table 2.6.2.* lists the composition of the supplements used that fell broadly into two categories - those studies that used a combination of vitamins and minerals (Harris et al., 2011; Haskell et al., 2010; Long and Benton, 2012) and those studies with doses much higher than the dietary reference values (DRV) levels (including B vitamins) but 3 minerals or less (Carroll et al., 2000; Schlebusch et al., 2000; Kennedy et al., 2010; Stough et al., 2011). A priori it was decided to use a conservative approach and the random effects model was applied, however, (with the exception of 'non-clinical anxious mood') examination of Q-values revealed that there was no evidence of heterogeneity in the ten analyses in *Table 2.6.3.*

Stress was investigated in all but one trial (Haskell et al., 2010) with five reporting a beneficial effect of taking multivitamins/minerals (Carroll et al., 2000, Schlebusch et al., 2000, Kennedy et al., 2010, Stough et al., 2011, Long and Benton, 2012) although one did not (Harris et al., 2011). Meta-analysis revealed that multivitamin / mineral supplementation significantly reduced stress (pooled sample size, n=878; standardized mean difference; SMD= -0.295, 95% CI: −0.429, -0.161, p = 0.001; *Figure 2.6.2.*). *Figure 2.6.2.* shows the effect sizes for individual studies, however, the final effect size is shown in bold: this is the summated effect size for all studies.

Six studies examined the effect of multivitamins / minerals on mild psychiatric symptoms, and on five occasions a positive effect was reported (Carroll et al., 2000; Schlebusch et al., 2000; Kennedy et al., 2010, Harris et al., 2011, Long and Benton, 2012). Supplementation significantly improved mild psychiatric symptoms (pooled sample size, n=1034; SMD= -0.304, 95% CI: −0.427, -0.181, p= 0.001; *Figure 2.6.3.*). *Figure 2.6.3.* shows the effect sizes for individual studies, however, the final effect size is shown in bold: this is the summated effect size for all studies. More specifically when sub-clinical anxiety measures were considered, out of four studies two had a

Table 2.6.2. – Table of showing the nutrient content of supplements

Name of supplement and vitamin/mineral content	RDI (25 year old male)	*22; 34	Schlebusch et al. (2000)	Haskell et al. (2010)	Stough et al. (2011)	Harris et al. (2011)	Long and Benton (2012)
• Supplement name:		Berocca ®	Berocca ® Calmag	Supradyn ®	Executive B ® Active	Swisse Men's Ultivite ®	Centrum ® Advance 50+
• A (palmitate; µg)	900			800			800
• B1 (thiamine hydrochloride; mg)	1.2	15	15	4.2	75	30	1.4
• B2 (riboflavin; mg)	1.3	15	15	4.8	10	30	1.75
• B3 (nicotinamide; mg)	16	50	50	54	100	30	20
• B5(pantothenic acid; mg)	5	23	23	18	68.7	64.13	7.5
• B6 (pyridoxine hydrochloride; mg)	1.3	10	10	6	25	30	2
• Folic acid (synthetic B9; µg)	400	400		600	150	500	200
• B12 (cyanocobalamin; µg)	2.4	10	10	3	30	30	2.5
• Choline bitartrite (mg)	550				25	25	

• C (ascorbic acid; mg)	900	500	1000	180	250	165.2	100
• D (µg)	5			5			5
• E (D-alpha-tocopheryl acid succinate; mg)	15			10	41.3	41.33	15
• H (biotin; µg)	30	150	150	450	20		62.5
• K (µg)				30			30
• Calcium (mg)	1000	100	100	120	100	21	162
• Chloride (mg)	2300						36.3
• Chromium (µg)	35			25		6.2	40
• Copper (µg)	900			900		28	500
• Fluoride (mg)	4			1.5			
• Iodine (µg)	150			75	140	50	100
• Iron (mg)	8			8		3	5
• Magnesium (mg)	400	100	100	45		55.48	100

• Manganese (mg)	2.3		1.8		1.2	2
• Molybdenum (μg)	45		45			50
• Phosphorus (mg)	700				126	125
• Potassium (mg)	4700		55	117.3	4	40
• Selenium (μg)	55				26	30
• Zinc (mg)	9.4	10	8		6	5

*Kennedy et al. (22); Carroll et al. (34)

Stough et al. also included 50μg lutein, 25mg inositol, 250mg avena sativa (oats) extract equivalent to dry seed, and 100mg passiflora incarnata (passion flower) extract equivalent to dry herb; Harris et al. also included 40mg bioflavonoids, 25mg inositol, 50mg lysine hydrochloride, 1mg tyrosine and 1mg ubidecarenon (Co-enzyme Q10); Long and Benton also included 500μg lutein.

Table 2.6.3. -Results of meta-analysis examining the effects of vitamins/ minerals on mood (BOLD indicates statistical significance; *ITALICS* indicates approaching significance)

Mood facet	Studies	Standardized mean difference (SMD; random model: bold indicates statistical significance)	Standard error	Lower limit	Upper limit	p-value
Stress	(Carroll et al., 2000; Schlebusch et al., 2000; Kennedy et al., 2010; Stough et al., 2011; Harris et al., 2011; Long and Benton, 2012)	**-0.295**	0.068	-0.429	-0.161	0.001
Mild psychiatric symptoms	(Carroll et al., 2000; Schlebusch et al., 2000; Kennedy et al., 2010; Haskell et al., 2010; Harris et al., 2011; Long and Benton, 2012)	**-0.304**	0.063	-0.427	-0.181	0.001
Sub-clinical anxiety	(Carroll et al., 2000; Schlebusch et al., 2000; Harris et al., 2011; Long and Benton, 2012)	**-0.320**	0.082	-0.481	-0.160	0.001
Sub clinical depression	(Carroll et al., 2000; Harris et al., 2011; Long and Benton, 2012)	-0.196	0.115	-0.422	0.030	0.089
Composed / anxious	(Carroll et al., 2000; Kennedy et al., 2010; Haskell et al., 2010; Stough et al., 2011; Harris et al., 2011; Long and Benton, 2012)	-0.035	0.089	-0.209	0.139	0.691
Energetic / tired	(Carroll et al., 2000; Kennedy et al., 2010; Haskell et al., 2010; Stough et al., 2011; Harris et al., 2011; Long and Benton, 2012)	**-0.268**	0.072	-0.410	-0.127	0.001
Elated / depressed	(Carroll et al., 2000; 2000; Kennedy et al., 2010; Stough et al., 2011; Harris et al., 2011; Long and Benton, 2012)	**-0.227**	0.085	-0.393	-0.061	0.007

Clearheaded / confused	(Kennedy et al., 2010; Stough et al., 2011; Harris et al., 2011; Long and Benton, 2012)	**-0.216**	0.091	-0.395	-0.037	0.018
Agreeable / hostile	(Kennedy et al., 2010; Stough et al., 2011; Harris et al., 2011; Long and Benton, 2012)	**-0.231**	0.091	-0.411	-0.052	0.011

Figure 2.6.2 Forest plot showing the effects of multivitamins / minerals on Perceived Stress

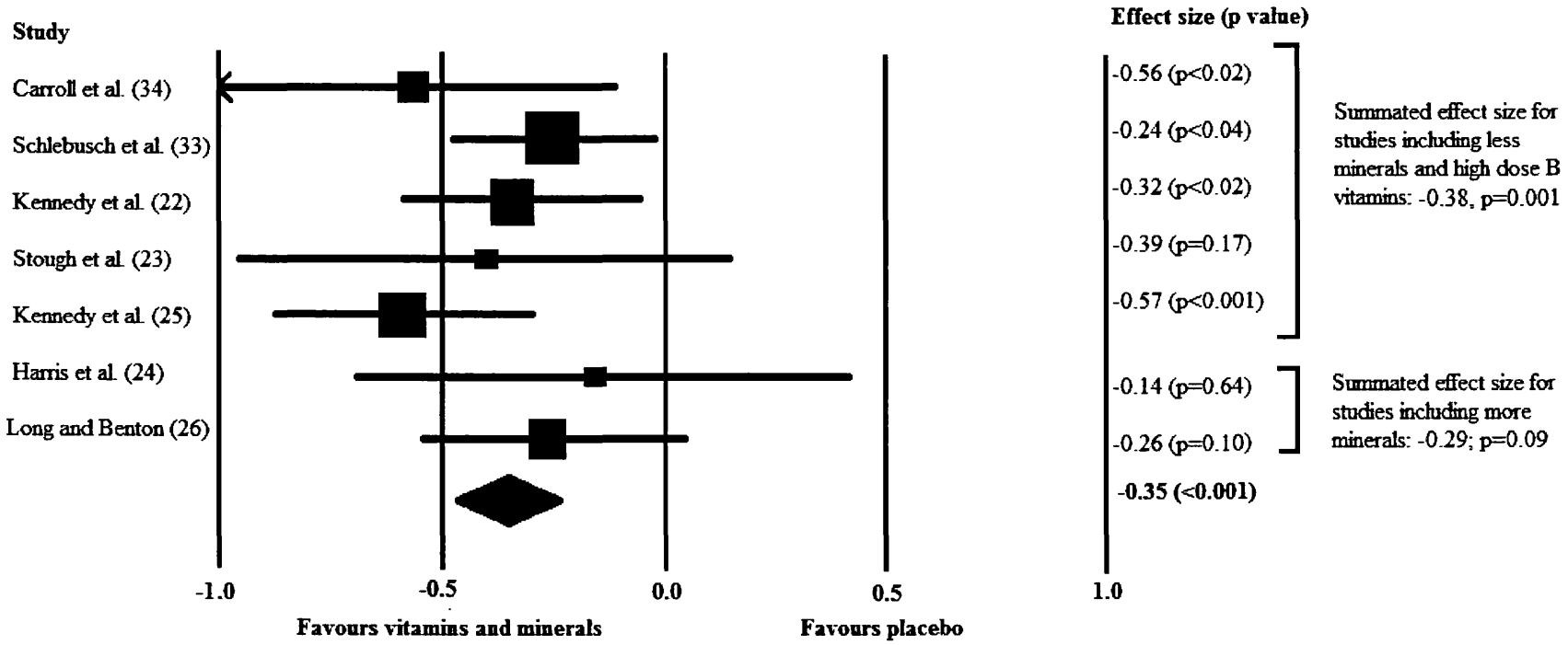
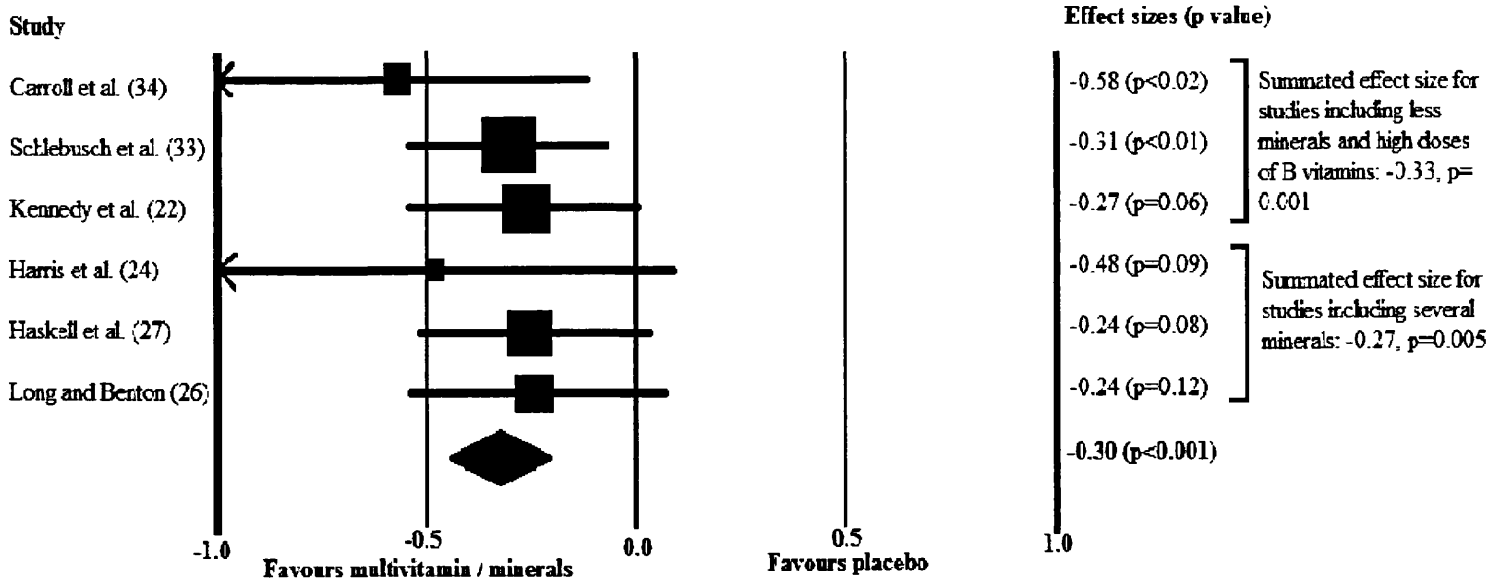


Figure 2.6.3 Forest plot showing the effects of multivitamins / minerals on mild psychiatric symptoms

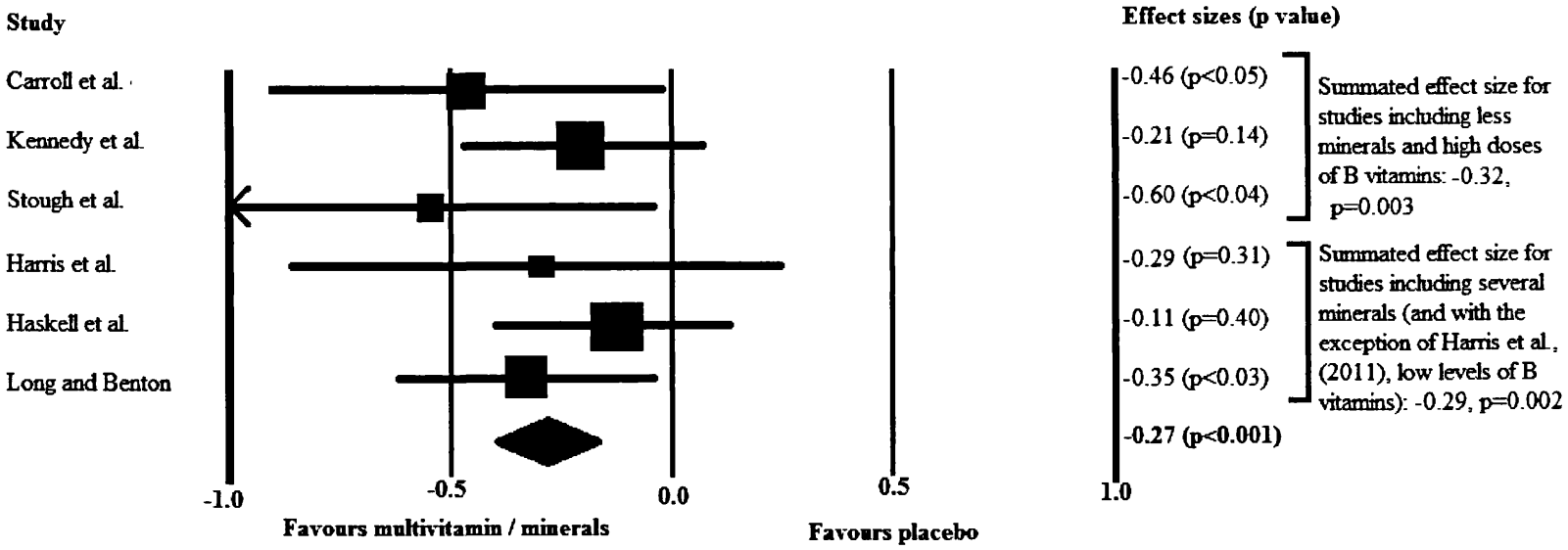


significant positive effect (Carroll et al., 2000, Schlebusch et al., 2000). With a total pooled sample size of 603 individuals supplementation significantly improved sub-clinical anxiety (SMD= -0.320, 95% CI: −0.481, -0.160, p=0.001). However, of the three trials that reported measures of sub-clinical depression (Carroll et al., 2000; Harris et al., 2011; Long and Benton, 2012) none reported a significant effect and the summated data failed to achieve statistical significance (n=303; SMD= -0.196, 95% CI: −0.422, 0.030, p=0.089).

Turning to everyday measures of mood, with every day reports of being composed / anxious supplementation did not influence this aspect of mood (n=518; SMD= -0.035, 95% CI: −0.209, 0.139, p=0.691). Although there was in this one instance evidence of heterogeneity (Q (4) = 10.28, p=0.016) it has been decided a priori to adopt the random effects model. Of the six studies that examined energetic / tired, five reported a positive effect (Carroll et al., 2000; Kennedy et al., 2010; Stough et al., 2011; Harris et al., 2011). Supplementation significantly increased energy (n= 794; SMD=-0.268, 95% CI:−0.410, -0.1427, p=0.001; *Figure 2.6.4.*). *Figure 2.6.4.* shows the effect sizes for individual studies, however, the final effect size is shown in bold: this is the summated effect size for all studies. When we considered measures of being clearheaded as opposed to confused, three out of five studies reported a positive effect (Carroll et al., 2000, Stough et al., 2011; Long and Benton, 2012). Although only one of the five studies that reported everyday measures of feeling elated / depressed found a significant positive effect (Stough et al., 2011), overall, supplementation made participants feel more elated (n=578; SMD= -0.227, 95% CI: −0.393, -0.061, p=0.007). With regard to clearheaded / confused, supplementation significantly reduced confusion (n=578; SMD= -0.216, 95% CI: −0.395, -0.037, p = 0.018). In contrast although no study reported a significant effect of supplementation on agreeable / hostile (Kennedy et al., 2010; Stough et al., 2011; Harris et al., 2011; Long and Benton, 2012), when these data were combined those taking the active supplements were less likely to report being hostile (n=498; SMD= -0.231, 95% CI: −0.411, -0.052, p= 0.011).

The above analyses combined studies using males and females. Too few RCTs had studied female populations to carry out separate meta-analyses for males and females. There were, however, sufficient studies to compare those using different types of supplement. *Table 2.6.2.* shows that the supplement fell into two broad categories –

Figure 2.6.4 Forest plot showing the effect of multivitamins / minerals on fatigue



those with a combination of high dose B vitamins and three or less minerals or those containing vitamins and a wider range of minerals. The data were reanalyzed depending on the type of supplement taken. An examination of *Table 2.6.4.* shows a general tendency for the studies that had the fewer minerals have a larger effect size. Illustrative examples are that with stress: the SMD was 0.318 with the fewer minerals but only 0.288 with the supplements with more nutrients (*Figure 2.6.2.* shows effect sizes). With measures of mild psychiatric symptoms, obtained for example with the GHQ, the comparable SMDs were 0.332 and 0.267. Notably, although at initial glance it would appear that including several minerals had lesser effect than a supplement with fewer minerals, the studies that included fewer minerals had considerably high doses of vitamins, in particular at least 5 times the RDA of several B vitamins (see *Table 2.6.2.*).

When we examined effect sizes based on B vitamin content of the supplement, there was a trend for studies with high doses of B vitamins to produce the largest effect sizes, for example, *Figure 2.6.2.* shows that studies with larger effect sizes tended to contain higher levels of several B vitamins (e.g. Carroll et al., 2000; Schlebusch et al., 2000; Kennedy et al., 2010; Stough et al., 2011), and those with lower effect sizes had extra minerals (Harris et al., 2011; Long and Benton, 2012; although it must be noted that Harris et al., 2011, also had particularly high doses of B vitamins).

Another illustration is with mild psychiatric symptoms – *Figure 2.6.3.* shows that studies that included high levels of B vitamins (including Harris et al. 2011 who also gave several minerals) produced larger effect sizes. There was a similar pattern when we considered those with the highest doses of B vitamins and energetic / tired (*Figure 2.6.4.*). Despite these suggestions, there was not a straightforward relationship between B vitamin content of the supplements and effect sizes, *Table 2.6.2.* shows that different supplements contained varying levels of B vitamins. Whilst Stough et al. (2011) used a supplement with the highest value of vitamin B1, it contained less B2 than all but two studies. Similarly, whilst Harris et al. contained the highest amount of B2, with the exception of Long and Benton (2012) it contained the lowest amount of B3. Thus the exact contribution of individual B vitamins to effect size is indeterminable. There is a need to examine the effects of individual B vitamins, or a B vitamin complex on mood in a controlled and systematic manner, for example, a

Table 2.6.4. - Meta-analysis examining the effects of vitamins/ minerals on mood when using either a high dose B-vitamin supplement (+ 3 minerals) or a multi-vit / mineral supplement

Mood facet	Studies	Standardized mean difference (SMD; random model)	Standard error	Lower limit	Upper limit	p-value
Stress (Berocca)	(Carroll et al., 2000; Schlebusch et al., 2000; Kennedy et al., 2010; Stough et al., 2011)	**-0.318**	0.079	-0.474	-0.163	0.001
Stress (multivit / minerals)	(Harris et al., 2011; Long and Benton, 2012)	-0.288	0.134	-0.491	0.036	0.090
Mild psychiatric symptoms (Berocca)	(Carroll et al., 2000; Schlebusch et al., 2000; Kennedy et al., 2010)	**-0.332**	0.083	-0.495	-0.169	0.001
Mild psychiatric symptoms (multivit / minerals)	(Haskell et al., 2010; Harris et al., 2011; Long and Benton, 2012)	**-0.267**	0.096	-0.455	-0.079	0.005
Sub-clinical anxiety (Berocca)	(Carroll et al., 2000; Schlebusch et al., 2000)	**-0.358**	0.103	-0.561	-0.155	0.001
Sub-clinical anxiety (multivit / minerals)	(Harris et al., 2011; Long and Benton, 2012)	*-0.257*	0.135	-0.520	0.007	0.057
Sub-clinical depression (Berocca)	(Carroll et al., 2000)	-0.213	0.224	-0.652	0.227	0.343
Sub-clinical depression (multivit / minerals)	(Harris et al. 2011; Long and Benton, 2012)	-0.190	0.134	-0.453	0.074	0.158
Composed / anxious (Berocca)	Carroll et al., 2000; Kennedy et al., 2010)	-0.184	0.118	-0.415	0.048	0.120
Composed / anxious (multivits / minerals)	(Harris et al., 2011; Long and Benton, 2012)	0.067	0.257	-0.107	0.421	0.794
Energetic / tired (Berocca)	(Carroll et al., 2000; Kennedy et al., 2010; Stough et al., 2011)	**-0.321**	0.109	-0.535	-0.107	0.003
Energetic / tired (multivit /	(Harris et al., 2011; Long and Benton, 2012)	**-0.228**	0.096	-0.416	-0.040	0.002

minerals)						
Elated / depressed (Berocca)	(Carroll et al., 2000; Kennedy et al., 2010; Stough et al., 2011)	**-0.250**	0.109	-0.463	-0.037	0.022
Elated / depressed (multivit / minerals)	(Harris et al., 2011; Long and Benton, 2012)	-0.192	0.134	-0.455	0.072	0.154
Clearheaded / confused (Berocca)	(Kennedy et al., 2010; Stough et al., 2011)	**-0.321**	0.125	-0.566	-0.077	0.010
Clearaheaded / confused (multivit / minerals)	(Harris et al., 2011; Long and Benton, 2012)	-0.095	0.134	-0.358	0.168	0.478
Agreeable / hostile (Berocca)	(Kennedy et al., 2010; Stough et al., 2011)	*-0.279*	0.158	-0.588	0.030	0.076
Agreeable / hostile (multivit / minerals)	(Harris et al., 2011; Long and Benton, 2012)	-0.205	0.134	-0.468	0.059	0.128

direction for future research would be to vary the doses of B-vitamins in a double-blind RCT and examine the effects on mood.

The possibility that the way in which mood was measured was a cause of heterogeneity was also considered. For example, for mild psychiatric symptoms the effect sizes for studies using the GHQ (Kennedy et al., 2010; chapter 4; Haskell et al., 2010; Carroll et al., 2000) and studies that did not (Haskell et al., 2010; Schlebusch et al., 2000) were compared. The original analysis showed that supplements to reduce mild psychiatric symptoms (SMD= 0.30, 95% CI: 0.43, 0.18, p= 0.001). When the data were re-analyzed those studies that had used the GHQ produced a significant result (SMD = 0.31, 95% CI: 0.48, 0.13, p= 0.001) but so did the studies using different measures (SMD = 0.28, 95% CI: 0.46, 0.11, p= 0.001). With regard to stress, meta-analysis revealed that multivitamin / mineral supplementation significantly reduced stress (SMD = 0.30, 95% CI: 0.43, 0.16, p = 0.001). The data based on the PSS were compared to the use of other measures. When the PSS had been used (Kennedy et al., 2010; Harris et al., 2011; chapter 4; Carroll et al., 2000) supplementation significantly reduced stress (SMD = 0.32, 95% CI: 0.49, 0.14, p =0.001) but similarly the use of other measures of stress (Stough et al., 2011; Schlebusch et al., 2000) again resulted in a positive response to vitamins and minerals (SMD = 0.26, 95% CI: 0.47, 0.05, $p<0.014$). It appeared in at least these instances the type of tests used did not strongly affect the results. For other outcomes, such as fatigue, the use of a range of different tests prevented this type of sub-analysis.

We correlated levels of vitamins and minerals with mood and mild psychiatric symptoms using Spearman's Rho. Although most correlations were non-significant, there emerged a consistent pattern of associations between vitamins (particularly B vitamins) and mild psychiatric symptoms. Mild psychiatric symptoms were significantly negatively correlated (n=6; 0.05) with levels of vitamins A, B1, B2, B5, B6, B12, D, K, as well as calcium and molybdenum. As sample sizes were small caution must be exercised when interpreting these findings.

2.5.4. Discussion

The present study suggests that multivitamin and mineral supplements may have positive effects on stress, mild psychiatric symptoms, sub-clinical anxiety, and several aspects of mood including energetic / tired, elated / depressed, clearheaded / confused and agreeable / hostile (*Table 2.6.3.*). It is relevant that these findings reflect work carried out by a number of researchers in several different countries; an observation that suggests the generality of the findings.

A question that needs to be considered with all meta-analyses concerns heterogeneity. Ideally, all studies should use the same experimental protocol as heterogeneity arises if this does not occur, that is the outcome varies between studies. In practice it is rare for two protocols to be identical and it should be considered whether differences between studies make it inappropriate to integrate the data. The major issue in the present analysis is whether it is appropriate to integrate studies that had used different multi-vitamin / mineral formulations, supplements that differed to some extent in the number of micro-nutrients and the dose. Although a reasonable concern, in practice the various formulations had much in common, for example all included many of the same micro-nutrients (*Table 2.6.2.*).

The Cochran's Q statistic is a classical measure of heterogeneity. In the present study this measure did not indicate a problem of heterogeneity, that is the responses to different supplements were broadly similar. An alternative response is to consider sub-groups of studies established depending on parameters that a prior might be predicted to influence the findings. As sub-analyses that considered only formulations produced by a single manufacturer still produced significant findings that there was clear evidence of a response where variability in nutritional composition and dose were not an issue. That significant results were also found when the remaining supplements were considered suggested a more general response than to a particular formulation. Inevitably there was also a variation in the measure taken of a particular aspect of mood. However, analysis of studies chosen to be homogeneous in terms of the measure used to assess a particular dimension of mood also resulted in beneficial responses, suggesting that the use of a range of outcome measures was not a concern.

Although such arguments suggest that in general multi-vitamins / minerals improve mood the present analysis is at the best a preliminary summary of our present state of

knowledge. The most that can be expected is that these findings will generate additional studies that address important questions. Questions such as what are the active ingredients; what is the optimal dose; do particular existing dietary styles increase the likelihood of responding to supplementation; do particular individuals require different formulations?

It is difficult to avoid the conclusion that the diets of the populations in the studies examined were not providing optimal nutrition. The fact that there was a greater response to the supplements offering higher doses than suggested by the RDAs (*Table 2.6.3.*) questions whether the RDAs or Dietary References Values (DRV) provide intakes that adequately meet the needs of the brain. The present findings question the received wisdom that the consumption in industrialized societies of diets containing sufficient energy and protein will naturally provide sufficient levels of micro-nutrients. Such views, however, may often reflect a failure to consider the manner in which recommended intakes are generated and hence their meaning and the way they should be interpreted. The introduction to the British DRVs stated that: ''some nutrients may have a variety of physiological effects at different levels of intake. Which of these effects should form the parameter of adequacy is therefore to some extent arbitrary'' .... "Claims have also been made that at very high levels of intake some nutrients have especially beneficial or therapeutic effects but the panel decided that these effects did not fall within their definition of requirement" (Department of Health, 1991). Since no psychological or behavioural parameter was employed when deriving DRVs the present findings should not come as a surprise. DRVs and RDAs were devised primarily, albeit not entirely, to prevent clinical deficiency diseases and not to promote optimal psychological functioning. The American Dietary References Intakes (DRI, 1998) make a similar point when considering the required nutritional intake: "A key question is, adequate for what? In many cases, a continuum of benefits may be ascribed to various levels of intake of the same nutrient".

Before using population norms to establish that a micronutrient deficiency exists, attention should be paid to the wide range of individual needs for nutrients. In addition, population norms reflect the "selected criterion or indicator of adequacy" (DRI, 1998). An example indicates how a lack of understanding of RDAs can lead to false conclusions. The most widely used test of thiamine status is its ability to activate the erythrocyte transketolase enzyme although its excretion in urine is also considered

(DR1, 1998). However, in a double-blind trial thiamine supplementation was found to improve mood, although as judged by the usual physiological index of bodily status, erythrocyte transketolase activation, the population was well nourished prior to supplementation (Benton et al., 1997). Similarly Harrell (1946) reported that improved cognition and greater height resulted from thiamine supplements in children whose diet already supplied the recommended level. Such findings support the view that RDAs, as a measure of nutritional adequacy, should be used with great caution in the context of the functioning of the brain. The only conclusion in the area of mental health is that there is no relevant indicator of nutritional status or nutritional need. Ultimately, the only test of nutritional status is whether in a well controlled trial supplementation improves functioning.

The next question is what are the active ingredients? There can be no more than speculation. There is evidence to suggest that thiamine is involved in the regulation of mood (Benton et al., 1995; Benton et al., 1997; Schmidt et al., 1991; Heseker et al., 1990). The homocysteine hypothesis provides an additional explanation although if this is the mechanism then vitamins B_6, B_{12} and folate would be the active ingredients as these vitamins are known to decrease homocysteine. However, although Folstein et al. (2007) suggested that there is an association between homocysteine and depression, the present study found no effect of supplementation on sub-clinical symptoms of depression (*Table 2.6.3.*). The possibility remains that a response might occur in those with a clinical diagnosis, although the limited number of studies to date does not support such a suggestion (Malouf and Grimley, 2003; Taylor et al., 2004). It is possible that minerals were responsible for improvements in mood and mild psychiatric symptoms (Kaplan et al., 2007). In both industrialized and developing countries iron deficiency is common and it has been suggested that around 20% of the world's population is deficient (Benton, 2008). When there is a bodily deficit of iron it is directed away from the brain to make red blood cells and therefore the brain levels may become depleted, despite the absence of a deficiency disease (iron deficiency anemia). Iron deficiency is associated with fatigue, poor mood and an inability to concentrate and remember. It has been found that iron supplementation leads to improvements to lassitude, concentration and mood (Balin et al., 1992); whilst selenium improved symptoms of depression, anxiety, fatigue and hostility (Benton, 1991; Benton and Cook, 1991; Hawkes and Hornbostel, 1996). It should be

remembered, however, that the high B vitamin formula in the present study, which had a greater impact (*Table 2.6.4.),* did not include iron (*Table 2.6.2.*). In summary there is little that can be said about the active ingredients. It would, however, be surprising if the present formulations had by informed guesswork created the optimal combination of nutrients and we await the considerable body of research that is needed to establish the optimal supplement. In fact the optimal supplement may differ from individual to individual depending on physiological differences.

We must wait for the optimal dose to be established but if it turns out to be many times the present RDAs then this is bound to be contentious. There will be widespread implications as received wisdom suggests that a wide ranging and balanced diet should be able to provide an adequate provision of micro-nutrients. The preliminary examination of the various studies in the present review found that those with in many instances five to ten times the RDA and three minerals improved mood to a greater extent than those with about once the RDA and more minerals (*Table 2.6.2*). Such a finding should be viewed as preliminary as no study has actively compared different doses and the number of studies presently considered is small. The question that will arise if the present indications are replicated is whether it is possible to achieve such a high level of intake from the diet. Would the nature of our diet need to change to achieve such a high intake of B vitamins or will more food items need to be fortified? It is usual to suggest that supplements should not be used to cover over the deficiencies of a poor diet but in many cases there may be no alternative. These comments are highly speculative. As yet we have not established the particular nutrients that form the active ingredients in a multi-supplement and equally we have little more than a vague indication of the desirable dose.

In fact the optimal supplement may differ from individual to individual depending on physiological differences. It has been suggested that there are several mechanisms by which individual differences may mediate the relationship between diet and behaviour (Kaplan et al., 2007). Firstly, inborn errors of metabolism may affect the way an individual responds to supplementation. A review of 50 human genetic diseases that reflect inborn metabolic errors showed that the majority were correctable by supplementation with vitamins, which raised the coenzyme levels and enhance enzymatic activity (Ames et al., 2002). Similarly it is possible that brain dysfunction and unstable mood reflect genetic mutations, and supplementation with multi-

vitamins/minerals (potentially at pharmacological doses) will result in normal metabolic functioning and the subsequent amelioration of symptoms.

An obvious inadequacy of the literature is the lack of studies of females, in fact there was only one trial that had studied women (Haskell et al., 2010) although two had samples including both genders (Schlebusch et al., 2000; Stough et al., 2011). Given a difference in aspects of physiological and habitual diet it should not be assumed that the response would be similar in a female sample – perhaps the nature of the optimal supplement will differ. It has been reported that the percentage of males between the ages 19-34 were below the Lower Nutrient Reference Intake (the bottom 2.5%) for certain nutrients, including riboflavin (7% below LNRI), vitamin A (16%), and magnesium (9%). Women in this age bracket had even more nutritional deficiencies, for example riboflavin (12%), B-6 (7%), vitamin A (13%), iron (40%), calcium (7%) and magnesium (20%; Ruston et al., 2003). From these data it is reasonable to suggest that supplementation will potentially be more beneficial in female populations.

Not the least surprising thing about these findings is that they were found in samples of the general population, where it might be expected that there would be only limited opportunities for improvement, given that they were not chosen because of their initially poor mood. You can only speculate whether a similar or even greater response might be found in those with problems that had resulted in a lowering of mood. We await studies that had considered whether micro-nutrient supplementation is beneficial when administered to those with clinical problems. It is difficult to predict the outcome. Those with an initially low mood have further to improve and hence it may prove easier to demonstrate the influence of an intervention. However, if clinical symptoms are a response to unfortunate life events it may be unrealistic to expect that giving a dietary supplement is going to overwhelm the influence of other important factors. There is, however, a preliminary study of giving micro-nutrient supplements to those clinically distressed following the New Zealand earthquake (Rucklidge et al., 2012) of whom 60% had post-traumatic stress disorder. Because of the circumstances the trial was not blinded and the control group did not take a placebo but it was reported that treatment groups experienced significant declines in psychological symptoms with those receiving supplementation having better outcomes than the controls. There is, however, nothing in the present meta-analysis that would support the suggestion that micro-nutrient supplementation would help those with

clinical mood problems. Simply the question has not been examined in well designed trials. The possibility of synergistic interactions between dietary supplementation and treatments such as cognitive behavioural therapy also need to be considered. Even if a dietary intervention may not of itself produce a significant clinical improvement it may facilitate the response to other treatments by for example reducing perceived stress.

In summary micro-nutrient supplementation had a beneficial effect on perceived stress, mild- psychiatric symptoms and aspects of everyday mood in healthy populations. There was a suggestion that supplements containing high doses of B vitamins were more effective (*Table 2.6.4.*), a suggestion that raises important questions about the optimal level of the intake of micro-nutrients and whether they can be achieved without fortification, however, the active ingredients and the optimal doses remain unclear. In particular there is a lack of studies using females. The possibility that micronutrients may be beneficial in clinical populations warrants further investigation. There are consistent findings from a range of studies, carried out in a number of countries by different researchers, which report that multi-vitamin / mineral supplementation improves aspects of stress, mild psychiatric symptoms and mood. A major purpose is to stimulate research that needs to consider the active ingredients and optimal dose. Until these parameters are established it would be unwise to over-interpret the findings and assume that dietary manipulations have any than other a minor influence in those without a pre-existing mood-related problem.

3.7. Conclusion of thesis

Chapter one explored factors that influence food choice and healthy eating, in particular factors that influence the consumption of fruits, vegetables, fish and fish products. Food choice was affected by four inter-related factors, including physiological, cognitive, lifestyle and socio-cultural factors. A list of themes was created that included barriers and promoters of healthy eating as well as general factors affecting food choice, providing a practical and targetable framework with the aim of aiding public health interventions. The themes in chapter one were presented in a simple form so that health promoters can isolate and target specific factors for investigation. Each factor had either a positive or negative influence on food choice and healthy eating and should be addressed in interventions that aim to improve the diet. Researchers must focus on the extent to which each theme affects different populations - this will enable health practitioners to tailor interventions to specific groups.

The themes presented in chapter one provide a targetable framework that can be used to improve nutritional status through the alteration of dietary habits; however, in some circumstances this may not be possible and an alternative method of improving nutritional status is to incorporate dietary supplements into the diet. Many researchers advocate the consumption of a healthy diet as opposed to the use of supplements, however, this is not always practical due to the constraints on healthy eating such as barriers to the consumption of a healthy diet that were highlighted in chapter one. For example 'sensory preferences and aversions', 'knowledge and skills', 'preference and health conflict', 'independence, improvisation, simplicity and convenience', 'conflict of financial priorities' and 'family and peers'. Some segments of the population are particularly vulnerable to poor dietary habits, and in this instance it may be practical to use supplements to increase consumption of nutrients that are not present in the diet. Omega-3 and vitamin and mineral supplements may be a safeguard and a preventative measure against poor nutritional status. Therefore in chapter two factors that affect supplement use were explored, and the results suggested that supplement use is affected by three inter-related super-ordinate themes including personal factors, barriers and socio-cultural factors. The themes had either a positive or negative influence on supplement use, for example most personal factors increased the likelihood of supplement use whilst barriers negated supplement use. As with factors

affecting food choice, researchers must focus on the extent to which each theme effects different populations - this will enable health practitioners to tailor interventions to specific groups. Although supplements should not be used to replace a balanced diet, there may be circumstances under which they are beneficial, for example for groups with financial issues, as well as groups who may not be able to consume certain nutrients though the diet.

Chapter three examined the effects of vitamins, minerals and DHA on aggression and impulsivity, as well as the relative contributions of fatty acids and vitamins/minerals. There are various well designed studies that find that both DHA and vitamins / minerals decrease aggressive and anti-social behaviours in real-world situations. Supplementation with DHA resulted in a significantly lower incidence of Extra-aggression in the Picture Frustration Test, and there was also a trend for Intra-aggression to decrease. Although the initial analyses on the effect of vitamins, minerals or DHA on impulsivity found no measure to be significantly affected, given that the present sample had no history of impulsive behaviour halves of the population that were more or less impulsive were distinguished. With the GoStop measure the initially more impulsive half of the sample benefited from DHA but not from vitamins and minerals nor a combination of both supplements. Thus DHA selectively decreased impulsive responding in those with an initially higher level of impulsivity. No other measure of impulsivity was affected and this is perhaps not surprising given that impulsivity is a multifaceted construct. There was no evidence of either an additive or synergistic interaction with any measure of aggression or measures of impulsive behaviour.

An objective of chapter four was to examine the effects of vitamins, minerals and fatty acids on stress, mild psychiatric symptoms and mood. With the measures from the GHQ (mild psychiatric symptoms) the vitamin/mineral supplement tended to have the most positive influence. With the anxiety sub-scale the largest difference was between those taking the placebo and vitamins/minerals. With the depression sub-scale of the GHQ the taking of vitamins/minerals was associated with the greatest improvement whereas the combination of both active supplements was associated with the least. The failure to find an influence of DHA on the GHQ may reflect the use of a non-clinical population (Long, 2011). With regard to the stress measure the finding that multi-vitamin and minerals supplementation decreased perceived stress appears to be a robust phenomenon as it replicates several previous studies. With regard to mood the

taking of DHA resulted in increased energy whereas taking both supplements resulted in feeling more tired. Similarly with the clearheaded/confused ratings the consumption of vitamins/minerals alone resulted in feeling more clearheaded than if both supplements had been consumed. In summary the findings of chapter four suggest that multivitamin and mineral supplements may have positive effects on stress, mild psychiatric symptoms, sub-clinical anxiety, and several aspects of mood including energetic / tired, elated / depressed, clearheaded / confused and agreeable / hostile. The meta-analysis in chapter four highlighted that there are consistent findings from a range of studies, carried out in a number of countries by different researchers, which report that multi-vitamin / mineral supplementation improves aspects of stress, mild psychiatric symptoms and mood. An additional aim of chapter four was to explore the possibility of a synergistic interaction between fatty acid and vitamin/mineral supplementation. This possibility was not supported and the consumption of both multi-vitamin/mineral and DHA supplements negatively influenced aspects of mood. With regard to the stress measure there was an interaction between the different types of supplement with a combination of DHA and vitamins/minerals having less ability to reduce stress than the latter supplement by itself.

The present study found that supplementation with micronutrients or DHA had no effect cognitive performance. In addition, there was no synergistic action between micronutrients and DHA on any cognitive domain. Although we found no significant effect of micronutrient supplementation on RT, vigilance and memory, this is not to say that supplementation does not affect cognitive performance per se. It is possible that incongruence between study findings may reflect heterogeneity of tests; differences in the supplement content; variation between populations; differing length of interventions. Furthermore, we examined 3 facets of cognitive performance – RT, vigilance and memory. Other facets of cognitive performance that require further investigation include general cognition; reasoning ability; number facility; visual perception. The present study found no effect of DHA on memory, reaction time or vigilance. The literature pertaining to omega-3, particularly DHA on cognitive performance is less established than the literature on micronutrients and cognitive performance, however most data from intervention studies is consistent with the present finding that supplementation with omega-3 fatty acids has no effect on cognitive performance. In conclusion, the present findings combined with other recent

reports suggest that vitamins, minerals and DHA do not significantly affect reaction time, vigilance, immediate or delayed memory in cognitively intact healthy young adult males. Although supplementation with micronutrients and DHA is unlikely to produce beneficial effects on RT, vigilance and memory in the absence of cognitive or dietary deficits, their role in other aspects of cognitive performance is under-researched, including general cognition; reasoning ability; number facility and visual perception; cognitive reactivity; attention; response inhibition; facial emotion recognition; memory picture recall; face recall; verbal fluency; numeric working memory; alphabetic working memory; spatial working memory; working memory; delayed picture recognition; the Stroop task. The role of micronutrients and DHA in these cognitive domains require further investigation. If the area is pursued it is possible that a much longer period of intervention is required to produce benefits on cognitive performance in young adults. Given previous evidence it is important that future studies assessing n-3 and cognitive performance take ApoE status into account since this preliminary evidence suggests that there may be individual differences that account for variation in responsiveness to supplementation with omega-3 fatty acids.

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1.Participant Information Sheet

The aim of this study is to examine food consumption and factors that affect food choice. You will form part of a small group (6-10 individuals) that will discuss factors affecting the consumption of food stuffs for 30 minutes. The discussion will be recorded, although the comments will never be associated with you.

The study will take approximately 30 minutes. You may take a break or leave at any time. You are not obligated to discuss anything with which you do not feel comfortable. The study is conducted in accordance with procedures set-out by the Departmental ethics guidelines. Upon participation, you will receive 3 credits on the Psychology subject pool.

Anonymity and confidentiality are ensured at all times. If you have any questions, you may ask them at any time. However if you wish to speak to a researcher at a later stage, you may do so by emailing 444451@swansea.ac.uk. Alternatively, call on 07747307444.

In order to participate, please read and sign the informed consent form attached to this sheet.

2. Interview schedule

What do you like to eat?

Why?

What don't you like to eat?

Why?

What general factors guide your food choice in everyday situations, for example at breakfast, lunch and dinner?

What do you think about when making a food choice?

How often do you consume fruit and vegetables?

What are the reasons behind your choosing to consume, or not to consume fruit and vegetables?

How often do you consume fish and seafood?

What are the reasons behind your choosing to consume, or not to consume fish and seafood?

What do you know about supplements?

Do you currently take any supplements?

Why?

Would you ever consider taking supplements?

Why?

(If the participant does not make reference to fish oil and vitamin and mineral supplements, ask the following)

What are your views on fish oil supplements, such as cod liver oil, omega-3 and so on?

What are your views on vitamin and mineral supplements?

Would you ever consider taking any of these?

Questions arising from focus group 2.

Do you think there in enough information to make an informed decision about which supplements may be beneficial?

Do you feel under any pressure to take supplements?

- END -

Interview 27/04/10, 12.30-1pm, female participant. Interview 1.

Try and elaborate on your answers, just so I can get a like, a sort of detailed understanding, so try and think about what your saying you know? Obviously one word answers are not really going to help me

P1: Yeh

SL: it's a qualitative project so I'm trying to get a sort of deep understanding of what's going on so just relax, and you know try and chill. Right I'm going to start with some general questions just to get you going and get you thinking and stuff ok?

P1: Ok

SL: So the first one – [refers to paper pad] I might take notes as well but this is nothing it's just to make notes of what you're doing

P1: Oh right Ok cool

SL: So the first one is what do you like to eat?

P1: mmm anything really, I'm usually like – on the day I'm like, oh what do I kind of fancy? And sometimes it's like pizza. But I kinda like 'salady' foods more, to be honest. I don't know why – I think they are just like - more – I duno they make me feel better when I eat them rather than like fatty foods like fish and chips and stuff like that.

SL: Ok, as well I'm just going to – I don't want to seem ignorant I'm going to try and focus on this [notes] because if I nod or anything I'm giving you leads and things,

P1: Ok yeh

SL: you know the whole experimenter bias thing? [agreement] So i'm going to try and sort of, you know...

P1: Yeh, that's alright

SL: You said that they make you feel better, why is that?

P1: Ermm I duno I suppose it's like, everything you hear nowadays isn't it. Everything you hear is to do with like what foods are healthy and stuff like that and if you eat fatty foods and stuff you feel fuller, I suppose salads are like, lighter and that aren't they really.

SL: Ok what so what don't you like to eat?

P1: Ermm [pause] pasta, because it's too plain really. Ermm, it's just a bit boring, that's.....I never used to like chocolate when I was little, but I think that's because it made me feel ill so.

SL: So do you eat chocolate now?

P1: Yeh, a lot [laughs]

SL: Why do you like to eat chocolate now?

P1: Because I suppose it tastes good. I don't know there's nothing really – I just grew a up and I like the taste of it better now.

SL: So what sort of general factors guide your food choice in everyday situations, for example at breakfast lunch and dinner?

P1: Umm usually like – I don't know like being a student it's kind of like what's in the cupboard [laughs]. So usually like simple thinks like break and, I don't know stuff like that. And you just make up with what ever you can do. But then umm, I don't know usually we tend to go out a lot at dinner to be honest [laughs[[pause[

SL: So where do you go out for dinner?

P1: Pub on the pond. Like Harvester, places like that. Just – probably gets you out of the house really so.....it's nice.

SL: You said about being a student, so how does that effect your food choice?

P1: I don't' know I suppose you like – I don't know I suppose your going out a lot more as well so in the day after like, a night out or something you don't really want to eat. Do you know what I mean? You want just like simple foods that you can just make easily and like bread and stuff like that or – I suppose...I duno it's like money as well you just kind of just tend to [laughs] go for cereal and stuff and spend money on clothes and stuff like that [laughs]

SL: Ok so what do you think about when you're making a food choice if you're going to eat or going to buy something to eat?

P1: mmmm....I duno just kind of like, what ever I fancy, just like....I duno I'm kind of....I'm not – I used to be choosy but I'm not really choosy with my foods anymore so just kind of walk around and see what I want and just chuck it in [laughs]

SL: So how often do you consume fruit and veg?

P1: Ermm, not as much as I should [laughs]. Probably like, I duno [I usually have something like a few times a week or something but not every single day which is kind of bad. So probably like three times, four times a week.

SL: is that for fruit or veg or like, specifically?

P1: mmm veg I eat less of, I eat quite a bit of fruit to be honest like bananas and stuff like that. It's just easy to have to snack on isn't it. So yeh, but not as much veg as I should.

SL: So like how much, how many pieces of fruit would you say you have a day? Or like, a day or a week.

P1: probably just like, I duno probably just one piece of fruit a day or two pieces of fruit a day. But then you know I drink orange juice and stuff like that so...

SL: And what about veg, how many times a week?

P1: mmm probably like, four times a week or something and that would probably only be like peas and carrots and potatoes and stuff like that.

SL: OK so why is that then – why would you say your fruit and veg consumption is how it is?

P1: I suppose it's probably just what you cook really, like I cook more things like spag bol and chilli con carnie and stuff like that whereas I don't really – I don't know – I hardly eat like – if you cook meat and stuff then you have it with it but like I suppose that's more like when I go out for food and stuff that I have veg, whereas when I stay in I'll just do simple foods that – I don't know – like it's probably laziness to be honest [laughs].

SL: Is it just laziness?

P1: No I suppose it's like what is – well yeh I suppose it is, it's like what's easiest to cook, like all us girls will just be in the house I'm like, oh who's cooking what? And then everyone will be like, I'm cooking chilli con carnie, and you're like, oh go on then I'll have some as well. So it's kind of like a bad situation, whereas if your on your own you'd probably be like, oh maybe I'll try and cook something decent for once.

SL: Yeh. Ok. So how often do you consume fish and seafood?

P1: Ermm fish, probably like – I don't know I always have fish like that's the thing I have when I go out. I'm always like either fish and chips or the roast dinner so [laughs]. And seeing as we go out quite a bit, probably about three times a week or something.

SL: really? What about seafood?

P1: Oh I don't really like seafood. Like I'll have tuna now and again, like tuna sandwiches and stuff but I hardly ever have that, like I don't know a few times a month? Not really into my seafood's.

SL: So what sort of fish do you have when you go out?

P1: Oh just like cod [laughs] like the usual like simple really. Nothing like haddock or anything like that.

SL: Is it battered or is it just cooked fresh or?

P1: Ermm usually battered [laughs]

SL: Ermm so what are the reasons behind your choosing to consume or not to consume fish and seafood?

P1: mmm I suppose I don't really have any, it's just like not really liking like, raw fish or tuna or anything like that, or Sushi. I don't know I'm not really a massive fan of fish. I never have been to be honest so....I duno cods alright and I'll just have that when I want it but apart from that I just generally choose not to eat it, I'd prefer to eat other stuff.

SL: Ok. What do you know about supplements?

P1: Ermm I duno I usually have like vitamins and stuff, but I don't know. Like omega-3 and stuff like that, but I don't really know a lot about them [laughs]. I just kind of tend to know that if you take them their – they do help. And like they don't I duno some people say that like account for not eating vegetables and stuff like that but I don't think they do, I think they just kind of help with like your daily diet and stuff.

SL: Hmm. So can you name any supplements?

P1: What do you mean, like vitamin – like iron and stuff like that?

SL: Anything just what comes to your mind when you think about supplements.

P1: Ermm when I'm thinking of supplements I come to like, I don't know like, multivitamins and like, iron vitamins and just stuff like that like – I don't know ermm....omega-3 like cod liver oil, errm....what else? I don't know just like primrose oil, just stuff like that. Like Holland and Barratt comes to my mind to be honest [laughs]

SL: So, I don't know, did you mention - do you currently take any supplements?

P1: Ermm, yeh I usually take like multi-vitamins everyday so....and I used to take cod liver oil, like when I was little just like 'coz my Dad takes it, so....I suppose I always had it.

SL: You said that you take [took] cod liver oil because your Dad takes it, so why else would you consider supplements? Like....first say why you would consider taking multi-vitamins and then say why you would consider taking the cod liver oil.

P1: Ok multivitamins just - I duno really I suppose just again it's just like what you hear – they're good for you, good for your health and they just help like, get more like, well vitamins into your body really isn't it so....it just helps along with a good diet. And cod liver oil - I don't know I just [laughs] my Dad just kind of made me take it when I was little so I suppose just kind of from that.

SL: So what are your views on like fish oil supplements such as cod liver oil and omega-3 and so on?

P1: ermm, I think – yeh I think they're really good 'coz from what you here it's like good for your brain and all that kind of stuff isn't it. So I suppose <u>they are</u> helpful in a way...to....I don't know, just to make you feel better. But again I suppose if you don't eat much fish and stuff it's probably good to like, get something from somewhere.

SL: So you said that they make you feel better? What do you mean by that?

P1: I don't know they just kind of....oh like the media especially like all you hear is about how like all your diets- and how you eat and it's like a big part of life obviously. So I suppose you just, your doing it and it's like, oh at least I'm doing something.

SL: So it makes you feel better as an individual [agreement] if you take them 'coz you think your looking after your health

P1: Yeh [laughs]

SL: So when you said they're good for your brain, do you know any more about that, like specifically what goes on?

P1: Ermm no I don't to be honest, I just - just again like, omega-3 helps the development of your brain and like, natural stuff – I don't know natural stuff going on and....just a natural oil or something. I'm not quite sure.

SL: Ok so what are your views on vitamin and mineral supplements?

P1: They're healthy, they're good, probably more people should take them just so that – I don't know I suppose it's just helps a long with a balanced diet really doesn't it? Just to make you feel....more healthy I suppose.

SL: Do you think there is enough information provided to make an informed decision about which supplements may be beneficial?

P1: i suppose if you looked into it there probably would be, but like on the surface you don't really – you kind of hear that it's good, and this is what you should take and I suppose you just listen to - I don't know – I'm quite influenced I guess about what other people say and stuff so I'm more likely to just go ahead and take them whereas – I don't know I suppose if you looked into it you'd probably know better like, what you wanted and what was good/best for you and stuff

SL: So would you like more information about it or would you say more people should go away and look for it?

P1: I think if you want it then yeh, you go and look for it 'coz then you know what's right for you to take but I suppose like for me I'm just happy think – at least thinking that I'm getting a decent diet and that it's kind of, I don't know....that it's kind of helping somehow but apart from that I'm not to fussed if I'm honest. But I suppose if your looking for it then it's helpful.

SL: Do you feel under any pressure, any sort of pressure at all - social pressure or whatever to take supplements?

P1: Ermm, no not really. Like I suppose...no no-ones really told me like [apart from when I was younger obviously like, and my Dad was like, oh take this and stuff like that. But, oh my God it sounds like he's a druggy [laughs], no but it's just like, [laughs] he was just like, oh

these are good for you have these, but apart from that like nothing really bothered me just, if i wanted it I'll take it.

SL: So do you think that supplements can have health benefits or no health benefits at all?

P1: Ermm yeh I suppose – well yeh I suppose they have health benefits 'coz it's like, if you're not getting enough your natural like daily irons and stuff I suppose supplements are kind of, I don't know, a way to get those....I don't know. Yeh, I suppose they do.

SL: So can supplements be used as something – like a substitution for something that might not present in the diet?

P1: I don't – well everyone says – it says that your not meant to use it as like, you know instead of. But I suppose then if your not then at least your getting something even if it is like the tiniest amount. I suppose you should try and eat like, as healthy and as good of it as possible just to keep you going really.

SL: So what would you say the best sources of information are for details about dietary supplements?

P1: mmm I don't know I suppose if you went into like, I don't know your doctors or something they'd probably tell you or like, a nutrition like – like a diet person – I don't know what they're called, a nutritionist or something. I suppose if you just asked around or like the internet is good for anything really. Just look on there.

SL: Ok so that's it that's the end...we've finished the recording.

- End –

2:

24: Interview 2, 27/04/2010, 1.30pm-2pm, female participant (P 14)

SL: So ermm, the purpose of the interview is that you give detailed answers – I' trying to find underlying processes and things like that

P1: Ok

SL: Try and elaborate on what you're saying because obviously like one word answers, or like simple sentences (agreement) are not going to be sort of enough for me to do anything with really

P1: Ok

SL: So just try and relax and you know, just what ever really (agreement). So ermm, I've got the interview schedule by here, so I'm going to start with a general question, What do you like to eat? If I'm taking notes it's just because I'm scribbling things down (agreement) that are interesting or what have you ok?

P1: Ok

SL: So what do you like to eat?

P1: Ermm, I like a mixture of things really, I'm really into pasta, errm pizza, things that are easy to make 'coz I'm not very good at cooking. But erm, I also like sweet stuff then as well - like chocolate and sweets and crisps and things.

SL: You said things that are easy – what do you mean by that?

P1: Ermm easy to cook like 'coz I can't really cook that well. So stuff that doesn't take very long or doesn't take much effort

SL: So what about chocolate, why do you like chocolate?

P1: ermm....I just – I've got a really sweet tooth. I like sweet things. Just, I get cravings for it now and again [laughs]

[pause]

SL: If I'm quiet as well it's because I'm waiting to see if there's anything more that you want to sat

P1: Oh right ok.

SL: Ermm so what don't you like to eat?

P1: Ermm, there's not a lot I don't like to eat really.

[pause]

SL: I'm the same

P1: Yeh [laughs]

SL: I even like sprouts [laughs]

P1: Oh no! Sprouts I can't do. I like most vegetables but not sprouts.

SL: I like everything, I can't name a food that I actually don't like [agreement]. Even down to jalepinos and peppers and –

P1: Oh no I can't do spicy stuff!

[laughs]

P1: Spicy stuff, sprouts and liver as well I can't eat. That's it.

SL: So what is it about foods that like, you don't like?

P1: Ermm I just don't like the taste, and the texture. Yeh. Really. But like I said there's not much I don't like so I can't really be that specific with that one.

SL: So would you say that taste and texture are important when you're deciding what to eat?

P1: Yeh. Yeh 'coz it makes you – you think of that when you go back to it. It's like whether you want to eat more of it or not.

SL: Mmm. So what other things do you think are important?

P1: Ermm....[pause] whether it fills you up a bit. Like [stutter] if I just want a quick snack or something I'll eat something that isn't that filling but if I 'wana – if I'm busy for the rest of the night I'll eat something that's quite substantial.

SL: So would you say that time of day is important?

P1: Oh yeh! Yeh definitely.

SL: Ok so here's a question off the interview guide now. So what general factors guide your food choice in everyday situations; like for example when you're choosing what to eat at breakfast, lunch and dinner?

P1: Hmm, for like breakfast you eat cereals and toast and things, but lunch is sandwiches and things. But for my evening meal then I'll have quite a big meal with my family.

SL: So you live at home then?

P1: yeh I live at home

SL: SO obviously you said cereal for breakfast, and then what ever you said for lunch and then a meal – what makes you choose those things rather than just, snacking through out the day, or rather than having sort of, I don't know curry for breakfast you know?

P1: Yeh. I duno it's just....your just used to it, it's just like a set structure. It just – yeh it's just one of those set structures that you're used to really.

[pause]

P1: Ermm....yeh I'm just....that's what I'm used to.

SL: Ok so what do you think of when you're making a food choice?

P1: Errr.....I duno, it's just what you fancy at the time really init? Ermm....[pause] whether it will fill me a lot will – is part of it. Whether I want something just quite quick or whether I'm hungry or not [pause] Ermm.....taste as well – you think of taste and what you fancy at that point. I think that.

SL: So what sort of other things?

P1: Ermm, well time of day obviously, like you said, plays a part in it. Ermm....[pause] I can't think of anything else.

SL: Ok. How often do you consume fruit and veg?

P1: Ermm, not a great deal but I try to eat at least one piece of fruit a day. Ermm, vegetables – I have some quite regularly with my main meal I'll eat vegetables. Like ermm, potatoes and carrots and peas and stuff. But Sunday then with the Sunday dinner, that's veg overload.

SL: Yeh I love that

[laughs]

SL: So like with your main meal, what would you have with your main meal type thing?

P1: Ermm....what like the actual (meat)?

SL: mmm

P1: Ermm, we usually have like fish or meat and things like that and then with fruit err, – not fruit veg - with it then.

SL: So do you have veg every night or?

P1: Not every night no, but I'd say two or three nights out of the week....we have it .

[pause]

SL: So what's the reasons behind like you choosing to consume or not to consume some fruit and vegetables?

P1: Ermm, the fruit thing is just 'coz it's healthy. Ermm and the veg thing is 'coz – well with me it's – my parents make my food for me so....it's what's there. That's why I eat it, 'coz it's there basically.

SL: Mmm. So what sort of fruit do you eat?

P1: Ermm, bananas, apples, grapes.....[pause]. That's it really [pause].

SL: Ok so how often do you consume fish and seafood?

P1: Ermm, once a week usually. We have err, salmon or – I quite like prawns and things like that. Like shellfish.

[pause]

SL: So again what's the reasons behind you choosing to eat, or not to eat fish and seafood?

P1: Ermm, I just like it really. So....I just like the tas – I just – I particularly like shellfish but I like ermm, salmon as well, it's quite.....it's not really a healthy aspect it's just that I just enjoy eating it –

SL: You just enjoy it

P1: Yeh

SL: Yeh. So what do you know about supplements?

P1: Like vitamins and stuff?

SL: What ever comes to your mind like when you think about supplements.

P1: Ermm....[pause] Are they like...oh....are they vitamins and stuff or like?

SL: I don't know you tell me? [laughs]

P1: I don't really know to be honest.

SL: Like if some one said to you 'supplements', what would you think about?

[pause]

P1: I'd give a blank - well I know the word but I can't think of what it is really.

SL: You just said vitamins?

P1: Is it – that, oh right yeh. That's' what I would think probably. If (I was asked that) –

SL: Would you think about anything else?

P1: Not really.

SL: No. Can you name any supplements?

P1: Ermm like vitamin C and Iron and all that sort of stuff.

[pause]

SL: Hmm. Do you currently take any supplements?

P1: Yeh I'm taking ermm, multivitamin things.

SL: Yeh, just the multi-vit ones?

P1: Yeh

SL: So why do you take those?

P1: Ermm.....[pause] Well I've just –been told to take 'em 'coz ermm....like I've been getting lots of ulcers and stuff. I've been run down so I've been told to take them to make make....to boost my immune system or something.

SL: Yeh. Who told you to take them then?

P1: Ermm parents and the doctor, but....

SL: So do you know what they do or?

P1: Not really no [laughs]

SL: Just take them and...

P1: I'm hoping they're good!

[laughs]

SL: Hope so! Yeh did you even read the label or (see?) [laughs]. Ermm so what's your views on sort of fish oil supplements, which is cod liver oil, omega-3 and stuff like that?

P1: Ermm, I think they're good, I've heard that they're good for like the brain and that....but ermm, I'd be put off them 'coz after having them before I had an allergic reaction to something.

SL: Really?

P1: So I'm blaming them. But...yeh

SL: So you actually had an allergic reaction to these things?

P1: Well I think so yeh

SL: What happened?

P1: I was – Oh...my friends, well my friends thought I had botox 'coz my face like proper puffed out

SL: Really?!

P1: Yeh so....but then again I'm fine with fish

SL: Yeh that's the thing, that's what I was just thinking

P1: Yeh. But it was when I started taking them that it sort of started

SL: It could have been something to do with the capsules or something like that.

P1: Might have been yeh.

SL : 'Coz like if you're eating fish and stuff like that, then you know [agreement] Ermm, so you said they're good for your brain. What do you mean by that?

P1: I've – I've been told like – in school we were told to take them 'coz they help aid with revision and stuff. But I don't know whether that's true.

SL: The school told you that did they?

P1: Yeh

SL: Ermm so have you got any other sort of views or like beliefs about them or – because what I'm trying, I'm trying to get an understanding of what people think about these sort of things –

P1: Oh right, oh they're good for ermm, joints and stuff aren't they. Like ermm, [indistinct]

SL: Yeh. Do you know anything else?

P1: no that's all I know really.

SL: yeh. Ermm, so what's your views on vitamin and mineral supplements?

P1: if they do good then great...but....it should – technically people should try and get it from food I guess but if you can't then taking things like that is a good idea.

SL: Yeh. It's just kind of like ermm, yeh I know what you mean. Ermm, can you name anymore vitamin and mineral supplements?

P1: Errr....god....calcium ones.....errr.....no that's it really.

SL: So would you cons – obviously you take a multivitamin, would you ever consider taking fish oil supplements?

P1: Ermm maybe I'm not sure....if they do, if they do good then possibly yeh.

SL: When you say 'if' they do good, what do you mean by that?

P1: Ermm....I may try them just to see if they help in any with anything, but I don't know really.

SL: Like how would you know though, if they help? Do you know what I mean?

P1: Yeh. Like I guess if some went, oh I've been taking these, and like they feel loads better after it then possibly.

SL: Yeh. So under what circumstances would you consider taking the fish oil supplements?

P1: Ermm, say if - well if someone I know had been taken them and said that they'd helped them in so and so way then possibly if they - if I thought that was good then I'd try and take 'em.

SL: Yeh, I see what you mean. So like, do you think that there is enough information provided to you, like to people to make an informed decision about which supplements are sort of beneficial?

P1: Not really no

SL: No

P1: No 'coz I don't know a lot about them

SL: This is what I've found as well [agreement] is that most people, yeh. Ermm so do you feel under any pressure to take supplements or anything?

P1: Not really no. There's nothing...like you get, you get told all the things that are bad for you but you don't really get – get told a lot about what's good for you [agreement] like I couldn't tell you a lot about supplements and things like that.

SL: Yeh. So what do you think is bad for you?

P1: Oh like umm, fast foods, or like if your in MacDonalds and things like that. Fatty foods, ermm really fizzy drinks, sugary stuff. Mmm, all that sort of stuff.

SL: Mmm. So do you think that supplements have health benefits or no health benefits at all?

P1: I think they do have health benefits....but I couldn't really say because I don't know a great deal about it. But...

SL: Yeh. Ermm do you think that supplements can be used as a substitution for something that might not present in the diet?

P1: Err yeh really.

SL: Yeh?

P1: Yeh.

SL: What are the best sources of information for details about dietary supplements?

P1: Ermm, I couldn't tell you to be honest....ermmm [pause] you get stuff on the back of food don't you?

SL: Yeh

P1: Yeh. Ermmm

[pause]

SL: So would you say like, do you believe the sort of information you get from marketing and things like that? Like when you heard – like obviously you heard that omega3- is good for the brain. Do you believe this sort of information?

P1: Yeh, I tend to believe things like that.

SL: Why would you believe it?

P1: If you – well I guess if you hear it enough you kind of get convinced really.

SL: Yeh

P1: But yeh. You just sort of – if it's told to you, you just assume 'coz of....yeh.

SL: Ok. Well we've come to the end of the schedule now, so thanks for taking part. I'm just going to turn the recorder off now.

- END –

25: Interview 3, 27/04/2010, 3.15-3.45, female participant (P 15)

SL: Right so that's recording. So I'm just going to read something from the introduction here just to let you know what's going on. So today's session should last between 30 and 45 minutes sometimes it's a little bit shorter and you'll be asked a series of questions about factors which might influence food choice and the decision to take supplements. So the purpose of an interview is so that we can gain sort of a detailed understanding people's views, opinions and sort of outlooks. So you know, try and elaborate where you can, whereas if you can't then that's fine. Umm so basically I'll just be asking and seeing what you come up with. I might take a few notes (then) of anything of interest. So your encouraged to relax and basically just elaborate on the processes and just –

P1: Ok sure

SL: An informal sort of atmosphere. So I'm just going to begin with a general question of what do you like to eat?

P1: What do I like to eat – Ermm....[pause] I'm very much for fresh food, I don't eat anything real frozen or anything. A lot of sort of fresh fruit and veg and I make most of my dinners like fresh. Ermm....[pause] It's really hard to elaborate on that [laughs]

SL: Why do you choose fresh stuff?

P1: Healthier. I try and lead a healthy lifestyle, and I just enjoy it more to be honest. I'm not – I don't particularly appreciate the taste of sort of, processed food and stuff. I just generally prefer....natural, fresh stuff.

SL: Ok, so what don't you like to eat?

P1: Ermm, sort of like instant meals and things like that. Like microwavable meals – it's very rare I'll eat them because they just, yeh they don't taste very good.

SL: Ok, you s - so would you say taste is an important factor?

P1: Yeh

SL: SO like what general factors guide your food choice in everyday situations, for example at breakfast, lunch and dinner?

P1: What's that – what sorry?

SL: What general factors guide food choice?

P1: Ermm, taste definitely, obviously. It's probably the first one. And then sort of healthiness. Like (we all like foods that are) unhealthy obviously but [laughs] ermm, yeh that does come into it. But yeh, primarily just taste really.

SL: Is there anything else?

P1: Ermm....[pause] I guess how nice food looks comes into it, like colour, that kind of thing. Sort of how attractive it looks.

[pause]

SL: Ok so what do you think about making – what do you think about <u>when</u> your making a food choice? We've got taste....

P1: Ermm.....

SL: Say healthfulness, can you elaborate on that?

P1: Ermm, yeh just sort of ermm, well sort of in – whether it's fresh, whether it's healthy. Not necessarily in terms of calories, but just in terms of sort of, ermm vitamins and things like that. Ermm....[pause]

SL: SO what do you think about when you think of something being healthy?

P1: What do I think about? Ermm, just being healthier, being – it makes me feel better to eat healthy food, like just makes me feel healthier. If you eat something fresh as opposed to eating something.....

SL: What would you define as healthy?

P1: Ermmm.....fresh? [laughs] I keep saying fresh. Ermm....yeh just like, not processed. Ermm....not - what do you mean healthy in terms of myself or [indistinct]?

SL: In terms of the food.

P1: Yeh in terms of the food. Ermm yeh just fresh and not processed. A good amount of vitamins and minerals. A good amount of energy.

SL: Ok. So how often do you consume fruit and veg?

P1: Ermm probably four of five times a day? Ermm, yeh I'd say I get my five-a-day.

SL: So like, fruit first – how often do you consume fruit, and what sort of fruit?

P1: Probably twice a day. Generally like apples, bananas, oranges. Suppose I don't really get anything more exotic than that.

SL: So why do you stick to the apples and oranges and that?

P1: Cheapest [laughs]

SL: Yeh. Yeh ok. So what about vegetables?

P1: Vegetables, i eat a lot of like Mediterranean veg, so like mushrooms, courgettes, tomatoes, stuff like that.

SL: I love Mediterranean veg!

P1: Yeh. It's probably what I have most to be honest like.

SL: And you can get the little mix – the little sachets, the actual Mediterranean veg sachets

P1: Oh really?

SL: It just adds a bit of flavour to them [agreement] really really nice. I love that, it's one of my favourite dishes to be honest

[laughs]

SL: Ermm, so yeh so you – how many times a day would you say you consume vegetables?

P1: Probably once in like an evening meal, I don't really have it – like I'll have salad or something with lunch maybe but I don't have (too much), evening with an evening meal.

SL: So would you have other things with the evening meal as well or just the vegetables?

P1: No I normally have like, I eat quite a lot of pasta, quite a lot of toast, so I'd always have like something with it. Ermm I'm generally – I'm kind of vegetarian. I only eat free range meat so I don't eat it often because it's too expensive. So I generally will have like something vegetarian but....

SL: Yeh so free range meat, so that's like obviously nothing – not chicken that has been ermm, grown on a battery farm [agreement] and things like that

P1: Yeh, yeh. But it's expensive to buy so it's not something I buy that often

SL: Yeh. So would you say price is an important factor as well?

P1: Yeh definitely [laughs]

SL: Yeh especially being a student isn't it -

P1: I was gona' say being a student yeh. Hopefully in the future so like [laughs]

SL: Yeh. Ermm, so what's the reasons behind you choosing to consume, or not to consume fruit and vegetables? Like you said the exotic ones, they're expensive or what have you [agreement] So why would you decide to eat fruit and veg and like why would you not decide to eat certain fruit and veg?

P1: Ermm, partly taste as well obviously like – well not partly, in a big way taste like, I just really enjoy that kind of veg. Like I wouldn't be so inclined to buy like carrots or like, I duno chickpea like, things like ermm.... I don't know 'm not a massive fan of root vegetables – I don't buy a lot of root veg. I buy more....

SL: Is there any other reason why you consume fruit and vegetables then?

P1: Just 'coz I enjoy it, ermm....[pause]

SL: It's alright if you can't think of anything

P1: Yeh

SL: So how often do you consume fish and seafood?

P1: Ermm maybe – I eat quite – probably the most fish I eat would be tinned tuna, again just because it's the cheapest. I probably would eat more if I could. Ermm, but I probably only eat it like, maybe twice a week at the most really.

SL: And that's just tinned tuna is it?

P1: Yeh generally. I mean –

SL: Just fish -

P1: I'll buy sort of fresh fish like salmon or something sometimes like, but not –

SL: yeh, see I don't – like I think....for 1 people are scared of how to cook it

P1: Yeh

SL: I know it's really easy, and it is easy but like –

P1: Yeh, it stinks the house out as well, i duno it just [laughs]

SL: Yeh it smells doesn't it

P1: Yeh

SL: Ermm, so do you buy fresh fish then?

P1: Occasionally yeh but not often like –

SL: And salmon is it?

P1: Yeh usually salmon or something. It's occasionally like haddock or cod or something, but yeh not often really.

SL: Ok

P1: I'm more likely to buy like, that's one of the things I <u>would</u> buy frozen – fish fingers or like, battered cod or something like that like....

SL: Yeh. So how often would you buy those things?

P1: how often? Ermm....[pause] duno maybe...yeh well I'd probably eat them maybe once a week so when I go shopping like I might buy like two items in my shopping basket or something.

SL: So ermm, why would you decide to consume the salmon and the fish? And if you don't buy it on a regular occasion, why is that?

P1: Ermm, I would – I would choose to buy it because obviously it's a protein and obviously being mostly vegetarian I need a some more protein. Ermm, so that's...something 'coz fish is obviously a lot more responsibly farmed, if it is farmed ermm than factory farmed animals, so I would eat fish. Ermm and yeh it's just a high protein alternative to sort of....

SL: Yeh

P1: being a vegetarian relying on like beans and things like that, like it's just, you know it's just a bit difficult [laughs]

SL: (It's quite hard to do) [agreement] I love with a vegetarian and I – she made spaghetti Bolognese the other day and she made it out of Quorn and I actually preferred it

P1: Yeh!

SL: It was a lot lighter [agreement] the taste – you probably can't tell the taste because like the sauce and the vegetables are over – that's what you can taste when you taste spaghetti Bolognese isn't it

P1: Exactly yeh

SL: And I mean it just felt – it felt the texture was better and it just was better

P1: Yeh

SL: It doesn't feel so heavy you know?

P1: Yeh I definitely enjoy it, yeh I do eat quite a lot of Quorn as well, that's....yeh...

SL: Ermm, what do you know about supplements?

P1: Ermm, a fair bit. Ermm I don't know I'm quite - I'd say I'm quite knowledgeable sort of about what you need in your diet. I wouldn't necessarily say I was that up on supplements specifically. Ermm....[pause] ermm, I used to – well I used to take a lot of supplements actually, a few years ago because I was quite unwell for quite a period of time and they didn't know what was wrong, so they sort of said you know, try all of these different supplements, and I ended up taking a whole range of supplements. I was on the – I was taking like 20 different supplements a day or something ridiculous [laughs] So I'm like....

SL: Really?!

P1: Yeh just in the hope that something might sort of help it, but ermm....yeh so I have taken quite a range in my time. Ermm, and that was –

SL: SO what sort of things have you taken?

P1: Ermm anything from like vitamins to like ermm...what's it called, Q 10? Have you heard of Q 10? It's like a....

SL: That's something that produces collagen in your skin isn't it?

P1: Yeh, yeh I was 'gona say yeh. Ermm, what else is it? What else did I used to take? A lot of like, digestion things 'coz I was losing a lot of weight so I think they like – my digestion wasn't working properly. So like ermm, enzymes and things like that. Ermmm.....I (should know) what I've taken....[pause]. Yeh I can't remember really, I suppose. Yeh it was generally just a lot of what you would have in your healthy diet but just a lot more of it to try and sort of make it more substantial. So....

SL: So what else do you know about supplements?

P1: Ermm.....[pause] I keep wanting to give my opinion (at this point) [laughs]

SL: You can give your opinion, that's fab, that's great.

P1: Oh Ok. Yeh ermm, what else can I say, like I – I from my perspective I wouldn't take supplements unless I felt like I was needing something extra like I prefer to try and get everything I need from like, just the food I eat and just from the diet I eat. Ermm, but if say for example, I'm starting to go down with like – I feel a bit ill or something I might take some Vitamin C as like a boost. But I wouldn't – I wouldn't wana rely on taking supplements on a daily basis like, I think the best vitamins and nutrients and stuff you can get is just from fresh food and things like that so, that's what I prefer myself. But....

SL: That was one of the questions anyway so

P1: Oh? Ok [laughs]

SL: This is the thing like with the interview, you just – it's nice to get some (answers) with people giving they're opinions and things like that you know? [agreement]. Ermm ok so can you name any supplements?

P1: Ermm, [laughs] I can name a lot of vitamins but that doesn't really count –

SL: That counts

P1: Yeh so -

SL: anything that you can think of that comes to your mind when you think of –

P1: Ok, so yeh you've got like your vitamin C, you've got your –all your like multivitamins, you've got ones for like pregnancy for pregnant women, I can't remember what's in them –

SL: You don't know what's in that one?

P1: No, I can't remember exactly [laughs]. You've got like ermm, oh what's it called? Err, like you've got the fish oils, ermm your omega-3 and things like that....ermm....cod liver oil, ermm.....[pause]

SL: That's fine so if that's all you can do

P1: Yeh like i can't think of much off the top of my head

SL: Ermm so do you currently take any supplements?

P1: I don't no, I have like – as I said I have like vitamin C in the house but I suppose it's only a thing I'll take if I'm feeling under the weather. Like you know if I haven't had a lot of time to necessarily like eat a lot of veg and stuff I'll think I should probably take some vitamin C. But that's probably the only supplement I regularly have in the house.

SL: Ok so why do you choose not to take any of the supplements you just mentioned?

P1: Ermm because I generally feel quite healthy, like if I was feeling unhealthy I'd be more inclined to look into something like that. Like if I didn't feel – if I was feeling sort of low on energy or something

I'd probably look into it, what I could take to help me with that. But I prefer to look first, to sort of, yeh my diet and what ever. I focus more on that as opposed to using supplements.

SL: Hmmhmm. So what are your views on fish oil supplements, such as cod liver oil and omega-3 and so on?

P1: Ermm, I don't know – I don't know <u>that much</u> about them or what they do to be perfectly honest. Ermm, but I – I mean I know like my Mum takes ermm cod liver oil and she's always found it useful for whatever she wants it to be useful for [laughs] ermm, but yeh I don't really have much knowledge of the fish oils to be honest. It's just...

SL: SO what are your opinions on it then?

P1: Ermm yeh –

SL: I know you just mentioned what you mentioned but –

P1: Yeh. I mean I - if it's – again if some one's feeling sort of low on something and they're gona need a boost like it can help, and sort of things like evening primrose oil as a supplement and stuff, it's a similar thing isn't it. It's good for women's health and stuff. Ermm...so yeh if it -again I would take it and I would advise other people to take it if they feel like they were lacking in something in, in that way. But....

SL: Yeh ermm, I think like omega-3, err. Ok. What are your views on vitamin and mineral supplements? It's probably going to be the same sort of answer –

P1: Yeh as the other thing, but ermm yeh I mean they – I probably ermm...would go to them first but again like it – like the quality of the supplement you're taking, like when I was taking them I was very aware of buying the more expensive ones when I was, when I was ill to actually get like the good. 'Coz I know they come in different forms don't they. And some of them have other things in them which help you to absorb a bit more quickly and things like that so if I were to take a vitamin supplement I would probably go for a more expensive one just because it's probably a lot more likely to actually do what it's supposed to be doing.

SL: Sorry if you don't mind me asking, you don't have to answer, what was wrong? What –

P1: Oh it's just - no not at all, it's not a problem, ermm [laughs] they never really found out to be honest. I was ill for about 2 years between the age of 14 and 16 and I basically just had every symptom and concern. Like constant headaches, like they thought for a while it might be a thyroid then they thought it was a brain tumour, all sorts of horrendous stuff –

SL: Goodness grief

P1: And I just got back like better after 2 years or so. Ermm

SL: Really?!

P1: Yeh it was, it was pretty aweful to be honest [laughs] ermm, and I couldn't like walk properly or anything like that like when – like all my muscles just weren't functioning properly

SL: Really?!

P1: And my memory wasn't working and like, I was sort of going to school and like [well I was still trying to get into school. And like I'd be in a lesson and then literally the next I couldn't tell you what I'd learnt in that lesson at all like it was really wierd

SL: And it wasn't a tumour or anything resting on a certain part of your brain?

P1: No like they – they put it in the end to like ME? Which is just one – have you heard of ME? It's quite often taken the mick out of 'coz it's one of those things that – it's just kind of, they just kind of give a label to things like that they, they can't really....

SL: that's it I mean it's got to be some form of illness [agreement] and there may be a future diagnosis out there waiting to be discovered [agreement] but obviously they couldn't put their finger on or –

P1: Yeh 'coz they tested everything they could possibly test, like I did so many blood tests and like they couldn't actually find anything wrong with me, like I wasn't lacking in anything

SL: That's got to be frustrating then though

P1: Yeh and it was just so strange [laughs]

SL: Like they just tried everything did they?

P1: Yeh

SL: Was it like other things as well as supplements?

P1: Yeh like the doctor said you know maybe try some supplements. I went on like all sorts of different like diets, like I went on like a gluten free diet for a period of time, a dairy free diet, like all these things. Like none of it really made any difference in the end [laughs] ermm –

SL: What about your GCSE's and things?

P1: Yeh it was difficult 'coz ermm, well I - I got – I started to get better enough in terms of sort of my mental abilities and stuff – mental abilities [laughs] but you know like I mean that I could start learning again properly about 6 months before my GCSEs so I just kind of, sort of went all into it for that period of time and like I had a home tutor for my maths and stuff and that sort of, just helped me get through it really.

SL: So it literally just got better on it's own?

P1: yeh, like –

SL: That's crazy, that's absolutely crazy

P1: It really was yeh. I mean I – I was like really really ill for like say, four months, I literally couldn't really walk around the house or anything like, and then from that point on I was just generally pretty ill – couldn't really do much and – but I could sort of make it to school maybe one or two days a week and like stuff like that, so....

SL: God. I'd better get on with the interview, I've got to transcribe all this! [laughs]

SL: Ermm, ok so I've asked you what your views are so –

P1: Yeh

SL: Would you ever consider taking any of these? [agreement] I've pretty much got you opinion but, you know like, can you just elaborate on that any more?

P1: Yeh, yeh I mean I –yeh ermm, as I said like if....if I – I was feeling under the weather in any way or if I was going – like for instance when I went to Kenya last year I wasn't particularly aware of what I would be eating 'coz I was going to live in a, like an orphanage or what ever and I thought like the food I would be eating was pretty limited so I would just supp – I took some supplements then as sort of a prep – a preparation rather, for like you know I might not have a very balanced diet so in order to make up for that I would have taken supplements so in that kind of situation I would ermmm....err did you ask me – what did you ask me again? I keep doing this so, just start again –

SL: Would you ever consider taking supplements

P1: yeh, yeh I was just checking I was answering the question. Ermm yeh. So I would take them in certain circumstances but I wouldn't really take them on a daily basis if I'm feeling healthy, like perhaps it's something I'd consider during pregnancy for instance like it's probably something I'd do. Ermm, or when I get older, like sort of <u>older older</u>, maybe I would. But I wouldn't (be taking them) at this point in my life if I'm fit and healthy.

SL: Ok. Ermm, so do you think there is enough information provided to you to make an informed decision about what supplements may be beneficial?

P1: I wouldn't say so no, I mean I think if you go and seek information about it, like it's all on the packages and what ever if you go into Boots like it's all there, but – and if you ask some one to help you but i don't think it's something you're really...educated about if you see what I mean [agreement] I didn't really feel that I was educated that well to some – what you sort of need in you diet really to be honest at school or anything. Like my Mum was always very like health conscious so I was brought up that way

SL: brought up like that yeh

P1: but like if I hadn't of been I don't think I'd have much of a knowledge at all to be honest [laughs] based on like education so

SL: definitely. Ermm so do you feel under any pressure to take supplements?

P1: No I wouldn't say so

SL: So do you think that supplements have any health benefits or no health benefits at all?

P1: I'd say that yeh – I'd say that in the right circumstances they have health benefits in the sense that like, if you just take them on a daily basis I don't think it necessarily helps so much as if ermm, you take it as a boost like 'coz I think that if you take them on a daily basis your body is more used to

it whereas if you take it ermm, like as an a one off, like as an addition to a healthy diet then I think it's probably more helpful.

SL: Ok. ermm, so do you think supplements can be used as a substitution for something that might not be present in the diet?

P1: Ermm, I think they probably can be but not as effectively like I' still stand by like what you just get naturally in your food is the best, like the best form of ermm, of the supplement ermm, or of the vitamin or whatever rather. Ermm, but yeh I'd say in certain circumstances like if you can't get that from food then I'd say that it can be used as...yeh...

SL: What would you say the best sources of information are about details of dietary supplements?

P1: Ermm, probably the internet, maybe like, sort of like ask some one in like a health food store or something like that. They're usually pretty helpful. Ermm, books, not school [laughs]

SL: Ok, done

P1: Cool

- END

26: Interview 4,

SL: So yeh if you just try and relax and just try and think about the answers and you know give – give, sort of elaborate on the questions, ermm like I said the interview should last – it's meant to last about 45 minutes but it usually lasts between 15 and 20 minutes. So I'm just going to start with some general questions just to get you relaxed and talking about things. So the first question is what do you like to eat?

P1: Ermm I usually eat quite healthily err I put on a lot of weight last year because I was eating fast food and junk, so this year – and before then I knew to eat healthily but I sometimes didn't. So I do try to eat healthily. Ermm (I'm) trying the get the recommended amount of carbohydrates, proteins, fruit and vegetables, I drink a lot of water just to keep my weight stable at the level I want it, so.....

SL: You said you used to eat a lot of fast food, is there any reason for that?

P1: It was my first year in uni and I just couldn't be bothered to go to Tesco. I've got a car as well so I can just drive to MacDonalds, it takes like 5 minutes so I just did that. And I had a boyfriend as well, we just both used to do it. Ringing dominoes, Chinese, it's just easy to do.

SL: Did you put on a lot of weight then?

P1: 2 and a half stone

SL: And you've lost most of it now by the looks though?

P1: Yeh it's all – well I'm 13 stone and I'm 10stone 10 now

SL: That's really good, really good. Ermm, so why would you say that you like to eat healthy again?

P1: So that I don't put the weight on again, and also because I felt, disgust – like I just felt so tired all the time and ill, and like I got ill really easily, and now that I'm healthier I – my edu(cation) – like being able to concentrate in lectures and it just made me so slow, it was horrible so eating healthy it's just- makes you more focused and gives you a lot more energy, so....I just feel better when I'm not clogged up with crap.

SL: Yeh, yeh. So what don't you like to eat?

P1: I try to avoid, ermm, MacDonalds and KFC <u>but I do</u> enjoy it, I do like to eat it, but I don't. I – there's a lot of vegetables that I don't like to eat but I've always been forced to eat them so I always <u>do</u> just eat them automatically. But there's not a lot- oh fish! I hate fish, I can't eat fish. So I always have like omega-3 supplements and things like that because I know that it's good for you, but I just <u>can't</u> eat it, it's disgusting, so yeh.

SL: What do you mean; you were forced to eat vegetables?

P1: Ever since I was little; cooked dinner every Sunday, there would be broccoli, peas, carrot, cabbage, and I wasn't – I never questioned it I always ate it, but broccoli was the worst and my Mum used to <u>always</u> put it on my plate and she <u>always</u> makes me eat at least two little pieces of broccoli. So I've always just eaten it, 'coz I know it's good for me so I do.

SL: SO do you like the taste or is it just...?

P1: I'm used to the taste now but I'd never enjoy eating it, I just do.

SL: Ermm, yeh ok so – so what general factors guide your food choice in everyday situations, for example at breakfast, lunch and dinner?

P1: Ermm, 'coz I'm in uni and I buy all my own food, if I don't buy chocolate bars and crisps and stuff, I can't eat them. So I always make sure I buy one type of cereal, and then I'll have chicken with wraps, and then I'll have past – brown pasta and sauce for tea, and that's what I eat every day until I buy something different and then I put that in instead so, just going around shopping knowing what's good for me and just buying it so I can't eat anything different.

SL: SO you stick to that? You don't like snack on anything else or?

P1: No I don't buy any snack food in Tesco, but if I do feel like it I might go out and buy maybe a chocolate bar because it's better than buying a whole pack and then getting through it through the week.

SL: Yeh. So what do you think about when you're making a food choice? Whether it be in a restaurant or when you're cooking your dinner or?

P1: I try and look at the calories for most things and the fat, which is made really easy in Tesco because they've got the little like percentage of daily intake thing but in restaurants it's much harder, so I just try and think if it's 'gona be a burger with chips it's not 'gona be good for me but then when I go out In don't wana eat a salad because like I just think it's a bit boring. So I try and choose something in the middle, depending on where I go.

SL: SO are you still losing weight now or is it- have you sort of plateued?

P1: I – I sort, yeh I more or less have. I know that if I cut my calories down a lot more I would probably continue to lose weight but I don't really want to – 'coz you've got exams coming up now as well, when you're starving it's hard to concentrate so in the Summer I'm probably gona exercise and maybe just have soup and then a salad in the day and then I'll lose- I'll probably get down, my goal is maybe 9 and half, 10 stone and I'm 10 stone 10, so another 10 pounds (but) I know I've gota realiy focus.

SL: So have you been doing exercise with it now then or?

P1: I've stopped exercising now 'coz of our exams but before April I went swimming twice a week and I did yoga once a week

SL: That's really good well done. Ermm so what- how often do you consume fruit and vegetables?

P1: Everyday, ermm.....I usually have a pepper with my wraps for lunch with lettuce, cucumber, and then I'll try and have a piece of fruit after it. And then for tea a couple of tomatoes would be in with whatever I eat.....ermm, sometimes I'll do myself like a cook dinner style broccoli with beans and things like that and then some more fruit. And I also make a lot of fruit smoothies, which (I) throw in a couple of different types of fruit, so...

SL: [indistinct] so would you say you get you five a day?

P1: most day's yeh

SL: Ok so what's the reason behind ermm, your deciding to consume fruit and vegetables every day?

P1: It's just what they tell you to do, it's meant to be good for you it – I don't – I like the taste of fruit, I don't enjoy vegetables very much so I always make sure it's fruit and when you're trying to eat healthily, fruit and vegetables are what you're supposed to eat so I do try.

SL: Yeh. Ermm so how often do you consume fish and seafood?

P1: I don't, just supplements. I can't eat it at all. I – I do like sushi, but ermm, only really good sort of restaurant sushi I don't like ermm – you can get like Marks and Spencer's little ermm snacks and stuff, I don't like that particularly but I do try sushi, but that's about it.

SL: What do you have with the sushi?

P1: Just on its own, usually.

SL: DO you have the salmon or the prawns with it or anything?

P1: oh, errm salmon I prefer yeh, I – again like seafood is worse than - like proper prawns and lobster and things like that is the worst.

SL: So what puts you off?

P1: I just – I just can't stand the taste or the smell, its just urghh – it doesn't seem right I duno I hate it

[laughs]

SL: OK so ermm, you just pretty much answered but what are your reasons behind choosing not to consume fish and seafood?

P1: because I don't like it – I wish I did like it, I know it's really good for you, especially salmon and stuff and I have tried most types of fish and like tuna. It would be so easy to just get, oh you know a baked potato and just shove it full of tuna and stuff but I just can't eat it, it's salty and....urghhh

SL: OK. So what do you know about supplements?

P1: Errm, we get told a lot of different things, like recently I'm sure they said a lot of supplements give you cancer, which they say –

SL: That's news to me

P1: They say about all – like I don't know I can't remember what supplements but I know it was on the news like some supplements give you cancer, but they say that about everything but I take like mulit-vitamins and omega-3, ermm....I've not(iced) –like some supplements ermm, what's the one – rosemary? That's good for periods and period pain?

SL: That is ermm, I've gone blank - .....Everyone brings that up – primrose oil evening primrose oil

P1: Primrose! Yeh that's the one, I used to take that.....ermm, oh what's the other – water retention tablets that help err – those are really good for when you're on a diet, so if I am sort of really trying I'll take those

SL: really?

P1: Yeh and around periods again apparently wa(ter) – you retain a lot of water on your period so they're really good to clear it all out but....

SL: really?

P1: Yeh

SL: Ermm, what supplements can you name?

P1: Charcoal, charcoal tablets which is good for ermm, constipation and things. I know because my Mum has a lot of problems and she always takes those, evening primrose oil, like omega-3 fish oils, multi-vitamins, err vitamin C, you can get like vitamin A, B and D, in one tablet, ermm you can get the effervescent ones – that's vitamin C as well though I think mainly, ermm, the water retention – I don't know what they're called....ermm.....

SL: Ok that's fine; you seem to have a pretty good knowledge. So at the moment what supplements are you taking?

P1: Err omega-3, they say they're good for the brain and exams as well so I always take them around exam time, and multi-vitamins.

SL: Ok so you just said that they're good for the brain and you take them around exam time, what are the other reasons you take these supplements?

P1: Because I don't have any fish in my diet and I know that it's meant – it's good for you and you can only get omega-3 from fish I think? Can you, and some vegetables?

SL: Some vegetables yeh

P1: But I don't think I like or would incorporate any of the vegetables that contain it into my diet so I just take the supplement.

SL: SO what are your views on fish oil supplements, which is cod liver oil and omega-3 and so on?

P1: Ermm, I'm not sure whether they're – they're obviously not as good as the real thing but.....as far as just trying to get it into my diet I –I just give it a go, it's only one tablet a day so I just take it and it can't be doing much harm so

SL: What do you mean by it's obviously not as good as ermm, as getting it from the diet?

P1: Well it's – it's more chemi(cally), you know they obviously...to get it into to a little tablet like that they obv(iously) – you know it – it just can't be as good as the actual fish that it comes from. It's all manmade and I just – I would prefer to like fish and to eat it, but that's as close as I can get.

SL: Ok. SO what are your views on vitamin and mineral supplements?

P1: If you couldn't have the daily intake required for all the things that supplements are supposed to do for you then that's obviously better than taking supplements, but again like some of them; water retention, evening primrose oil; sort of help with certain things and I do, I do like to take them. But overall like, especially like the fish oil ones and stuff it's probably much better that you just eat fish rather than having supplements for them.

SL: So with regards to evening primrose, do you think that can be obtained from the diet or do you think that's – can only be obtained in the supplement?

P1: I'm not sure; I mean they say cranberry juice is good for periods and things so I'm sure maybe you could just have a glass of that or so, would probably be just as good. But I'm not sure, is evening primrose in a food or is it a flower? I thought it was a flower.

SL: I'm not sure, I'm not sure about that one. Ermm, so obviously to take both of those supplements ermm - so do you think there is enough information provided to you to make an informed decision about what supplements may be beneficial? You seem quite well informed, but you know, in general.

P1: I got most of my information from my Mum and I don't know where she got that information from, but as far as what's on the bottle they just say to just take one a day and then a big list of chemical things that are in it. They don't really say much about what its gona actually do for you, I just know from what my mother has said. And sometimes if you go into Holland and Barrett they can give you some good information about what, what's best to take, 'coz I've got really thin hair and I know there are supplements you can take to help with that

SL: really?

P1: Yeh. I can't remember what it's called now. But you can, they strengthen the hair and nails. But Holland and Barratt's probably the best place to go for information about them, like you can get loads from Tesco but, there's not much information –

SL: So if you like – if you've got an ailment and you sort of want information on it and what can make it better you go to Holland and Barratt?

P1: Yeh, if it's – if it's something like...mmmm I've got lots of spots or my nails are really week or my hair or something – just something like that, I go to Holland and Barratt but, general stuff my Mum tends to know. I don't know how, but it makes sense what she says, I've never really questioned it.

SL: So do you find that these supplements work?

P1: Yeh.....the- the water retention ones, I always feel like they work. Ermm, but I – I can be - I'll buy them and then sometimes I'll take them, like the fish oil, I take those all – I've always taken those. Err but sometimes I'll buy like multi-vitamins and I'll take them for a week or two and then forget and....so I don't know if I've ever, other than the fish oil, ever tried anything long enough to see if it works.

SL: SO why is that –why don't you stick to taking it?

P1: I don't know, I just forget and....I – I well, I literally just like forget about it, or can't be bothered or ....I don't know why. Like the water retention; I'll take them as long as I'm on a diet and then when I'm not on a diet I won't bother and evening primrose oil; maybe I'll take around my period to help with it but I don't take them consistently.

SL: Ermm so do you feel under any pressure to take supplements?

P1: No. If they –if my Mum says, oh, oh you've got this – take this, then I'll do it. But other than that, no. I just....if I see them in Tesco I think, oh that looks like a good one, I'll try that one [laughs]. But other than that nothing really forces me to do it.

SL: Ok. Do you think that supplements can have health benefits or no health benefits at all?

[pause]

P1: I think that they do, but I don't know why. It's really strange now that you asked me about it; I don't know why I do. But...if you can't get it in your diet normally then maybe it is a good idea to take some.

SL: SO do you think that supplements can be used as a substitution for something that might not be present in the diet?

P1: Yeh if you really can't get it any other way then maybe it – it's better than nothing at all I suppose. But yeh like, the fish oil for me, I – I just can't put it in my diet any other way so I'll take them. Whether it's doing me any good or not, I don't know, hopefully it is.

SL: Ok. So what are the best sources of information for details about dietary supplements?

P1: Probably going to the doctor would be the best and asking them but like I said in Holland and Barratt the staff there tend to have a pretty good idea of what you need. I get information from my family, my Mum my Nan, my Aunty; they all seem to know quite a lot. But probably the doctor would be the best person to go to about it, but I never have.

SL: Ok then, well that's it, it's all done.

- END –

27: Interview 5, 30/04/2010. 1-1.30, male participant (P 15), 15 minutes 13 seconds.

SL: I'm just going to start now. So today's session will last about 20 minutes. Ermm you will be asked a series of questions about factors that may influence food choice and the decision to take supplements. The purpose of a – ermm the interview is that ermm you give me in depth sort of answers and elaborate on the answers where you can instead of giving me one word answers and things like that

P1: Ok

SL: Just try and really, you know relax and get into it. So yeh you're encouraged to relax and discuss and debate the answers, and just enjoy the session really. Enjoy being interviews [laughs]. Ok so we're going to start with some general questions just to get you going and get you thinking and stuff

P1: Yeh

SL: So ermm, what do you like to eat? [indistinct] And by the way, if I'm taking notes it's just take no – pay no attention [laughs]. If I go quiet as well that's because I'm expecting you to elaborate or whatever

P1: Ok. Ermm what do I eat? I eat a lot [laughs]. Ermm I spend most of the time – I do all my cooking and stuff at home so I pretty much eat whatever interests me at the time ermm, I eat a lot of Mexican food, a lot of Spanish food, a fair bit of Italian and French as well. I – I like to vary what I eat I suppose. Ermm.....that's more or less it, I don't dislike anything as far as I know. Just eat whatever I find really [laughs]. Ermm do you want me to expand on that anymore or?

SL: Try and keep your voice up

P1: I'm Sorry [laughs]

SL: No that's fine! Ermm, so why do you like to eat all those different dishes?

P1: It keeps it interesting I suppose. There's nothing worse than eating the same meal again and again, and again and again. And I find that most foods tend to be a bit more ermm....well I find a lot of British food tends to be really bland so I just get bored of it and try something else [indistinct].

SL: Hmmm. So what don't you like to eat?

P1: I don't think there's really much I don't like to eat. Ermm I don't particularly like greasy food, particularly sort of your take away kebabs and all that sort of stuff. I hate that. But apart from that I don't really dislike anything (for one) so....

SL: Ok so what general factors guide your food choice in everyday situations, for example at breakfast, lunch and dinner?

P1: Ermm – I don't – I wouldn't say there's necessarily a.....particular way of doing it I just think, Oooh I'd quite like this today. Or I would quite like, I don't know, something with bread in it for breakfast or, I fancy porridge or, whatever. I'm – I don't think there's, well as far as I know there isn't a particular....strategy to picking what I want I just quite like the sound of something and then have it really. It's just gut instinct.

SL: SO do you plan? You don't plan like?

P1: Ermm, not usually. I mean I – if there's – 'coz ermm, there's a big group of us who I live with, and we all cook – well I do all the cooking and everyone else washes up and stuff. So ermm, if I'm making a big meal then I'll plan. So say if I've heard about something that's, that's quite interesting or someone has told me a recipe, I'll but things specifically for that, and I'll plan that way. But usually I'll....plan when I shop so I'll say I want to make this for this meal, this for this meal, this for this meal; and then just have it there for when I'm ready to cook it. So if I feel like it, then I'll have it.

SL: Yeh. Ermm so what do you think about when making a food choice?

P1: How do you mean?

SL: Sort of if you think – if you're going to the shop, or if you're going to buy something to eat, do you think – like what enters your mind about that food? What makes you decide what food to pick?

P1: Ermm, usually I just pick stuff that.....stuff that I quite enjoy. I mean although I don't dislike foods I prefer some over others. So as I said I love a lot of Mexican food and so I tend to buy things that will go well with that so – or .....it's usually that sort of stuff or I'll – I'll buy something that I

know a lot of people in my house like so when we cook it we'll all enjoy it sort of thing. Ermm, that's pretty much it I think.

SL: Ok ermm, how often do you consume fruit and vegetables?

P1: Often. Ermm, well I go through stages. Normally when I've just been shopping I have a lot of fruit and then it sort of tails of as I start to run out of stuff and then I'll buy more, continuous. I mean normally I'd definitely have quite a lot of fruit and veg.....

SL: SO how many pieces of fruit would you eat a day, and what sort of fruit? And the same with vegetables.

P1: Ermm, fruit wise I'd probably have....fruit maybe two times a day? Two, may(be) – well two or three times a day, then I tend to have like a fruit juice or a smoothie or something. It's the same with most food like it just depends on my mood. I have a lot bananas, I have a lot of pears, I occasionally eat mango. Stuff like that, ermm...oranges, the usual. In terms of vegetables, normally I'll have a lot more vegetables with my dinner, and then maybe some salad or something for lunch. Ermm but vegetables I tend to stick with Mediterranean -y things like ermm courgettes, peppers, aubergines, ermm that sort of stuff. A lot of onion.

SL: How do you cook aubergines, because I love Mediterranean beg I had it for dinner last night [laughs] and I had it for lunch today but I, I just – they're the black things aren't they?

P1: Yeh , yeh they – I think it depends, I mean you can oven cook them or I, I tend to sort of chop them up and stir-fry them. So you put them in little chunks and stuff

SL: Yeh that's what I do with my Mediterranean veg

P1: I mean I think that's – usually tastes the best, but...

SL: They – are they like courgettes? Do you cook them like courgettes, chop them like courgettes?

P1: Yeh I'd – I mean, 'coz obviously they're fatter, you can't really chop them up properly like a courgette but.....I don't - I don't know if there's any hard and fast rules of sort of - I just sort of make it up as I go along [laughs]

SL: I've never tried them that's all - this is going to skew my interview

[laughs]

SL: Ermm so what are the reasons behind you're deciding to consume fruit and vegetables?

P1: Ermm, I just like the taste. Ermm.....that's pretty much it; I mean obviously you get all this crap in the media, 5 a day and all stuff like that. But I think a lot of that's – they pick five a day because it's a round number, rather than anything else. They just want people to eat more healthily. Ermm, as far as I'm concerned, if it tastes nice and.....doesn't like – say with greasy food one of the reasons I don't like it is I feel really sleepy after I eat it, and I don't really feel that with fruit. Fruit and veg you tend to have a lot more energy afterwards, so maybe that plays some sort of part in it, but mainly it's just the taste.

SL: So you – do you believe the media when they say things like that?

P1: No. I think, I agree with the idea that people should be eating more healthy stuff. I mean obviously 'coz there's the obesity epidemic and all that sort of stuff but ermm, I think that fact that they picked five a day, I think it's just really 'coz it's a round number and it's something that people can always achieve.

SL: Ermm I was going to ask you a question..... [pause] ..... I've gone blank

[laughs]

SL: It was quite important as well, it was just something - about something you just said – You said that you like, you know you- you're eating fruit and vegetables because you like fruit and vegetables and you like the taste.

P1: Yeh

SL: You like the feeling after, but what if you preferred the taste of sort of junk food?

P1: I'd probably eat more junk food.

SL: Ahhh ok. Ermm....by the way, it's apparently, it's 10 a day you're required to eat, but the government didn't think people would comply with it

P1: Really, [laughs] well there you go

SL: Yep. Ermm, how often do you consume fish and seafood?

P1: Not very often. I like it but it's expensive. Ermm, if I go out to a restaurant I might eat it a lot more. Ermm...but normally I tend not to, I mean in terms of cooking fish, I don't really know how to do it so I don't really – I've never really got round to doing it and 'coz it's – tend – if you go to the fishmonger of whatever it tends to be quite expensive so not very often.

SL: Ermm so what are your reasons behind choosing not to consume fish and seafood?

P1: That was- that was just it really, the price

SL: Yeh, is there any other reasons?

P1: Ermm, I suppose its price and ignorance, not entirely sure how to cook a lot of fish. I – I – because I haven't, I've never really eaten that much, I find it difficult to tell the difference between what I would like – well I know I would like it but the difference between what goes with what and stuff like that.

SL: Yeh. Ermm, what do you know about supplements?

P1: Very little. I don't really know much about them. I know some people take them if they're not taking in enough of whatever the vitamin is or....if they've.....yeh I don't really know much at all [laughs]

SL: So can you name any?

[pause]

P1: Ermm....I don't think so.....no

SL: Do you currently take any supplements?

P1: No

SL: Why?

P1: Ermm, it's never really occurred to me. I always thought if you're taking supplements it's usually 'coz you're not taking in enough of something and I think I tend – tend to have more of a balanced diet, ermm....to be honest I always just thought supplements were something that...if your....having a problem with taking - eating certain foods or something like that then maybe it's recommended by a doctor or by a friend or by....somebody who knows a bit more. So it's never really occurred to me.

SL: Ok, ermm so what are your views on fish oil supplements? Which is cod liver oil and omega-3 and so on?

P1: Ermm....I don't really have much of a opinion on it – I think My Mum used to force feed me those things when I was a kid [laughs] but ermm, I, I don't know if it made any difference or not, or nothing that I've noticed. I mean providing you're eating enough of the right stuff anyway I think – they're on(ly) – they're literally just (like) they're supplements, so

SL: Yeh ok. Ermm so what are your views on vitamin and mineral supplements?

P1: Same again. Ermm...I think – I get the feeling a lot of it is.....err sort of – like a feel good thing – if you eat this vitamin you will feel good. Whether you – whether it changes or not, you might believe that you feel good and therefore take more of it, sort of – it's more advertising than doing stuff. But again, if you're not taking in the right amount of vitamins or if you're not making the vitamins yourself within your body then I suppose you need them.

SL: Ok. So would you ever consider taking any of these?

P1: Not if I had to pay for them [laughs] Ermm, yeh I –I – to be honest I don't think I've ever really needed them, so if you don't need them, don't take them.

SL: Under what circumstances would you consider taking vitamin and mineral supplements?

P1: Ermm, if it was – if it was recommended to me for - as in – if I was, I don't know ermm, if I was in ill health and someone – and a doctor said, ok I think you should be taking these 'coz sort of whatever reason, then I would take them, but other than that I probably wouldn't bother.

SL: Ok under what circumstances would you consider taking fish oil supplements?

P1: Same sort of thing, ermm I think for a while my Mum was on about taking some sort of fish oil supplements to help you concentrate or to make you better at studying or something like that but again I get the feeling a lot of that's pretty....wishy washy I suppose.

SL: What do you mean by wishy washy?

P1: Ermm I think it's a lot of marketing. I think if you're – if you're eating well and if you're taking....your fish oil or whatever from eating fish or – 'coz I'm pretty sure a lot of the stuff that you get from the fish you can get from other stuff- I'm not entirely sure – but you can get from a lot of other ermm, foods anyway or if not you can make it yourself. But I find it hard to see how oil can help me concentrate better if you see what I mean.

SL: OK

P1: I'm kind of cynical about that [laughs]

SL: Ok so do you think there is enough information provided to you to make an informed decision about which supplements may be beneficial?

P1: There may well be, but I've never.....pursued it or never really thought to have it, so...I mean there could be – it's – I suppose it's just a matter of looking. Ermm.....I suppose in terms of the fact that I've never really thought about it then maybe there's not enough information, 'coz if it hasn't occurred to me then obviously I've not get – got any information from it [agreement].

SL: Ok. Do you feel under any pressure to take supplements?

P1: No

SL: Ermm, do you think that supplements have health benefits or no health benefits at all?

P1: Ermm, I think – I think it depends on your situation. I think if your, as I've said, and I keep repeating myself now like [laughs]

SL: that's ok

P1: If, If I – If you need the vitamins and you're not getting them [agreement] in other ways then they're obviously gona have benefits. Otherwise, I don't think there's any point in taking them.

SL: Ok, so do you think that supplements can be used as a substitution for something that might not be present in the diet?

P1: I suppose, I mean I think they should be supplements, taken as supplements as opposed to instead of something [agreement]. If – if you're short on whatever for whatever reason then ok, they should be taken. But I think it would more be an extremity as in ermm....for some reason you can't get a certain type of fruit, or you can't get a certain vitamin, or you can't get a certain type of whatever it is you need [agreement] and so that would be when supplements should be taken, rather than.....say not eating this kind of food because you can take this supplement instead – you see what I mean?

SL: Ok. Ermm what are the best sources of information for details about dietary supplements?

P1: [laughs] Ermm, the internet, I'd guess? I'd have no idea. Ermm, I suppose if you were gona look into it, maybe speaking to....I don't know a dietary expert or a fitness instructor or someone who's more likely to know a bit about that sort of stuff.

SL: Ok, that's it.

P1: Cool!

SL: Done!

- END -

28: Interview 6. 04/05/2010, 1-1.30, male participant (P 17), 15 minutes 13 seconds.

SL: I'm just going to start now. So today's session will last about 20 minutes. Ermm you will be asked a series of questions about factors that may influence food choice and the decision to take supplements. The purpose of a – ermm the interview is that ermm you give me in depth sort of answers and elaborate on the answers where you can instead of giving me one word answers and things like that

P1: Ok

SL: Just try and really, you know relax and get into it. So yeh you're encouraged to relax and discuss and debate the answers, and just enjoy the session really. Enjoy being interviews [laughs]. Ok so we're going to start with some general questions just to get you going and get you thinking and stuff

P1: Yeh

SL: So ermm, what do you like to eat? [indistinct] And by the way, if I'm taking notes it's just take no – pay no attention [laughs]. If I go quiet as well that's because I'm expecting you to elaborate or whatever

P1: Ok. Ermm what do I eat? I eat a lot [laughs]. Ermm I spend most of the time – I do all my cooking and stuff at home so I pretty much eat whatever interests me at the time ermm, I eat a lot of Mexican food, a lot of Spanish food, a fair bit of Italian and French as well. I – I like to vary what I eat I suppose. Ermm.....that's more or less it, I don't dislike anything as far as I know. Just eat whatever I find really [laughs]. Ermm do you want me to expand on that anymore or?

SL: Try and keep your voice up

P1: I'm Sorry [laughs]

SL: No that's fine! Ermm, so why do you like to eat all those different dishes?

P1: It keeps it interesting I suppose. There's nothing worse than eating the same meal again and again, and again and again. And I find that most foods tend to be a bit more ermm....well I find a lot of British food tends to be really bland so I just get bored of it and try something else [indistinct].

SL: Hmmm. So what don't you like to eat?

P1: I don't think there's really much I don't like to eat. Ermm I don't particularly like greasy food, particularly sort of your take away kebabs and all that sort of stuff. I hate that. But apart from that I don't really dislike anything (for one) so....

SL: Ok so what general factors guide your food choice in everyday situations, for example at breakfast, lunch and dinner?

P1: Ermm – I don't – I wouldn't say there's necessarily a.....particular way of doing it I just think, Oooh I'd quite like this today. Or I would quite like, I don't know, something with bread in it for breakfast or, I fancy porridge or, whatever. I'm – I don't think there's, well as far as I know there isn't a particular....strategy to picking what I want I just quite like the sound of something and then have it really. It's just gut instinct.

SL: SO do you plan? You don't plan like?

P1: Ermm, not usually. I mean I – if there's – 'coz ermm, there's a big group of us who I live with, and we all cook – well I do all the cooking and everyone else washes up and stuff. So ermm, if I'm making a big meal then I'll plan. So say if I've heard about something that's, that's quite interesting or someone has told me a recipe, I'll but things specifically for that, and I'll plan that way. But usually I'll....plan when I shop so I'll say I want to make this for this meal, this for this meal, this for this meal; and then just have it there for when I'm ready to cook it. So if I feel like it, then I'll have it.

SL: Yeh. Ermm so what do you think about when making a food choice?

P1: How do you mean?

SL: Sort of if you think – if you're going to the shop, or if you're going to buy something to eat, do you think – like what enters your mind about that food? What makes you decide what food to pick?

P1: Ermm, usually I just pick stuff that.....stuff that I quite enjoy. I mean although I don't dislike foods I prefer some over others. So as I said I love a lot of Mexican food and so I tend to buy things that will go well with that so – or .....it's usually that sort of stuff or I'll – I'll buy something that I know a lot of people in my house like so when we cook it we'll all enjoy it sort of thing. Ermm, that's pretty much it I think.

SL: Ok ermm, how often do you consume fruit and vegetables?

P1: Often. Ermm, well I go through stages. Normally when I've just been shopping I have a lot of fruit and then it sort of tails of as I start to run out of stuff and then I'll buy more, continuous. I mean normally I'd definitely have quite a lot of fruit and veg.....

SL: SO how many pieces of fruit would you eat a day, and what sort of fruit? And the same with vegetables.

P1: Ermm, fruit wise I'd probably have....fruit maybe two times a day? Two, may(be) – well two or three times a day, then I tend to have like a fruit juice or a smoothie or something. It's the same with most food like it just depends on my mood. I have a lot bananas, I have a lot of pears, I occasionally eat mango. Stuff like that, ermm...oranges, the usual. In terms of vegetables, normally I'll have a lot more vegetables with my dinner, and then maybe some salad or something for lunch. Ermm but vegetables I tend to stick with Mediterranean -y things like ermm courgettes, peppers, aubergines, ermm that sort of stuff. A lot of onion.

SL: How do you cook aubergines, because I love Mediterranean beg I had it for dinner last night [laughs] and I had it for lunch today but I, I just – they're the black things aren't they?

P1: Yeh , yeh they – I think it depends, I mean you can oven cook them or I, I tend to sort of chop them up and stir-fry them. So you put them in little chunks and stuff

SL: Yeh that's what I do with my Mediterranean veg

P1: I mean I think that's – usually tastes the best, but...

SL: They – are they like courgettes? Do you cook them like courgettes, chop them like courgettes?

P1: Yeh I'd – I mean, 'coz obviously they're fatter, you can't really chop them up properly like a courgette but.....I don't - I don't know if there's any hard and fast rules of sort of - I just sort of make it up as I go along [laughs]

SL: I've never tried them that's all - this is going to skew my interview

[laughs]

SL: Ermm so what are the reasons behind you're deciding to consume fruit and vegetables?

P1: Ermm, I just like the taste. Ermm.....that's pretty much it; I mean obviously you get all this crap in the media, 5 a day and all stuff like that. But I think a lot of that's – they pick five a day because it's a round number, rather than anything else. They just want people to eat more healthily. Ermm, as far as I'm concerned, if it tastes nice and.....doesn't like – say with greasy food one of the reasons I don't like it is I feel really sleepy after I eat it, and I don't really feel that with fruit. Fruit and veg you tend to have a lot more energy afterwards, so maybe that plays some sort of part in it, but mainly it's just the taste.

SL: So you – do you believe the media when they say things like that?

P1: No. I think, I agree with the idea that people should be eating more healthy stuff. I mean obviously 'coz there's the obesity epidemic and all that sort of stuff but ermm, I think that fact that they picked five a day, I think it's just really 'coz it's a round number and it's something that people can always achieve.

SL: Ermm I was going to ask you a question..... [pause] ..... I've gone blank

[laughs]

SL: It was quite important as well, it was just something - about something you just said – You said that you like, you know you- you're eating fruit and vegetables because you like fruit and vegetables and you like the taste.

P1: Yeh

SL: You like the feeling after, but what if you preferred the taste of sort of junk food?

P1: I'd probably eat more junk food.

SL: Ahhh ok. Ermm....by the way, it's apparently, it's 10 a day you're required to eat, but the government didn't think people would comply with it

P1: Really, [laughs] well there you go

SL: Yep. Ermm, how often do you consume fish and seafood?

P1: Not very often. I like it but it's expensive. Ermm, if I go out to a restaurant I might eat it a lot more. Ermm...but normally I tend not to, I mean in terms of cooking fish, I don't really know how to do it so I don't really – I've never really got round to doing it and 'coz it's – tend – if you go to the fishmonger of whatever it tends to be quite expensive so not very often.

SL: Ermm so what are your reasons behind choosing not to consume fish and seafood?

P1: That was- that was just it really, the price

SL: Yeh, is there any other reasons?

P1: Ermm, I suppose its price and ignorance, not entirely sure how to cook a lot of fish. I – I – because I haven't, I've never really eaten that much, I find it difficult to tell the difference between what I would like – well I know I would like it but the difference between what goes with what and stuff like that.

SL: Yeh. Ermm, what do you know about supplements?

P1: Very little. I don't really know much about them. I know some people take them if they're not taking in enough of whatever the vitamin is or....if they've.....yeh I don't really know much at all [laughs]

SL: So can you name any?

[pause]

P1: Ermm....I don't think so.....no

SL: Do you currently take any supplements?

P1: No

SL: Why?

P1: Ermm, it's never really occurred to me. I always thought if you're taking supplements it's usually 'coz you're not taking in enough of something and I think I tend – tend to have more of a balanced diet, ermm....to be honest I always just thought supplements were something that...if your....having a problem with taking - eating certain foods or something like that then maybe it's recommended by a doctor or by a friend or by....somebody who knows a bit more. So it's never really occurred to me.

SL: Ok, ermm so what are your views on fish oil supplements? Which is cod liver oil and omega-3 and so on?

P1: Ermm....I don't really have much of a opinion on it – I think My Mum used to force feed me those things when I was a kid [laughs] but ermm, I, I don't know if it made any difference or not, or nothing that I've noticed. I mean providing you're eating enough of the right stuff anyway I think – they're on(ly) – they're literally just (like) they're supplements, so

SL: Yeh ok. Ermm so what are your views on vitamin and mineral supplements?

P1: Same again. Ermm...I think – I get the feeling a lot of it is.....err sort of – like a feel good thing – if you eat this vitamin you will feel good. Whether you – whether it changes or not, you might believe that you feel good and therefore take more of it, sort of – it's more advertising than doing stuff. But again, if you're not taking in the right amount of vitamins or if you're not making the vitamins yourself within your body then I suppose you need them.

SL: Ok. So would you ever consider taking any of these?

P1: Not if I had to pay for them [laughs] Ermm, yeh I –I – to be honest I don't think I've ever really needed them, so if you don't need them, don't take them.

SL: Under what circumstances would you consider taking vitamin and mineral supplements?

P1: Ermm, if it was – if it was recommended to me for - as in – if I was, I don't know ermm, if I was in ill health and someone – and a doctor said, ok I think you should be taking these 'coz sort of whatever reason, then I would take them, but other than that I probably wouldn't bother.

SL: Ok under what circumstances would you consider taking fish oil supplements?

P1: Same sort of thing, ermm I think for a while my Mum was on about taking some sort of fish oil supplements to help you concentrate or to make you better at studying or something like that but again I get the feeling a lot of that's pretty....wishy washy I suppose.

SL: What do you mean by wishy washy?

P1: Ermm I think it's a lot of marketing. I think if you're – if you're eating well and if you're taking....your fish oil or whatever <u>from eating fish</u> or – 'coz I'm pretty sure a lot of the stuff that you get from the fish you can get from other stuff- I'm not entirely sure – but you can get from a lot of other ermm, foods anyway or if not you can make it yourself. But I find it hard to see how oil can help me concentrate better if you see what I mean.

SL: OK

P1: I'm kind of cynical about that [laughs]

SL: Ok so do you think there is enough information provided to you to make an informed decision about which supplements may be beneficial?

P1: There may well be, but I've never.....pursued it or never really thought to have it, so...I mean there could be – it's – I suppose it's just a matter of looking. Ermm.....I suppose in terms of the fact that I've never really thought about it then maybe there's not enough information, 'coz if it hasn't occurred to me then obviously I've not get – got any information from it [agreement].

SL: Ok. Do you feel under any pressure to take supplements?

P1: No

SL: Ermm, do you think that supplements have health benefits or no health benefits at all?

P1: Ermm, I think – I think it depends on your situation. I think if your, as I've said, and I keep repeating myself now like [laughs]

SL: that's ok

P1: If, If I – If you need the vitamins and you're not getting them [agreement] in other ways then they're obviously gona have benefits. Otherwise, I don't think there's any point in taking them.

SL: Ok, so do you think that supplements can be used as a substitution for something that might not be present in the diet?

P1: I suppose, I mean I think they should be supplements, taken as supplements as opposed to instead of something [agreement]. If – if you're short on whatever for whatever reason then ok, they should be taken. But I think it would more be an extremity as in ermm....for some reason you can't get a certain type of fruit, or you can't get a certain vitamin, or you can't get a certain type of whatever it is you need [agreement] and so <u>that</u> would be when supplements should be taken, rather than.....say not eating this kind of food because you can take this supplement instead – you see what I mean?

SL: Ok. Ermm what are the best sources of information for details about dietary supplements?

P1: [laughs] Ermm, the internet, I'd guess? I'd have no idea. Ermm, I suppose if you were gona look into it, maybe speaking to....I don't know a dietary expert or a fitness instructor or someone who's more likely to know a bit about that sort of stuff.

SL: Ok, that's it.

P1: Cool!

SL: Done!

- END -

29: Interview 7, 04/05/2010, 12.45-1pm, female participant (P 17), 10 minutes 53 seconds.

SL: I'm just going to start recording. So today's session will last about 20 minutes and you'll be asked a series of questions about factors which may influence food choice and the decision to take supplements. So the purpose of an interview is to gain an in depth and detailed – in depth and detailed answer unlike what's obtained in a survey ok? So you're encouraged to just relax and think about the answers and try and elaborate ok?

P1: Ok

SL: So we're going to start with a – with a general question, what do you like to eat?

P1: Ermm, I try and eat like healthy foods and stuff, like ermm, for breakfast I usually have ermm, well toast and stuff. Like whole meal bread and everything. Ermm.....I duno, like I tend to eat a lot of like tuna and pasta. I try and get like 5 fruit and veg and stuff, but I really like, like stuff like pizza and MacDonalds and everything as well, and take aways'. Ermm but I do like – really like fruit and vegetables so I always try and eat those. Erm I don't eat like a lot of meat really, I was trying to be vegetarian before and I don't really like any red meat, so I don't really eat that. I'm not that keen on fish either, I only really eat like tuna and fish fingers, so that's cod or whatever, Yeh.

SL: Ok so why – why ermm, you say that you eat sort of healthy on the morning. Why do you choose those sorts of foods?

P1: Ermm....I don't know really, it's just 'coz they're better for you and I do like them as well, and I'm not really fussed on like, you know the little cereals with loads of sugar and stuff in them? It just, doesn't really fill me up so – and like cereal bars and things, I can't eat them 'coz I just get really hungry.

SL: Yeh. So what don't you like to eat?

P1: Ermm, I don't like – I don't like anything spicy, ermm and I don't like red meat or anything like that.

[pause]

P1: Yeh, that's about it really.

SL: SO why don't you like to eat red meat and stuff like meats?

P1: I just don't like the taste of it or like the texture or anything.

SL: When you say 'or anything', is there any other reason or?

P1: Ermm....[pause] ....and also because I did want to be vegetarian before, I just don't really agree with it. I'd rather eat stuff like eggs or chicken or - I just think it's less cruel, I don't know.

SL: Ok so it's – so why did you become vegetarian? What did you – did you try?

P1: I was before for a while yeh, 'coz I just – I just didn't really agree with killing animals, like I wouldn't do it myself and ermm, also like it's supposed to be healthier and better for the environment as well. I think it's like that stuff with like methane and with the cows, and I don't know it's supposed to reduce like global warming or –

SL: Really?!

P1: Apparently yeh

SL: I didn't know that

P1: I just went on all these websites and just found out about it but then it only lasted a couple of weeks so...

SL: really, why?

P1: Yeh, I just, I missed like chicken, really. And then I think I had MacDonald's then not long after that so [laughs] yeh. And ermm, everyone in my house like eats a lot of red meat and they all – they were all just like, what are you doing? And they were all like, I don't know, they didn't really help so.

SL: Yeh, it is a commitment isn't it?

P1: Yeh

SL: So what general factors guide your food choice in everyday situations, for example at breakfast, lunch and dinner?

[pause]

P1: Hmmm, depends like what I've – how much money I've got as well, like what I've bought. Ermm, but I usually have something like banana and like toast, just something that will fill me up and that I think is quite healthy.

SL: What about lunch and dinner?

P1: Ermm, depends where I am as well, like if I'm out I'll get ermm....like a pasty or something, but then I'll make sure I have ermm, like a cooked dinner later on.....ermm.....I don't know I just try and eat like regularly, depending on where I am.

SL: OK. So what do you think about when making a food choice?

P1: Ermm.....[pause] ....I don't know really, just whether I like it or not, and how hungry I am. Ermm, I suppose like whether it's healthy or not as well.

[pause]

SL: Ok. How often do you consume fruit and vegetables?

P1: Everyday.

SL: Ok can you tell me what types of fruit and veg and how often?

P1: Ermm I usually have like, bananas and apples and I'll have like ermm mixed veg like.....green beans and peas and stuff like that. I usually buy like quite a lot of Broccoli, and sweet corn I usually eat quite a lot of....ermm.....yeh that's it really.....

SL: Ok so –

P1: Oh and peppers and like salad; lettuce and cucumber.

SL: SO how often do you consume those things?

P1: Err, about like, a couple of times a day. It's not always 5 but, usually around that.

SL: Ok so what's the reason behind your choosing to consume these fruit and veg?

P1: Ermm, just 'coz I like them and they're healthy and stuff as well.

SL: Is there any fruit and veg that you don't like?

P1: Ermm, I don't like pears, and stuff like – you know those like funny like avocados and all those like weird things [agreement] .....ermm.....Yeh just, just those I think. I don't like olives either, I don't know if they are fruit or veg

SL: I think they're veg. Ermm how often do you consume fish and seafood?

P1: Ermm, about once or twice a week, not very often.

SL: Ok what types of fish and seafood?

P1: Ermm just tuna and ermm, like fish fingers – like cod fish fingers. And ermm.....sometimes I eat mackerel as well 'coz it's supposed to be good for you, 'coz it's like oily fish.

SL: Is that tinned or fresh?

P1: Ermm in a tin

SL: Right.

P1: And it's like tuned tina – tinned tuna [laughs] yeh

SL: So what your reasons behind choosing to consume fish and seafood? I know you just said its health

P1: Yeh

SL: Any other reasons?

P1: Ermm, I do really like tuna like as long as it's mixed with mayonnaise or salad cream or something, and ermm just 'coz you - it's – well you're supposed to eat it ermm.....and also like I would rather eat fish than like actual animals, like when I was kind of trying to be vegetarian as well.

SL: [agreement] Ermm what do you know about supplements?

P1: Ermm, quite a bit, like I take iron tablets 'coz I did think that I was anemic, but apparently I'm not now but I'm still taking them. And ermm, I do take like those cod liver oil ones as well 'coz I don't eat a lot of fish.

SL: Ok so can you name any other supplements?

P1: Ermm, like glucosamine and stuff like that. Ermm my brother takes quite a lot, he takes these really weird ermm, garlic ones and stuff? Ermm.....like magnesium, things like that, and Zinc and stuff I think he takes.

SL: Ok so you said you take iron and cod liver oil, do you take -

P1: Yeh

SL: Do you take any others?

P1: No. I used to take multi-vitamins, but I don't take them anymore.

SL: Ok so why – firstly why do you take the supplements that you take? And secondly, why don't you take the multi-vitamins anymore?

P1: Ermm I just used to forget to take them, and like buying them all the time, I just – I just can't really be bothered any more. Ermm, 'coz I do think that I eat kind of, quite a lot of stuff. Ermm I take the iron tablets 'coz ermm, I get tired and stuff quite a lot so I did think I was anemic, so I'm just keeping on taking those even though I'm not. And ermm, I just take the cod liver oil ones 'coz I don't eat a lot of fish and I don't think I've got like, enough stuff that you get from them.

SL: OK. Ermm so what are your views on fish oil supplements such as cod liver oil, omega 3 and so on?

P1: Ermm yeh I think they're like, a good idea.....yeh. I don't really know like much about them, I just take them. I don't know.

SL: Yeh. Ok ermm, so do you know what they do or?

P1: Ermm....well it gives you that omega-3 oil doesn't it, or like the special – I don't know – I don't know really, it's just.....

SL: Ok, so what are your views on vitamin and mineral supplements?

P1: Ermm, I think they're a good idea if you don't get them from eating...like vegetables and stuff. Errm, but also like if you take too many then it's bad for you isn't it, I think.

SLP: Mmm, Ok. Ermm, so under what circumstances would you advocate someone taking vitamin and mineral supplements?

P1: Ermm if they don't have like, a very healthy diet or if they've got health problems or....yeh

SL: Ermm under what circumstances would you advocate someone taking fish oil supplements?

P1: Ermm, if they don't like fish or if they don't eat it.

SL: Yeh ok, do you think there is enough information provided to you to make an informed decision about what supplements may be beneficial?

P1: Ermm, I think there is if you're like interested and want to find out about it, 'coz I suppose there's a lot on the internet and stuff, but ermm, you could go into like Holland and Barratt and ask I suppose. But I don't think people really know unless you're like really interested in finding out. I wouldn't really have a clue.

SL: So do you think supplements have health benefits or no health benefits at all?

P1: Ermm, I'm not really sure. Like they're supposed to aren't they? But – I think they do.

SL: What do you think? Like about it all.

P1: Ermm, yeh I mean like if you don't eat certain foods I do think it's a good idea, but then – as long as you're not overdosing on things.

SL: So can supplements be used as a substitution for something that might not be present in the diet?

P1: Yeh

SL: Ok ermm, what are the best sources of information for details about dietary supplements?

P1: Ermm, the internet I suppose, or like health shops. Ermm...or like doctors if you ask them, dieticians....

SL: Ok that's the end.

- END -

30: Focus group discussion 23/03/2010, 4.30pm. Female participants, group 1.

[First 11 minutes giving out and signing consent forms and dietary forms]

SL: Right, my input is going to be completely minimal. I Just want to get a view of what guide's your food choices. So I'm just going to start with a question – and I'm going to keep the questions minimal just for you to know. Don't expect me to direct or anything like that, you know just speak for yourselves. So err just a question, just an ice-breaker, what do you like to eat and why? What do you like to eat firstly?

P1: Chicken, chicken all the time [laughs, agreement from P3]. Just because it goes with most things. Yeh, chicken.

P2: Is that just for like, hot food then, or do you eat it in sandwiches as well?

P1: Yeh

P3: Yeh I like it in sandwiches. That's the only meat I really like mind [agreement from P1]

P2: I eat every single meat expect pork [laughs]

P1: I don't like lamb as I said before, it's too fatty

P3: Oh I don't like lamb

P2: Not even lamb chops? [disagreement from P1]

P4: I like chocolate and sweet stuff like that [agreement from P1]. I'd choose that over savoury stuff any day.

P2: I prefer savoury. Like instead f chocolate I'd have a packet of crisps

P4: Really?

P2: But I do like sweets.

P1: I'd rather a massive bar of chocolate [laughs]

P3: Yeh and me. I'd feel better though, if I eat like 5 sandwiches I'd feel better than eating a bar of chocolate [laughs]. I don't know why it's probably got more –

P1: It depends what's in the sandwiches don't it.

P4: But then if you eat so many sandwiches it still doesn't satisfy your craving for chocolate [agreement all round]

P2: But chocolate doesn't satisfy you either. It's temporary then you have to eat more [agreement] that's what I do [laughs]

P1: Chocolate and sandwiches [laughs] the chocolate's nice.

P1: I'm not a fan of fish, I've got to say. I only like cod [laughs]

P3: I love fish

P2: And me

SL: Why do you like chicken, why would you say that's what you like to eat? Why would you choose it?

P1: Ermm, it hasn't got no, really, fat on it. I know it's got it on the actual like, (thing – skin?) But you haven't got to eat it that way. Whereas if you got like, pork and lamb and stuff it's always got like, bone and fat on it or something on it. And that puts me off.

P4: You can get like, chicken breast which you can cut up and put in anything [agreement from P1]

P2: you can cook it loads of different ways like can't you.

P1: And you don't feel bad eating loads of chicken rather than eating something else.

P3: it just seems healthier doesn't it, like don't seem as fattening.

P1: It's not though is it? I don't know

P3: I don't know?

P4: No chicken's good for you isn't it?

P1: I think so.

P2: All meats' good for you in proportion like, yeh [agreement]

P4: too much red meat is bad for you

SL: why is chicken good for you?

P4: Well because there's not much fat in it but your still getting protein

P3: don't even know what that is

[laughs, indistinct]

P4: I don't think there is much fat in chicken, because not a lot of fat comes out does it, especially when –

P2: Bit it can be cooked unhealthily [laughs, agreement] because the way I like it is hot, spicy, draped in hot sauce and oil chicken. So I guess you could –

P1: I like it with everything I do.

SL: [turns to P4] Why would you say you would like to eat chocolate? If you were choosing chocolate, what would sort of, be the motives behind it?

P4: I like the texture of chocolate, so when I'm eating chocolate like – only chocolate has that texture. So when I'm craving that texture I've got to have chocolate. And it tastes nice.

P1: I think it like, makes you feel better when you're eating it, and then afterwards you feel bad. I mean like, when you're eating it you're like....

P3: If I've had a stressful day I will get chocolate [agreement]

P2: I eat it when I'm sad usually or when I've got nothing else to eat [laughs]. It's just quicker and cheaper.

P1: I think its like; it's just a thing you do though init. Sit at the telly and its like, oh let's go get some chocolate [laughs]

P4: It's like a comfort food isn't it [agreement]

P1: It's like you wouldn't sit there and go, oh let's go and have a salad [laughs] let's go and eat some carrots. Yeh.

SL: You mentioned fish. What are your perceptions of fish? You know, if you made a choice – would you eat fish?

P3: Yeh

What do you think about that?

P3: I just like it.

SL: You just like it?

P3: Yeh it's easier to make like, a tuna sandwich and stuff. Apparently it's good for the brains, but [laughs] we'll see

SL: Why?

P3: I don't know why I've just heard it. I think my mother used to tell me that just to make me eat it

P2: I think its omega oils or something

P1: has it all got it in though?

P2: That's why you've got cod over oil

P4: Isn't it just the oily fish?

P2: No – well yeh, well I guess so.

What do you mean, elaborate on that?

P4: What, oily fish? Like mackerel, cod tuna [others make suggestions and mention these]

P3: It all tastes the same to me. I just put lemon on it or vinegar.

P1: I can't stand the smell of fish -

P2: But then again like ermm, mackerel doesn't taste the same as salmon [agreement from P3] and tuna doesn't taste the same as –

P3: Actually, they just smell the same [laughs] Yeh that's true.

SL: [turns to P1] why don't you like fish?

P1: The smell. And the texture, I don't like it.....

P4: I don't like the bones in it as well

P1: yeh and that, yeh. And then it puts me off really.

P3: I don't think of texture of food

P1: Oh I do, really bad.

P3: I don't

P1: That's why I don't like half of the fruit and veg I eat. Because it's squidgy [agreement from P4]– [laughs] it's like –

P2: I do. Like if I'm having porridge or mash it can't have any oats in it. That's the only thing that puts me off. And custard - I'll have to have to have it it straight from the pot I don't like skin forming on the top of it and stuff like that-

P3: Urgghhhh, that's what puts me off

P1: I don't like, like bits in orange juice and stuff. That puts me off

P2: Ughhhh

P1: It's gota be smooth [laughs]

SL: Ok so if you had to name a food that you <u>didn't</u> like to eat, in contrast to what you don't like to eat, what would that be? Food that you just don't like.

P2: anything that [indistinct] –

P3: onions!

P4: Onions, I hate onions

P3: It's like the smell. No I just hate them

P4: and there's a funny texture to them, textures again [laughs] they're so strong

SL: sorry I'm just moving that [recorder] closer to the middle

P3: No, I don't like onions. That's my one thing

P2: Do you mean like food, or just liquid stuff?

SL: what have you got in mind?

P2: like milk and honey I hate

SL: Yhe it can be anything, any sort of food or drinkstuffs.

P1: I can't think of anything. Like I can think of things, but nothing that I really hate

P2: I don't like greasy things

P1: I don't like fish [laughs] I really don't like it. Uhmm....

SL: Why would you say that you don't like the things that you just mentioned? Everybody.

P1: I think it's from an early age I do. I think my mum didn't – she even admitted to me that she didn't feed me enough good things [laughs] she used to just me there and chuck whatever in front of me.

P3: I've never seen people use onions as much as when I moved to uni [

P1: and me!

P3: Like they put onions with everything, and at home I don't think I've ever seen an onion in my house

P1: Yeh, it's like what you're used to init. I know.

P3: and like here –

P4: I don't know because my parents eat onions, and everybody around me eats onions. It's just I don't like onions. I've never liked onions.

P3: my house is terrible. I wouldn't be surprised if they [housemates] have it with their chocolate [laughs] there are onions everywhere all the time. Like with their dinner they'll have onions.

P2: With their gravy?!

P3: Yeh

P1: Well actually you can have –

P4: You can have like roasted onions as well can't you

P3: Yeh

P1: actually you can have like, sausage and onion gravy can't you?

P3: No, I will eat around an onion [laughs]. You know you have like, chopped up onions in things? I'll eat around it –

P4: but then you've still got the taste of onions [agreement from P3]

P3: Yeh I won't enjoy the meal then, I'll be like, you've ruined it with onions

P2: Oh I know what I don't like -

P1: [to P3] Do you like onion rings?

P3: No I'll eat the crispiness around it if I have to. I just hate onions. They're like slippery aswell.

SL: [turns to P2] You said that onions are good for a meal. Why's that?

P2: They add to the flavour. I have onions with everything. Like if I start cooking, the first thing I'll do is chop up an onion. Put it in, let is sizzle for abit then add my chicken or my – even if I have like a tin of something – like some days I'll have a tin of tuna with jacket potato and I'll put the tuna in the pan and then onions. Or even if it's cold – tuna mayonnaise, raw onions.

P3: urghhh [laughs]

P2: It just adds to the flavour

P1: I don't mind it in a flavor but like, if it's actually in something then I won't actually eat dinner unless it's disguised –

P3: I don't even like cheese and onion crisps

P4: Or me they just taste funny

P3: yeh [laughs]

P1: I don't mind them. But then it's not actually eating it, it's just –

P4: It's such anoverpowering taste aswell isn't it [agreement]

SL: So earlier you were given a hypothetical lunch buffet to choose a lunch and a dessert from. So what did you choose?

P1: I chose the worst on the list [laughs]. I think it was burger and chips and chocolate.

SL: Burger, chips and chocolate. [turns to P2] What did you choose?

P2: Spaghetti Bolognese

SL: and dessert?

P2: oh, and cake.

P3: Spaghetti Bolognese and cake

P4: Spaghetti Bolognese and chocolate.

SL: [turns to P1] so you said that's the worst thing. Why do you think that's the worst thing?

P1: Because there is so much fat in it. That's what I think anyway. Like if you're on a diet that would be the last thing you would eat wouldn't it really, out of the all the rest. Because like, obviously spaghetti [Bolognese] has got pasta which is generally as long as you have the right amount...it's like eating bread and there's loads of carbs, but with the burger and stuff. And then obviously chocolate is pretty bad for you when you could have fruit salad.

SL: So why did you choose what you did?

P1: Because I'd want to eat it [laughs]. That's about it really. Ermm, I don't know....

SL: But why did you choose it – what do you prefer about it? What factors made you choose that?

P1: Ermm, it's probably 'cause it's like, because more filling and stuff. Like if I ate a salad or something, I'd probably go back for like either more or something else after. But if you ate a burger the bread fills you up straight away. Even though you might not eat it all but it just.....and then chocolate's the sweetest thing on there so it just makes you think to yourself that it's 'gona keep you going for longer, but really it's not.

SL: [turns to P2] SO why did you choose what you chose?

P2: I chose spaghetti Bolognese because I love meat and it's quite filling anyway. Erm, I just like to be – I like things that's got lots of stuff in it. So with spaghetti Bolognese you can have veg, onions [laughs], all the sauce in it and then it's got pasta....Then I chose cake because....if I had a meal that would be the dessert I would choose after. Like I wouldn't choose a yoghurt because that would be the dessert I would have after lunch. Like my sandwiches and then my yoghurt. And then I wouldn't have a chocolate bar with my lunch either...like...it just goes with it. Cake after a hot meal. For me anyway.

SL: Why?

P2: I duno... I've never - maybe it's the way I've been brought up. Like if you have a hot meal, you have like a pudding or cake and ice-cream. I guess fruit salad could have been one of them but my mum bakes so It's gona be a cake. But if you had like a small lunch then you'd have – then you'd have a chocolate bar or a yoghurt.

P1: It's more of a snacky isn't it, a yoghurt? like in the day – it seems to be more of a snack food [agreement from P2] Like with tea your sitting down and you have time to prepare it and stuff. But with lunch though –

P2: Yeh and chocolate is for on the go. But If I had spaghetti Bolognese I'd be sitting down.

P1: Yeh like I wouldn't – I wouldn't really eat a burger and chips for lunch. It's normally like a sandwich or, soup or something like that

SL: But there's a sandwich on that option, why didn't you choose – there's a sandwich on the selection there. Why didn't you choose that?

P1: Because I picked something I would probably rather eat than a sandwich

SL: Why would you rather eat it though – specifically what would make you choose that?

P1: Ermm, taste maybe. Because I'm like, quite fussy with my food so I don't really like many things in sandwiches. And I always like – 'coz it tends to be like – It sounds really stupid but like, condensed stuff in sandwiches and then.... I like to know exactly what's going in there. I know obviously I could have made it myself because it's a buffet thing and it's like, presented so I'd be like, checking it and stuff like that. Whereas if you have like, if you have a burger and stuff like that all you gota do is lift it up and you know what's in there. I know you don't actually know what's in the burger but really speaking you know what's in there.

SL: [turns to P3] Ok so what about you?

P3: I duno coz you're out, spaghetti Bolognese is just – it's like a meal init? Do you get me? And if you have a meal, and you're out you normally have a cake. You don't – if you go to a restaurant you don't have a bar of chocolate for dessert [agreement] you normally have (fattening) - [laughs] like cake or ice-cream or something. So if you're out and about you normally get a bit of a healthy option that's gona fill you up and then have a big slice of cake. It makes you feel better

SL: Do you consider spaghetti Bolognese healthy?

P3: It would be healthier than chips and burger [laughs] but it's gona – it's probably gona fill me up as long as you don't put onions in there! Coz then I'm not gona eat it.

P1: Pasta is a filling food though isn't it? [agreement from P2 and P3]

P2: It will fill you up for longer.

P1: Yeh, it's like soup and that.

P3: I like burger and chips it just reminds me of like, McDonald's [agreement from P1, laughs] and stuff like that and I'm thinking – like in a buffet I'd just go for spaghetti Bolognese

P2: Make the most of it

P3: yeh!

P1: It's got onions in there though! [indistinct]

P3: Id just ask them not to. Or I'd pick – eat around it!

SL: what do you think is healthy about it?

P3: Because it's got pasta, then you've got your mince aswell. And then you've got your vegetables – it's got vegetables in it. And...it's just better than...chips! [laughs, turns to P1] Sorry!

P1: Yeh but you don't know how it's made though do you. It could be really –

P3: It's probably – I wouldn't be surprised if they're on the same level [agreement from P1]. 'Coz think you're frying your mince and in like, oil and stuff ain't you.

P2: Yeh.

SL: Ermm, what about you then? Why did you choose what you did? [P4]

P4: err, because ermm, spaghetti Bolognese was the best out of the list that I liked. I didn't really like the others....

SL: In terms of?

P4: Well I just didn't like the food on the others....

SL: what didn't you like about the other food? And what did you like about –

P4: Well I can't remember, what was the others? [laughs] I just remember thinking, I don't like that, I don't like that, I don't like that.

SL: What was it you didn't like about them though? like, was it you know any particular factor? the way they looked or something?

P4: No it's just the food in there, I just wouldn't eat it. Like I think it was – like I remember there was salad and chicken and I eat like salad. Like I don't like lettuce and stuff, so I would be abit stuffed really. And ermm, and fish was another option wasn't it? And I don't eat fish so that [spaghetti Bolognese] was the only other option really so....and I chose chocolate because that's what I like

SL: Why do you like it again?

P4: because I like the texture and it's sweet and nice.

SL: Ok, so if you were choosing lunch – and you prepared - on a sort of normal or average day what would you choose then?

P1: Lunch as in the middle of the day yeh?

SL: Yeh like this was a buffet, and you know you had the option to choose from, you know like a sort of buffet eating out in your eyes. But what if you were just having lunch on a normal day? What would guide your choice then?

P1: I'd either have soup or crackers normally, or jacket potato. Something like that. Because it's like, it's not as big but it just keeps you going through it [the day]. Yeh.

P2: Probably a jacket potato, or a chicken salad sandwich or a cheese sandwich

SL: Why would you choose that?

P2: Because I love sandwiches they always fill me up, and jacket potatoes always fill me up aswell and you can never get bored of them because you can put different things in them all the time.

SL: So like, would you say variety is important?

P2: Yeh

SL: What about you? [P3]

P3: I'd just make a sandwich 'coz it's easier. It's just laziness so I'd just make a sandwich it's easier. I wouldn't make a jacket potato because you've got to wait for it to cook, and I'd probably snack while I was waiting for it to cook whereas with a sandwich you'd make it straight away and eat it straight away

P1: You've got to have bread first mind [laughs]

P3: Yeh. Steal it from someone's shelf it's alright!

SL: What about you [P4]?

P4: errr usually I'd have leftovers from the night before. If there wasn't any left over's then I'd probably get something on toast.

SL: Why would you choose something like that, either leftovers or toast or something?

P4: Well leftovers because they need to be used up and it would save them going to waste, and something on toast because it's quick. You don't wana spend all afternoon, well lunchtime, cooking really. 'Coz then you could cook a proper meal in the evening.

SL: Right I feel like I'm asking you questions now and that's not like the purpose of having a group. You need to discuss among yourselves so like, I'm going to ask you a question now and let you get on with it. What general factors guide your food choice in everyday living, so like the food choices you make on a daily basis, what things come to your head or what determines what you choose? And what do you think about when you're making a food choice? Go for it!

P1: I think like, I think being at uni you – I think you kind of pick up stuff really quick don't you. That's what I do. And it ends up being unhealthy because you havn;t got the option to make it or – that's the thing, healthy things are always more expensive [laughs]

P3: Yeh. It's laziness for me. It's laziness because at home, if I like try even try and go in the kitchen my mum's so like, 'no I'll do it' 'coz I'll make such a mess and she'll do it for me. Whereas in uni I've got like, no-one to do it for me so I'm like 'yeh, I'll just have a sandwich' [laughs] and hope someone will feel sorry for me and make it for me

P1: (and leave something in the shop?)

P3: Yeh [laughs] But it's different when you're in uni coz like, you're going out and buying the food. 'Coz you're not – like in your first year of uni you've never bought a big shop before so you're just going out and buying crap. And then you slowly learn that like, you just need to buy pasta, because that will just go with everything [laughs]

P2: I'm abit opposite to that because I've always like – well my Mum's like literally – well I should say my Dad taught me how to cook when I was younger so when I came to uni I had all my pots and pans and stuff and my mum used to like err, send me home every week with like meat and fish to put in my freezer from the butchers so I would have food to cook rather than eating out. So when I look for food to buy it's always.....

P1: It's always ingredients like

P2: Yeh it has to be ingredients – not – sometimes I'll definitely have chips. That's like a must, especially if you can't be bothered to cook anything you'll just put them in the oven [agreement from P1] so I'll just look for like, things that I can cook – and easy things that I can cook but I do look at like, salt intake and stuff like that but it doesn't bother me that much. I'll only look at it if that week I say to myself like, 'oh, I'm gona be good this week.' But it really doesn't bother me. Like some of the stuff [on the labels] I really don't understand –

P1: It's 2000 [kcal]

P3: I know, I don't' understand it. I don't even know how many calories you're supposed to have in a day I don't think. So if I see like 600 [kcal] I'm like 'oh, I think I'm allowed that yeh [laughs] I think I'm allowed it!

P1: I'll have that [laughs]

P3: I just hope for the best, but errr....

P4: normally what I do is at the beginning of the week I'm working out – I'll work out which nights I'm going out, or like if I'm going out for a run or if I'm, I duno going to the cinema or whatever and I'll work around that what I've got time to cook. SO I make a plan for the week as like, what I can fit and when and do the shop around your list then. So that's how I usually decide on what I eat

P1: I should do that actually

P2: that's very focused.

P3: I know

P2: I just buy anything, and then on the night look in the cupboard and hope for the best [agreement] and jus throw something together -

P3: and then you realize you haven't been to Tescos for a few weeks and you're like....[laughs]

P1: bread and water, lots of bread

P2: That's one thing that I've been taught – that you can like, make something from nothing

P1: Yeh....

P2: just random things –

P1: I'm so fussy with my food though like, it sounds really stupid but like if someone's used my pan and had certain food in it, I won't use the pan after it, I just won't. And that's why like, if I've got ingredients in my thing [cupboard?], if I haven't got a pan I just won't eat it. 'Coz I've got like, massive bags of pasta but because someone's used my pan I just won't eat it [laughs] it's really like....I'm really strange like that

P4: Can't you wash the pan?

P2: I'm like that with (bones and?) pork

P1: I can but it's just the thought of like...I don't know. It's the thought of like, stirring it with pasta and the something forgotten mixes in with it. Urrghhh! No

P2: Just wash it properly then until it's gone

[laughs, indistinct]

P1: It's just in my mind I know that that's been in it and like –

P3: But you could eat it and you wouldn't know they'd used it for all you know

P1: if it was growing mould for a month? [laughs]

P3: (they could have that same food on your plate)

P1: Yeh I know but that's why I used to put foil on everything. I used to put foil on my plates at the start of the year

P3: I know that's crazy!

P1: But then when I'm out I don't really think about it so it's really strange. It's like I think its coz...I don't know....

P2: I don't like eating a lot of ermm – like when I buy, I don't like buying ready meals and stuff because I feel like, like my Mum would really shake her head at me. Even though I love ermm – some of the lasagnas' that are readymade are like so nice. And I can't - I've made lasagnas before and it doesn't taste as nice as those ones. But it's just the fact that in my mind like with my culture, buying things like that is abit wrong [agreement from P1]. Like buying what you can easily make, which is gona be cheaper anyway

P3: Yeh

P1: Yeh but I think like that if it's like, one of you then it's hard to like –

P3: That's what I have – when I'm cooking –

P2: but it can last you two days and then you can freeze them

P4: Yeh you freeze it

P2: Yeh it's just -

P3: I'd just eat it all because I know it's there I'll just put it on my plate. I'll just eat it all

P1: just go back for it every so often

P3: Yeh I've gone through all this effort I'll just eat it all in one go

P2: That's one thing you should know as a student. Just make a big pot of something, eat for the next two nights and when you get fed up of something just put it in the container then freeze it and eat what you want for the next week and next week you can come back you that –

P1: I can't do that

P3: Oh I'm terrible Ill just eat it all [laughs] I duno because I havn't got like portions down yet. Do you know like if I'm cooking something like I don't – for one person I don't know how much I need. Does that make sense?

P2: that's why –

P3: Like I don't want too little but then I –

P4: Do you know how much you want when it's on the plate? can you see?

P1: [indistinct]

P3: No, 'cause I'm still like, well I'm really hungry. Like yeh. And then I'm like, really bloated and then I feel really disgusting after. I'm like I've just eaten over -

P4: Do you have to eat everything that's on your plate - are you one of those people that has to finish it all?

P3: Yeh, yeh I got too

P1: I reckon that's the parents I do. 'Coz they're like, sit there and don't move –

P3: Yeh coz my Mum – I remember one Christmas I didn't like the gravy that my Mum put on the Christmas dinner and she wouldn't let me down from the table. I was there all day.

P1: Like, I'm not eating it.

P3: I ate it in the end...

P1: I didn't eat mine [dinner]. I was just staring at it and then it turned into mush and then she was like leave it [laughs]-

P2: I just can't sit on.

SL: Earlier you mentioned something that stuck in my head that ermm, what did you say? That you were going to be good this week.

P2: yeh.

What do you mean by that?

P2: Sometimes like you wana eat different to how you've eaten last week 'cause you stepped on the scales and your abit heavier or you look abit bigger so you say ' oh right, in your mind your going to be good', or you set out to be good. So you go on a little – not diet but you say I'm gona eat more veg this week [agreement from P1] or I'm not gona have like anymore sugar in my tea and just things like that.

P1: you can get bored of it though can't you. Like if you've been like, eating really bad for a while and then you just feel like disgusting and then you wana eat something that's actually healthy. But then you eat one healthy thing and then you go back to it [laughs, agreement] I'm like –

P2: but then sometimes you're not even eating unhealthy it's just like, your mind tells you that you look a little bit bigger and you should – you're like maybe I was because I had that one biscuit this week [laughs]

P1: One biscuit? [laughs] isn't the pack empty?

P3: I always say that. I'm like right I'm 'gona be good this week. I'm gona have this meal. And half way through the week I'm like...and then I just do a massive binge! Or like, the following week I'll just binge on what I've cut out

P2: mmmm, that's why I go to the gym

SL: Sorry is that true for everyone – like when you think you're going to be good so to speak?

P2: Yeh for me anyway.

SL: does that translate into action?

P4: Generally what I do, 'coz I have to make my lunch for work like before I go to work, I think the night before that I'm going to be really good tomorrow and I'm only going to pack like, I duno like a box of pasta, or erm, a banana and some apple juice or something like that. If I haven't got chocolate then I can't eat it. But then the next dayI'll have my lunch and I'll be really craving chocolate so then I'll come home and go straight to the fridge and eat chocolate. So it doesn't actually follow through. Well it does for the lunchtime but not for the whole day.

P2: that's what happens to me but then I realize that I need to stop carrying money aswell. 'Coz I'll make like, sandwiches and fruit and rice cakes and stuff and then I'll eat that in no time and then I'll be like, 'oh I'm hungry.' So then I'll just buy everything else that I shouldn't – well, in my mind that's not being good or healthy.

SL: [to P2] You said veg earlier – that you'd eat veg. Why?

P2: Because it's just healthy. It makes me feel better when I eat veg anyway. It's better for your skin....

P1: It gives you more energy as well doesn't it?

P2: yeh

SL: Does everyone agree with that?

P3: Yeh

P2: And it fills you up the same it's just your mind says that you want to eat chips and stuff -

SL: does anyone disagree?

[no comments]

SL: Ok carry on, go for it!

P1: I'm not a fan of veg though.

SL: So just sticking within the theme now like, just think about the factors that – like if you were going to the shop because you were hungry and you wanted to buy something, or if you were going to - you were hungry and you were making any sort of food choice what sort of things would influence it? What other things?

P4: well if you go to the shop when you're hungry, that's the worst time to go shopping [agreement] because you just grab everything that's in store quick. And you just grab loads because you're eyes are bigger than your belly.

SL: forget I said hungry – if you just went. Or if you were in your house and picking something, or in any situation – what sort of other things or factors might influence what you choose?

P3: Stress influences me. 'coz if I'm stressed out then I just want sugar and just dirty food basically [agreement from P1] or like curries and stuff

P1: I always used to eat in sequence though, like when I was younger. So like, I'd live off sausages for a month, or I'd live off fish fingers for a month and stuff like that [laughs]. So I think I'm still like that in ways. Ermm, but errm it's abit different now 'coz my mum makes me the food but....

P3: I eat better when I'm living with my Mum because like she does it all for me

P2: I'm better because I don't do food shopping, not that I buy lots of rubbish but my Mum doesn't believe in junk food [agreement from P1] so the only junk food we got are crisps and that's for my brothers lunch box

P1: Oh that's encouraging though –

P2: So like you have to ask if you can have one and usually it's a no so you have to buy your own junk food which is a long thing...you just want it in the cupboard. Yeh.

P3: I duno when I'm at home if I'm proper pigging out, you can see that them like 'oh, is that another biscuit' and it puts you off [agreement] I'm like, no I'm putting it back now.

P1: that's like comfort eating though isn't it. You take stuff when people aren't there and then you just eat [laughs]

P3: Yeh

P1: and just – it doesn't stop you

P3: Or like, they'll make a joke and you're like 'I'm put of that now'

P1: Yeh

P2: I was gona say as well ermm, when your round your friends as well I don't know what it is but you eat more. And I found that when I came to uni – my family we never used to eat out. It's only recently because the parties have gotton boring that we've started going out for food for people's birthdays. So like, when I came to uni it was like, 'ok shall we go out for food?' 'shall we go out for lunch?' 'shall we go out for dinner?' 'shall we go out for breakfast?'

P3: Yeh 'coz if it was in my house you would only go out for a meal if it was like, a birthday [agreement]. Like you wouldn't just randomly be like, 'com'on, let's go for a meal' .

P2: When I came to uni I ate out....probably more in one month that I'd eaten out in my entire life. Since I came [laughs].

P1: It's like if someone eats it makes you 'wana eat....'coz if your round people -

P2: Yeh and if you're making a salad aswell and they're making like, some hefty solid meal then you're like, 'can I have some of that instead?'

SL: [to P4] So what about you Laura? What sort of factors guide your food choices?

P4: ermm I don't know really. I guess I think - if I'm hungry or not is a big thing 'coz if I'm hungry then I will just eat rubbish. But if I'm not that hungry then I got time to cook before I get hungry, like a proper meal. I healthy meal I suppose.

P2: If I'm busy as well, like I eat lots of small things [agreement] that never fill me up so I end up eating more for the day – like lots of small things Like rather than having breakfast lunch and dinner and couple of snacks I'll have like 10 snacks throughout the whole day and then I'll still be hungry.

P4: But if I'm busy then I find that I'm not hungry I don't think about it. Like if you're at home like.....

[Interrupted by outside party]

SL: Ok so does anyone ever cook from scratch?

[agreement from P1; P2 and P4]

P1: If the pans are clean [laughs]

P4: Yeh I always cook from scratch so I know exactly what's going into my food.

SL: Why would you or wouldn't you cook from scratch everybody? Just think about - the 'why's' in the reasons why you choose stuff.

P2: I don't –

P3: It's time consuming ain't it.

P2: I don't eat certain foods for religious reason's so I wouldn't feel comf – like I've stopped eating from chip shops because I've noticed that they heat the pork sausages up in the same pan that they heat the chips up with. So I only eat chips from places which I know don't mix the meat with the actual chips. So I prfer to just make my own chips and home or in the oven but I guess that's not from scratch. But if you get what I mean like, certain things like Bolognese, sometimes it's not beef mince and people you ask – they can never tell you which one it is.

P4: Yeh

P1: I don't really like much ingredients, like that's why I never make anything because – 'coz I know what's going in there, I don't like half of it whereas like, if I buy something that's already there then I just think 'oh I'll eat because It's already in there' and it's kind of the size, do you know what I mean coz you don't know exactly what's going in there. I know that's a bad thing but....

P4: I'd rather know exactly what's in my food, and like the amounts like you were saying about salt and things – I'd like to know how much salt is in my food.

P1: I'd like – I do – I would like to know, but then I don't – do you know what I mean? I just....as far as the ingredients, I'd like to know how much....if there was anything bad going in there or stuff like that. But the actual food that's going in there, that's.....[trails off]

SL: [to P4] Why would you like to know how much salt is going in your food?

P4: Because too much salt is bad for you

SL: [to P1] Ok. And what do you mean about you'd like to know if there is anything bad going in?

P1: like errm...Yeh like too much salt, too much sugar. Yeh basically that really.

SL: Why do you consider those things 'bad'?

P1: Because they can cause problems with your health. And there's kind of like, so much warning these days and stuff like that, that it's kind of drilled into your head to have a look [at labels] really.

SL: So do you think that health is important in guiding food choice then?

P1: Yeh I do because – It's obviously like, when you're on a diet and stuff you're going to be- you're going to start eating healthy and stuff because you're doing exercise yet when you're not on a diet you don't really think about doing exercise so – not so much you don't do it but you kind of – when you-re on a diet you think about it more. So by eating healthy you want to do healthy things.

P4: I disagree with that. If I'm exercise then after I think 'oh, afterwards I deserve this bar of chocolate now, it's ok.' I've wasted a load of calories running so I'm alright to have this bar of chocolate, so I disagree with that.

P1: I feel bad I do. 'Coz I feel like 'oh, I've done this now I don't want to eat anything.' Even if I'm like hungry, I'm just like no. And then it's like the next day, and then Ill something and then....It's just that the (momentum?) at the time, and I'm just like 'nah I can't' [laughs]. I feel bad. 'Coz you know how many calories you've burned off, because obviously it says in the gym or whatever – you don't know when you're running or whatever but in the gym – then I constantly read the back like, if I come home and I'm just like 'oh if I eat this that means that I've got like, 200 calories down again [laughs].

P2: I never read calories

P4: No

P2: Especially after I've eaten them - I think what's the point.

P3: I mean you've ate them then [laughs]

P2: You can't do anything about it!

P4: But it's nice to know like, out of curiosity what's the content of it -

P2: But I don't believe that like, calories are the main thing. I think it's what you eat for your body 'coz they always tell you oh, you need to eat 2000kcal or else it's bad for you [agreement] but some people have a higher metabolism so they need to eat more and some people have got slower ones so they need to eat less, and then some people have got health problems so they need to eat more of something or less of something [agreement]. So I just give my body what it needs.

P1: I think If you go on like ermm, program diets and stuff, like slimming world, weightwatchers and stuff, it's kind of drilled into your head that you've got to look at it. Or it's natural. It's like you're

sitting – like – at weightwatchers you're like, 'oh I've had so many points today', you know it's just a natural thing. Like before all that [weightwatchers] personally I wouldn't have really bothered but I feel bad now because I know had much stuff is actually in it. But....but then again though, even though you compare the calories and the fat, I don't really take the fat into context even though obviously fat is a big issue.

P4: There's too many things to juggle aren't there?

P1: Yeh

P4: You've got like, 6% of your salt intake – agreement] but there's like, 10% of your sugar or -

P2: And then as well what you think is going to be healthy...it's not. Like, you might as well just have a burger and chips.

P4: Yeh like fruit and stuff. That's full of sugar [agreement] yet you wouldn't think you know, that doesn't have how many grams of sugar it's got in it. You wouldn't count that would you, you wouldn't think about that [agreement].

P2: Yeh you say it's a fruit so you can eat it.

P4: Yeh

P1: It's like orange juice. I can't believe how much sugars' in that, its ridiculous.

P2: And it's bad for your teeth as well [agreement from P1] but 'coz it's an orange it's fine [laughs]

P4: 'It's good for you, it's got vitamin c in it' [quotes]

P1: Yeh.

SL: [to P3] Do you think that healthy eating is important?

P3: Yeh I suppose coz if you look at people who do eat healthy they seem to live longer like do you know in like, Italy and that? Because they're quite healthy there....they live 'til they're like, really old.

P1: It's 'coz they haven't got stuff that you go to buy – well they have got stuff you buy in the supermarket or whatever but they're used to growing their own food and –

P3: Yeh

P4: And they don't snack in places like that either [agreement from P1] They've got like a totally different culture. Like we are [we snack don't we [agreement from P1].

P3: It's 'coz we've got vending machines, like everywhere.

P1: Yeh.

P3: it's so easy

P1: It's encouraging isn't it. When you're walking past and your hungry it's just like, 'oh just pick that up on the way.' And then.....

SL: The conversation gone dead has it? [laughs] Right I think that's enough for that part of the discussion because I've just let you basically do your own thing. So that bits gone right. But I've got a few things now which I sort of expected you to point out and I just want you to elaborate on these things for me now ok so I'm just going to throw a few words at you. So 'healthy eating' – for example, what do you consider to be healthy eating?

P1: Fruit and veg.

P3: Yeh fruit and veg.

P2: I think a balanced diet. So fruit, veg, meat, beans, lentils, everything.

SL: Do you all agree with that or do you –

P1: I just associate it with fruit and veg

SL: just fruit and veg.....

P1: I know it's not –

SL: no that's fine

P1: but when you think of healthy living you – I automatically think of like, picking up an apple rather than a chocolate bar or something like that, or like having a plate full of veg or whatever rather than thinking 'oh' – but then I need to have meat on it, and then I need to have this. I think it's just too much really, personally.

SL: [to P4] What do you think Laura?

P4: I'd say a balanced diet – you need abit of everything. But then...then again I wouldn't include like....cake or chocolate in that mixture. I'd say you get that from somewhere else.

P2: Yeh, flour [laughs]

P1: But then if it's a balanced diet you could say that a little bit of chocolate is ok for you [disagreement from P2].

P4: Yeh but I'd say that you go back to like....like natural foods rather than processed foods [agreement from P2]

P2: Yes and that's processed [chocolate] I think a healthy diet is something that's not processed.

P1: What about organic chocolate? [laughs]

P4: It's still processed chocolate

[laughs]

P2: You could have coco – you could have coco from the ground but then that's not very nice

SL: So any more perceptions – any specific reasons about what you think is healthy? That didn't come out right [laughs] Like, what are your perceptions of healthy eating? Is there anything else? Are your perceptions vague, or are they detailed or?

P1: I think it can't be these days like, because it's so like.....it's on everything really.

P2: My minds' confused. I think it's the news [laughs]

P1: Yeh

P3: Yeh 'coz one minute like, the news is like 'yeh you can have this, it's fine.' And then the next minute –

P2: then it causes cancer –

P3: Yeh so –

P1: Everything apparently causes cancer –

P2: Causes cancer!! Yeh so you get confused. You're like, 'oh, yeh I eat all of this all of ' – 'Coz my Dad has just realized he's got high cholesterol. So he's like, like addicted to cashew nuts and my mums trying to tell him 'oh they're so bad for you' blah blah blah [agreement] so he's basically said he's cutting it down so I went on the internet and I said to him, 'oh, cashew nuts are actually good for you.' But the bad thing is they are high in fat

P1: Yeh

P2: So they're high in fat but they're high in unsaturated fat which is good for you. So they're good for you but they're not! So he was like, 'well what am I supposed to do? Am I supposed to eat them or not?' [agreement] That's why I get confused because there's different –

P4: Bu t then I think you need a balanced diet because if you go back to like....like when we were hunter gatherers and stuff – things like that – then we were – our bodies were evolved to eat like, basic stuff. They weren't evolved to eat like bread and pasta [agreement] and like, chocolate or anything like that. They've been evolved to eat fruit and veg and different types of like, animals like fish and meat and stuff isn't it.

P1; Yeh but then people – obviously it's probably different things as well like but then ermm...people used to die younger and then that's to do with the food they ate as well.

P2: But then they used to eat loads of meat

P4: But it only would have been what they could catch. If you think about it, like how much could they catch?

P1: yeh it all depends on what ermm...like, if they were high up or.....

P2: Yeh

SL: Would you say healthy eating is important in guiding your food choice or not?

P2: Very important

P1: Yeh

P2: 'Coz I don't wana have health problems when I'm older.

P1: I think it depends on the person though, 'coz like I know this old man. He's about 90 now but he eats like two packets of sweets – big packets of sweets, like toffees, a day and he's fine [indistinct]

P3: I just think healthy eating means you're gona lose weight. That's – that's the only – that's what I do think though [agreement from P2]. 'Coz if you like, look at people they're like, 'oh I went on this diet and I only ate fruit and veg' and they've lost loads of weight. That's the only – that's what I do think of it.

P2: But people in the carribean, they're like <u>really</u> curvy, like they are rarely small people and they're really healthy [agreement from P1]. Like the only downfall is the salt, so....

P3: Yeh

SL: [to P4] Uhmm, right just yes or no....would you say that healthy eating is important? Well not just yeh or no if you want to elaborate....

P4: Uhmm....is it important to me or just generally?

SL: To you, in guiding your food choice.

P4: Inguiding my food choice?

SL: Like your all saying healthy eating is important but does that actually translate into – in terms of picking healthy food?

P4: Well no not really coz I think it's important but then again I don't actually eat that healthy really

SL: We're talking here in terms of actual food choice now –

P2: SO when you're 'gona buy something or do you think it needs to be healthy?

SL: yeh or when your 'gona eat something.

P2: That's my first instinct

P1: Yeh I feel bad if I <u>don't</u> do it [agreement from P3]

SL: But you do it anyway?

P1: Yeh I just do it anyway

SL: that's fine. Ermm, right so with regards to taste, would you say taste is important in guiding food choice?

P1: Yeh. Taste and texture I think is the most important.

SL: The most important things?

P1: Yeh

P2: I think taste is most important 'coz I like seasoning and flavour

P3: If your 'gona eat something bland you're not 'gona 'wana eat it again are you.

P1: I duno I think it's personal opinion though isn't it? [agreement] 'Coz like some people [indistinct]

P2: Yeh some people [indistinct]

P4: Like potatoes are quite bland aren't they, but like you know, you like the taste of it don't you –

P2: But you'll have it with something, seasoned [agreement]

P4: yeh like a jacket -

P1: Yeh you wouldn't just sit there and eat a bowl of potatoes [laughs]

P3: I would

P2: Some people don't like any salt, any pepper, no seasoning what so ever.

SL: So with regards to convenience, would you say convenience is important?

P1: What we eat 'coz of convenience?

SL: Like when you're making a food choice?

P1: Yeh I think so. I think -

SL: You know like we had a big discussion about this earlier when you both said you'd prepare a meal, and you said [P3] you'd eat a sandwich because it's easy.

P3: Yeh

SL: But would you say – you know how important is it? Also what are your perceptions of convenience - what do you consider to be convenient?

P1: What ever's easy [laughs]. Well I think it's – it <u>does</u> depend on when it is, how hungry you are and where you are, because if you don't- you haven't got access to it [prepared food] you're more likely to eat something that's convenient to you because you don't want to have to go and walk to get it or....

P3: It's waiting around for stuff to cook. I hate it.

P1: It's 'coz you tend to eat more while you're waiting around -

P3: Yeh

P1: And then it's just it could have been a healthy meal and then you're just snacking on like –

P4: But if you're cooking everything from scratch then you've 'got cut everything up and you're not really waiting around 'coz you've got stuff to do.

P2: Yeh

P1: But then stuff like that normally takes about an hour in the oven doesn't it so [laughs' so when you're waiting for that hour –

P2: But if you've frozen it after then the next day you can just defrost it in the microwave and heat it up

P1: I can't do that, I've got to chuck it out

P4: Yeh it tastes (disgusting doesn't it?)

P2: Yeh but as well I do buy stuff or get stuff that are convenient.

P3: Yeh I'll have like –

P2: It depends how busy I am through the week or....

P3: I'll have a couple of ready meals –

P2: Just in case....

P3: So if I do feel like just chucking it in the microwave then it's there [agreement from P1]. But then if I'm feeling then I can wait for food then I can cook it

P2: Yeh that's like at my Mums house. Like she – either my Mum, Dad or me would cook everyday but if no-one can be bothered to cook or some one's 'gona be late or something like that it would just be like oven food that night

P3: Yeh

P2: So just have what you want – chips, fish sausages....

P1: Mmm. See my Mum would just go out and get fast food [laughs] it's probably a bad thing but...

P4: But then that's what – like that's why I said we make a list so we're organized. So you know –

P2: But I can't plan things with food like all the time. If I had money – if I lived in London that would be really bad that would be so bad. I guess it just depends....what's accessible to you 'coz if you live across the road from like, a Chinese or chip shop [laughs] then you're just 'gona walk over and get it.

P3: Doing your walk Aimz [to P1, laughs]

P1: I know. Or like, if you've had something like earlier on or something and some one's like, 'oh I'm going over the Chinese, do you want anything?' I'm just like [laughs]....'No'. The you always end up having something, and you have some of theirs and it's like having like two meals and....

SL: GO on, ok....I'm just sitting here waiting for....Ok so price. This was something I was quite shocked you didn't mention because when I go shopping – actually I don't [laughs] – but what do you think about price?

P2: I think someone mentioned price?

P1: I mentioned price as well

P2: Yeh you mentioned price, that it's cheaper ermm -

P1: Yeh that it's cheaper to eat fatty food than healthy

SL: Oh you said mentioned price did you? I must have switched off [laughs]

P1: Yeh [laughs] now we know who's she's listening to!

P2: And then I said as well that it's cheaper – 'coz I said when I ermm...I can't remember what I said...I said it's cheaper to buy the ingredients rather than buy.....[agreement] 'Coz you can buy like, say, I 'duno you know like Jamie Olivers' adverts? He feeds a family for like, four pounds and it's healthy and you'll spend on yourself - four pounds for fast food even with pizzas that are like 12 pounds for yourself – that could be like someone's weekly shop [laughs]

P4: Well you have to like – if you're like cooking from scratch then you have to invest in stuff – like invest in spices

P2: that's true –

P4: Which are quite expensive to buy at the beginning but then you don't have to buy them for a while 'coz they're already there

P1: Yeh

P2: A lot of stuff I've already got I guess

P4: Yeh

P2: and then I -well I bought a – I used to have a huge sack of potatoes id always –(have potatoes?)

P1: Mine always go off 'coz I'm on my own and I don't eat them that much so they go off after a week and it just puts me off buying them again.

P2: But like food is – like organic food is like – it's <u>not that</u> much more expensive but you notice the price.

P1: You go to like – if you go to the market which people don't really think about its much cheaper –

P2: Yeh It's much cheaper [agreement] –

P1: than if you go to the supermarket –

P2: it's the same with butchers it's cheaper than in the supermarket

P1: Yeh and its normally better for you as well because it's not – it normally fresh isn't it....but then its inconvenient to go [to the butchers]....if you go to Tescos for something else then you can.....

SL: How important would you say price is?

P1: I think it is important because it distracts me from things if they are too expensive

P3: Yeh 'coz they have them pound things in Tescos and you're just like, 'yeh I'm 'gona get those'

P1: Yeh if they've got like yellow stickers you're like 'I'll have that'

P3: Yeh I'll have that!

P2: See I've got a problem with like errm, Asda price stuff. I think I'm abit prejudice towards it [laughs]

P1: That's why I only shop – I hope you havn't got a problem with Tesco's mind [laughs]

P2: 'Coz I can taste the difference!

S:: So how important would you say price is?

P2: it's important when you haven't got money, but when you have got money I don't really.....pay attention to it and what I'm buying isn't ridiculously expensive anyway.

SL: What about you guys?

P3: I – Yeh I'd say that it's important. 'Coz if you buy like – say you buy loads of organic stuff and it goes off you're like ;man I spent...' – like if you bought Tescos own carrots for 21p like –

P1: (next to nothing?)

P3: and like the organic ones are a pound you're like –

P2; You can buy one carrot [laughs] you don't have to buy loads

P4: The thing is like, if you buy like Tescos value tomatoes and stuff they taste nothing like the more expensive ones [agreement from P2] they've got no flavor at all and if anything they're sour sometimes, you know?

P1: They probably go off quicker as well. When you think about it they just taste....

P4: They're just picked sooner though aren't they -

P2: That's like when you buy a bag of salad. It goes off so quick [agreement] but like an actual lettuce lasts like double the time

P1: Yeh a lot longer

P2: SO maybe it's best to invest a bit more money in it [laughs]

P3: Yeh I'll try it out

P2: 'Coz you might get your money's worth in the end, that's what I think 'coz instead of buying 10 different errm, ready meals for like two weeks just but a packet of potatoes that last you two weeks and then some meat that will last you two weeks.

SL: What do you think – what do you know about supplements?

P1: Not much!

P3: No

P2: I've got a medicine bag. My Mum – well Caribbean's, are well into like...bush teas they call them. So I've only like – I've been brought up on herbal teas, vitamins for everything 'coz I've got a low immune system so I have to take vitamins for everything, but I take what I need.

P4: I'd say that you should be able to get everything you need from food unless like you say you've got a low immune system and then you need a boost and that's fine, but like the rest of the time I'd say like, you know you should be getting it from your food. It's not as good from supplements as what it is from your food.

P2: Some things I don't eat because I don't like it so I have to have – Like I don't like milk so I need calcium somewhere along the line [agreement from P1] and cheese and cheese all the time isn't really doing anything for me.

P4: I don't think about that. I don't like milk either but I don't think about that, like calcium –

P2: Yeh – that's - you think about my teeth when I get old....dentures [laughs]

P1: I like milk.

SL: Name me some types of supplements, you know....

P2: Iron....

P3: I don't know any

P2: Iron, Zinc, Magnesium, Vitamin C, Vitamin B, Biotin –

SL: Anyone else?

P4: Cod liver oil

SL: Are you all familiar with these?

P2: Evening primrose –

SL: Is anyone else familiar with these?

P3: I know cod liver oil but that's it! [laughs]

P1: I am familiar with them but I don't make a big thing to get them 'coz....I duno I just don't really.

P3: No I've never thought of that

P1: I used to take something before but it didn't react very well with me so I just didn't take it again and since then It's just put me off really. Even though I know that there's loads of different things but like – if something was like – if you needed it then I think it would be symptoms to show that you did need it and then you should get it. That's my opinion [laughs]

SL: So given this do you think supplements are good or bad?

P2: For me they're good 'coz I have a cold nine times out of the month and like they help me get over my colds quicker. Whereas like Beacham's and stuff like that might not help but I need to keep taking vitamins so I can get over it quicker.

P1: Yeh if you need it I think it is vital obviously, but I don't think you should put it in your body if you don't need it at the beginning [agreement] 'coz you just 'gona miss it if anything if you stop taking it your body probably 'gona react when if you don't – if it's not used to it then it's not going to.

SL: What do you think?

P4: Hmm I don't take any –

P3: I don't take any and I don't really get colds or anything so...

P4; I mean I get a lot of colds and stuff but I don't take vitamins but I find that if I increase my fruit consumption then I don't get as many colds. But then I don't need to take supplements I just increase my fruit so – but then again, like you said [to P2] you need to take them so –

P2: yeh 'coz I've got asthma as well so that gives you a low immune system –

P4: Yeh

P2: you can catch anything that's going

P4: But I don't think – it's not black and white you know? If you need them you need them but I don't think it's necessarily a good thing or a bad thing it just depends on the individual I think [agreement]/

SL: So would any of you ever consider taking vitamin and mineral supplements? Well you do...[to P2]

P1: Yeh just to try them [laughs] This is the thing like – if – I'm probably contradicting myself actually but like – I 'duno, if I thought I needed it then I would take it but I wouldn't really like, just go out purposely I don't think...

P3: If I was advised to take them like by a doctor or something I'd take them but I wouldn't go out of my way to go and buy them.

SL: what about you? [to P4]

P4: I wouldn't take them unless it was really necessary.

SL: What about ermm, omega-3 supplements? Fish oil supplements.

P2: Well I eat fish so I can get that from fish.

P4: I probably <u>should</u> be taking something in that case but so far, so good!

P1: Mmm, I – well I don't really eat fish at all that much and yeh I'm – well touch wood. I just think I'm alright at the moment but it might – the thing is though stuff like that might affect you when you're older so maybe like you said you should [to P4].... Like if I – say you know, I went to go buy

fish or something and one it was in –omega-3] and one was without then I'd pick the one with it in but that's probably natural really.

P4: but why would you take it? Because - for like your brain and stuff is it? Like –

P2: yeh and it's really good for your skin

P4: for your skin...

P2: yeh it keeps it moisturized -

P1: But like the only thing with omega 3 though -

P2: I've taken it before and it's quite good –

P4: is it definitely proven though?

P2: but like the taste of it – it sounds a bit disgusting but when you burp you can taste – have you ever taken cod liver oil? You can taste the oil every time.

P1: [indistinct]

P4: What even with like the tablets?

P2: Yeh that's what I mean?

P4: yeh the tablets...

P2: it's like a jelly thing and then it's got the oil in the middle – well some of them and then you can just taste it like inside you

P4: oh nice!

P1: it gives you bad breath [laughs]

SL: Ok well I think I'll wrap it up there 'coz we're running out of time and we're going to get kicked out now. So err, I think we've got enough – like there are other things like family preferences but I think we've covered those and stuff like that, so that's done. Done and dusted!

[SL gives participants questionnaires to fill out]

- END

<u>31: Focus group discussion 24/03/2010, 12.30pm. Male participants, group 2.</u>

SL: Ok, so like I said, I'm just interested in factors that may influence food choice. So to start off, I'm going to ask a basic question. What do you like to eat and why [pause] anyone start.

P1: uhmm, I like eating healthy food at the moment because I've got a triathlon coming up, a sporting event, and I have to be in shape for it, and I can't be eating fat because it's not gona hinder me ....and I try to eat cheapy food, so cheapy healthy foods because I haven't got much money [laughs] (being) a student and everything. Yeh, cheap healthy foods.

SL: Ok, what would you class as cheap?

P1: uhmm, I tend to eat alot of, err fish, so cheap cod fillets, and then just vegetables. Just 70p new potatoes from Tesco's, and carrots and broccoli and just make it up that way. Spice it up with some ketchup [laughs]

SL: As you do. Ok, [turns to next participant] How about you?

P2: It's the same, tends to be all sporting activities, it's pasta, rice, that sort of stuff, and then I try and eat as much meat as I can with it. So again, cheap, sort of try and get the cheaper cuts, so, instead of buying chicken breast buy chicken thigh, that sort of stuff. But it's mainly meat and pasta, meat and rice. (So I'm like that) Don't really eat that many vegetables, but I try to bulk it out [the meal] with a lot of peas, and you know, cheap veg rather than buy fresh. Uhmm, but yeh, same as Trig [P1], the most important thing is sort of health and price. Those two.

SL: Yes so like, would you say that....what is the major factor when you choose what to eat? What is it [your choice] guided by?

P1: Health, that's the major one.

P2: [agrees] At the moment yeh.

SL: Health?

P1: Yeh.

SL: [Turns to P3] How about you about?

P3: Uhmm, I'm not sporty! So, [laughs] I'm probably far less healthy than those two [P1 and P2]. Ermm, generally what's cheapest at the moment, coming towards the end of the term. But I do try and eat what's healthy, so I tend to have alot of frozen veg and that sort of thing, again sort of, pasta and rice and.....quite, I try and have like, red meats and stuff generally. But uhm, yeh I think that's about it.

P4: Well, I hardly ever eat red meat uhmm, 'coz my partner doesn't like it, we're always having chicken. And we try and always cook something from scratch, you know vegetables and make a sauce up and stuff with rice. But more recently we've been having errm, cheap oven food because we just haven't got the time to cook. So our diet has like, taken a turn for the worst [laughs] it's like pizzas and chips and nasty things. But before we were eating good stuff, so....[trails off, looks to next participant]

P5: Ermm, I eat alot of ermm vegetables, I'm trying to eat more fruit as well, errm I eat chicken and fish quite alot as well and I'm trying to cut down on red meat. And like minced beef, I don't have that as often as I used to. I'd say that ermm, health is probably more important than price, when it comes to buying.....

SL; Ok, I feel like I'm asking you questions here, and I want you to discuss things. So just discuss among yourselves what you chose on the hypothetical buffet and why you chose it.

P1: Ok, uhmm, well I think, it's got to the point now where [stutters], I'm happy that I can, if I was offered food I wouldn't, it's not just because...I'd, I'd choose the healthy thing even if there was other things –

P3: Even if there was a big slice of chocolate cake? Mmmm

P4: with a cherry on top?

[laughs]

P1: [laughs] No, my will power's gone pretty good now, that ermm –

P3: I'd say I'd have to eat it, if there was some cake there -

[Laughs]

P3: it would be gone!

P4: [turns to P1] What happens when your event is over? Are you gona go back to your old ways?

P1: Well I suppose it does depend on training as well, I mean like if I'm... back into running and I'm running say, what 5, 10K a day I start to substitute then just eating calories, and getting anything I can just to get some energy, because I know that it's not gona, thing [lead to weight gain?]. I mean I think I, probably do [lowers tone]as everyone does, [I] get paranoid that I'm gona put on weight [laughs] again if I stop training, but err, no like, If I'm running a lot I tend to just eat what I can but I do enjoy being healthy – I feel a lot better in myself when I'm healthy

[mmm in agreement]

P3: [turns to P1] Do you ever find it takes a lot of time to prepare these meals like?

P1: Ermm, no I boil a lot

[laughs]

P4: See I usually like, roast, and it takes - by the time like, from peeling to eating it takes about an hour, hour and a half -

P3: I went - I had a steamer last year, and I went through a stage of using a steamer, but it just takes too long. I mean that's why I'm eating so much crap at the moment. Just pop it in the oven, 20-30 minutes -

P4: I find it's like worth it. Because you can still leave, like the healthy food in the oven and then go off and do something else and wait until it's ready.

P1: Yeh

P4: So it does take a long time but it's not like you have to stay there watching.

P1: I suppose it's time, because Rich (P3) you've got a baby now as well haven't you? So it's like -

P3: Yeh. I just can't, I haven't got time to chop stuff up and cook nicely

P1: that's what I would have thought, the pizzas just like –

P3: Easy!

P1: Yeh

P2: It's that you don't put weight on -

[laughs]

P2: It's more the preparation than the cooking –

P3 – Yeh really!

P2: ....the time it takes to cook it....

P3: I mean, you can spend a good hour odd cutting stuff up if you 'wana make a nice roast or something like that.

P1: Yeh and the output you get from I suppose, it isn't that err [laughs] -

P3 – [interrupts] five minutes eating it!

P1: unless you are Jamie Oliver it's not like....No, but I think, I think as well about what they tell you to eat as well. I mean, like out there there's all these different studies and everything about –

P3: What like, 5-day?

P1: Yeh

P3: Does anyone here actually eat five-a-day? I have a couple of pieces of fruit like for lunch, and err maybe a portion a day with my tea. I never get five.

P4: I get it quite often. It is quite easy if you have a banana and a piece of fruit as a snack, that's one of your five per day. And in a meal, you can easily get three pieces.

P3: Yeh they're doing that erm, dairy three a day now aren't they. Where you're supposed to have cheese or, milk or something like that. Or yoghurt, I think I saw it on TV.

P1: I thought that was bad for you? [laughs]

P3: It's probably a marketing ploy isn't it, make you spend more money.

P1: Yeh but, like I suppose when you're going to the supermarket as well, there's alot like, finding everything on deal is -

P3: crap chocolate in it!

[laughs]

P1: Yeh!

P2: That's what I mean. Fresh fruit and veg isn't cheap.

P4: No it's not is it.

P2: If you end up buying a completely fresh basket it costs much more than going to the market –

P4: The markets alot cheaper isn't it. And good fresh stuff.

P2: But again that's convenience isn't it. (instead of going to the market) Tescos have their free car park for two hours.

P4: You just gota cross the road –

P3: You can just go and park in tescos and then go to the market [laughs]

P2: [But it's the same] ....Yeh it's easy to say that but then people shop at Tescos because they have the free car park

[agreement]

P4: You've still got to go to Tescos' for some of your stuff anyway, so it is abit more effort then going to the market to pick up the veg –

P3: We online shop now. It's just less hassle. [agreement] Like I say you then get to see what you're eating. But you then usually get the tiniest pack of apples [laughs]

P1: Those tiny little Satsuma things where you just eat like, about five in one sitting [laughs] ?

[agreement]

P3: They always look like err, they're massive don't theyAnd they're tiny little things.

P1: yeh but meat, I mean, 'coz you've got to try and get your meat and everything, but –

P4: It's important to have protein.

P1: Yeh!

P4: It's got other things in it, like Zinc and stuff

SL: Why? Why is it important to have protein?

P4: Well, it's important for body function. You have to have protein for muscle repair and growth.

P3: Does that mean it's bad though, that my partner and I, only eat chicken?

P4: No – not so –

P2: Chickens' good protein

P4: Yeh

P3: but surely it would be better if we had a more varied diet? With you know....do you know what i'm sayin, a little red meat init? [laughs] and some sausages, and steak....

P1: I think it just depends what you're doing. I mean like, like we were always told that protein, like if you were doing weight training or anything like that you just ate as much protein as you could get. Like I mean, that like I was buying protein shakes and I was just taking it as red that it was helping, I didn't actually know that it was helping [laughs] but I was spending like, 30/40 quid on protein shakes at a time, and didn't even know what was happening to be honest [laughs] you know? But ermm, but yeh trying to get like, trying to buy protein in a shop, no as in like as in meat form, to get a good bit of beef, which is - your only really gona get one meal out of it ain't you. And like one bit of steak it just isn't – its just financially expensive

[agreement]

P3: It is expensive isn't it?

P4: especially if your just errr –

P3: Big joints are like a fiver aren't they?

P1: Yeh

P3: carve that up [indistinct]

P4: It depends what cut it is aswell. Like, even the cheaper cuts – they're not cheap –

P3: Do you guys freeze alot of stuff? Some chicken –

P1: Yeh

P2: I do all the time

P1: I've got a tiny freezer!

P3: But then I don't know if that's bad you see, to freeze your meat.

P2: Your still alive at the moment [laughs]

P1: What after it's cooked?

P3: No no no, like when you buy it. 'Coz we used to get those packets of cheap chicken breasts, but they're always yellow and err like, when you cook them up all the water comes out –

P1: They shrink don' they? [Laughs]

P3: Yeh, we ermm, now we've got the (presh?) to freeze 'em, they stay nice and pink then. But I didn't know if it was...bad for you....but –

P1: But it's like a fresh chicken breast. I mean like, you go in to look for a fresh chicken breast –

P3: it's like a fiver for four or something [laughs]

P1: If you can't freeze it, you have to eat that then [P3: yeh] It's just like, you spend all –

P4: You can cook it on the day and then like, eat it the next day [agreement] without doing anything to it

P1: yeh but -

P4: It's only if you leave it uncooked that it'll spoil so it can, it can be eaten cheap that way.

P1: If you buy like say, a couple of chicken breasts then – if you buy more it's cheaper. So then like, you end up buying loads of chicken breast and you end up eating chicken for every meal for like the next (year) [laughs]

[agreement]

P3: Out of interest, what does everyone have for breakfast?

[Indistinct]

P3: I generally don't have time for breakfast –

SL: sorry will you just go through individualyl and say what you have again just so it's clear?

P4: I always have cereal. Toast is my hangover food, which is very rare.

P3: I'll always have two slices of toast and err, a mug off coffee on weekdays. But I'll treat myself to some bran flakes at the weekend [laughs]

P2: A big bunch or crunchy nut cornflakes and a cup of tea [laughs]. That's breakfast.

P1: Ermm, I always have eggs on toast with ketchup [laughs] and a cup of coffee. I find that if I don't have a really big breakfast I feel really down. If I don't have a cup of coffee in the morning –

P3: Ohhhh definitely!

P1: I can't function if I haven't had a cup of coffee

P3: [laughs] me too!

P1: I've got to have like five cups of coffee a day I can't function

(unknown) That's bad.

P3: you get those like stomach pains and it [stomach] starts making noises [laughs] and going all over the shop....

P1: I've start ermm, buying err, sometimes for cereal I have those oats from Tesco's, like honey oats, like things with err, like the Tesco's own stuff

P3: I did used to make myself porridge alot but I find again that –

P1: I find that though if I've got an open bag I just pick at them all day. They last like two or three days and then they're gone [laughs]

P3: [turns to P!] you know like with that big slice of chocolate cake, like do you have dessert that often? 'Coz –

P1: Never

P3: Really?

P1: I never eat dessert

P3: Oh cum on –

P2: I buy those little pots from Tesco's that you put in the microwave for 30 seconds. I always have pudding.

P3: Because errm, we've got this rule. We've got two golden rules in our house when it comes to high calorie stuff. We only have one take away per month, per pay check. So we only have two take – take outs per month. And we only have desserts at weekends, like Saturday and Sunday/ And that's how we try and keep things in check.

P1: What kind of dessert would you have though?

P3: Ermm, we're talking like errm – she loves to make pies and stuff so she'll make an apple pie. Or a crumble (possibly) it's always traditionally stuff, so....nasty stuff I guess [laughs] lot's of sugar. It tastes nice!

SL: What do you mean by keep things in check?

P3: We had this stage before where we had dessert with every meal, and thought that, things were getting a little bit out of hand, and it wasn't very – she was, I mean she was pregnant at the time but she was putting a lot of additional weight on. I mean thankfully she's lost it all now, she's shaved off two and a half stone. But we were eating dessert every night, and I didn't – I didn't particularly think it was healthy, so I said why don't we save some money, save some calories, and only have them as a treat on weekends. So, and it's worked pretty well.

P1: Do you find it easy to stick to?

P3: Yes! And I look forward to it now. And it – it's saving us quite abit of money I think, so, it's good.

SL: What's everyone else's views on that, desserts?

[laughs]

P4: I try to fill myself up with a meal and not have a dessert. 'Coz desserts are generally less healthy than the meal could be.

P2: I quite actually like a yoghurt. It's only here and there. I don't know really. I'm not really, as you can see, one to worry about my weight really. I just, you know, I like a pudding, so I'll have a pudding with - I'm like Jim (P4), I'll try and a eat good –

P4: Good man [laughs]

P3: I'll try and eat a good, big meal, but ermm, I'll always have a pudding at the end of it. But err it's, I don't know, I don't think it's a problem so much having a pudding. I think it's more, this isn't picking at anyone at all, but you (tend to not have pudding) but then during the day if your snacking, your kind of – you might as well just have a big proper dinner, you know have a main course and a pudding and then cut out the snacks or rubbish during the day rather than just say cut out the pudding but still snacking throughout the day. It's this whole eating in moderation culture that we've built up that people just can't quite grasp the hang of. So, I don't know, I tend not to snack during the day. But yeh, I'll have a bigger meal in the evening. And that includes a pudding, so...but yeh.

P1: Do you find the snacking depends on what you're doing like? Like if I'm sitting around doing nothing -

P2: Yeh, if I'm writing essays it's terrible – I'll just sit there eating –

P3: I'm terrible. I'll go through so many cups of coffee and biscuits like, anything like that. It's just and I just –

P2: Go a little nuts [laughs]

P1: Yeh

P2: (Don't know if I have to start doing essays?) [laughs]

[indistinct]

P1: No but like I find I snack a lot more if I'm...like if I'm busy I won't snack. If I'm doing stuff I won't snack at all but if I'm sitting around doing nothing I just eat out of boredom sometimes – and I just -

P3: I'm snacking more at lunch now, and not eating properly at tea time. 'Coz err, when we were cooking nice meals, like say she would make a pasta bake or something like that, it was take – we were cooking more than we needed and tubbing it up so we both had lunch the next day. It saves money and it's nice. But now I'm eating chocolate bars, pasties, crisps for lunch, so....

SL: Why?

P3: Coz I just find it easier, when I'm reading a paper or something like that, to pick at food rather than take the time to – take an hour or so to have lunch or something like that. I'll sit by my desk and eat.

P1: I find it hard as well like, if you're in uni like, unless you do prepare it in the morning I suppose and bring it into uni, where do you go to eat for something healthy? Like, I mean if you really wanted like, I mean if you just wanted to run in and grab like, something. I mean you just want something quick don't you? Because in between lectures and stuff you have to eat like a pasty, or a sandwich or baguette.

P3: They could do with something healthy on campus, rather than that refectory rubbish [laughs]

P4: That's the nature of fast foods, that is, they've got to have preservatives so they won't spoil [agreement]. They're high in salt, sugar or fat anyway.

P3: They're still tasty [laughs, agreement]

SL: You seem to have mentioned, sort of health and convenience quite a lot. Is there anything else, major factors, that guide you when you select food?

P3: Well I do find cost an issue. Like I say with the lunches. Cause it was – I mean I'm probably spending about 20 pounds a week, buying snacky food that's not really good for me. So I really wana get back to cooking properly to get my lunches back to save some money, so...Yeh I'd say cost is – does affect me. Especially at the end of the month. When your starving yourself [laughs]

SL: Anyone else?

P1: Cost. It's just err, well pretty hard to be honest with you. I mean, Yeh cost I think [laughs]

P3: Especially this time of term. Loans are running out. It's quite expensive. So what ever's cheapest at the moment.

P4: I try and be quite ethical though, like I don't – I try to buy as much British grown food as possible rather than food that's come from abroad and in season food as well rather than stuff that's come out of a green house when it shouldn't be grown at that time of year

P3: there can be loads of air miles and stuff can't there?

P2: Like strawberries at this time of year.

P4: See that is a consideration for me. I do try and cut down on foods that shouldn't be grown –

P3: Did you see that Sushi thing a couple of weeks ago where Salmon was coming from Chilli and then being frozen and then served up with Sushi -

[unknown]: [urgghhhh]

P3: with the label fresh [laughs]. I think it was like Waitrose or something.

P1: See I wouldn't, wouldn't care at all about that. I just like, when I go into the supermarket anything that's cheapest. I don't care why it's grown, where it's grown, how it's grown, I don't care [laughs] I don't care about – I don't really care about farming that much. I just eat anything that's cheapest.

P2: I prefer to eat ethical food, but then I'm not bothered. If push came to shove, I wouldn't lose any sleep over it.

P3: you've got to strike a balance between ethical and cheap [agreement]

P1: cheap usually wins [laughs]

P2: ethical is generally more expensive [agreement]. It's like a month ago when I killed, skinned and cut and chopped my own rabbit and ate it – I'd say that was quite ethical, you know it lived a good life got killed in a good way and ended up and I ended up eating it, and then last week I went to

(Max) meat market up in the Enterprise Park and it's probably come from – well it's probably not even animal [laughs throughout]

P1: Noah's Arc ini? [laughs]

P4: Did it like, squalk when you poked it? Trying to crawl away [laughs]

P2: But yeh I - try to think about ethical food when you're buying it, I try to at least. But then I'm not overly bothered.

P1: But then I'd never look at what's in the food, I'd just, eat it [agreement]. Like, I tend not to waste food aswell. If something's been in my fridge for a week, I'd rather eat it than throw away food to be honest with you. I'd rather just eat it.

P3: But things have got such short expiry dates haven't they? If I've got fruit going off, my girlfriends got a smoothie maker so it just all goes in there.

P1: I can't sand people who just throw it away by expiry date though. Just look at milk and throw it away by expiry date – my girlfriend does that [laughs, agreement] just smell it – if it smells like cheese then throw it away [laughs]

P4: When it's staring back at you [laughs]

P2: (when it gets hard to pull)

P1: When it's walking out through the front door then...[laughs]

SL: Ok, what do you know about supplements?

P3: You mean like vitamins, like er....

SL: Any supplements. What comes to your mind when you think about supplements?

P1: I take quite a lot of supplements. Ermm, when I'm training I take a lot of protein shakes. And I take a lot of err, Lucozade and stuff to re-energise after I come back from a big gym session so then just to get me back to what I was like. Hydration and everything. Yeh but I take protein – But I don't know, thinking about it, I don't know quite whether it's working, to be honest with you. Protein, I just take it as red that it does work, and I keep buying it. It becomes a habit after a while, to buy them.

P2: My answers are 'gona be quite similar to trigs' (P1), so again, I do quite a lot of running so carbo gels and things like that. And again, protein drinks at the end for recovery. Errm, they are the only sort of supplements –I don't take vitamins tablets or anything like that. But if I end up if I'm running, out on a big run, or something like that I'll take dextrose, that sort of stuff just to keep myself going but errm, ut apart from that the only supplements I'll take are those that I know are 'gona be beneficial to me actually doing sports as a opposed to, I don't know, getting more omega-3 from a cod liver oil tablet. I don't take supplements like that- only what's beneficial to me actually doing sport. Yeh, what I take.

P3: I don't take any. I used to, mainly 'coz my ex did. But when I stopped taking them I didn't notice any difference so. I don't take any at the moment. But I used to, when I was an undergraduate, always get cod liver oil tablets. Ermm, I (used) to take for exam periods, just because it's something, my Mum always used to do when I was little. Like, for GCSE's cook me loads of fish. Just because I was a lazy person and didn't wana cook anything [laughs]. (Again), buy cod liver oil tablets to have. But I don't do it anymore.

SL: Why did she want to cook fish for you do you think?

P3: Because – everyone – It's like – the public, a public thing, they perceive fish to be good for your brain don't they, this whole omega 3 thing. I mean, I don't know if it's true or not, but it's in everything now isn't it. Like, feed yourself omega-3 and you'll be super brainy [laughs]

SL: Does everyone agree with that or?

P2: Your led to believe everything's good for you, then everything gives you cancer [laughs, agreement] you never quite know who to believe.

P4: Yeh it depends who you believe basically doesn't it because there are always contradictory messages. Like some people say caffeine is bad for you and it's too much, but then I think if you have it in moderation then I don't see any harm in it. It's the same for anything.

P3: It's the same with anything though isn't it, it's –

P1: If I was gona pick a supplement though, the amount of supplements you can buy – I wouldn't know where to start [agreement]

P3: You don't know what's in them most of the time do you.

P1: Well, so many of them do different things. And there's no way you can take them all because they all do the same so you might as well just take none of them to be honest with you.

P2: It's all money though isn't it? We'd never taken supplements before they produced them [agreement]. And yet here we are, we're just being told that you need to take a certain amount of omega-3, and vitamin C, A, B, and all that jazz. It's like, at which point do you actually need to? At what point is it beneficial to you – how do you know you're not just being ployed into some marketing scheme?

P3: Do you guys, do you ever buy into any of them herbal tea bags, like primrose oil and things like that that are supposed to calm you down?

[disagreement]

P1: I've tried them once, they're horrible aren't they [agreement]

P3: You always read the back of the pack and they're like ahhh, they relax you - calm you down, make you sleepy [laughs] I don't know, I just doesn't –

P2: reading the back of the pack does [laughs, agreement]

P4: I just don't think supplements are any substitute for a healthy diet [agreement]. I have used supplements in the past, but I figure if I can get more from fruit and veg for less money – so I just get it from a balanced diet now.

P2: It's like those drinks hat, you know those fruit smoothies that say they can count as two, or one of your five a day. And yeh, technically it can count as one or two of your five a day. But through the process of mushing it and all that you lose so much of the goodness that's actually in the fruit anyway so you're better off, like I say, I mean a smoothie's not a supplement but with the supplements you're gona lose the actual goodness from the original source anyway [agreement].

SL: So would any of you consider taking a vitamin and mineral supplement?

[Disagreement all round]

P3: Unless there was a documentary on some prime time (TV programme) about some person who turned their life around then (no).....it depends how much it costs really doesn't it.

P2: If I needed more vitamin C I'd just buy more Satsuma's, do it that way [agreement]

P4: Or oranges

P2: Or orange juice rather than actually buying a tablet [agreement]

P4: I automatically think of how I can improve my diet rather than consider supplements [agreement] it never even enters my mind.

P3: I'm the same. Generally when I've been out drinking or just not eating properly, when I've been on the run [laughs], like I haven't had enough fruit and veg and stuff I'll just have to spend the next week eating properly again to feel better.

What about omega-3 supplments?

P1: Ermm, well, I wouldn't even know what they do [laughs]

P3: You can't avoid them though most of the time. You're buying butter and bread and it'' just be in there.

P4: Well surely that means you don't have to buy supplements then, if they're in everything?

P3: And ermm - I think that they don't know what the GDA is do they? It always comes up with err, that they don't know what the recommended amount is 'coz no-one's done any research on it. So we could be filling ourselves with [laughs] , like the chap said, all sorts of carcinogenic maybe.

END –

13.

Would you like to earn £60?

The psychology department is about to begin a study looking at the effects omega-3 and vitamin and mineral supplements on mood and behaviour in **MALES**.

The study involves a 2 hour testing session in the department of psychology. After the testing session you are required to take a combination of tablets for 12 weeks, containing omega-3, vitamins and minerals, or placebo. You are then required to come back after 12 weeks for an additional testing session. The second testing session will fall in exam period, and although we wish to carry out the second testing session 12 weeks after the first testing session, we will be flexible and take into account your exams.

The study is due to begin shortly - if you are:

MALE

HAVE NOT TAKEN FISH OIL or VITAMIN AND MINERAL SUPPLEMENTS IN THE PAST 6 MONTHS (this will be verified)

ARE A NATIVE ENGLISH SPEAKER

HAVE NOT TAKEN PART IN ANY OTHER PSYCHOLOGY STUDY MEASURING REACTION TIME AND VIGILANCE

and wish to participate, please contact Sara with your name and contact details:

07747307444 (leave a text/answer phone message)

444451@swansea.ac.uk

NOTE: YOU WILL BE PAID UPON COMPLETION OF THE SECOND TESTING SESSION

14. Participant Information Sheet

It has been suggested that omega-3 fish oils and vitamins and minerals may have an effect on mood and mental performance. In order to investigate this suggestion the present study aims to examine the effects of vitamin, mineral and omega-3 fish oil supplementation on mood and mental performance. The experiment is split up into two testing sessions. During the first session you are required to complete a series of tests for 90 minutes that assess mood and mental performance. At the end of the session you will be given tablets that you must take as instructed on the label. You MUST follow the instructions and take the tablets every day, preferably with a meal. You must return for another identical testing session approximately 12 weeks later.

The tablets provided may be active or non-active (placebo). You will not know if you are taking the active or placebo capsule. Active capsules will contain omega-3 fatty acids (fish oils) or vitamins and minerals. Placebo capsules will contain an inactive substance. The amount of omega-3, vitamins and minerals in the active capsule are similar to that which can be bought in store. No side effects are expected, however if you do experience any side effects please contact Sara (07747307444).

The series of tests (test battery) are to be completed by hand or at a computer and include measures of mood such and measures of mental (cognitive) performance such as reaction time, memory and attention.

You may take a break or leave at any time without penalty. The study is conducted in accordance with procedures set-out by the Departmental ethics guidelines. Upon completion of the second testing session you will receive a cash reward of £60.

Anonymity and confidentiality are ensured at all times. If you have any questions, you may ask them at any time. However if you wish to speak to a researcher at a later stage, you may

do so by emailing 444451@swansea.ac.uk. Alternatively, call on 07747307444.

In order to participate, please read and sign the informed consent form attached to this sheet.

15. Participant number:

Consent form

Participant name:

Gender:

DOB:

Date:

I am at least 18 years of age. I agree to take part in the present study. I have read the Participant Information Sheet attached to this form, which I may keep for future reference. I understand my role in the present study. My questions have been answered and I understand I am free to ask questions at any point during the study.

I am free to withdraw from the research at any time.

I understand that the data I provide during the experiments investigating the effects of food choice on mood and mental performance will remain confidential.

Data Protection: I agree to the researcher processing personal data that I have given. I agree to the analysis of the data I have provided for any purposes connected with the present study or future studies conducted by the researcher.

Name of participant

(print).....Signed.....Date.....

Name of witness

(print).....Signed.....Date.....

16. Debrief form

The aim of the present study was to examine the effects of omega-3, vitamin and mineral supplementation on mood and mental (cognitive) performance. This research area is ambiguous therefore additional studies such as the present study will help clarify the role of omega-3, vitamin and mineral supplements on mood and cognitive performance.

You completed several tests throughout this experiment. The cognitive tests include attention, memory, reaction time and impulsivity. Mood was measured using the Profile of Mood States Questionnaire, the Picture Frustration Study (PF Study) and the Buss and Perry Aggression Questionnaire.

I hope this form helps clarify the research purpose, however if you have any further questions, feel free to ask now or contact the researcher at 444451@swansea.ac.uk, or 07747307444.

Thank you for your time, your participation is greatly appreciated.

17. PF Task

18. Buss-Perry Scale

Please rate each of the following items in terms of how characteristic they are of you. Use the following scale for answering these items.

1 2 3 4 5 6 7
extremely uncharacteristic of me **extremely characteristic of me**

Please circle the number that corresponds most closely to your behaviour. There are 29 items in total – ensure you complete the items overleaf.

1) Once in a while I can't control the urge to strike another person.	1 2 3 4 5 6 7
2) Given enough provocation, I may hit another person.	1 2 3 4 5 6 7
3) If somebody hits me, I hit back.	1 2 3 4 5 6 7
4) I get into fights a little more than the average person.	1 2 3 4 5 6 7
5) If I have to resort to violence to protect my rights, I will.	1 2 3 4 5 6 7
6) There are people who pushed me so far that we came to blows.	1 2 3 4 5 6 7
7) I can think of no good reason for ever hitting a person.	1 2 3 4 5 6 7
8) I have threatened people I know.	1 2 3 4 5 6 7
9) I have become so mad that I have broken things.	1 2 3 4 5 6 7
10) I tell my friends openly when I disagree with them.	1 2 3 4 5 6 7
11) I often find myself disagreeing with people.	1 2 3 4 5 6 7
12) When people annoy me, I may tell them what I think of them.	1 2 3 4 5 6 7
13) I can't help getting into arguments when people disagree with me.	1 2 3 4 5 6 7
14) My friends say that I'm somewhat argumentative.	1 2 3 4 5 6 7
15) I flare up quickly but get over it quickly.	1 2 3 4 5 6 7
16) When frustrated, I let my irritation show.	1 2 3 4 5 6 7

1 2 3 4 5 6 7
extremely uncharacteristic **extremely characteristic**

of me	of me	
17) I sometimes feel like a powder keg ready to explode.		1 2 3 4 5 6 7
18) I am an even-tempered person.		1 2 3 4 5 6 7
19) Some of my friends think I'm a hothead.		1 2 3 4 5 6 7
20) Sometimes I fly off the handle for no good reason.		1 2 3 4 5 6 7
21) I have trouble controlling my temper.		1 2 3 4 5 6 7
22) I am sometimes eaten up with jealousy.		1 2 3 4 5 6 7
23) At times I feel I have gotten a raw deal out of life.		1 2 3 4 5 6 7
24) Other people always seem to get the breaks.		1 2 3 4 5 6 7
25) I wonder why sometimes I feel so bitter about things.		1 2 3 4 5 6 7
26) I know that "friends" talk about me behind my back.		1 2 3 4 5 6 7
27) I am suspicious of overly friendly strangers.		1 2 3 4 5 6 7
28) I sometimes feel that people are laughing at me behind me back.		1 2 3 4 5 6 7
29) When people are especially nice, I wonder what they want.		1 2 3 4 5 6 7

19. Instructions - GOSTOP

For this task, you need to pay attention and remember the numbers. Five numbers will flash on the screen. The numbers will be black against a white background. The numbers appear on the screen immediately after each other. If the numbers match, then you should click the left mouse button, but only when the number you see is exactly the same as the one just before it. If the numbers do not match, then do not click the mouse button.

IMPORTANT - Whenever you click, or respond to a number, you must click while that number is still on the screen – clicking after the number disappears does not count. Sometimes a number that matches the one you just saw will change from black to red – DO NOT CLICK FOR **ANY** NUMBER that changes to red.

In summary, you click the left mouse button when you see a matching number, only if that number does not turn red and you must remember to respond when that number is still on the screen.

During the session you will get a short rest break – do not leave during this time. At this time, the computer will tell you how many points you have earned. Just before the end of the break, a message will tell you to get ready, at this point watch the screen for the next part of the session to begin.

You will be paid for this session based on how accurately you perform...i.e. for clicking the mouse when you are supposed to and not clicking the mouse when you are not supposed to. When the session is over, a message will tell you how many points you have earned.

ARE THERE ANY QUESTIONS?

20. Instructions – TIME

In this task you are required to estimate when 1 minute has gone by. You must press the left mouse button when you think a minute has passed. You are required to make 5 estimations.

You must click to start the timer, and when you think a minute has passed you must click to stop the timer. Each time you complete your guess by stopping the timer, you will see two things:

1) the number of points paid for that guess
2) how much time actually passed.

Use this information to do better on your next guess. Remember, you will make five guesses. After your last guess, a message will appear telling you the session is over.

ANY QUESTIONS?

21. Instructions – SKIP

In this task you will earn points whenever you press the left mouse button. Each time you press the mouse button, the number of points you earned for that press will be shown at the bottom of the screen. Nothing in the task will tell you *when* to press the button. You can press the button whenever you want to, but keep in mind, the *longer* you wait before pressing the button, the more *that* press will be worth.

During the session, a counter at the top of the screen will keep track of the total number of points that you have earned.

Your session will last about 20 minutes and a message at the end will tell you how many points you have earned during your session. Remember, you can press the mouse button whenever you want to, but the *longer* you wait before pressing the button, the more points *that* press will be worth.

ANY QUESTIONS?

22. Profile of Mood States (POMS)

23. Visual Analogue Scale

Please place one CROSS on each line to indicate how you feel at this moment. If neither adjective describes you then put a mark in the middle: if you tend to one end of the line then place the cross towards one end to the extent the adjective describes you.

Agreeable ——————————————— **Hostile**

Clearheaded ——————————————— **Confused**

Composed ——————————————— **Anxious**

Elated ——————————————— **Depressed**

Confident ——————————————— **Unsure**

Energetic ——————————————— **Tired**

Unstressed ——————————————— **Stressed**

24. General Health Questionnaire

25. Perceived Stress Scale- 10 Item

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, please indicate with a check how often you felt or thought a certain way.

1. In the last month, how often have you been upset because of something that happened unexpectedly?
___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

2. In the last month, how often have you felt that you were unable to control the important things in your life?
___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

3. In the last month, how often have you felt nervous and "stressed"?
___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

4. In the last month, how often have you felt confident about your ability to handle your personal problems?
___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

5. In the last month, how often have you felt that things were going your way?
___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

6. In the last month, how often have you found that you could not cope with all the things that you had to do?
___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

7. In the last month, how often have you been able to control irritations in your life?
___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

8. In the last month, how often have you felt that you were on top of things?
___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

9. In the last month, how often have you been angered because of things that were outside of your control?
___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?
___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

Scoring: PSS scores are obtained by reversing responses (e.g., 0 = 4, 1 = 3, 2 = 2, 3 = 1 & 4 = 0) to the four positively stated items (items 4, 5, 7, & 8) and then summing across all scale items. A short 4 item scale can be made from questions 2, 4, 5 and 10 of the PSS 10 item scale.

26. Immediate memory task

27. Delayed memory task