

Nutritional analysis case study essay sample

[Literature](#), [Russian Literature](#)



Nutrition is a science that examines the relationship between diet and health (Morris et al, 2004). Deficiencies, excesses and imbalances in diet can produce negative impacts on health, which may lead to disease (CV, metabolic or musculoskeletal). Physical inactivity is also an influential factor to many diseases in later life, just like poor nutrition; therefore improvements in both areas can have positive effects in lifestyle and health. There are seven main classes of nutrients that the body needs: carbohydrates, protein, fats, vitamins, minerals, fibre and water (Murphy & Poos, 2002). The food we eat is then digested and absorbed, and then metabolized to release energy that the body can use. The human body needs energy in order to function properly and individual energy requirements depend on a number of factors, based mainly on energy expenditure. The four components of energy expenditure comprise of Basal metabolic rate (BMR); thermic effect of food (TEF); adaptive thermogenesis (AT) and of course physical activity (Griffin, 2002).

Current nutritional recommendations

Due to the subject leading an active lifestyle, the energy requirements would therefore be greater than that of a sedentary person. Dietary Reference Intakes (DRI, 2002) demonstrated that estimated energy requirements (EER) for sedentary adults ranged between 1800 to 2.600 kcal/day compared to an EER of 2.500 to 3.720 kcal/day that is suggested for active individuals (Reilly & Thomas, 1979). However subject specific, based on the assumption that energy expenditures off the football field are only moderate, the daily energy requirement of male soccer players was estimated at 14.7MJ . day⁻¹ (3500kcal/day) (Williams, 1994). With the clients recommended energy

levels coinciding with the literature (+3500kcal), the client's percentage of energy should be derived from 60% carbohydrates, 25% from fats and 15% from protein (Mullinix et al, 2002). However Burke et al (2003) suggests that active individuals, carbohydrates contribute to 60 -70% of total energy intake. Although the client may find it difficult to meet these requirements due to high alcohol levels and poor nutritional knowledge associated with students (Webb et al, 1996)

With carbohydrates being the main source of energy for the body, DRI (2002) recommend that 130g/day is sufficient for both males and females. However griffin (2002) states that 6g of glucose per hour or 144g / day, equivalent to approximately 600kcal per day is needed in order to function the brain. Carbohydrates are classified according to their structure into ' simple' or ' complex'. Simple carbohydrates are the main source of energy for the body and directly absorbed and metabolized in the liver where it is converted to glucose (Griffin, 2002). Complex carbohydrates however are broken down in digestion to maltose and then glucose.

A higher carbohydrate intake is recommended when you exercise to maximise glycogen stores (Sheppard, 1999). People who exercise regularly along with athletes increase their carbohydrate intake, this is known as Carbohydrate loading. Effective carbohydrate loading approximately doubles normal glycogen stores. Once this has been accomplished, reserves remain elevated for 3-6 days unless exhausting exercise is undertaken (Goforth et al, 1994). Therefore the daily intake of carbohydrates that is recommended to maintain muscle glycogen stores during multiple days of exercise is 500-

600g or 8-10g. kg⁻¹ (Costill, 1988) or 60 – 70% of total energy intake (Clark, 1994; Maughan, 1997).

Protein is made up of amino acids linked together in long chains. It is found primarily in the muscles and comprises about 15% of the body weight for a human (Williams ; Devlin, 1999). Protein is needed to build up and maintain all the cells in the body. It is essential in the actual structures of the body for the formation of muscles, bones, skin and hair (Griffin, 2002) as well as being used to meet energy demands if insufficient amounts of carbohydrates and fats available.

The recommended dietary allowance (RDA) for protein is 52-56 g/day of adult males or 46 g/day for adult females or 0. 80g . kg⁻¹. day⁻¹ for adult males (DRI, 2002). According to Burke ; Deakin (2006) active athletes playing power sports (such as football), those engaged in muscle-development training, and elite endurance athletes, all require approximately 2 grams of protein per day per kilogram of body weight, roughly double that of a sedentary persons. It has also been established that more protein is needed in people who exercise to replace the amino acids metabolized in gluconeogenesis, and to cover the demands of muscle repair and hypertrophy (Millward et al, 1994). However conflicting literature (Butterfield ; Calloway, 1994; Todd et al, 1984; Gontzea, 1975) suggests protein requirements should decrease in individuals who are regularly active as protein metabolism becomes more efficient.

Dietary fat is a vital nutrient that should be included in the diet. Not only is fat an important source of energy and energy store (adipose tissue), it also

provides insulation for the body and support and cushioning for the vital organs (Griffin, 2002). Fat is also needed for the carrier of fat-soluble vitamins A, D, E and K and the help there absorption. The essential fatty acids that the diet must supply are the omega-6 family (linolenic acid) and the omega-3 family (alpha linolenic acid). They are vital for the development of cell membranes and are also involved in the regulation of immune responses and blood clotting (Griffin, 2002) The acceptable macronutrient distribution range (AMDR) for fat is 25 - 35% for 14 - 18 year old males/females and 20 - 35% for adult males/females (DRI, 2002). Soccer players however have been recommended to consume less than 30% of there total energy needs from fat (Clark, 1994). Just like carbohydrates, body fat stores provide a major source of energy fuel; whereas fat sources (Plasma free fatty acids derived from adipose tissue and intramuscular triglycerides) are relatively plentiful, carbohydrate sources (plasma glucose derived from the liver or dietary carbohydrate intake, and muscle glycogen stores) are limited (Burke et al, 2003).

Vitamins and minerals are found naturally in food and are fundamental in the maintenance of all body functions as well as helping preserving health and preventing disease. Vitamins do not provide energy, although some are involved in the release of energy from food (Griffin, 2002). The recommended vitamin and mineral intake according to the US DRI (2002) can be seen on appendix 3.

For the body to function properly it requires water; the precise amount depends on the level of activity (intensity), temperature, humidity as well as

other factors. The recommended intake of water according to DRI (2002) is 3.7 L/day for adult males and 2.3 to 2.7 for adult females. However Hicks (2005) proposed that 2-2.5 L/day is the minimum to maintain proper hydration. Although this amount doesn't take into account the environmental temperature or those who perform physical activity.

The sweat loss that accompanies prolonged exercise leads to a loss of electrolytes and water from the body. The importance of fluid intake for hydration offers benefits to performance in a number of sports and exercise activities. Consequently dehydration not only demonstrates decrement in performance but can also lead to severe health risks associated with substantial fluid loss (Coyle & Hamilton, 1990). Therefore it is detrimental that fluid intake is high for those who regularly participate in physical activity as a loss of 10 -20% total body water could result in serious disability or even death (Adolph et al, 1947).

Potential constraints to the subject meeting the requirements

Due to the subject being a university student, there are many possible constraints to the subject meeting the recommended requirements. Ruiz et al, (2005) established that when people go to university (mainly athletes) or start work, the quality of their diet deteriorates. This could be due not only to a lack of time to eat healthily but finding the unhealthy options readily available and easy to consume. Financial issues play a big part within a student's life and can be a key constraint to the subject not meeting the requirements. Other potential constraints for students include peers, lack of knowledge on the appropriate foods and the inability to cook healthy meals

(Haberman ; Luffey, 1998). Religion and food allergies can also provide limitations although this doesn't apply for the subject. The student lifestyle generally includes a higher intake of alcohol due to social events and pressure from peers (Webb et al, 1996).

The aim of this investigation was to assess the subject's nutritional intake and provide them with the appropriate information to help improve their diet. The subjects lifestyle and interests were important elements when interpreting the data and providing the correct interventions and dietary strategies to meet the clients specific needs.

Method

Subjects

The subject for the case study investigation was a 21-year-old male student from the University of Teesside. The subject's height was measured using a SECA, UK stadiometre (1.78m) and weighed using the SECA, UK scales (65kg), consequently the subject had a BMI of 20.52 ($\text{kg} \cdot \text{m}^{-2}$). The subject was a member of the university men's football team, which require participation in multiple training sessions and competitive games. The subject was considered to have moderately / very active lifestyle (Appendix 8) due to participating in daily gym sessions as well as university and semi-professional football. The university of Teesside ethics board approved the investigation prior to the data collection and dietary analysis.

Procedure

Written informed consent and a medical questionnaire were obtained after the purpose, nature and requirements of the project were explained to the subject. All information gathered during the investigation was kept confidential and filed away only to be accessible to the researcher.

Anthropometric data in terms of mass (kg) and height (m) of the participant was recorded and the associated body mass index (BMI) ($\text{kg} \cdot \text{m}^{-2}$) was calculated. Skin fold measurements were deemed insignificant for the study, as the subject's set goal was to improve soccer performance and not weight loss/gain.

Analysis

The subject completed a seven day food diary, recording the amount and type of food / drink ingested. The completed food diary was then analysed using the COMP-EAT software (Appendix 4 COMP-EAT Guidelines), this helped identify the client's nutrient excesses and deficiencies. From the first COMP-EAT analysis (Appendix 5), the subject's total energy expenditure and so requirement (Appendix 8) were calculated, along with the client specific macronutrient requirements (carbohydrates, protein and fats).

The software used calculates the absolute measure of the quantity of each nutrient (in grams etc) and the corresponding percentages. The reference dietary intakes adopted in the study are the recommended values for the general population by age and sex, without taking into account physical activity. From this data, the researcher was able to assess the client's nutrient intake (deficiencies and excesses) and provide dietary strategies specific to the client's current lifestyle.

The subject was given dietary interventions to help improve their nutrition and set specific goals to help rectify current problems and also meet the demands of their current lifestyle. The process was then repeated following the implementation of the chosen nutritional strategy aimed at helping the case study to rectify the problems identified during the first analysis. The strategy was then evaluated based on the data provided from the second seven-day food diary analysed using the COMP-EAT software (Appendix 6). This second COMP-EAT analysis was compared to the pre intervention results to see if improvements had been made by the dietary modifications. The subject and researcher both discussed the nutritional strategies and agreed that the goal was to help improve performance in soccer. Increasing the client's macronutrient consumption as well as fluid intake along with a decrease in alcohol levels was agreed. The client however specified that no supplements would be implemented into the diet in order to help performance due to a personal choice.