The role of attitude and barriers on the implementation of a nutrition intervention in primary school children

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OPSOMMING

Agtergrond

Suid-Afrika is 'n multikulturele, ontwikkelende land wat tans belas word met 'n unieke viervoudige las van siekte, waarvan een wanvoeding is (beide oor- en ondervoeding). Die toename van kinderobesiteit in die huidige Suid-Afrikaanse gesondheidsopset is van kommerwekkende belang, ongeveer 14% seuns en 18% meisies is tans oorgewig en hierdie syfer word beraam om te styg na 25% binne die volgende dekade. Gesonde eetgewoontes en verhoogde fisieke aktiwiteit is belangrike komponente van 'n gesonde lewenstyl en 'n verlaagde risiko vir oorgewig en obesiteit. Beide is ook dikwels die pilare van verskeie lewenstylverandering intervensie programme ten einde oorgewig/obesiteit te voorkom of te verminder.

Doelwit

Hierdie sub-studie was deel van 'n grootter intervensie studie waar 'n voedingsonderrig intervensieprogram (VOIP) vir kinders in die vorm van 'n musiekspel (gebaseer op die Suid Afrikaanse Voedsel Gebaseerde Dieet Riglyne [SAVGDR]) ontwikkel is om voedingkennis te verbeter en gevolglik ook gesonder lewenstylgewoontes. Die doelwit van hierdie sub-studie was dus om die *houding* van 'n spesifiek groep laerskoolkinders (tussen die ouderdom van 6 en 12 jaar) teenoor gesond eet, ongesond eet, en fisieke aktiwiteit voor en na 'n VOIP en blootstelling aan die standaard skoolkurrikulum te ondersoek en te beskryf. Tweedens was dit ook die doelwit om motiveerders van en struikelblokke vir gesond eet, ongesond eet, en fisieke aktiwiteit te identifiseer.

Metodes

Kinders is ewekansig gekies vanuit die eksperimentele groep (n=143) van die hoofstudie. Kinders is gegroepeer in vier fokusgroepe per skool (6 kinders per fokusgroep) waaruit kwalitatiewe data ingesamel is oor kinders se *houding* en persepsies teenoor gesond eet, ongesond eet en fisieke aktiwiteit. Fokusgroepe was gedefinieer volgens ouderdom en geslag (seuns en dogters apart, graad I-III en IV-VI apart), dus in totaal 96 kinders. 'n Totaal van 75 kinders het die sub-studie voltooi, 21 kinders het uitgeval vanweë skool-verwante probleme of naskoolse aktiwiteite wat se tye gebots het met die tye wat die VOIP geïmplimenteer is. Kwantitatiewe data is ingesamel met behulp van 'n sosio-demografiese en fisieke aktiwiteitsvraelys asook 'n 3-punt gesigsuitdrukkingshedoniese skaal om *houding* te kwantifiseer teenoor gesond eet, ongesond eet en fisieke aktiwiteit. Alle data (beide kwantitatief en kwalitatief) is voor en na die intervensie ingesamel.

Resultate

Die hoofresultate van hierdie sub-studie was dat die *houding* van meeste laerskoolkinders teenoor gesond en ongesond eet, asook fisieke aktiwiteit onveranderd gebly het na afloop van 'n unieke VOIP. Vyf hoof temas wat geïdentifiseer is binne die omvang van die fokusgroepe was gesondheidsbewustheid, gesonde eetgewoontes, ongesonde eetgewoontes, fisieke aktiwiteit en gevolge van ongesonde eetgewoontes en onaktiwiteit. Moeders is as die hoof motiveerders geïdentifiseer om gesond te eet en ongesonde kos te vermy. Smaak en die reuk van kos is beide geïdentifiseer as motiveerders van en/of struikelblokke vir gesond eet en ongesond eet. Ouer dogters assosieer ongesond eet met oorgewig terwyl die meeste kinders die kombinasie van beide ongesond eet en onaktiwiteit as rede aanvoer vir oorgewig. Meeste kinders 's het positiewe *houding* teenoor fisieke aktiwiteit en geniet om dit te doen, alhoewel hul ouers die grootste motiveringsfaktor is vir deelname en nie hulself nie.

Gevolgtrekking

Al het sommige kinders se *houding* verander in die verlange rigting na afloop van die VOIP, het meeste kinders se *houding* ten opsigte van gesond en ongesond eet, asook fisieke aktiwiteit onveranderd gebly. Dit kan moontlik toegeskryf word aan die meetinstrument wat nie sensitief genoeg was om subtiele veranderinge in *houding* waar te neem nie. Verskeie faktore wat kinders se *houding* en persepsie teenoor gesond en ongesond eet, asook fisiek aktiwiteit beide positief en negatief kan beïnvloed is geïdentifiseer. Hierdie studie is een van 'n beperkte aantal studies wat die "ware" motiveerders van en struikelblokke vir kinders se *houding* teenoor gesond en ongesond eet asook fisieke aktiwiteit ondersoek het. Resultate gegenereer uit hierdie sub-studie kan dus 'n waardevolle bydrae lewer ten opsigte van die huidige literatuur beskikbaar oor die betrokke studieveld.

Sleutelterme

Kinders; voedingsonderrig intervensieprogram; gesond eet; ongesond eet; fisieke aktiwiteit; *houding*.

SUMMARY

Background

South Africa is a multicultural, multi-ethnic developing country currently experiencing a unique quadruple burden of disease, of which malnutrition (both over- and under nutrition) is one of them. The increase in childhood obesity within the current South-African health setting is of serious concern, approximately 14% boys and 18% girls currently are overweight and it is estimated that this number will increase to 25% within the next decade. Healthy eating habits and increased physical activity are important components of a healthy lifestyle, and decrease the risk of overweight and obesity. It is also often the corner stone of many lifestyle modification intervention programmes aimed at preventing or decreasing overweight/obesity.

Aim

This sub-study was part of a larger intervention study where a nutrition education intervention programme (NEIP) for children in the form of a musical play (based on the South African Food Based Dietary Guidelines [SAFBDG]) was developed to increase nutrition knowledge and thereby also contribute towards healthy lifestyle behaviour. The aim of this sub-study was therefore *to explore and describe* the *attitude* of a specific group of primary school children (aged 6-12 years) towards healthy eating, unhealthy eating, and physical activity before and after a NEIP as well as the standard school curriculum. Secondly, it was aimed to identify possible barriers to and motivators for healthy eating, unhealthy eating and physical activity.

Methods

Children were randomly selected from the experimental group (n=143) of the main study. Children were selected into one of four focus groups per school (6 children per focus group) from which qualitative data were gathered on children's *attitude* and perception towards healthy eating, unhealthy eating, and physical activity. Focus groups were defined by age and gender (boys and girls seperately, grades I-III and grades IV-VI seperately), totalling a number of 96 children. A total of 75 children completed this sub-study, 21 children dropped out due to school-related problems or after school activities that clashed with the time slots during which the NEIP was implimented. Quantitative data was gathered with a socio-demographic and physical activity questionnaire, as well as a 3-point hedonic facial expression scale which was used to quantify *attitude* towards healthy eating, unhealhty eating and physical activity. All data (quantitative and qualitative) were collected at both baseline and end measurements.

Results

The main findings of this sub-study were that the *attitude* of most primary school children towards healthy eating, unhealthy eating or physical activity remained unchanged after a unique NEIP. Five major themes were identified out of focus group discussions namely health awareness, healthy eating, unhealthy eating, physical activity, and consequences of unhealthy eating and sedentary behaviour. Mothers were identified as the main motivator for eating healthy and avoiding unhealthy eating. The taste and smell of food were both either identified as motivators or barriers for healthy eating and unhealthy eating. Older girls associate unhealthy eating with becoming fat while many children associate the combination of unhealthy eating and being sedentary with becoming fat. Most children have a positive *attitude* towards physical activity and enjoy doing it although the biggest motivator for partaking in physical activity is their parents and not themselves.

Conclusion

Even though some children's *attitude* did change in the desired direction after the implementation of a unique and fun NEIP, most children's *attitude* towards healthy eating, unhealthy eating and physical activity remained unchanged. This might have been due to the measurement tool that was not sensitive enough to detect subtle changes. Various factors that can influence children's *attitude* and perceptions towards healthy eating, unhealthy eating and physical activity both positively or negatively were identified. This study is one of only a few that explored and described the 'true' motivators of and barriers for children's *attitude* towards healthy eating, unhealthy eating and physical activity. Results generated from this sub-study can thus make a valuable contribution to the existing literature available in this specific study field.

Keywords

Children; nutrition education intervention programme; healthy eating; unhealthy eating; physical activity; *attitude*.

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LIST OF ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
BMI	Body mass index
CD	Compact disc
CG	Control group
CHOPPS	Christchurch Obesity Prevention Project in Schools
COAN	Childhood Obesity Action Network
EG	Experimental group
EUFIC	European Food Information Council
FAO	Food and Agriculture Organization
HAART	Highly active antiretroviral therapy
HIV	Human Immunodeficiency Virus
IOTF	The International Obesity Taskforce
ISAK	International Society for the Advancement of Kinanthropometry
kJ	Kilojoules
KAB	Knowledge-Attitude-Behaviour
MRC	Medical Research Council
NCDs	Non-communicable disease
NOO	National Obesity Observatory
NEIP	Nutrition education intervention programme
NFCS	National Food Consumption Survey
NICHQ	National Initiative for Children's Healthcare Quality
SABC	South African Broadcasting Channel

SAFBDG	South African food-based dietary guidelines
USA	United States of America
WC	Waist circumference
WHO	World Health Organization

CHAPTER 1: MOTIVATION OF THE STUDY

1.1 BACKGROUND AND PROBLEM STATEMENT

Nutrition transition typically refers to the increased consumption of unhealthy foods (foods high in sugar, saturated fat and sodium) and an increase in the prevalence of overweight in middle-to-low income countries. It, therefore, focuses mainly on two dimensions of large shift, namely diet (the structure and overall composition of the diet) as well as body size and body composition. Malnutrition in developing countries once identified by emaciated bodies (under nutrition), is now also associated with obesity (over nutrition) (Popkin, 2001).

This particular form of transition is also closely associated with two other forms of transition (either precedent or simultaneously), namely: i.) epidemiological transition, which refers to the shift from a high prevalence of infectious disease (normally associated with malnutrition, periodic famine and poor environmental sanitation) to one of high prevalence of chronic and degenerative disease (associated with urban-industrial lifestyles); and ii.) demographic transition, which refers to the shift from a pattern of high fertility and mortality to one of low fertility and mortality (typical of modern industrialized countries) (Omran, 1971; Olshanksky & Ault, 1986; Popkin & Gordon-Larsen, 2004).

South Africa is a multicultural, multi-ethnic, developing country in which the major part of its population is in a process of transition from a traditional, rural type of lifestyle to a more modern, urban and "westernised" type of lifestyle, which is also accompanied by a rapid progression between under and over nutrition. This particular trend has been detected not only in adults, but also in children within developing countries (Triches & Giugliani, 2005; Vorster *et al.*, 2011).

According to the World Health Organization (WHO), under nutrition in adults can be defined as a body mass index (BMI) of < 18.5 kg/m²; and in children it is classified according to z-scores as < -2 standard deviations of the mean for weight-for-age and height-for-age. Overweight on the other hand in adults is defined as a BMI between 25 and 30 kg/m² and obesity as a BMI of ≥ 30 kg/m². In children being overweight is defined as ≥ 2 standard deviations of the median for weight-for-age as well as BMI-for-age and for obesity as ≥ 3 standard deviations of the median for weight-for-age as well as BMI-for-age (Cole *et al.*, 2000; Chowdhury *et al.*, 2007; WHO, 2009a).

This profound transition between under and over nutrition is characterized by a quadruple burden of communicable, non-communicable, prenatal and maternal, and injury-related disorders in both urban and

rural areas of South Africa. The WHO estimates the burden of non-communicable diseases (NCDs) in South Africa as being two to three times higher than that in developed countries (WHO, 2008a). The burden of disease related to NCDs (including cardiovascular disease, type 2 diabetes, cancer, chronic lung disease and depression) is predicted to increase substantially in South Africa over the next few decades if drastic measures are not taken to combat this particular trend. This trend has become even more apparent since the public health sector started to accelerate their roll-out of highly active antiretroviral therapy (HAART), which in turn has led to a decrease in deaths from Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) and tuberculosis (Jahn *et al.*, 2008; Mayosi *et al*., 2009; Reniers *et al.*, 2009) and an increase in metabolic syndrome (lipodystrophy/lipoatrophy; dyslipideamia; type 2 diabetes mellitus and insulin resistance), which are also associated with an increased risk for cardiovascular disease (Barbaro, 2006).

Tobacco use, physical inactivity, unhealthy dietary behaviour and obesity are some of the common risk factors for NCDs such as obesity, cardiovascular disease, type 2 diabetes mellitus and cancer (Triches & Giugliani, 2005; MRC, 2007; Norman *et al.*, 2007). The South African adult population has high levels of these risk factors and, therefore, large proportions of this burden could be attributed to these lifestyle risk factors (Triches & Giugliani, 2005; MRC, 2007; Norman *et al.*, 2007).

If the focus is shifted even further towards childhood obesity in particular, an interesting observation was made by the Health of the Nation study (2006) which showed that South African children have similar values for being overweight and obese as children in the United States during the time period between 1976 and 1980. Reason for concern then develops, because if the same increasing pattern for being overweight and or being obese follows (as was observed between 1988 and 1994 in the United States), it can be expected that 24% of South African children will have a BMI of more than 25 kg/m² in less than a decade (Armstrong *et al*., 2006). This in itself is again very disturbing, since childhood obesity is also an important predictor for adulthood obesity. The Health of the Nation study (n=10 195 primary school children between the ages 6 to 13 years from five South African provinces) showed that the prevalence for obesity for boys (n=5611) was 3.2% and for girls (n=4584) 4.9%, whereas the prevalence for being overweight for boys was 14.0% and for girls 17.9% (Armstrong *et al*., 2006).

In South Africa where under nutrition, poverty, HIV/AIDS and other infectious diseases form part of the bigger reality, obesity (including childhood obesity) seems to be of less concern (Joubert *et al.*, 2007). However, increasing health costs, both at state level and the private sector have moved obesity up on the priority list of health concerns of South Africans, both in adults as well as children (Joubert *et al.*, 2007).

There is a significant effect on the physical and psychological health and development of children due to the impact of being overweight or obese (Dehghan *et al.*, 2005). In the long term possible health risks include the following: hyperlipidaemia; hypertension; glucose intolerance; an increased risk for cardiovascular and digestive disease during adulthood; type 2 diabetes mellitus, infertility, as well as psychological disorders such as depression (Dehghan *et al.*, 2005). Again, this could lead to an even further increase in the financial burden of NCDs in the South African health context.

Proper insight into the extent of and risk factors for NCDs in the South-African context, with specific reference to obesity, particular childhood obesity, is necessary in order to apply effective advocacy and action steps (Mayosi *et al.*, 2009).

1.2 APPROACH TO THE PROBLEM

Though the aetiology for obesity is extraordinarily complex; an interaction of biological and psychological factors (together with a notably strong environmental and cultural contribution) provides for the most complete and basic explanatory overview. This interaction of contributing factors does indeed differ from the type as well as the extent in which these factors present within different age groups, as well as between different age groups (EUFIC, 2005). This, therefore, means that the type and extent of contributing factors for adulthood obesity may indeed differ from the type and extent of contributing factors for childhood obesity, but also for within a particular age group.

Children's eating and physical activity behaviour as well as their *attitude* towards such behaviour is influenced by various factors by various degrees and combinations. Possible influential factors (both externally and internally) that all play a determining role in *attitude* formulation and, therefore, behaviour; include nutrition knowledge, physiological needs, body image, personal experience, intrapersonal behaviour (food and taste preference), gender, self-efficacy, age, peer pressure, social norms, parental behaviour, the media, fast foods, cultural factors, food availability and accessibility, and the type of school nutritional education (Pirouznia, 2001; Reinehr *et al.*, 2003; Reinaerts *et al.*, 2007).

Attitude refers to the general feeling (which could vary from positive to negative) or evaluation (good to bad) a person has towards him/herself, other individuals, objects or actions (Edwards & Louw, 1998). *Attitude* towards certain behaviour, objects or individuals in general have the following properties: i.) it will have a relatively stable and lasting impression such as certain individual personal traits; and ii.) it is an evaluation, meaning whether a person's perception is good or bad, negative or positive; which finally directs an individual's behaviour (Edwards & Louw, 1998). *Attitude* and beliefs can and do change; it is suggested that

if beliefs ("perception") of dietary and physical activity behaviour can be altered, *attitudes* regarding such behaviour become more favourable and, therefore, the contingency of behaviour modification increases (EUFIC, 2005).

There are three bases for *attitude* change namely compliance, identification and internalization. Compliance refers to behaviour modification based on risks and consequences; therefore the focus is not necessarily on current beliefs, but rather the outcome of behaviour modification (Edwards & Louw, 1998). If one applies this to the current study it means that an individual might evaluate his/her own healthy eating and physical activity behaviour, which in turn might lead to a change within *attitude* and actual behaviour with regard to food choices and physical activity. Identification explains an individual's belief or reason for behaviour modification in terms of their need to be similar to those individuals they like and admire (Edwards & Louw, 1998). Within the current sub-study, one of the study objectives was to determine motivational factors and/or barriers which play a role in children's current beliefs/*attitude* towards healthy eating and physical activity behaviour. For example, the possible influence of the parents' and peer's beliefs and behaviour has on the child's current *attitude*/beliefs and behaviour will be examined. Internalization refers to change in belief and affect when one finds the content of the *attitude* to be intrinsically rewarding, therefore leading to actual change in belief or evaluation towards the *attitude* object (Edwards & Louw, 1998). Therefore, using internalization provides and idealistically leads to internal evaluation of participating children's own current knowledge and behaviour, and how it, therefore, can improve towards more ideal behaviour.

Primary prevention of childhood obesity may in broad thus involve changing dietary habits and food choices as well as increasing energy expenditure by changing physical activity behaviour of children. This already has formed the basic components of many past, but also in terms of future planned childhood obesity prevention programmes (Epstein *et al.*, 2001). A systematic review that was compiled and based on all school-based nutrition intervention studies that were globally performed during the time period 1995 to 2006 has indicated significant progress with regard to participating children's nutritional behaviour (Steyn *et al.*, 2009).

The South African food-based dietary guidelines (SAFBDG) were designed and implemented in 2001 as a tool for nutritionists and dieticians to educate the public on healthy eating (Vorster *et al*., 2001). Food-based dietary guidelines messages accompanied by a food guide and appropriate education material are being designed and used world-wide to educate populations on healthy eating and thereby ensure adequate nutrition but also to lower the risk of diet-related NCDs. They are also easier to understand and conceptualize by the general public than nutrients and quantities of nutrients (FAO/WHO, 1998).

Since there was at the time limited data available in South Africa on nutrition education intervention programmes amongst school-aged children aimed at increasing nutritional knowledge and improving healthy eating to ultimately prevent childhood obesity, a unique nutrition education intervention programme (NEIP) was developed by Kruger (2007), based on the SAFBDGs and presented in the format of a musical play. As far as we are aware this is the first SAFBDG-based NEIP and one of few in the world. Furthermore, since there is paucity in the literature also on the influence of a NEIP on the *attitude* towards healthy eating, unhealthy eating, and physical activity amongst primary school children, the results of this study will add to the existing data in this field. This study will also add new insights into possible barriers and motivational factors that could play a role in the success of future NEIPs aimed at facilitating positive change in the *attitude* of primary school children towards healthy eating, unhealthy eating, and physical activity.

This study, therefore, *aimed to explore and describe* the *attitude* of a specific group of primary school children towards healthy eating, unhealthy eating and physical activity before and after a NEIP. Secondly, it aimed to identify possible barriers and/or motivational factors in terms of their *attitude* towards healthy eating, unhealthy eating and physical activity.

1.3 STUDY DESIGN

This sub-study was part of a main study (Figure 1.1) in which a musical play based on the SAFBDG was developed (Kruger, 2007) and implemented amongst primary school children to increase their nutritional knowledge. Two M.Sc students (Ms. K. Kruger and Ms. M. Harris) participated in the main study; each having a different study focus as part of their master's degrees.

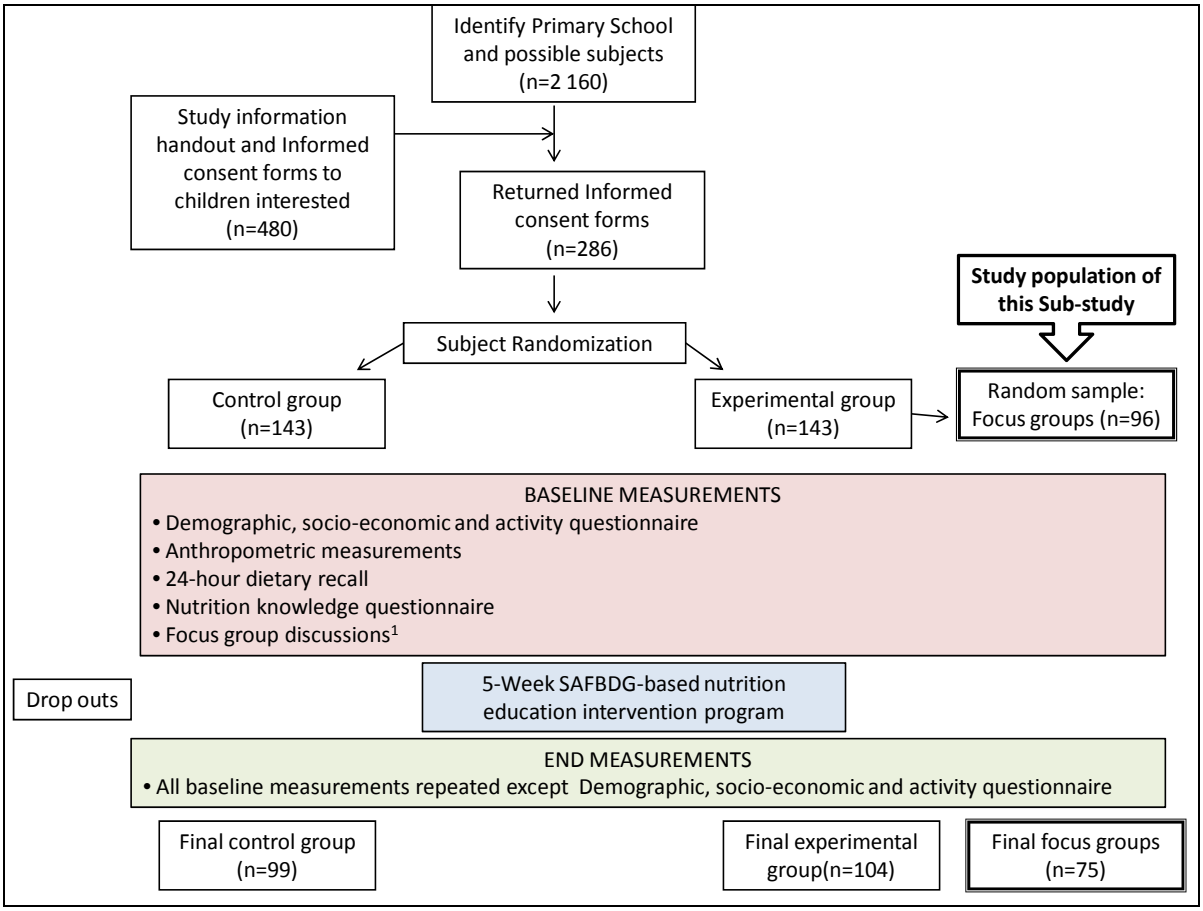

Figure 1.1 Schematic overview of the study design of the main study

1.3.1 Aim of this dissertation:

To explore and describe the *attitude* of a specific group of primary school children (aged 6-12 years) towards healthy eating, unhealthy eating and physical activity before and after a NEIP as well as the standard school-curriculum. Secondly, it was aimed to identify possible barriers and/or motivational factors in terms of their *attitude* towards healthy eating, unhealthy eating and physical activity

1.3.2 Objectives:

- *to describe attitude* towards healthy eating, unhealthy eating and physical activity before and after a SAFBDG-based NEIP and the standard school curriculum,
- *to explore* motivational factors towards healthy eating, unhealthy eating, and physical activity, and
- *to explore* possible barriers towards healthy eating, unhealthy eating, and physical activity.

1.3.3 Hypothesis:

In this objective-driven study it is hypothesized that the attitude of children, who are exposed to the standard school-curriculum and a unique NEIP, will positively change toward healthy eating and physical activity and negatively towards unhealthy eating over a period of time.

1.3.4 Concept clarification:

For the purpose of this study *attitude* refers to the positive or negative feeling or evaluation children have towards healthy eating, unhealthy eating and physical activity (Edwards & Louw, 1998).

1.4 SIGNIFICANCE OF THE STUDY

The main study will be the first of its kind in South-Africa and one of few in the world using food-based dietary guidelines as the study material for nutrition education amongst primary school children. Additionally, the use of music and dance to help in the transfer of nutritional knowledge is unique.

Since there is paucity in the literature on the influence of a NEIP on the *attitude* towards healthy eating, unhealthy eating, and physical activity amongst school-aged children, as well as in possible barriers and motivational factors that could play a role in the success of NEIPs aimed at facilitating positive change in the *attitude* of school-aged children towards healthy eating, unhealthy eating, and physical activity, the results of this study will give valuable insights into these factors and add to the existing data in this field.

1.5 OUTLINE OF THIS DISSERTATION

Chapter 1 gives background information to the research problem and the aims and objectives of this dissertation are described.

Chapter 2 provides a literature review on the relevant aspects concerning childhood obesity; with special reference to a definition of childhood obesity, the prevalence of childhood obesity, health consequences of obesity during childhood, previous research interventions aimed at childhood obesity (with specific reference to the role of attitude and actual behaviour), success factors of previous childhood obesity prevention studies, as well as factors that seem to have an influence on children's *attitude* (positive and/or negative) and behaviour towards healthy eating and physical activity.

Chapter 3 outlines the methodology of the main study with a more in-depth description of this sub-study's methodology, as well as problems encountered in this sub-study and study limitations.

Chapter 4 presents the results from socio-demographic and physical activity behaviour questionnaire, as well as focus group discussions.

In Chapter 5 an overall discussion, conclusion and recommendations for future research are outlined.

CHAPTER 2: LITERATURE REVIEW

2.1 DEFINITION OF CHILDHOOD OBESITY

A simple definition of obesity would be an excess of body fat (Dehghan *et al*., 2005), or a persistent positive energy balance (Wardle, 2005).

Another definition that is used for obesity by the WHO (WHO, 2008b) is the excessive build-up of adipose tissue that could negatively influence the health of an individual.

In adults, adiposity is assessed by using the BMI; weight/height² - kg/m²; also known as Quetelet's index, which can be defined as body mass in kilogram divided by height in metre squared. Adults with a BMI between 24.9 and 29.9kg/m² are classified as being overweight and a BMI of over 30kg /m² as obese (Centres for Disease Control and Prevention, 2008).

The Centre for Disease Control and Prevention defines overweight for children as at or above the 95th percentile of BMI for age and being at risk for overweight between the 85th and 95th percentile for BMI for age (Cole *et al*., 2000).

European researchers classify overweight for children at or above the 85th percentile and obesity as at or above the 95th percentile for BMI (Dehghan *et al*., 2005).

If z-scores are used to classify children as either overweight or obese, childhood overweight is classified as ≥ 2 standard deviations of the median for weight-for-age as well as BMI for age and childhood obesity as ≥ 3 standard deviations of the mean for weight-for-age as well as BMI for age (Cole *et al*., 2000; WHO, 2009a).

2.2 PREVALENCE OF OBESITY AMONGST CHILDREN

The prevalence of childhood obesity in developed countries is observed to be very high, for example in the United States 25% of children are overweight and 11% are obese, though there is a definite increase in developing countries as well, due to an increase in westernisation, urbanisation and mechanisation (Swinburn *et al.*, 2004; Dehghan *et al*., 2005; Kruger *et al*., 2005; Flynn *et* al., 2006; Salmon *et al*., 2005).
In a study across 34 countries (mostly developed countries), large variations (overweight [5.1 – 25.4%]; obese [0.4 – 7.0%]) were found in the prevalence of obesity amongst school-aged children (10 – 16 years) (Janssen *et al*., 2005). The following three countries presented the highest and lowest prevalence of obesity

amongst school-aged children within the 2001/2002 Healthy behaviour in School-aged Children study: Malta (25.4%), United States (25.1%) and Wales (21.2%) versus Lithuania (5.1% and 0.4%), Russia (5.9% and 0.6%) and Latvia (5.9% and 0.5%) respectively (Janssen *et al*., 2005).

After adjusting rates according to South African demographics, Armstrong and co-workers (2006) reported that the prevalence of obesity amongst South African children (between the ages of 6-13 years) was 2.4% for boys and 4.8% for girls; and for being overweight it was 10.9% for boys and 17.5% for girls. An interesting observation that was also made showed that the prevalence of overweight and obesity for black girls increased between the ages from 6 to 13 years from 12 to 22%, and decreased for White girls between the ages of 6 to 13 years from 25 to 15% (Armstrong, 2006).

From the THUSA BANA study (Kruger *et al*., 2005) that was done in the North West Province of South Africa on school children between the ages of 10 to 15 years, it was concluded that the highest prevalence for obesity/overweight presented in White children (14.2%) in comparison to black (7.1%), Indian (6.4%) and coloured (2.9%) children. The prevalence rate was twice as high in girls; it was also higher and more apparent in urban areas, smaller households as well as high and low income households. The prevalence of overweight/obesity corresponds with the results found in the South African National Food Consumption Survey (NFCS) (Labadarios *et al*., 2000) – the prevalence of overweight children between the ages of 1-9 years was higher in all urban areas (7.5%) than the national average (6 %).

2.3 CAUSES OF CHILDHOOD OBESITY

Various mechanisms have been proposed on the development of obesity, but according to Wardle (2005), there are mainly two contributing factors in the development of childhood obesity (though very unique and individually variable) namely: 1.) inherited bio-behavioural tendencies (genetic causes), and 2.) environmental influences on children's dietary and physical activity behaviour. These two main areas will now be discussed in more detail under points 2.3.1, 2.3.2 and 2.3.3.

2.3.1 Genetic, prenatal and early life factors contributing to childhood obesity

Single genetic defects account for only a small part of human obesity. The predisposition to obesity seems to be caused by the complex interaction of at least 250 obesity-associated genes and potentially prenatal factors (Ebbeling *et al*., 2002).

According to Whitaker and Dietz's hypothesis (1998), prenatal over nutrition (maternal obesity can increase the transport of nutrients across the placenta, which in turn leads to a change in appetite, neuro-endocrine functioning and energy metabolism) might affect the possible risk for lifelong obesity. On the other hand, prenatal under nutrition, according to Barker's hypothesis, influences during early development such as intrauterine life could result in permanent changes with regard to physiology and metabolism that result in increased disease risk during adulthood. During periods of maternal under nutrition the fetus reduces insulin secretion and increases peripheral insulin resistance; thus if nutrient availability would be abundant in postnatal life, that would explain why thin babies would become overweight during childhood (Godfrey & Barker, 2001; De Boo & Harding, 2006).

Another potential route through which genetics can contribute towards adiposity is through behaviour. Behaviour genetic research has shown that many behavioural, emotional and cognitive traits are highly inheritable. Given that eating and activity are fundamental in the outcome of energy balance, it is plausible that they could form part of the steps or development from genes to adiposity (Wardle, 2005).

Children, who are bottle fed, also seem to be more at risk for obesity later in childhood than those who are breastfed. Possible explanation for this particular factor can either be related to permanent physiological changes caused by some intrinsic factor which is unique to breast milk; or the locus of control over feeding rate and taste preference (Von Kries *et al*., 1999; Gillman *et al*., 2001).

One other possible contributing factor which still remains debatable is that individuals who have an early adiposity rebound have an increased risk for obesity later in life. Adiposity rebound refers to the second rise in the BMI (BMI *nadir)* that occurs between the ages of 5 and 7 years (Freedman *et al*., 2001; Dietz, 2000).

2.3.2 Environmental causes for childhood obesity

In Table 2.1 factors that could possibly influence children's dietary and physical activity behaviour and, therefore, lead to an increase risk for the development of childhood obesity (increased dietary intake and decreased physical activity equals increased risk for development of childhood obesity) are summarised.

Table 2.1 Factors that could influence children's dietary and physical activity behaviour, directly and or indirectly (adapted from Doak *et al*., 2006)

Potential influential factors Indirect influence on children's dietary and physical activity behaviour	**Potential influence:**
<u>International factors</u>	
Market globalisation: more convenience foods, sedentary entertainment	Influence on food choices (healthy food versus unhealthy foods) and decreasing the amount of time spent on physical activity.
Food marketing towards children (Role of the media).	Influence on food choices (healthy versus unhealthy food choices).
Children's ability to spend money	Influence on dietary intake (the amount and type of food that are bought).
<u>National factors</u>	
Urbanisation: increased fast food intake and use of public transport.	Influence on food choices (healthy food versus unhealthy food choices) and decreasing physical activity.
Manufactured/imported goods: more convenience foods, sedentary entertainment.	Influence on food choices (healthy versus unhealthy foods) and decreasing the amount of time spent on physical activities.
Health: policies and or treatment strategies	Influence on the type of preventative or treatment strategies that could be planned and implemented with regard to health related issues.

Table 2.1 Factors that could influence children's dietary and physical activity behaviour, directly and or indirectly (adapted from Doak *et al*., 2006) (continue)

Potential influential factors Indirect influence on children's dietary and physical activity behaviour	**Potential influence:**
National factors (continue)	
National education: nutrition and physical activity policies, e.g. physical charter.	
Vending machines: easy fast food availability.	Influence on food choices (healthy versus unhealthy food choices) and a potential increase in energy intake.
Media and culture: Food marketing, especially fast foods, type and preparation of consumed within certain cultural backgrounds.	Influence on food choices (healthy versus unhealthy food choices, as well as amount due to bigger portion sizes of fast food meals).
Economy: influence on household budget/expenditure on food, petrol price	Potential influence on both dietary intake (type and amount of food bought and therefore consumed) and physical activity (driving with a car, using public transport or walking or cycling.
Community/Locality factors	
School buses: thus fewer children walk or cycle to school.	↓ physical activity.
Community awareness or *attitudes*: influence on children's *attitude* regarding healthy eating and physical activity	
Community sports and recreational facilities: availability.	↑ or ↓ physical activity.
Agriculture/vegetable gardens: the availability of vegetables, as well as therefore the amount included into the diet.	↑ or ↓ vegetable intake (can either be positive or negative, depending on whether it is included into the diet or not).

Table 2.1 Factors that could influence children's dietary and physical activity behaviour, directly and or indirectly (adapted from Doak *et al*., 2006) (continue)

Potential influential factors Indirect influence on children's dietary and physical activity behaviour	**Influence on dietary and / or physical activity behaviour**
Community/Locality factors (continue)	
Local markets: availability of food (both variety and amount)	↑ or ↓ food and energy intake (the amount and type of food bought and consumed).
Median income of community: influence on household income	↑ or ↓ food and energy intake (the amount and type of food bought and consumed).
School factors	
Physical activity at school – time and space, physical education, playground	↑ or ↓ physical activity.
Transport to and from school to home.	↓ physical activity.
Teacher's knowledge and *attitudes*: influence on children's knowledge and *attitudes*.	↑ or ↓ food and energy intake (depending also on food choices and preferences) or physical activity.
Lunch breaks: amount and type of lunch boxes sent to school with children.	↑ or ↓ food and energy intake.
School snack shops: type of food available and how frequently children buy food at their school snack shop.	↑ or ↓ food and energy intake.
Education regarding physical activity and dietary intake: influence on nutritional knowledge and attitude of children.	↑ or ↓ dietary intake and physical activity.
Peer pressure: can influence self-esteem and confidence, dietary choices and physical activity participation.	Influence food choices and physical activity participation.

Table 2.1 Factors that could influence children's dietary and physical activity behaviour, directly and or indirectly (adapted from Doak *et al*., 2006) (continue)

Potential influential factors Indirect influence on children's dietary and physical activity behaviour	**Influence on dietary and / or physical activity behaviour**
Home factors	
Family dietary and physical activity patterns: influences on children's dietary and physical activity patterns.	↑ or ↓ food and energy intake (type of food choices) and physical activity.
Amount of televisions and television viewing: increase sedentary behaviour, food advertisements.	↑ food and energy intake and ↓ lower physical activity.
Socio-economic status: Means of transport and monthly budget spent on food.	↑ or ↓ food and energy intake (types of food choices) and physical activity.
Parent knowledge and *attitudes*: influence on children's knowledge and *attitudes*.	↑ or ↓ food and energy intake (types of food choices) and physical activity.
Individual factors	
Children's dietary and physical activity pattern within and outside the school environment, nutrition knowledge, *attitude* and body image.	↑ or ↓ risk to develop childhood obesity.

Dietary behaviour, as well as physical activity and sedentary behaviour can be influenced by various factor as highlighted in Table 2.1, some of the influential factors will now be discussed in more detail under points 2.3.2.1 to 2.3.2.3, also to the degree in which these factors can influence the *attitude* of children with regard to dietary and physical activity behaviour.

2.3.2.1 The role of *attitude* in behaviour

Attitude can be defined as the positive or negative evaluation an individual make regarding his or her environment (this can include for e.g. people, objects, ideas, and activities). An individual can also be conflicted regarding a certain item in question, thus an individual can have both positive and negative *attitudes* regarding a certain item in question at the same time. *Attitude* and beliefs can and do change over time (Edwards & Louw, 1998). There are three bases for *attitude change* namely compliance, identification and internalization (as described in Chapter 1).

There are different behaviour modification theories, but the so called *Knowledge-Attitude-Behaviour* (KAB) model suggests that knowledge (education) leads to a greater awareness and *attitude change* which is a prerequisite of intentional performance of health related-behaviours, therefore, thus if nutrition knowledge is increased, behaviour changes may occur due to *positive attitude changes* (Lin *et al*., 2007). According to Leiserowitz and co-researchers (2004), this particular behaviour modification theory model has two major barriers, it does not take the following into consideration: i.) individual capability, which includes lack of specific skills; illiteracy; low social status; lack of resources, empowerment, habit and routine; and ii.) external constraints, such as lack of choices; costs; laws and regulations; available technologies; social norms and expectations; social, economic and political contexts (NOO, 2011).

Other theories that could possibly explain behaviour modification in terms of lifestyle (dietary and physical activity behaviour) modification, include the following: i.) theory of reasoned action and planned behaviour, ii.) social cognitive theory; and iii.) the health belief model (EUFIC, 2005). The theory of reasoned action and planned behaviour stated that behaviour is determined by an individual's intention to perform it. This particular intention is influenced by 1.) *attitude* (*attitude* toward the ideal behaviour), and 2.) subjective norms about the behaviour (judgement of other important people's *attitud*e/feeling with regard to the ideal behaviour). The social cognitive theory states that behaviour is determined by an individual's 1.) self-efficacy or belief that he or she has the ability/skills to perform the ideal behaviour, and 2.) motivation for performing the ideal behaviour. The health belief model states that behaviour is influenced by 1.) a feeling of being personally threatened by a disease, and 2.) a belief that the benefits of adopting the ideal behaviour outweigh the perceived costs.

2.3.2.2 Dietary behaviour

Poor dietary behaviour can be directly linked to the high intake of unhealthy foods and snacks and is, therefore, seen as one of the main risk factors for the development of childhood obesity (Swinburn *et al*., 2004). The mere increase in physical activity seems not enough to counteract the effect and associated health risks of following an energy dense and poor nutritive diet. It takes on average about 1 to 2 hours for children of vigorous activity to counteract the effect of a fast food meal with an energy density of >3297kJ (Styne, 2005). It is, therefore, important to take into consideration all the different influential or contributing factors (both externally and internally) involved in children's *attitude* formulation regarding dietary behaviour and food choices in order to identify possible *barriers to and motivators for* healthy eating.

Children's eating *attitude's* and dietary behaviour (both healthy and unhealthy) can either be related to the lack of appropriate nutrition knowledge (Triches & Giugliani, 2005) or poor implementation of it (Dehghan

et al., 2005; Kruger *et al*., 2005); but partly also due to the influence of other contributing factors such as physiological needs, body image, personal experience, intrapersonal behaviour (food and taste preference), gender, self-efficacy, age, peer pressure, social norms, parental behaviour, the media, fast food consumption, cultural factors, food availability and accessibility, and the type of school nutritional education (Pirouznia, 2001; Reinehr *et al.*, 2003; Reinaerts *et al.*, 2007). These particular factors can play a determining role in *attitude* formulation and also change within *attitude* for children with regard to both dietary and physical activity behaviour

i. Energy density and macronutrient content of food

Currently there is no evidence that links the energy density of a food or diet with being overweight or obese amongst children. This could possibly be due to the type of measurements used to evaluate body composition in children such as the BMI and waist circumference but could also be due to the misreporting of snack occasions by children, as well as children's self-definition or perception of what exactly a snack is (Mathesen *et* al., 2006; Mendoza *et al*., 2006). An association between energy density and overweight or obesity amongst adults has, however, been shown in large cross sectional studies (Mathesen *et* al., 2006; Mendoza *et al*., 2006).

Fat is an energy dense macronutrient, therefore, the excessive intake of it is often believed to cause weight gain (Jequier, 2001), but some epidemiological studies do not consistently show direct association between dietary fat intake and childhood obesity (Ludwig *et* al., 1999; Atkin & Davies, 2000). The type of dietary fat seems to be more important with regard to obesity related diseases (Moussavi *et al*., 2008).

Refined carbohydrates also contribute substantially to the energy density of foods, such as breads, ready to eat cereals, potatoes, soft drinks, cakes and biscuits. It has also been shown that when people try to lower their dietary fat intake they often increase their carbohydrate consumption which includes refined carbohydrates (Subar *et* al., 1998; Cavadini *et al*., 2000). A diet that contains a lot of high glycemic index foods induces a sequence of hormonal events that stimulate hunger and cause overeating in adolescents. Although a high glycemic index diet has been linked with risk for central adiposity (Toeller *et al*., 2001), the importance of the glycemic index in the cause of obesity has not been substantiated in long-term clinical trials (Ebbeling *et al*., 2002).

ii. Amount of food eaten

It seems as children grow older, they tend to become less responsive to internal hunger and satiety cues and become more reactive to environmental stimuli (Ebbeling *et al*., 2002; Ello-Martin *et al*., 2005). The age at which external cues (such as portion size) begins to influence an individual's food intake seem to be around five years. In a study where children of 3 years were served different portion sizes of macaroni and cheese on three different occasions, they consumed similar amounts at each meal, suggesting that children at this age still respond to physiologic cues for hunger and satiety. On the other hand when different portions of macaroni and cheese were served to five year old children they consumed most of the portion size presented to them, therefore significantly increasing their energy intake. This response occurred even when their hunger did not differ at the start of the meals (Rolls *et al*., 2000). According to one particular study, it was reported that children preferred larger than the recommended portion size of French fries, meats and potato chips and smaller than the recommended portions size of vegetables. Therefore, the netto effect of these combined effects will lead to an increase in total energy intake over the course of the day, poorer diet quality and, therefore, can be a significant contributor to obesity (Colapinto *et al*., 2007).

According to a study by Temple *et al.* (2007), television watching can lead to increase energy intake if children focus on the program they are watching, have access to food but are not focusing on how much they are eating, they eat much more compared to when they watch the same program repeatedly and have access to food. Then they focus more on what they are eating and also eat less.

iii. Sugar-sweetened beverage consumption

The consumption of sugar-sweetened beverages is considered a risk factor for weight gain and obesity when consumed consistently over a long period of time in both children and adults. In a cross-sectional study (Harnack *et al*., 1999) it was shown that total daily energy intake amongst school aged children who consumed soft drinks against those who did not, was ~10% greater. In a later systematic review (Malik *et al*., 2006) on the association between sugar-sweetened drinks and weight gain (15 cross-sectional, 10 prospective cohort and 5 experimental studies) a positive association between sugar-sweetened drinks and weight gain was revealed, especially in the bigger cross-sectional studies. Additionally, in three of the prospective studies a significant association was found between an increase in sugary soft drinks and weight gain, as well as risk of obesity in children and adults. It is proposed that sugar-sweetened soft drinks promote energy intake and excessive weight gain because of their high glycemic index (Ludwig *et al*., 2001) and/or because the compensation of energy consumed in liquid form is less satisfying than in solid form (Ludwig *et al*., 2001; Drewnowski & Bellisle, 2007). The evidence on sugar-sweetened soft drinks and possible weight gain,

therefore, seems to be consistent and moderately strong, and is of most relevance in population groups with a high intake, like children (Swinburn *et al*., 2004).

The recommended amount for sweetened cool drinks, such as carbonated cool drinks for South Africans, that was adapted from the SAFBG and United States of America (USA) Beverage Guidance Panel (2006) is no more than 240 ml per day (approximately one standard cup). These types of drinks should be limited by diabetics, inactive and overweight adults and children (NICUS, 2010).

iii. Fast food consumption and marketing of food (the media)

Fast foods can be defined as convenience foods obtained in self-service or take away eateries with minimal waiting and are usually characterized as energy dense, low in micronutrients and fibre, high in simple sugars and salt, generally larger in portion size than conventional home-cooked or restaurant foods and highly palatable (Feeley *et al*.,2009; Van Zyl *et al*., 2010).

Television marketing plays an important role in fast food consumption for both adults and children. A cross-sectional study done in 2005 in the US showed that during a 27.5 hour television time-slot on a Saturday morning broadcasting children's programmes, 49 % of the advertisements were of food. The most commonly advertised foods included ready-to-eat cereals and cereal bars (27%), popular restaurants (19%) and snack foods (18%). Ninety one percent of food advertisements (9 out of 10 food advertisements) were of food high in fat, sodium, added sugars and low in nutrient value (Batada *et al*., 2008). South African children on the other hand seem to be relatively safe with regard to their exposure to food advertisements on television. On South African Broadcasting Channel SABC 2 and SABC 1, two of the public broadcast channels on South African television, 49.5 hours of all programming content showed no food advertisements on SABC 2 and 16.9% on SABC 1. Of these food advertisements 42% were of relatively good nutritional value (Cassim, 2010). The International Obesity Taskforce (IOTF) is promoting global action on commercial marketing to children by means of two complementary initiatives. A first set of recommendations on the marketing of food and beverages to children, as well as a set of guidelines for national and trans-national action to reduce commercial promotions substantially that target children were developed by the IOTF Working Group. The first draft of this set of principles was launched during September 2006 at the International Congress on Obesity in Sydney and a second draft of these Sydney Principles was developed during November 2006 to April 2007 (summarized by Anon, 2009).

There is paucity in the literature on South African fast food consumption; especially for children. According to the Birth to Twenty cohort study, fast food intake and frequency at which fast food outlets are visited is

very high amongst young (~18 yrs) black South Africans (Feeley *et al*., 2009). The fast food intake for men and women ranged widely from 0 to 23 times a week, with the mean amount of fast food intake significantly higher for males than females, but the amount of visits per week to a fast food outlet was less for males than females. There was also no difference between the amount of visits during term-time and school holidays (Feeley *et al*., 2009).

According to a descriptive, cross-sectional study (Van Zyl *et al*., 2010), that was performed in different socio-economic areas in Johannesburg amongst young working adults (n=341, 19 to 30 years), fast food intake appears to be very common. The three main reasons for choosing fast foods included time limitations (58.9%), convenience (58.2%), and taste (52.5%).

iv. Fruit and vegetable intake

A*ttitude* towards fruit and vegetable intake forms an important part of children's healthy eating behaviour. A review by Campbell and Crawford (2001) concluded that consumption of fruit and vegetable intake can be correlated to accessibility, availability and exposure to a wide range of fruit and vegetables in the home environment. It seems that the fruit and vegetable intake of children is also influenced by psychosocial factors, such as intrapersonal (food preference), social (family eating habits, peer normative beliefs and encouragement) and cultural (culture is often expressed through food) factors (Reinaerts *et al*., 2007). *Positive attitudes* have been related to children's fruit and vegetable intake, as well as preference. Taste preference according to a review done by Blanchette and Brug (2005), is probably the most important personal determinant for fruit and vegetable consumption. Other factors that also seem to play a role are parental behaviour and habit.

Habit is one of the strongest predictors for both fruit and vegetable consumption, especially more so for boys than girls and also more for fruit consumption than vegetable consumption. The reason for the last mentioned is that vegetable intake is often a topic of argument in many households, where children are forced by parents to eat their vegetables (Reinaerts *et al*., 2007). A study by Wardle (2005) though, showed that exposure to a particular vegetable for as little as a fortnight can increase a child's preference for that particular vegetable. Taste, according to Birch and Fisher (1998), is also not only mediated by preference, but also by repeated exposure. It takes between 5-10 times repeated exposure to increase greater intake.

v. Taste, food preferences and peer pressure

In general children seem to prefer food that is less healthy (low dietary quality), which can cause energy imbalances (positive energy balance), which over a short period of time can lead to weight gain and in the long term childhood obesity (Ludwig *et al*., 2001; Cooke & Wardle, 2005; Schumacher, 2006).

Negative food changes with regard to food preferences and taste seem to occur around the age of 10 years and, therefore, any attempt to change these preferences should be established before then (McKinley *et al*., 2005).

In one particular study it was indicated that friends and peers form a large influence on what adolescents choose to eat (Contento *et al*., 2006). Others have, however, shown that peer pressure plays a smaller role in children and adolescent's *attitude* towards healthy and unhealthy food choices (Kaye *et al.*, 2011; Dammann & Smith, 2010). Thus it seems that peer pressure may or may not be a barrier to healthy eating and should be addressed in each unique setting accordingly.

vi. Nutrition knowledge

Though nutrition knowledge depends on age and type of school education, similar findings for nutrition knowledge have initially been found for both obese and non-obese children. There was no significant correlation between gender and nutrition knowledge, but a significant correlation between increasing age and nutrition knowledge (Reinehr *et al*., 2003).

Though, within a more recent study (Triches & Giugliani, 2005), it was reported that the nutrition knowledge of obese children was greater than non-obese children, probably because they are more interested in this type of information due to their condition. However, this increase in nutritional knowledge does not seem to have an effect on their weight as no effect on BMI outcome was shown.
In South Africa there is little published data on children's nutrition knowledge.

A study conducted in a rural public school in QwaQwa, Free State to determine the nutrition knowledge and the nutrition status of primary school children (n=142, mean age 11.2 years) found that most children had an average knowledge on basic nutrition, the main gap being the role of various food groups in the diet (Oldewage-Theron & Egal, 2010).

Research suggests that when nutrition education increases nutrition knowledge, *attitude* change and behaviour modification can occur (Shariff *et al*., 2008). Within a particular randomized, control intervention (nutrition education) study (Malaysia, 2008), 335 children from four primary schools were recruited and either assigned to a control or intervention group. The main objective of this study was to determine the changes in knowledge, *attitude* and dietary practices after a nutrition intervention. There were significant changes ($p < 0.001$) in terms of the post intervention means scores for knowledge ($F=17.72$, $p < 0.001$), *attitude* ($F=6.41$, $p < 0.05$) and behaviour ($F=15.49$, $p < 0.001$) in the intervention group. These changes were even maintained after adjusting for confounding factors (Shariff *et al*., 2008).

2.3.2.3 Physical and sedentary activity

A lack of physical activity or excessive inactivity (sedentary behaviour), specifically television watching, might be a contributing and or causing factor to childhood obesity in both girls and boys (Ebbeling *et al*., 2002). A cross-sectional study in South Carolina (Trost *et al.,* 2001) suggests that obese children in comparison to their non-obese counterparts spend less time in moderate and vigorous physical activity (at 5, 10 and 20 minutes, $p<0.05$). Similarly, a national representative cross-sectional study (Andersen *et al*., 1998) in the USA showed children who engaged less in vigorous physical activity or watched television more turned out to be the most overweight. Results from the American Framingham children's study (Proctor *et al*., 2003), indicated the amount of time spent watching television or playing video games is an important risk factor for developing excess body fat during childhood. This study showed that by the mean age of 11 years; children who watched three hours or more television per day had a mean sum of skin folds of 106.2 mm in comparison to mean sum of skin folds of 76.5 mm for the group of children who watched less than 1.75 hours per day ($p=0.007$). Lastly, a twelve year longitudinal study amongst 960 children (653 complete data on covariates) between the ages of 2 and 12 years showed that children (recruited from 10 designated hospitals around America) who are physically active and spend less time watching television are less likely to become overweight by the age of 12 years (O'Brien *et al.,* 2007). At least 25% of children in South Africa watch television for three or more hours daily (Steyn *et al*., 2009) which could pose as an important risk factor for becoming overweight or obese.

It is recommended by the USA Department of Agriculture and supported by the American Academy of Paediatrics as well as the Centres for Disease Control and Prevention that children and adolescents participate in $\geq$ 60 minutes of moderate activity most days of the week (Spear *et al.,* 2007). A health education intervention study amongst primary-school children (n=78) found a more positive *attitude* and a significantly higher score for intent to participate in physical activity after one year (Christodoulos *et al*., 2006).

Factors that may hamper physical activity amongst children and adolescents include the fact that a bigger portion of children do not participate in sport and are being transported to school, especially adolescent girls (Dehghan *et al*., 2005). According to Bennett (2007), children also living in an unsafe neighbourhood are less active than children living in a safe neighbourhood. Some parents also prefer that their children rather stay inside and watch television, because they can keep a better eye on their children while they continue with their household chores inside, compared to when they are outside playing (Dehghan *et al*., 2005).

In terms of the role of gender on *attitude* towards physical activity behaviour, boys display a more positive *attitude* towards physical activities that are challenging and have an element of risk, whereas girls showed more favourable *attitudes* towards physical activities emphasizing aesthetics (Folson-Mack, 1992; Hick *et al*., 2001; Koca *et al*., 2005). Children have shown to have a positive *attitude* towards physical activity and associate it with being healthy and leaner (Kaye *et al.,* 2010) and that unhealthy eating can be a barrier for being physically active. Another study that investigated the *attitude* of adolescents towards physical activity as well as perceived barriers and benefits found that overweight and obese adolescents showed lower sport participation and had a less positive *attitude* towards physical activity than normal weight adolescents (Deforche *et al*., 2006).

2.3.3 Most dominant influential environments with regard to children's *attitudes* and knowledge towards healthy eating and physical activity behaviour

The school and educational environment, as well as the home environment are the two most dominant environments that directly influence children's dietary and physical activity behaviour and therefore also preventative strategies aimed at childhood obesity.

2.3.3.1 The school and educational environment

The school environment play a key role in children's *attitude* and knowledge on healthy eating and physical activity and thus also in their dietary and physical activity behaviour. Factors to consider that make up the school environment and therefore the food availability and consumption at school include school tuck shops (type of food and drinks available), teacher's *attitude* and knowledge on physical activity and nutrition, the school curriculum on food and nutrition, the promotion and type of food brought along from home in lunchboxes, and the influences of peers.

The above mentioned, together with the physical activity environment, have a definite influence on obesity prevalence, but conclusive evidence is still lacking regarding which element/s is most important (Swinburn *et*

al., 2004; Naidoo *et al*., 2009). In South Africa, physical education as a subject also no longer exists since 1994, though it is a focus as part of the learning area of the subject Life Orientation (Du Toit *et al.*, 1997).

Over 30% of high school learners in the South African school environment indicated that they do not participate in physical education classes, less than 60% indicated that they participated in vigorous activity during the actual classes and only over a half of high school learners reported regular physical education classes. The engagement in physical activity for primary school children was reported to be even less (McVeigh *et al.,* 2004).

2.3.3.2 The home environment

The home and family environment is definitely the most important setting to shape children's *attitude* and behaviour towards physical activity and dietary behaviour, but very little is still known on specific home influences. The home environment as an intervention prevention setting is still very difficult to influence, because of the amount and heterogeneity of this particular environment (Swinburn *et* al., 2004; Reinaerts *et al.*, 2007).

The relationship between socio-economic status and obesity is very complex and widely varied from country to country with varying socio-economic levels (Wang, 2001). A systematic review of forty-five cross-sectional studies (measured the association between socio-economic status and adiposity in children [5-18 years] showed predominantly (42%) inverse associations between socio-economic status and adiposity in children. More research is needed with regard to the mechanisms through which parental social class influences childhood adiposity (Shrewsbury & Wardle, 2008). Two intervention studies, however, found that the socio-economic status of children did not have an impact on children's *attitude* or preferences towards physical activity (Neale *et al*., 1998; Baxter *et al*., 2000).

Parents play an important influential role in their children's dietary *attitude* and behaviour (food preferences and energy intake) by means of their own *attitudes* and behaviour as well as their child feeding practices (Scaglioni *et al*., 2008). Exerting excessive control over what and how much children eat, may indeed contribute to childhood overweight. According to the literature, there are two primary aspects of control, namely: restriction (restricting children's access to junk food and the total amount they eat in general) and pressure (pressure to eat more healthy food such as fruit and vegetables and to eat more in general) (Birch *et al*., 2001). Significant correlations have also been found between parents and their children's nutrition behaviour, such as food intake, eating motivations and body image (Scaglioni *et al*., 2008).

It, therefore, seems that positive parental role modelling seems to be a better method than dietary control in order to improve children's dietary behaviour (Scaglioni *et al*., 2008).

2.4 HEALTH RISKS THAT ARE ASSOCIATED WITH CHILDHOOD OBESITY

The same health risks that are associated with adult obesity can be associated with childhood obesity, which include hypertension, dyslipideamia, chronic inflammation, increased risk for arthrosclerosis and hyperinsulineamia. The combination of these disease risk factors, also known as the metabolic syndrome, has been identified in children as young as five years. Type 2 diabetes during adolescence accounts for almost half of all newly diagnosed cases in some populations these days. Frequent pulmonary health complications can also include sleep apnoea, asthma and exercise intolerance which in turn can lead to limited physical activity. In the obese child this can further lead to possible weight gain. Other serious health complications include hepatic, renal, musculoskeletal and neurological complications. Lastly, there are also substantial psychosocial consequences for children who are obese. Overweight children as young as five years, can develop a negative self-image. Obese adolescents have a poor self-esteem (Ebbeling *et al.,* 2002).

2.5 PREVENTION OF CHILDHOOD OBESITY

Most researchers agree upon the fact that prevention should rather be the key strategy in the controlling of the obesity epidemic (Dehghan *et al.*, 2005). It seems that no current programme for the treatment of obesity is particular successful, therefore, the shift should maybe be made from treatment to prevention rather during childhood (Kruger *et al.*, 2005).

2.5.1 PRIMARY PREVENTION

Prevention and or treatment of overweight or obesity is much easier to treat during childhood because children are still in the process of growing and maturing. It is also more difficult and less successful to treat obesity during adulthood (Kruger *et al.*, 2005; Dehghan *et al.*, 2005; Doak *et al.*, 2006).

Though the success and practical treatment of childhood obesity is also influenced by the intellectual and psychological immaturity of children in comparison to adults as well as their susceptibility to peer pressure and, therefore, most interventions have used school-based or family-based approaches (Ebbeling *et al.*, 2002).

2.5.1.1 Family-based interventions

The determinants of the outcome of family interventions are based on parental support, family functioning and home environment. In one particular long term study that seemed to be successful, Epstein and his colleagues (2001) used behavioural strategies (which included contracting, self-monitoring, social reinforcement and modelling) with obese children and their parents in order to limit the intake of high energy foods and to increase aerobic exercise. A 7.5% decrease was noted in the proportion of overweight individuals at a 10 year follow-up interval, in comparison to a 14.3% increase within the untreated control group of individuals.

2.5.1.2 School-based interventions

Despite the intensive and multi-year designs of some interventions, one study that seems to have had an effect on the prevalence of childhood obesity was the Planet Health intervention (Gortmaker *et al.,* 1999). Planet Health is an interdisciplinary curriculum that aims to decrease the amount of dietary fat consumption, increase the consumption of fruit and vegetables, and increase physical activity and reduce the amount of time spent viewing television. A group of 1295 ethnically diverse grade 6 and 7 students from 4 public schools from 4 different Massachusetts communities participated in the study. Over the period of two academic years the prevalence of obesity significantly decreased amongst girls, but not boys in the participating intervention schools (Gortmaker *et al.,* 1999).

A Cochrane review considering 22 studies (12 short term projects and 10 long term projects), mostly school based and focused on multiple interventions, showed that most interventions did not significantly reduce body weight of children possibly due to a too short intervention duration (Summerbell *et al.,* 2005). One of the interventions that were considered a good quality, randomized, controlled study was the Christchurch Obesity Prevention Project in Schools (CHOPPS); also referred to as the "ditch the fizz" project (James *et al.,* 2007). The project ran over a period of one year in six junior schools in England for children between the ages of 7 and 11 years (n=522). The content of the intervention focused on encouraging children to decrease their consumption of carbonated drinks, as well as one hour added of health education during one of the four school quarters. This project produced a modest reduction in the amount of carbonated drinks that were consumed by children, but a significant reduction in the amount of children that became overweight or obese. After three years (n=434) the age and sex specific BMI z-scores has increased in the control group by 0.10 (SD= ±0.53), but decreased in the intervention group by 0.01 (SD = ±0.58). The prevalence of overweight increased for both the control and intervention groups and the significant difference between the two was no longer evident after three years of study. The BMI z-score increased in the control group by 2.14±1.64 and in

the intervention group by 1.88 ±1.71. The waist circumference for both groups increased with a mean difference (z-score) of 0.09, p= 0.25. The study presented with significant differences in the proportion of overweight children in both the experimental and control group after a period of 12 months but, however, not after two years after the completion of the study (James *et al.*, 2007).

In South Africa the Healthy Kick Intervention Programme was developed and initiated in 2007 in the Western Cape for a trial period of 4 years. The programme was based on the success factors of 85 school intervention studies. The following outcome measurements were used to evaluate the various intervention studies – i.) changes in nutrition knowledge, *attitudes*, self-efficacy and stage of change; ii.) changes in dietary behaviour; iii.) changes in clinical/physical markers and iv.) process and/or policy outcomes (Steyn *et al.*, 2009).

Limitations for both family and school based intervention approaches may be attributed to the fact that the dietary and physical activity prescription is not efficient enough (Ebbeling *et al.*, 2002). An additional factor that could play a role is environmental factors that may overwhelm the design of behavioural and educational techniques that try to reduce energy intake and promote physical activity (Ebbeling *et al.*, 2002). Prevention has shown to be more effective by reducing the amount of sedentary behaviour and encouraging free play rather than to force exercise and limit food intake (Dehghan *et al.*, 2005). Prevention may be achieved by a combination of interventions focusing on the built environment, physical activity and good dietary practice as compiled in Table 2.2 (Dehghan *et al.*, 2005).

Table 2.2 Possible strategies that could be considered for the prevention of childhood obesity (Dehghan *et al.*, 2005)

I. Built environment	1. Increase in the network of designated walking paths and the safety of them. 2. Increase in the network of designated cycling paths. 3. Increase in the availability of public open spaces (e.g. parks). 4. Providing safe and inexpensive recreational facilities.
II. Physical activity	1. Increase the amount of sport participation. 2. Improving and increasing the amount of physical education time. 3. Making use of school report cards to parents to inform them on children's anthropometry. 4. Increase the amount of active modes to and from the school facility – walking, cycling and public transport.
III. TV Watching	1. Limit the amount of time children spend in front of the television. 2. Encourage children not to eat in front of the television. 3. Ban or restrict the amount of television advertising to children.
IV. Food environment	1. Applying small tax paid on foods with a low nutritional value e.g. soft drinks and snacks. 2. Increase the amount of food labelling on healthy food items. 3. Standardisation on product formulation.

It was concluded from this table that a few key issues are emerging with regard to childhood obesity prevention programmes namely i) influencing the knowledge, *attitude* and behaviour of children with regard to physical activity and nutrition; ii) both intervention and prevention must target children as well as the adults in their life (parents, health care providers, teachers and childcare providers); iii) it must address cultural and socio-economic factors; and iv) it requires a systemic, community approach with regard to prevention (Dehghan *et al*., 2005; ICF International, 2009).

The key success factors that were identified in the Health Kick Intervention School Programme in the Western Cape based on a systematic review of 85 school intervention studies, were the following: i.) generally improved behavioural outcomes if a nutrition-based curriculum was offered by trained teachers; ii.) the best clinical and behavioural outcomes are associated with interventions including a physical activity component; iii.) it includes a parental/family component; iv) are grounded on the theory

of behaviour, and v.) include a food service component based on best behavioural outcome (Steyn *et al.*, 2009).

CHAPTER 3: METHODOLOGY

3.1 INTRODUCTION

In this chapter the methodology of the main study (see Figure 1.1, Chapter 1) is shortly described under point 3.2.1 and followed by a detailed description of this sub-study's methodology under point 3.2.2 where clear distinction is made between qualitative (questionnaire and 3-point hedonic scale) and quantitative data (focus group discussions).

3.2.1 OVERVIEW OF THE MAIN STUDY'S METHODOLOGY

3.2.1.1 DESCRIPTION OF THE NUTRITION EDUCATION INTERVENTION PROGRAMME

A NEIP was compiled and piloted by Kruger (2007) as part of her B.Sc Honours in Nutrition degree, based on the SAFBDG in the form of a musical play (see addendum I on compact disc [cd]). This play was used as the unique NEIP which forms the basis of the main study (see Figure 1.1, Chapter 1). The aim of the main study was to increase primary school children's nutrition knowledge through a fun and unique programme during which they could also be physically active. A secondary aim was to promote healthy eating and physical activity amongst primary school children. The programme was developed and based on the SAFBDG to make it applicable to the South African setting and also to promote the SAFBDG amongst children, their parents/guardians, as well as teachers. It was decided to make use of music and dance to portray the various SAFBDG messages since it has been shown that music is an ideal medium to use when wanting to increase children's knowledge on a specific subject and that it creates a co-operative spirit which may increase the individuals learning ability as well as facilitate a positive attitude (Nzewi, 2005) towards the teaching material.

The SAFBDG at the time of the NEIP were developed for all South African 7 years and older (Vorster et al., 2001) and included:

1. Enjoy a variety of foods.
2. Be active.
3. Make starchy foods the basis of most meals.
4. Eat plenty of fruit and vegetables.
5. Eat dry beans, peas, lentils and soya often.
6. Meat, fish, chicken, milk and eggs can be eaten every day.

7. Eat fats sparingly.
8. Use salt sparingly.
9. Drink lots of clean, safe water.
10. If you drink alcohol, drink sensibly.

These guidelines were adapted slightly to make them more applicable to our study population by incorporating three additional guidelines proposed by Scott (2006) for children, namely, use sugar sparingly; eat five small meals per day; and no alcohol should be consumed by anyone under the age of 18 years.

3.2.1.2 STUDY DESIGN AND RESEARCH SETTING

The main study had a randomized, controlled intervention study design and was implemented over a 3-month period (April-June 2008 or July-September 2008) within four primary schools (President Pretorius; Potchefstroom Christian; Potchefstroom Primary and ML Fick) with similar socio-economical status within the city of Potchefstroom, North West Province. These schools were identified and selected on the basis of availibility and representation of various ethnic groups. All children were informed verbally of the proposed study (n=2160) and those that showed interest were handed out information sheets and informed consent forms to take home to their parents/guardians (n=480)

All children (n=286) that handed-in an informed consent form were randomly assigned to either the control (n=143) or experimental group (n=143). Children in the control group (CG) were exposed to the standard school nutrition curriculum while children in the experimental group (EG) were exposed to both the standard school nutrition curriculum as well as the NEIP (Kruger, 2010).

The NEIP lasted for a time-period of 5 weeks, in either the second or the third quarter of the school calender year. EG children received two, one-hour sessions per week during or after school hours; totaling 10 hours of exposure to the NEIP after the 5 week intervention period. The first 15 minutes of each session were spent on verbal nutrition education (see addendum II on cd) which contained messages based on the SAFBDG. During the next 40 minutes children were taught the different dance movements (each representative of the applicable SAFBDG for that particular session) and during the last 5 minutes of each session questions were asked with regard to the nutrition education given as well as on the different representative dance movements that were taught to children for that particular session. At the end of each session children received an information pamphlet (see addendum II on cd) on the information that was discussed during the particular session to take home to their parents/guardians. Any additional questions with regard to the particular session were welcomed and answered after each session. Parents, teachers and CG children were then invited at the

end of the intervention period to attend a concert during which the NEIP were performed. Each parent attending the concert received a concert information booklet containing information on each SAFBDG (see addendum II on cd).

All measurements were taken at baseline and end (before the concert), except for the socio-demographic and physical activity questionnaire which were only completed at baseline.

3.2.1.3 SELECTION AND SAMPLING OF SUBJECTS

Volunteer children, aged 6-12 years (grade I-VI), whose parents/guardians gave written, informed consent were included into the main study. In total 286 children were included in the main study representing all four participating primary schools. Children were randomized into either an EG or CG. Eighty three children dropped out of the study due to school-related problems or after school activities that clashed with the time slots during which the NEIP was implimented. In some schools the NEIP had to be implimented in the afternoons since no time could be allocated during school hours for this. At the end of the intervention period a total of 99 CG children and 104 EG children completed the main study.

It is reported in the literature that to have a 90% chance to detect a significant difference ($p<0.05$) within nutrition knowledge between two groups, the power needed for analysis of nutrition knowledge was at least 40 subjects per group (Shariff *et al.*, 2008), thus the final numbers per group were more than sufficient to detect any changes that could occur due to the NEIP.

3.2.1.4 DATA COLLECTION

i) Nutrition knowledge questionnaire

Nutritional knowledge of children was assessed with a standardised questionnaire which was adapted from Whati and co-workers (2005), the questionnaire was obtained from Whati (2005). The questionnaire was adapted after it was tested for face-validity in a group of children similar in age before the intervention (see addendum III). Trained field workers assisted children in completing the questionnaire in small groups (five children per group). The questionnaires were completed at baseline and end.

ii) Socio-demographic and physical activity questionnaire

The socio-demographic and physical activity questionnaire (see addendum IV) was sent home for completion by parents/guardians of all children participating in the study at baseline. All questionnaires had to be

returned before the NEIP commenced. Information obtained included monthly income, education level of parents/guardians, occupation of parents/guardians, food preparation methods, average monthly food budget, as well as sedentary and physical activity behaviour of children.

iii) 24-hour dietary recall questionnaire

Two 24-hour dietary recalls per child were obtained (one at baseline and one at end), by trained dietetic final year students or fieldworkers (see addendum V). The 24-hour dietary recalls were taken on two different days to ensure that the data produced by these questionnaires provided a representative picture of children's weekly dietary intakes. Students and fieldworkers were trained in the *multiple pass 24-hour dietary recall method*, therefore increasing the retrieval of requested information by allowing the child to review the food and beverage intake of the previous 24 hours several times (Gibson, 2005). Initialy the different types of food that the child ate during the past 24-hours were investigated, then more details about the the preparation methods and portion sizes were collected.

Photo books and food models were used to aid children in estimating their consumed food portion sizes. Food finder III version 1.0.0 (Medical Research Council, South Africa) was used in the analysis of these 24-hour dietary recalls.

iv) Anthropometric measurements

Children were measured in light clothing by trained fieldworkers at baseline and end. Weight was measured on a portable electronic scale (Precision, A&D Company, Japan) to the nearest 0.5 kg and height with an upright stadiometer to the nearest 0.5cm. BMI (kg/m²) was then calculated and evaluated with the WHO growth charts using z-scores (WHO, 2009b). The cross-hand method (a standardised technique) of the International Society for the Advancement of Kinanthropometry (ISAK) was used for the measurement of the mid-waist circumference (taken in line with the naval, at the level of the narrowest point between the lower costal (10^{th} rib) and the ileac crest) (see addendum VI).

3.2.1.5 ETHICAL CONSIDERATIONS

Ethical approval (approval number 07M06) was obtained from the Ethics Committee of the North-West University (Potchefstroom Campus) before conducting this study. The Department of Education was also informed in writing, and consent was obtained to do this study within the identified schools. Finally, all principals of participating schools as well as parents/guardians of primary school children that were included

in the study gave their written, informed consent. Children that dit not want to participate in the study were ensured that they will not be adversely affected in any way. Also all children were assured that they could drop-out from the study at anytime without having to give a reason and that all measurements were purely voluntary.

3.2.2 METHODOLOGY USED FOR THIS SUB-STUDY

3.2.2.1 STUDY DESIGN AND RESEARCH SETTING

This sub-study is an intervention study without a control group in which the *attitude* of children were examined before and after an intervention, consisting of a nutrition education programme in addition to exposure to the standard school nutrition education curriculum. The intervention were supplemented with focus groups discussions on the motivations and barriers to healthy eating, unhealthy eating and physical activity. The same study population was used that represented four primary schools (President Pretorius; Potchefstroom Christian; Potchefstroom Primary and ML Fick) with similar socio-economical status within the city of Potchefstroom, North West Province.

This sub-study was done to explore the *attitude* and barriers of primary school children towards healthy eating, unhealthy eating and physical activity prior to and after a unique NEIP and standard school curriculum. The results of this sub-study could generate valuable information for the development of future NEIPs amongst primary school children and give an indication on which *attitudes* and possible motivators for and barriers to address in terms of healthy eating, unhealthy eating and physical activity.

3.2.2.2 SELECTION AND SAMPLING OF SUBJECTS

Children were randomly selected from the EG (n=143) of the main study. Children were selected into one of four focus groups per school consisting out of 6 children per focus group. Focus groups were defined by age and gender (boys and girls seperately, grades I-III and grades IV-VI seperately), totalling a number of 96 children. A total of 75 children completed this sub-study, 21 children dropped out due to school-related problems or after school activities that clashed with the time slots during which the NEIP was implimented. The total amount of focus groups that were initially planned for was four focus groups (according to age groups and gender), at both baseline and end measurements, thus in total 32 focus groups. The final number of focus groups that were conducted after some of the groups had to be combined (due to during or after school activities and limited time available for baseline and end measurements) was 27 focus groups.

The number of focus groups to use are dependant on data saturation, thus one continue with focus groups untill a clear pattern emerges and only repetitious information are produced, so-called theoretical saturation (Krueger, 1994). It is, however, suggested that for a simple research question three to four focus groups should be held (Krueger, 1994; Burrows & Kendall, 1997). It was therfore decided for this sub-study to conduct four focus groups (according to age groups and gender) per school (at both baseline and end measurements), within each of the four participating schools. Data saturation were indeed achieved by end measurements with the same themes and sub-themes repeating in all focus groups.

3.2.2.3 DATA COLLECTION

All data were collected at both baseline and end measurements. Quantitative and qualitative data were collected. Quantitative data were collected with the use of a three-point hedonic attitude scoring scale, as well as a socio-demographic and physical activity questionnaire. Qualitative data were collected during focus groups by using a semi-structured questionnaire (see addendum III) to gather information on children's attitude towards healthy eating, unhealthy eating and physical activity.

3.2.2.3.1 Quantitative data collection

i) Hedonic scale

For the purpose of quantifying the effect of a unique NEIP on children's *attitude* towards healthy eating, unhealthy eating, and physical activity, a three-point hedonic facial expression scale was used (see Figure 3.1.) because of the many factors influencing our outcome measures and specific questions on all these factors (evaluating a group of food items and physical activities, not a single example of a particular food or activity, see addendum VIII), it was decided to use a 3-point hedonic scale in order to simplify measuring responses of children.

Facial expression 1 represented a positive *attitude* towards the indicated food and physical activity examples and was scored a 2 in order to quantify the particular *attitude*. Facial expression 2, indicated a neutral facial expression which represented a neutral *attitude* towards the indicated food or physical activity examples and was scored a 1 to quantify the particular *attitude*. Facial expression 3, indicated a negative facial expression which represented a negative *attitude* towards the indicated food or physical activity examples and was scored a 0 to quantify the particular *attitude*.

In order to establish that children had the same reference on healthy eating, unhealthy eating and physical activity, presentation boards with examples of healthy food, unhealthy food and physical activity were used

(see addendum VIII). Each child within the focus group setting was handed out three facial expression flash cards, which needed to be revealed *simultaneously* after presenting seperately each time examples of healthy food, unhealthy food and physical activity. Even though this was done in a group setting, possible peer pressure was limited by asking children to keep their chosen flash cards facing downwards on the ground in front of them and to reveal their chosen flash cards simultaneously on the count of three.

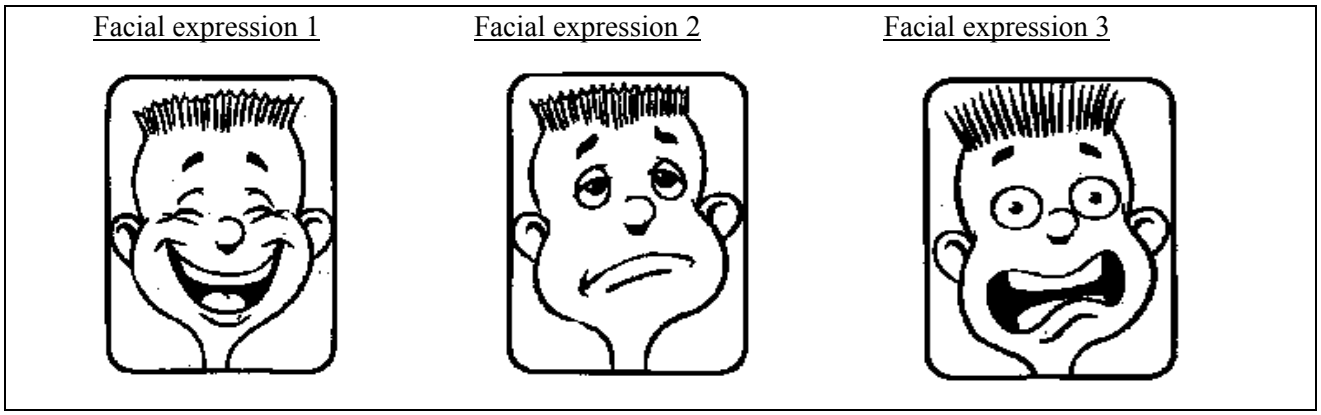

Figure 3.1 Hedonic scale used to score different *attitudes* with regard to healthy eating, unhealthy eating and physical activity

ii) Socio-demographic and physical activity questionnaire

The socio-demographic and physical activity questionnaire (see addendum IV) was sent home for completion by parents/guardians of all children participating in the study at baseline. The questionnaire was available in English or Afrikaans, questions that were not completed upon return were checked with the child. If the child could not answer a specific question the parent/guardian was contacted in order to minimize missing data. All questionnaires had to be returned before the NEIP commenced. Information obtained included monthly income, education level of parents/guardians, occupation of parents/guardians, food preparation methods, average monthly food budget, as well as sedentary and physical activity behaviour of children.

3.2.2.3.2 Qualitative data collection

i) Focus group discusssions

Focus group discussions produce qualitative data to the researcher and gave insight into the *attitudes*, perceptions and opinions of the study participants, therefore, how they evaluate or view reality. By asking open-ended questions, children were able to respond in the manner they wanted to, but also according to the response of other children within that particular focus group (Krueger, 1994; Kitzinger, 1995).

Focus groups typically consist of between 6 and 12 participants (Freeman, 2006). Due to concerns regarding the influence of gender and age on response of children to questions asked in focus groups it was decided to form focus groups based on gender and age ranges. Additionally, the effect of age and gender on attitude formulation and, therefore, behaviour could then be assessed. However, due to practical reasons some of the focus groups had to be combined in terms of gender at baseline or end measurements and we, therefore, can not look at the possible role of gender on the children's *attitude* on healthy eating, unhealthy eating and physical activity in this sub-study.

Semi-structured questions were based and formulated according to the objectives set for this sub-study (see addendum VII), and used to lead informal and spontaneous conversation within the context of each focus group. Since facilitators, primarily responsible for leading and eliciting conversation within a focus group and assistant facilitators, primarily responsible for taking field notes of responses both verbally and non-verbally of study participants, were not all familiar with conducting a focus group discussion; pre training was given based on current literature and two trial focus groups were run with each pair of facilitator and assistant facilitator in order to i.) familiarize both facilitators with conducting a focus group discussion and ii.) to test the semi-structured questionnaire for face validity.

All children received their education at school either in English or Afrikaans and it was, therefore, assumed that they have sufficient knowledge and understanding of one of these languages so that focus group discussions could be done in either English or Afrikaans, as preferred by the group of children. Each session during, before and after measurements was started by introducing and making children comfortable with each other, as well as with the facilitators for the particular focus group. The purpose of the focus group as well as tape-recorder was then explained by the facilitator to the children in order to make them comfortable with the set-up, before starting the actual intended discussions. Children were to sit down on the floor in a circle (informal set-up) with the assistant facilitators and made familiar with the different resources for the focus group; after which the intended semi-structured questions were asked and used to lead conversation in a spontaneous manner.

Presentation boards with different examples of healthy food, unhealthy food and different physical activities; as well as flash cards with different facial expressions representing different *attitudes* were used to ensure that children had the same reference of healthy food, unhealthy food, and physical activity in order to specifically quantify their attitude towards healthy eating, unhealthy eating and physical activity; but also to trigger verbal and non-verbal response of participating children. Each session was ended by summarizing everything that was said within the particular focus group by the assistant facilitator.

From the transcribed tapes and field notes; themes and patterns of common ideas were noted and are presented within Chapter 4, section 4.2.4. Main themes were identified according to the semi-structured questions that were posed within each focus group discussion, and based on the different comments that were made by children with regard to these questions, subthemes were identified. At the time of data analyses the researcher was not aware of any computer software programs that were available to analyse data obtained from such focus group discussions, thus the hand method was followed.

During data analysis, it was found that the tape-recordings of six focus groups were blank. Since the purpose of the tape-recordings was to have easy access to the detail of focus groups, some of the richness of these focus groups could have been missed by short written notes taken by the assistant facilitators, and, therefore, it was decided to exclude this data from the analysis process.

3.2.2.4 ETHICAL CONSIDERATIONS

Focus group discussions were tape-recorded; thus special attention was given to ensure confidentiality. Children were asked for their verbal consent and informed on the use of the tape-recordings prior to each focus group discussion and all concerns were adressed in this regard. Special attention was also given to creating a relaxed environment to ensure that children would feel safe and encouraged to express their individual opinions within the context of each focus group discussion. After the transcription of tape-recordings, the fieldnotes and tape-recordings were handed back to the North-West University where they will be kept and stored securely according to the University's prescription and be destroyed after five years after completion of the study.

3.2.2.5 STATISTICAL ANALYSIS

The Statistica program (data analysis software program; version 9; StatSoft, Inc. 2010), was used for all statistical calculations and analyses of the data by the Statistical Consultation Service of the North-West University. Descriptive statistics for categorical data is presented as percentages. Frequency tables and cross-tabulations were used to present results from the 3-point hedonic *attitude* scale. Qualitative data are presented according to themes and sub-themes and the frequency by which these themes presented are shown per age and gender grouping.

3.2.2.6 LIMITATIONS AND PROBLEMS ENCOUNTERED IN THIS SUB-STUDY

- Use of a 3-point hedonic scale may have caused subtle changes in *attitude* towards healthy eating, unhealthy eating and physical activity to be lost/missed. In other words, one cannot measure change in attitude if attitude at baseline is already optimal.
- Data obtained from focus groups might not be a true refelection of the children's attitudes and behaviours as discussion took place in groups, since children reflect a need to conform to their peers' opinions and behaviour.
- Six focus groups' tape-recordings were found to be blank upon analysis and the loss of these recordings may have influenced the themes, patterns and common ideas extracted from field notes that were available. The researcher acknowledges the fact that this should have been noted immediately after the particular focus group discussion.
- Focus group discussions with children are difficult and are time consuming. A major problem in conducting focus group discussions was time limitations due to school and after school activities of the children.
- Time constraints forced the researcher to combine boys and girls in groups which alter the initial design of the study.
- Focus groups were conducted in Afrikaans or English and all focus group moderators were white, thus it is possible that some responses of black children might have been misinterpreted.
- To measure the effect of a NEIP **ONLY** on children's *attitude* towards healthy eating, unhealthty eating and physical activity a control group will have to be included. This is recommended for future studies.

CHAPTER 4: RESULTS

4.1 INTRODUCTION

This chapter is divided into two main sections firstly, 4.2.1 which shows the quantitative data results obtained from the socio-demographic and physical activity questionnaire, as well as the *attitude* scores towards healthy eating, unhealthy eating, and physical activity calculated from the 3-point hedonic scale at baseline and after the NEIP. Secondly, 4.2.2 which shows the qualitative data results retrieved from the focus group discussions, highlighting identified barriers and motivational factors that influenced children's *attitude* (both externally and internally) towards healthy eating, unhealthy eating and physical activity behaviour.

4.2 RESULTS

4.2.1 QUANTITATIVE DATA RESULTS

The socio-demographic and physical activity results mirror specific characteristics of the specific study population and are summarised in Tables 4.1 - 4.3 and in Figures 4.1 - 4.6.

4.2.1.1 DEMOGRAPHIC AND SOCIO-ECONOMIC INFORMATION

In Table 4.1 the total group of children (n=75) in this sub-study showed a gender distribution of 47% male and 51% female. The gender distribution for the age group grade I-III's was 58% male and 42% female (thus more boys than girls), and in the age group grade IV-VI's the gender distribution was 33% male and 61% female (thus more girls than boys). In the total group of children 58% indicated that the father was the head of the household, 88% were living in brick/concrete houses with a flushing toilet (95% of children) with an average of 1 to 2 individuals per bed room (84% of children). Most households (95%) reported having both a radio and television set.

In terms of the household income, most parent's/guardians seem to be working for a wage, with an average of mostly two individuals contributing to the total household income.

Table 4.1 Demographic and socio-economic information for the total group of children and divided into two age groups, grade I-III and grade IV-VI, presented as a percentage of the group

Variables		Total group Percentage % (n=75)	Grade I-III Percentage % (n=38)	Grade IV-VI Percentage % (n=37)
Demographic information				
Grade	I-III (n=38)	51		
	IV-VI(n=37)	48		
	Not indicated	1		
Gender	Male	47	58	33
	Female	5	2	61
	Not indicated	2	-	-
Head of household	Father	58	54	63
	Mother	21	24	20
	Grandmother	8	8	8
	Grandfather	9	14	6
	Friend	1	-	-
	Not indicated	3	-	-
Socio-economic information				
Type of dwelling	Brick, concrete	88	89	89
	Traditional mud	1	3	-
	Tin	7	5	8
	Other	3	3	3
	Not indicated	1	-	-
Number of individuals per bed room	1-2 individuals	84	89	86
	3-4 individuals	11	11	11
	More than 4	1	-	3
	Not indicated	4	-	-
Type of toilet at home	Flush	95	97	94
	Pit	3	3	3
	Other	1	-	3
	Not indicated	1	-	-
Radio and/or television at home	Radio	1	-	3
	Television	4	3	5
	Both	95	97	92
Parent/care-givers employment status	At home	1	-	3
	Unemployed	8	9	9
	Self-employed	8	6	12
	Wage	53	57	55
	Other	7	6	9

Table 4.1 Demographic and socio-economic information for the total group of children and divided into two age groups, grade I-III and grade IV-VI, presented as a percentage of the group (continue)

Variables		Total group Percentage % (n=75)	Grade I-III Percentage % (n=38)	Grade IV-VI Percentage % (n=37)
	Not indicated	16	22	13
Number of individuals contributing to the total household income	1	27	34	19
	2	64	55	72
	3-4	7	8	6
	5-6	1	-	3
	More than 6	1	3	-

Figure 4.1 indicated that most children were black or white, with a small percentage being coloured.

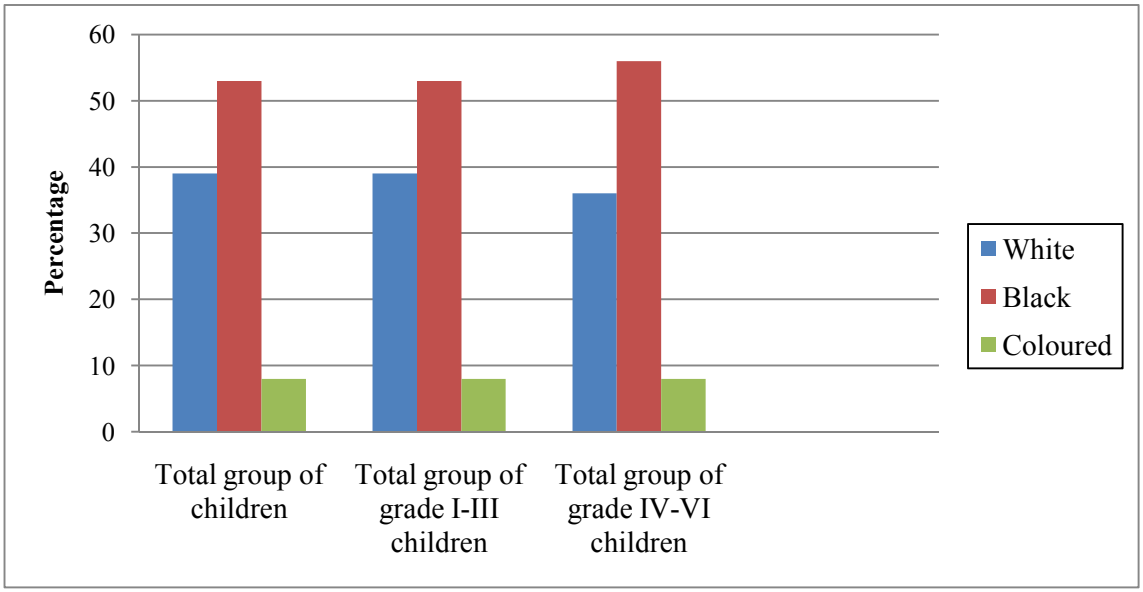

Figure 4.1 Ethnicity for the total group of children and divided into two age groups, grade I-III and grade IV-VI, presented as a percentage of the group.

From Figure 4.2 it is clear that most households had access to drinking water from their own tap.

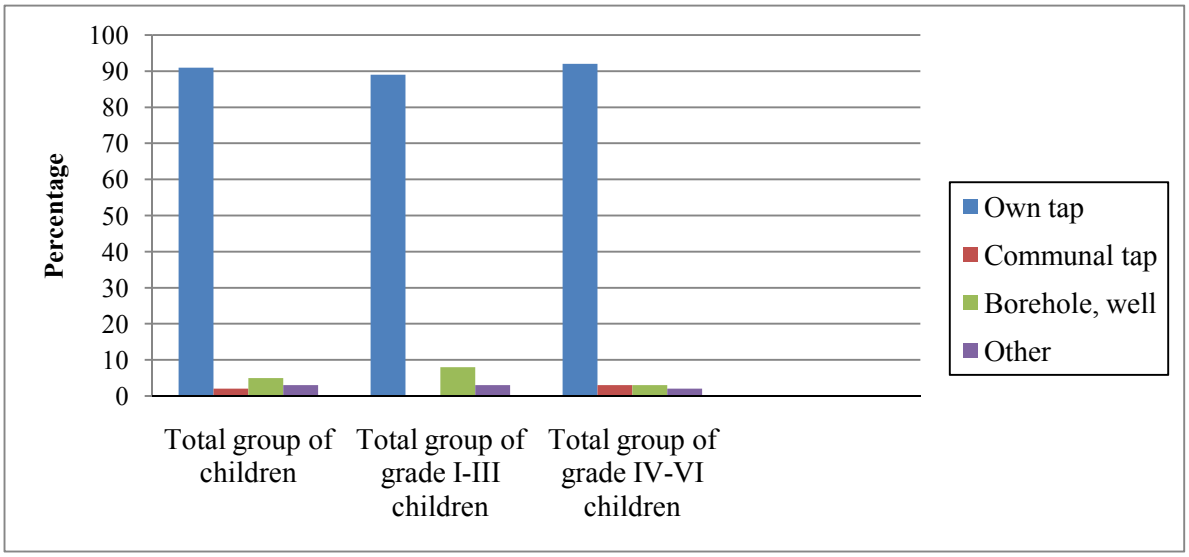

Figure 4.2 Source of drinking water for the total group of children and divided into two age groups, grade I-III and grade IV-VI, presented as percentage of the group.

Figure 4.3 indicated that the education level of most parents/guardians was grade 11 to 12, followed by a large number with tertiary education.

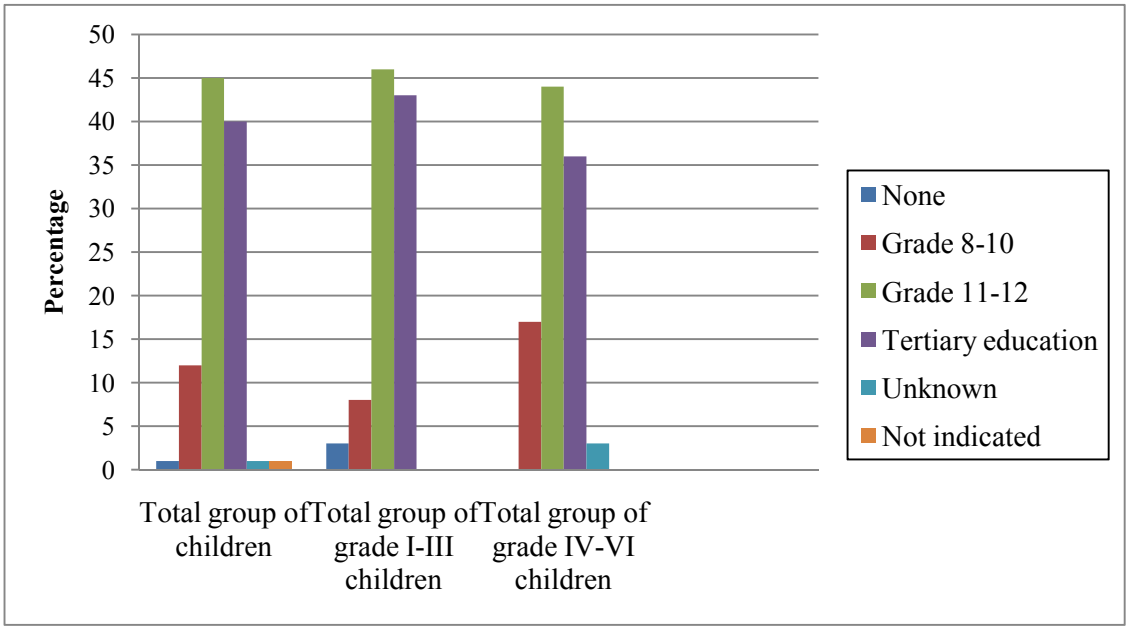

Figure 4.3 Education levels of parents/care-givers for the total group of children and divided into two age groups, grade I-III and grade IV-VI, presented as a percentage of the group.

4.2.1.2 FOOD PREPARATION, PURCHASING AND BUDGET

From Table 4.2 it is seen that both the food preparation as well as feeding of household members were primarily the role of the mother. Most children in the total group bought take-away's on a monthly basis (41%) or seldom (44%), and the reported monthly household income range were more than R5000-00 in 52% of households.

Table 4.2 Food preparation, purchasing and budget for the total group of children and divided into two age groups, grade I-III and grade IV-VI, presented as a percentage of the group

Variables		Total group Percentage (%) (n=75)	Grade I-III Percentage % (n=38)	Grade IV-VI Percentage % (n=37)
Individual mainly responsible for food preparation in household	Father	9	8	11
	Mother	76	78	78
	Grandmother	11	11	11
	Grandfather	1	3	-
	Not indicated	3	-	-
Individual mainly responsible for serving/feeding the household	Father	9	8	11
	Mother	77	81	
	Sibling	1	-	3
	Grandmother	10	11	8
	Aunt	1	-	3
	Not indicated	1	-	

Variables		Total group Percentage (%) (n=75)	Grade I-III Percentage % (n=38)	Grade IV-VI Percentage % (n=37)
Frequency of take-away food bought	Daily	1	-	3
	Weekly	14	16	11
	Monthly	41	42	39
	Seldom	44	42	47
Household income per month	None	3	-	6
	R100-R500	7	8	6
	R500-R1000	9	8	11
	R1000-R3000	9	8	11
	R3000-R5000	17	27	9
	Over R5000	52	49	57
	Not indicated	3		-

From Figure 4.4 it is clear that the mother was primarily involved in the choices of food bought for the household of most children.

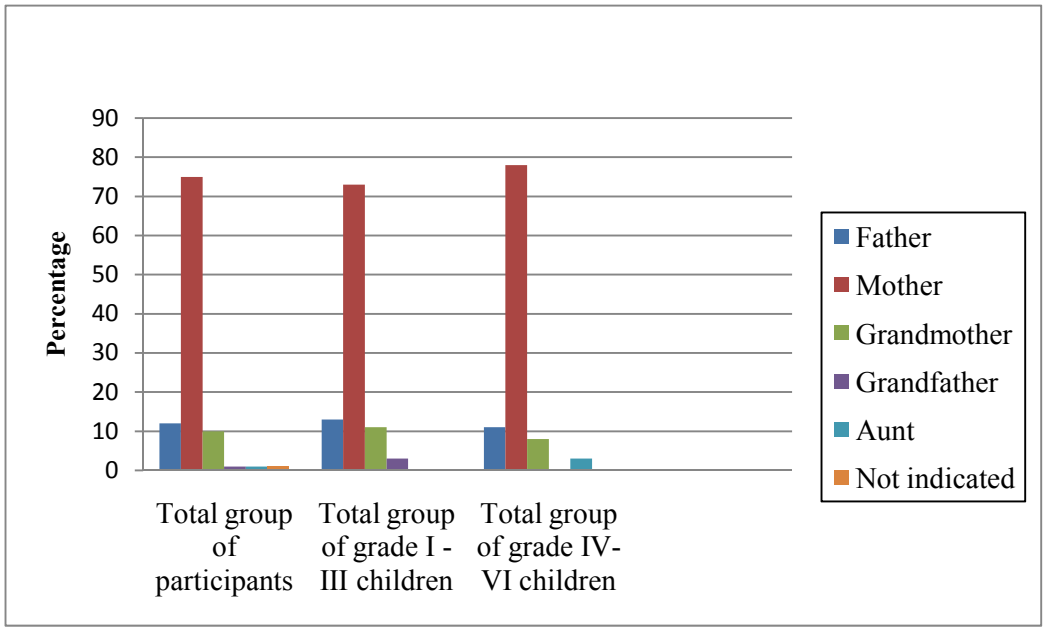

Figure 4.4 Individual mainly responsible for the choices of food bought for the household for the total group of children and divided into two age groups, grade I-III and grade IV-VI, presented as a percentage of the group.

According to Figure 4.5, mothers were primarily responsible for deciding how much money was spent on food for the household.

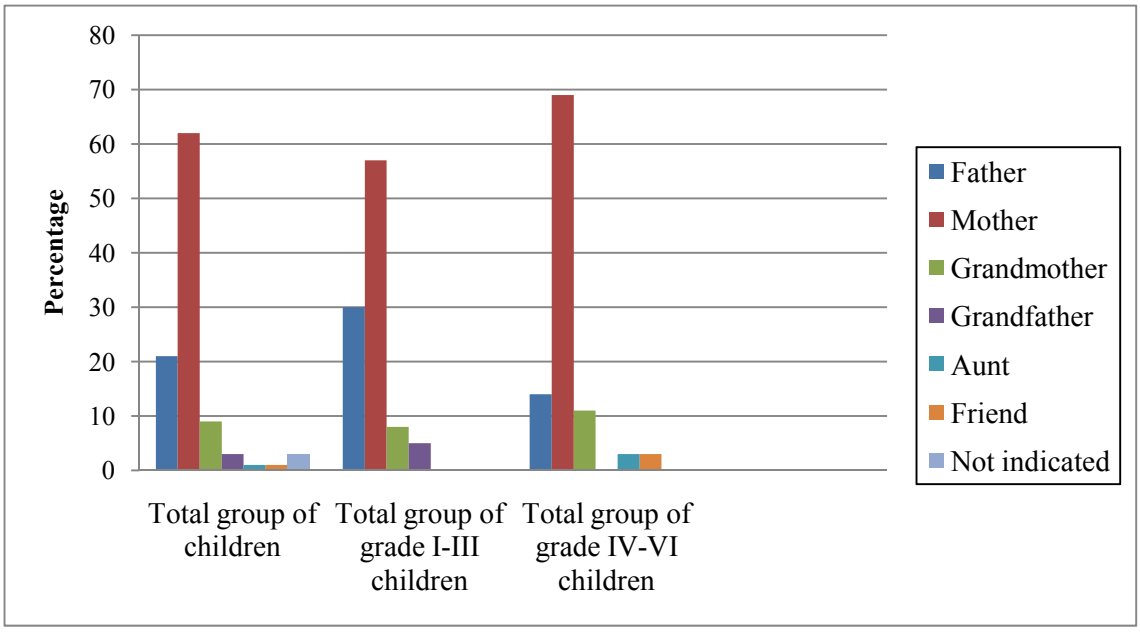

Figure 4.5 Individual mainly deciding how much money is spent on food for the household for the total group of children and divided into two age groups, grade I-III and grade IV-VI, presented as a percentage of the group.

The average amount of money that was monthly spent on food ranges between R1 500 to R 2 500, see Figure 4.6.

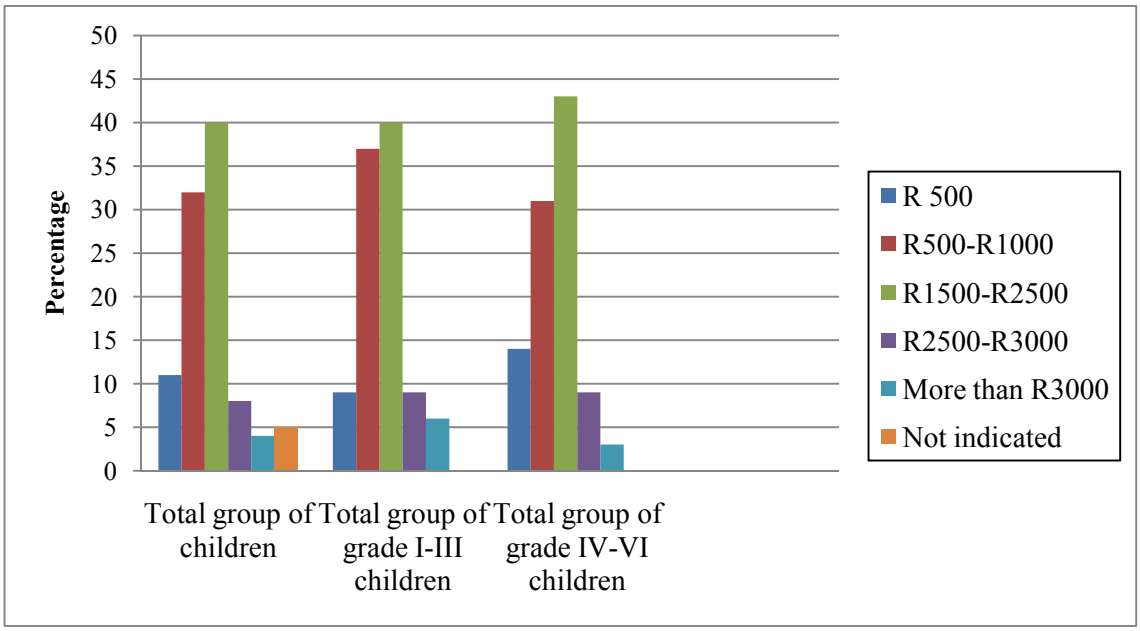

Figure 4.6 Average amount of money spent monthly on food for the total group of children and divided into two age groups, grade I-III and grade IV-VI, presented as a percentage of the group.

4.2.1.3 PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR

Table 4.3 shows that the majority of children (71%) were physically active and were participating in sport activities (64%) and most preferred playing outside above watching television (68%). Forty two percent of the total group of children indicated that they watch television or play station on average 1-2 hours per day.

Table 4.3 Physical activity and sedentary behaviour for the total group of children and divided into two age groups, grade I-III and grade IV-VI presented as a percentage of the group

Variables		Total group Percentage (%) (n=75)	Grade I-III Percentage (n=38)	Grade IV-VI Percentage (n=37)
Physically active	Yes	71	80	66
	No	17	17	20
	Don't know	8	3	14
	Not indicated	4	-	-
Participation in sport	Yes	64	57	74
	No	33	43	26
	Not indicated	3	-	-
Preference of playing outside or TV viewing	Watch television	29	31	31
	Play outside	68	69	69
	Not indicated	3	-	-
Time TV viewing or play station play/day	30 minutes	19	14	23
	1-2 hours	42	50	40
	More than 2 hours	24	19	31
	Only during weekends	11	17	6
	Not indicated	4	-	-

4.2.1.4 *ATTITUDE* SCALE SCORE TOWARDS HEALTHY EATING, UNHEALTHY EATING AND PHYSICAL ACITIVITY

Since the same children that participated within focus group discussions were used to determine (quantify) children's attitude towards healthy eating, unhealthy eating and physical activity, it was decided to omit the data gathered from school one, the total group size now being 68.

age groups (grade I-III's, n=34 and grade IV-VI's, n=34), 82 % of children indicated a positive *attitude* towards healthy From table 4.4 it was found that within the total group of children (n=68), as well as separately within the two eating at baseline. Within the total group of children at end measurements 93%

indicated a positive *attitude* towards healthy eating. Within the two age groups, 94% of grade I-III's (n=34) and 91% of grade IV-VI's (n=34) indicated a positive *attitude* towards healthy eating at end measurements. Children's attitude within the total group of children increased even more positively (11%) towards healthy eating between baseline and end measurements. Within the two age groups, grade I-III's (n=34) attitude increased positively by 12 % and for grade IV-VI's (n=34) by 9% towards healthy eating, between baseline and end measurements.

Table 4.4 Cross tabulations and frequencies for *attitude* scale scores towards Healthy Eating of the total group of children and divided into two age groups, grade I-III and grade IV-VI, groups before and after the intervention

Total group (n=68)					**Grade I-III (n=34)**					**Grade IV-VI (n=34)**				
Pre-*attitude* score – observed frequencies		**Post-*attitude* score – observed frequencies**			**Pre-*attitude* score – observed frequencies**		**Post-*attitude* score – observed frequencies**			**Pre-*attitude* score – observed frequencies**		**Post-*attitude* score – observed frequencies**		
		0[1]	**1[2]**	**2[3]**			**0[1]**	**1[2]**	**2[3]**			**0[1]**	**1[2]**	**2[3]**
0[1]	5	1	1*	3*	**0[1]**	5	1	1*	3*	**0[1]**	-	-	-	-
1[2]	7	-	3	4*	**1[2]**	1	-	-	1*	**1[2]**	6	-	3	3*
2[3]	56	-	-	56	**2[3]**	28	-	-	28	**2[3]**	28	-	-	28
Total subjects	**68**	1	4	63	Total subjects	**34**	1	1	32	Total subjects	**34**	-	3	31

*Different from pre-*attitude* score in the desired direction; [1]0 = Negative *attitude*; [2] 1= Neutral *attitude*; [3]2 = Positive *attitude*

From table 4.5 it was found that within the total group of children (n=68), as well as separately within the two age groups (grade I-III's, n=34 and grade IV-VI's, n=34), 68% of children indicated a positive *attitude* towards unhealthy eating at baseline. Within the total group of children at end measurements 57% indicated a positive *attitude* towards unhealthy eating. Within the two age groups, 65% of grade I-III's (n=34) and 71% of grade IV-VI's (n=34) indicated a positive *attitude* towards unhealthy eating at end measurements. Eleven percent of children changed their attitude towards unhealthy eating from positive to negative after the intervention. Within the two age groups, grade I-III's (n=34) attitude decreased (9%) towards unhealthy eating and for grade IV-VI's (n=34) by 12% between baseline and end measurements.

15% of children (7/46) that initially (at baseline) indicated a positive *attitude* towards unhealthy eating changed their *attitude* to negative after the 5-weeks. Nine percent (1/11) of children that initially indicated a neutral *attitude* towards unhealthy eating changed to a negative *attitude* after the 5-weeks.

From table 4.4 and 4.5 it is apparent that more than half (> 50%) of the total group of children had a positive attitude towards healthy and unhealthy eating, at both baseline and end measurements. A small positive increase in attitude towards healthy eating (11 %) and a positive decrease in attitude towards unhealthy eating (11%) within the total group of children could be detected between baseline and end measurements.

Table 4.5 Cross tabulations and frequencies for *attitud*e scale scores towards Unhealthy Eating of the total group of children and divided into two age groups, grade I-III and grade IV-VI, groups before and after the intervention

Total group (n=68)					**Grade I-III (n=34)**					**Grade IV-VI (n=34)**				
Pre-*attitude* score – observed frequencies		**Post-*attitude* score – observed frequencies**			**Pre-*attitude* score – observed frequencies**		**Post-*attitude* score – observed frequencies**			**Pre-*attitude* score – observed frequencies**		**Post-*attitude* score – observed frequencies**		
		0[1]	**1[2]**	**2[3]**			**0[1]**	**1[2]**	**2[3]**			**0[1]**	**1[2]**	**2[3]**
0[1]	11	4	2	5	**0[1]**	8	2	2	4	**0[1]**	3	2	-	1
1[2]	11	1*	8	2	**1[2]**	4	1*	3	-	**1[2]**	7	-	5	2
2[3]	46	5*	2*	39	**2[3]**	22	1*	2*	19	**2[3]**	24	4*	-	20
Total subjects	**68**	10	12	46	Total subjects	**34**	4	7	23	Total subjects	**34**	6	5	23

*Different from pre- *attitude* score in the desired direction; [1]0 = Negative *attitude*; [2] 1= Neutral *attitude*; [3]2 = Positive *attitude*

From table 4.6 it was found that within the total group of children 94% indicated a positive *attitude* towards physical activity at baseline. Within the total group of children at end measurements 97% indicated a positive *attitude* towards physical activity Within the two age groups, 88% of grade I-III's (n=34) and 100% of grade IV-VI's (n=34) indicated a positive *attitude* towards physical activity at end measurements. Children's attitude within the total group of children, increased positively (3%) towards physical activity between baseline and end measurements. Within the two age groups, grade I-III's (n=34) attitude increased positively (6%) towards physical activity and for grade IV-VI's (n=34) it stayed unchanged between baseline and end measurements.

Table 4.6 Cross tabulations and frequencies for *attitude* scale scores towards Physical Activity of the total group of children and divided into two age groups, grade I-III and grade IV-VI, groups before and after the intervention

Total group (n=68)					**Grade I-III (n=34)**					**Grade IV-VI (n=34)**				
Pre-*attitude* score – observed frequencies		**Post-*attitude* score – observed frequencies**			**Pre-*attitude* score – observed frequencies**		**Post-*attitude* score – observed frequencies**			**Pre-*attitude* score – observed frequencies**		**Post-*attitude* score – observed frequencies**		
		0[1]	**1[2]**	**2[3]**			**0[1]**	**1[2]**	**2[3]**			**0[1]**	**1[2]**	**2[3]**
0[1]	2	2	-	-	**0[1]**	2	2	-	-	**0[1]**	-	-	-	-
1[2]	2	-	-	2*	**1[2]**	2	-	-	2*	**1[2]**	-	-	-	-
2[3]	64	-	-	64	**2[3]**	30	-	-	30	**2[3]**	34	-	-	34
Total subjects	**68**	2	-	66	Total subjects	**34**	2	-	32	Total subjects	**34**	-	-	34

*Different from pre-*attitude* score in the desired direction; [1]0 = Negative *attitude*; [2] 1= Neutral *attitude*; [3]2 = Positive *attitude*

4.2.2 QUALITATIVE DATA RESULTS

Identified barriers and/or motivational factors that might influence the participating children's *attitudes* and perceptions regarding healthy eating, unhealthy eating and physical activity were grouped by main themes and sub-themes and presented within Tables 4.7 to 4.10. Additionally, the frequency of occurrence across focus groups (divided according to age and gender) of the reported motivators and barriers are indicated.

The five major themes identified from the focus group discussions were: i.) health awareness, ii.) healthy eating, iii.) unhealthy eating, iv.) physical activity and v.) consequences of unhealthy eating and sedentary behaviour. Under each major theme, sub themes were identified.

Theme 1: Health awareness

The following sub-themes' were identified under the health awareness theme:

Sub-theme 1 - Eating healthy:

The number of individual children that reported this sub-theme was 10 girls from the age group, grade I-III.

Sub-theme 2 - Being physically strong and having energy (a motivational factor):

The number of individual children that reported this sub-theme was 3 boys from the age group, grade I-III and 25 boys from the age group, grade IV-VI.

Sub-theme 3 - Eating healthy and being physically active:

The number of individual children that reported this sub-theme was 12 boys and 12 girls from the age group, grade IV-VI.

Sub-theme 4 – Requirement for having peers to socialize with (a motivational factor):

The number of individual children that reported this sub-theme was 2 girls from the age group, grade I-III.

Sub-theme 5 – Self- or body image (a motivational factor):

The number of children that reported this sub-theme was 2 girls from the age group, grade I-III.

Table 4.7 Possible barriers and/or motivational factors that might influence children's *attitude* and perceptions regarding health awareness (during both baseline and end measurements)

Main themes Sub-themes	**Quotes**	**Total amount of focus groups in which sub-themes presented**	**Barriers**	**Motivational factors**	**Age group (Amount of focus groups in which the subtheme frequently presented)**		**Gender-(Amount of focus groups in which the sub-theme frequently presented)**	
					Grade I-III	**Grade IV-VI**	**Boys**	**Girls**
Health awareness Sub-theme 1: Eating healthy	"I think it means I must eat carrots."	2 X			2 X			2 X
	"I like to be healthy and healthy foods make you strong."			X				
	"The vitamins that we get."							
	"The carbohydrates we get."							
	"Banana."							
	"Eat healthy, especially vegetables."							
	"You drink a lot of milk"							
	"You eat all your food."							
	"You eat a lot of beans and fruits."							
	"You eat a lot of fruit and vegetables that protects you against diseases."			X				
Sub-theme 2: Being physically strong and having energy	"To be strong and never get ill."	4 X		X	1 X	3 X	4 X	
	"To have energy."			X				
	"Your bones are strong."			X				

Table 4.7 Possible barriers and/or motivational factors that might influence children's *attitude* and perceptions regarding health awareness (during both baseline and end measurements) (continue)

Main themes Sub-themes	**Quotes**	**Total amount of focus groups in which sub-themes presented**	**Barriers**	**Motivational factors**	**Age group (Amount of focus groups in which the subtheme frequently presented)**		**Gender-(Amount of focus groups in which the sub-theme frequently presented)**	
					Grade I-III	**Grade IV-VI**	**Boys**	**Girls**
Sub-theme 2 (continue): Being physically strong and having energy	"Builds body and muscles and bones."			X				
	"Keeps your body clean and healthy."			X				
	"More energy and protect you from germs."			X				
Sub-theme 3: Eating healthy and being physically active	"Exercise and good food keep you healthy."	4 X		X		4 X	2 X	2 X
	"Powerade and towel when you exercise."							
	"To be strong, you must eat Kellogg's, Weetbix; go to the gym and do push-ups."			X				
	"Exercise and eat healthy."							
	"Makes you strong and fit."			X				
Sub-theme 4: Requirement for having peers to socialize with	"Makes the children play with you."	1 X		X	1 X			1 X

Table 4.7 Possible barriers and/or motivational factors that might influence children's *attitude* and perceptions regarding health awareness (during both baseline and end measurements) (continue)

Main themes Sub-themes	**Quotes**	**Total amount of focus groups in which sub-themes presented**	**Barriers**	**Motivational factors**	**Age group (Amount of focus groups in which the subtheme frequently presented)**		**Gender-(Amount of focus groups in which the sub-theme frequently presented)**	
					Grade I-III	**Grade IV-VI**	**Boys**	**Girls**
Sub-theme 5: Self or body image	"Children must be good in what they do." "To be always good.	1 X		X	1 X			1 X

Theme 2: Eating healthy

The following sub-themes were identified under theme two:

Sub-theme 1 – High nutritional value and associated health benefits (a motivational factor):

The number of children that reported this sub-theme was 5 boys from the age group, grade I-III and 6 girls from the age group, grade IV-VI.

Sub-theme 2 – General attitude towards healthy eating (taste can be both a barrier/motivational factor):

The number of children that reported this sub-theme was7 boys from the age group, grade I-III and 8 girls from the age group, grade IV-VI. Children (both boys and girls, both age groups) presented with a positive *attitude* towards healthy foods (with the exception of a few personal dislikes like oranges, fish, broccoli and cauliflower) because of their personal taste preferences and their association with good health.

Sub-theme 3 – Motivation for eating healthy (a motivational factor):

The number of children that reported this sub-theme was 13 boys and 10 girls from the age group, grade I-III and 10 boys and12 girls from the age group, grade IV-VI. In general parents, especially mothers of children, seems to play an important role in motivating children (both boys and girls, both age groups) to eat healthy.

Sub-theme 4 – Source of nutrition information (a motivational factor):

The number of children that reported this sub-theme was 6 boys and 6 girls from the age group, grade I-III and 6 boys and 6 girls from the age group, grade IV-VI. In general parents seem to be the greatest source of nutrition information for the majority of children (both boys and girls, both age groups).

Sub-theme 5 - Prevention from eating healthy e.g. personal taste preferences, texture of food; individuals; the media (a barrier):

The number of children that reported this sub-theme was 8 boys and 8 girls from the age group, grade IV-VI. Older children (grade IV-VI, both boys and girls), indicated that they don't always make healthy food choices due to personal taste preferences, food advertisements of unhealthy food and parent's unhealthy dietary behaviour.

Sub-theme 6-8 – Preference between fruits and vegetables (fruits, vegetables or both) (a motivational factor):

The number of children that reported that they had a high preference for fruits was 3 boys and 3 girls from the age group, grade I-III. The number of children that reported that they had a high preference for vegetables was 1 boy and 2 girls from the age group, grade IV-VI. The number of children that reported that they had a

high preference for both fruits and vegetables was 6 boys and 6 girls from the age group, grade I-III and 6 boys and 6 girls from the age group, grade IV-VI.

Sub-theme 9-11 –Preference of vegetable intake (raw, cooked, both) (can be both a barrier/motivational factor):

The number of children that reported that they had a high preference for raw vegetables was 2 boys and from the age group, grade I-III and 1girl from the age group, grade I-III and 4 girls from the age group, grade IV-VI. Those children that did indicated that they rather prefer their vegetables raw, prefer them in a salad format. The number of children that reported that they had a high preference for cooked vegetables was 2 boys from the age group, grade I-III and 2 boys from the age group, grade IV-VI and 4 girls from the age group, grade I-III and 4 girls from the age group, grade IV-VI. The number of children that reported that they prefer both raw and cooked vegetables was 3 boys from the age group, grade I-III and 3 girls from the age group, grade IV-VI.

Table 4.8 Possible barriers and/or motivational factors that might influence children's *attitude* and perceptions regarding healthy eating (during both baseline and end measurements)

Main themes Sub-themes	**Quotes**	**Total amount of focus groups in which sub-themes presented**	**Barriers**	**Motivational factors**	**Age group (Amount of focus groups in which the subtheme frequently presented)**		**Gender-(Amount of focus groups in which the sub-theme frequently presented)**	
					Grade I-III	**Grade IV-VI**	**Boys**	**Girls**
Healthy eating <u>Sub-theme 1:</u> Nutritional value and health benefit	"It has vitamins."	3 X		X	1X	2 X	1 X	2 X
	"Bread gives you fibre."			X				
	"You must drink milk and water every day."							
	"Doesn't have too much fat."			X				
	"Calcium builds your teeth."			X				
	"You need to eat a lot of fruits and vegetables in order to be healthy."			X				
	"It makes you strong and healthy."			X				
<u>Sub-theme 2:</u> General *attitude* towards eating healthy	"It is juicy."	3 X		X	2 X	1 X	2 X	1 X
	"It is healthy for you and nice to eat."			X				
	"It is healthy and mmm...."							
	"I like it"			X				
	"It is nice and healthy."			X				
	"I like everything except oranges."		X					
	"I like everything except cauliflower and broccoli."		X					
	"I like most vegetables cooked, not when it is raw."		X					
	"I like most of this food, except fish."		X					
	"I only like something if it is not going to make you fat."			X				

Table 4.8 Possible barriers and/or motivational factors that might influence children's *attitude* and perceptions regarding healthy eating (during both baseline and end measurements) (continue)

Main themes Sub-themes	**Quotes**	**Total amount of focus groups in which sub-themes presented**	**Barriers**	**Motivational factors**	**Age group (Amount of focus groups in which the subtheme frequently presented)**		**Gender-(Amount of focus groups in which the sub-theme frequently presented)**	
					Grade I-III	**Grade IV-VI**	**Boys**	**Girls**
Sub-theme 3: Motivation for eating healthy	"My mother."	8 X		X	4 X	4 X	4 X	4 X
	"My mother and father."			X				
	"I choose to eat what I like."			X				
	"When I see food on TV; I want to eat it."		X					
Sub-theme 4: Source of nutrition information	"My mommy and daddy."	4 X			2 X	2 X	2 X	2 X
	"The doctor."							
	"Dentist."							
	"You can read it in a magazine."							
	"The musical play we participated in."							
	"My teacher at school."							
	"At school, what is that subject call again...?"							
Sub-theme 5: Prevention from eating healthy e.g. taste, texture of food; individuals; the media.	"My younger brother."	3 X				3 X	1 X	2 X

Table 4.8 Possible barriers and/or motivational factors that might influence children's *attitude* and perceptions regarding healthy eating (during both baseline and end measurements) (continue)

Main themes Sub-themes	**Quotes**	**Total amount of focus groups in which sub-themes presented**	**Barriers**	**Motivational factors**	**Age group (Amount of focus groups in which the subtheme frequently presented)**		**Gender-(Amount of focus groups in which the sub-theme frequently presented)**	
					Grade I-III	**Grade IV-VI**	**Boys**	**Girls**
Sub-theme 5 (continue): Prevention from eating healthy e.g. taste, texture of food; individuals; the media	"On television."							
	"I don't like it because of the taste of it."		X					
	"Why should I do it if my parents don't do it?"		X					
Sub-theme 6: Preference for fruits.	"Fruits, it is healthy and gives you more vitamins."	2 X		X	2 X		1 X	1 X
	"Fruits; because it is healthy for you and gives you energy."			X				
	"I like fruit more because it is nice."			X				
Sub-theme 7: Preference of vegetables.	"Vegetables. I love onions when it cooks."	1 X		X		1 X	1 X	1 X
	"Vegetables make you strong."			X				
	"Vegetables ensure that you don't get spots on your skin."			X				
Sub-theme 8: Preference of both fruits and vegetables	"Both because it is healthy."	4 X		X	2 X	2 X	2 X	2 X

Table 4.8 Possible barriers and/or motivational factors that might influence children's *attitude* and perceptions regarding healthy eating (during both baseline and end measurements) (continue)

Main themes Sub-themes	**Quotes**	**Total amount of focus groups in which sub-themes presented**	**Barriers**	**Motivational factors**	**Age group (Amount of focus groups in which the subtheme frequently presented)**		**Gender-(Amount of focus groups in which the sub-theme frequently presented)**	
					Grade I-III	**Grade IV-VI**	**Boys**	**Girls**
Sub-theme 9: Preference of raw vegetables	"Raw like in a salad."	2 X		X	1 X	1 X	1 X	1 X
	"Raw, because if it is cooked some of the good stuff is lost."		X					
Sub-theme 10: Preference of cooked vegetables	"Cooked, because if you eat it raw, you can get sick."	2 X	X		1 X	1 X	1 X	1 X
	Cooked potato, because it is nice."			X				
Sub-theme 11: Preference of both raw and cooked vegetables	"Some raw, some cooked."	2 X			1 X	1 X	1 X	1 X

Theme 3: Unhealthy eating

The following sub-themes were identified under theme three:

Sub-theme 1 – Perception of eating unhealthy, the difference between healthy and unhealthy food (a barrier):
The number of children that reported this sub-theme was 28 girls from the age group, grade IV-VI.

Sub-theme 2 – General attitude towards eating unhealthy (can be a barrier/a motivational factor):
The number of children that reported this sub-theme was 5 boys and 5 girls from the age group, grade I-III and 5 boys and 5 girls from the age group, grade I-III. Children presented a positive *attitude* towards unhealthy foods due to the taste (barrier –attitude) of it, though they knew it is not healthy for them (*a motivational factor*).

Sub-theme 3 - Motivation for eating unhealthy e.g. taste, the media (a barrier):
The number of children that reported this sub-theme was 5 boys and 3 girls from the age group, grade I-III and 1girl from the age group, grade I-III and 5 boys and 2 girls from the age group, grade IV-VI. Children (boys and girls, both age groups) contributed their preference of unhealthy food to the taste of it.

Sub-theme 4- Prevention from eating unhealthy e.g. individuals, knowledge (a motivational factor):
The number of children that reported this sub-theme was 14 boys and 6 girls from the age group, grade I-III and 10 girls from the age group, grade IV-VI. Most of the children indicated that their own knowledge and motivation (grade IV-VI, boys and girls) and parental motivation (grade I-III, boys and girls) prevented them from following unhealthy dietary behaviour.

Sub-theme 5 – Perception of food available at school tuck shop (a barrier):
The number of children that reported this sub-theme was 24 boys from the age groups, grade I-III and grade IV-VI; 24 girls from the age's groups, grade I-III and grade IV-VI. Children (boys and girls, both age groups) perceived all food at their school tuck shops as unhealthy.

Sub-theme 6 -Preference between buying food from the school tuck shop and receiving a lunch box to school (a barrier/a motivational factor):
The amount of children that reported this sub-theme was 10 boys and 12 girls from the age group, grade I-III and 10 boys and 10 girls from the age group, grade IV-VI. All children indicated that they rather prefer to take a lunch box (motivator) to school than buying food from the school tuck shop (barrier).

Table 4.9 Possible barriers and/or motivational factors that might influence children's *attitude* and perceptions regarding unhealthy eating (both at baseline and end measurements)

Main themes Sub-themes	**Quotes**	**Total amount of focus groups in which sub-themes presented**	**Barriers**	**Motivational factors**	**Age group (Amount of focus groups in which the subtheme frequently presented)**		**Gender-(Amount of focus groups in which the sub-theme frequently presented)**	
					Grade I-III	**Grade IV-VI**	**Boys**	**Girls**
Unhealthy eating <u>Sub-theme 1:</u> Perception of eating unhealthy (difference between healthy and unhealthy food)	"Makes you fat."	5 X				5 X		5X
<u>Sub-theme 2:</u> General *attitude* towards eating unhealthy	"It is nice to eat."	7 X	X		4 X	3 X	4 X	3 X
	"I have a craving for it now."		X					
	"I like these things but I don't eat it every day because it is not good for you."		X	X				
	"I would like to eat it every day."		X					
	"Even if I know it is not healthy, I would still eat it because it is nice."		X	X				
<u>Sub-theme 3:</u> Motivation for eating unhealthy e.g. taste, the media (fast food restaurants)	"Because it is nice."	6 X		X	3 X	3 X	3 X	3 X
	"The taste."			X				

Table 4.9 Possible barriers and/or motivational factors that might influence children's *attitude* and perceptions regarding unhealthy eating (both at baseline and end measurements) (continue)

Main themes Sub-themes	**Quotes**	**Total amount of focus groups in which sub-themes presented**	**Barriers**	**Motivational factors**	**Age group (Amount of focus groups in which the subtheme frequently presented)**		**Gender-(Amount of focus groups in which the sub-theme frequently presented)**	
					Grade I-III	**Grade IV-VI**	**Boys**	**Girls**
Sub-theme 3 (continue): Motivation for eating unhealthy e.g. taste, the media (fast food restaurants)	"It is sweet and nice."			X				
	"The sugar is sweet, but too much fat."		X	X				
	"Happy meal."							
Sub-theme 4: Prevention from eating unhealthy e.g. individuals, knowledge	"Own choice."	8 X		X	4 X	4 X	4 X	4 X
	"My mother."			X				
	"Because I know it is not healthy for me."			X				
Sub-theme 5: Perception of food available at school tuck shop	"Unhealthy."	8 X			4 X	4 X	4 X	4 X
Sub-theme 6: Preference between buying food from the school tuck shop or receiving a lunch box to school	"Lunch box."	7 X			4 X	3 X	4 X	3 X

Theme 4: Physical activity

The following sub-themes were identified under theme four:

Sub-theme 1 – Perception of physical activity (a motivational factor):

The amount of children that reported this sub-theme was 12 girls from both age groups, grade I-III and grade IV-VI; 12 boys from both age groups, grade I-III and grade IV-VI. Children either considered physical activity as either exercising or participating in sport.

Sub-theme 2 – General attitude toward physical activity (a motivational factor):

The amount of children that reported this sub-theme was 11 boys and 14 girls from the age group, grade I-III and 20 boys and 8 girls from the age group, grade IV-VI. Boys (grade IV-VI) indicated that they prefer physical activity because it makes them strong (*a motivational factor*). Children in general (boys and girls, both age groups) presented with a positive *attitude* regarding physical activity.

Sub-theme 3 – Motivation behind physical activity (a motivational factor):

The amount of children that reported this sub-theme was 20 boys from both age groups, grade I-III and grade IV-VI; 20 girls from both age groups, grade I-III and grade IV-VI. Parents again seem to play an important *motivational role* in children's physical activity behaviour.

Sub-theme 4 – Prevention from being physically active (a barrier):

The number of children that reported this sub-theme was 1 girl from the age group, grade I-III. Inner motivation (barrier-attitude) seems to be the only factor that prevents certain children from having a positive *attitude* with regard to physical activity.

Theme 5: Consequence of unhealthy eating and sedentary behaviour (a motivational factor):

The number of children that reported this sub-theme was 10 boys from the age group, grade I –III and 2 boys from the age group, grade IV-VI and 16 girls from the age group, grade IV-VI. Most children (boys and girls, both age groups) considered the health consequences as either becoming overweight or not strongly built.

Table 4.10 Possible barriers and/or motivational factors that might influence children's *attitud*e and perceptions regarding physical activity (both at baseline and end measurements)

Main themes Sub-themes	**Quotes**	**Total amount of focus groups in which sub-themes presented**	**Barriers**	**Motivational factors**	**Age group (Amount of focus groups in which the subtheme frequently presented)**		**Gender-(Amount of focus groups in which the sub-theme frequently presented)**	
					Grade I-III	**Grade IV-VI**	**Boys**	**Girls**
Physical activity <u>Sub-theme 1:</u> Perception of physical activity	"Is dancing and cleaning the house also physical activity?"	4 X			3 X	1 X	3 X	1 X
	"Exercise."							
	"Doing sport."							
<u>Sub-theme 2:</u> General *attitude* towards physical activity	"Very nice."	9 X			2 X	7 X	5 X	4 X
	"I like it very much."			X				
	"I don't like exercise; it is too much stuff to do."		X					
	"I like everything because it is nice and makes my body strong."			X				
	"Ooh, that is my favourite."			X				
	"I like everything, expect the sport boys participate in."		X	X				
<u>Sub-theme 3:</u> Motivation behind physical activity	"Own choice."	7 X		X	3 X	4 X	5X	2 X
	"My parents."			X				
	The teachers at school."			X				
	"Biggest loser on TV."			X				

Table 4.10 Possible barriers and/or motivational factors that might influence children's *attitude* and perceptions regarding physical activity (both at baseline and end measurements) (continue)

Main themes Sub-themes	**Quotes**	**Total amount of focus groups in which sub-themes presented**	**Barriers**	**Motivational factors**	**Age group (Amount of focus groups in which the subtheme frequently presented)**		**Gender-(Amount of focus groups in which the sub-theme frequently presented)**	
					Grade I-III	**Grade IV-VI**	**Boys**	**Girls**
Sub-theme 3 (continue): Motivation behind physical activity	"To be thin."			X				
Sub-theme 4: Prevention from being physically active	"I don't like exercise; it is too much stuff to do."	1 X	X		1X			1X
Consequences of unhealthy eating and sedentary behaviour	"Can become fat."	5 X			1 X	4 X	2X	3 X
	"If you are too fat you won't be able to run around."							
	"Get easily tired."							
	"Won't be strong."							
	"You will get sick."							
	"You won't get enough soldiers."							

CHAPTER 5: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

Within this final chapter, the study findings will be discussed in the context of currently available literature and the specific aim and objectives of this particular sub-study. Conclusions and recommendations will then be made based on the discussion and available literature.

5.2 MAIN FINDINGS OF THIS SUB-STUDY

The main findings of this study were that more than half (> 50%) of the total group of children had a positive attitude towards healthy and unhealthy eating, as well as physical activity at both baseline and end measurements. As hypothesized a small positive increase in attitude towards healthy eating (11 %) and an increase towards unhealthy eating (11%) within the total group of children could be detected at end measurements. Attitude of children towards physical activity was positive and improved slightly (3%) at end measurements within the total group of children.

The five major themes that were identified and investigated within the context of focus group discussions included health awareness, healthy eating, unhealthy eating, physical activity, and consequences of unhealthy eating and sedentary behaviour. The mother was the biggest motivator for eating healthy food amongst most children while the biggest barrier was the taste and smell of some healthy foods. The biggest motivational factor for eating unhealthy food was its good taste amongst most children; most of the younger children were dependent on their mothers to prevent them from eating unhealthy foods while older children regulated these themselves. Older girls associated unhealthy eating with becoming fat while many children associate the combination of unhealthy eating and being sedentary with becoming fat. Most children had a positive *attitude* towards physical activity and enjoy doing it although the biggest motivator for partaking in physical activity is their parents and not themselves.

In the following sections a more detailed discussion of the main findings will follow.

5.3 DISCUSSION

5.3.1 Quantitative data

5.3.1.1 Socio-demographic information and physical activity

In this group of children socio-economic status was most probably not a barrier for making healthy food choices since most lived in brick houses, with flushing toilets, had only one to two people sharing a bedroom, the average household income was more than R5000-00, and the average amount of money spent on food ranged between R1500-00 to R2500-00 a month. Children from low-socio economic households could be faced with a financial barrier to be able to choose healthy foods. Often unhealthy foods (that are energy dense but not always nutrient rich) are cheaper to buy (Temple & Steyn, 2009). Recently Temple and co-workers (2011) came to the conclusion that in order to change from a usual South African diet to a healthier diet will amount to an additional ~R1 090/month for a family of five. This therefore may limit the availability and/or accessibility children have to healthy foods.

Within the current study, less than half (42 %) watched television and or played play-station for one to two hours/day. Watching television may pose a barrier to healthy eating, especially if junk foods are advertised on television (Batada *et al.,* 2008). From the current study's focus group discussions it was also mentioned that when food is seen on television or children see a picture of food they want to eat it. Additionally, television viewing and playing computer games can be a barrier to do physical activity. Results from the American Framingham children's study (Proctor *et al*., 2003) indicated the amount of time spent watching television or playing video games is an important risk factor for developing excess body fat during childhood. This study showed that children (~11 years) who watched three hours or more television per day had a mean sum of skin folds of 106.2 mm in comparison to mean sum of skin folds of 76.5 mm for the group of children who watched less than 1.75 hours per day ($p=0.007$).

From the quantitative data in this study it was clear that the mother was the person that was mainly responsible for food preparation and feeding of the household and also in terms of motivating children to eat healthily and is also the one that decides what food is bought for the household. Research indicates that the home environment is primarily responsible for shaping children's food choices. Both parents and friends can be a source of motivation for making and sustaining certain dietary choices (Andersen, *et al*., 1998).

Parents play an important influential role in their children's dietary behaviour (food preferences and energy intake) by means of their own behaviour as well as their child feeding practices (Scaglioni *et al*., 2008). Significant correlations have also been found between parents and their children's nutrition behaviour, such

as food intake, eating motivations and body image (Scaglioni *et al*., 2008). Though the role of peer pressure was not thoroughly investigated within the current study, research shows that children clearly value the opinions of their peers and this can, therefore, also extend to food choices made within the school environment. From the focus group discussions, peer-pressure did not come out strongly which might have been due to the fact that the discussions were done in group setting, the role of a sibling did, however, come out as another person influencing food choices.

5.3.1.2 *Attitude* towards healthy eating, unhealthy eating and physical activity behaviour

This current study was based on the behaviour change theory called the theory of planned behaviour (EUFIC, 2005). This theory is grounded on behaviour intention derived from *attitudes*, perception of social pressure to perform the behaviour and the perceived control over the behaviour (EUFIC, 2005). This particular model was successfully used in explaining fat, salt and milk intake, and also used to explain *attitudes* and beliefs in terms of starchy foods in the United Kingdom (Stubenitsky & Mela, 2000). It enables researchers within dietary studies to compare the strength of influences upon individuals and between sample groups and, therefore, can be useful in understanding the determinants of food choices (Stubenitsky & Mela, 2000).

Rating scales used for adults may not always be appropriate for usage in research with children with regard to scoring preferences, likes or dislikes, since unfamiliar words and scales based on numbers may be difficult to comprehend. One particular method that has been widely used is the "smiley-face" scale, where children are presented with different faces ranging from sad to happy and assigning a numerical value to each of these facial expressions (Keefer & Johnson, 2011). The use of five-point or nine point hedonic scales have been widely documented in nutrition intervention programmes for children, where food preferences or sensory evaluation of certain food products have been evaluated, e.g. fruits and vegetables (Andersen, *et al*., 2005). A three point hedonic scale was used in the current study to score the *attitude* (preferences and or sensory evaluation) of children in general with regard to healthy eating, unhealthy eating and physical activity. Due to the complexity of these outcomes that were measured it was decided to use a simple hedonic scale to simplify the scoring of *attitude* towards a group of items and not just one. For example, pictures of different foods were shown to children that were healthy to determine their attitude towards healthy eating in general and not just one healthy food item. Previous studies that made use of hedonic scales with five or more points only examined one food item or group of foods (such as vegetables or fruit), while we combined various food items from different food groups that were healthy into one group and did the same for unhealthy eating and physical activity. It is acknowledged by the researcher that the use of the three-point hedonic scale might have caused subtle changes within the attitude of children regarding healthy eating, unhealthy eating and physical activity to be missed. As previously stated, more than half (> 50%) of the total group of children

had a positive attitude towards healthy and unhealthy eating, as well as physical activity at both baseline and end measurements. As hypothesized a small positive increase in attitude towards healthy eating (11 %) and a positive decrease in attitude towards unhealthy eating (11%) within the total group of children could be detected at end measurements. Attitude of children towards physical activity was positively small increased (3%) at end measurements within the total group of children could be detected. The positive *attitud*e towards healthy eating and physical activity was a result that one would like to see amongst primary school-aged children, however, the positive *attitude* towards unhealthy eating is something that needs to be changed as this is associated with various health issues (Barbaro, 2006; Jahn *et al.*, 2008; Mayosi *et al*., 2009; Reniers *et al.*, 2009). As mentioned previously, due to the three-point hedonic scale being used subtle changes in *attitude* towards healthy eating, unhealthy eating and physical activity might have been lost. Another possible reason could have been that the time period in which the NEIP was implemented was too short to facilitate change from one behaviour change stage to another (e.g. contemplation to preparation – the so called theory of planned behaviour) (Prochaska & DiCliemente, 2005; EUFIC, 2005). However, since we did not measure these stages this is purely speculative.

5.3.2 Qualitative data

Five main themes with sub-themes were investigated and identified within the context of all focus group discussions held. Possible barriers and/or motivational factors that were identified and seem to play an important role in children's *attitude* towards healthy eating, unhealthy eating and physical activity will now be further discussed.

The main motivators of and barriers to healthy eating, unhealthy eating and physical activity that were mentioned most frequently across all focus groups can be grouped into the following main ideas, namely social influences, taste and texture, body weight concerns, the desire to be healthy, craving for unhealthy foods, availability of healthy and unhealthy foods, and being physically active.

5.3.2.1 Social influences

Most children indicated that they receive their nutritional information from their parents, and are also mostly motivated by their parents to eat healthily. Other sources of nutritional information and motivation for eating healthy included the school as well as the NEIP of this current study. Older children, however, decide themselves whether they eat unhealthy foods (based on own motivation and knowledge) while younger children are more dependent on their mother's influence on unhealthy food choices. The important role that parents and teachers play in children's dietary and physical activity behaviour is widely documented and their

role as models (in terms of their own knowledge, attitude and actual behaviour) is often stressed (positive role modelling) (Reinarts *et al*., 2007; Scaglioni *et al*., 2008; Dammann & Smith, 2010). Other factors that were identified to influence children's food choices were siblings and the media in the current study, these were motivators but also barriers. Sometimes siblings will be the cause of not eating healthy foods while the television was identified as a motivator to eat both healthy and unhealthy foods. These findings are well documented in the literature amongst primary school children and across different ethnic groups, and therefore support findings from previous studies (Cullen *et al*., 2000; Cullen *et al*., 2001; Sheperd *et al*., 2006, Dammann & Smith, 2010)

Rebellion (a barrier) was also identified to a lesser degree, especially in the older participants and could be confirmed in the following quote, "Why should I do it if my parents do not do it". Similar research findings, namely "Do not like to being preached to about my dietary behaviour" were also noted in the study of McKinley *et al*. (2005) who investigated children's (aged 11-12 years) views on food and nutrition using focus group discussions. Croll *et al*. (2001) investigated the meaning of "healthy" and "unhealthy" eating and the importance of healthy eating among USA adolescents also using focus group discussions and found rebellion to be less prevalent amongst their focus groups as a barrier for healthy eating. Rebellion therefore could be a barrier in some groups of children, but not all, thus before one want to implement a nutrition education intervention programme it seems to be wise to clarify possible barriers and motivators to help identify the best possible type of NEIP to be developed in order to increase the chances for success in change of behaviour as well as *attitude*.

5.3.2.2 Taste and texture

Taste and texture were identified as either motivational factor for or barrier to healthy eating or unhealthy eating. Palatability is proportional to the amount of pleasure an individual experiences when eating a particular food and is dependent on the sensory properties of such food for example taste, smell, texture and appearance (EUFIC, 2005; Kavey, 2010). Therefore, it is not surprising that food is not only a means of nourishment, but also a source of sensory pleasure and, therefore, providing strong enough reason for unhealthy dietary practices. Taste is known to play an important role in the attitude and preference of children towards healthy and unhealthy foods (Cullen *et al.*, 2000; Dammann & Smith, 2010). Results from this sub-study support these findings. In general most children perceived unhealthy foods as something they like to eat with general comments such as "Because it is nice" and the main reasons for this liking attributed to its taste, some examples of quotes include "It is sweet and nice", and "Even if I know it is not healthy, I would still eat it because it is nice".

The general feeling towards healthy food was also positive across all focus groups and related to the taste of healthy foods in general with some examples of quotes being “It is juicy”, “It is healthy and mmm....”, and “It is healthy for you and nice to eat”. With little exception most children indicated that they prefer both fruits and vegetables, if not, it was either because of the form in which fruit (a barrier) was presented or available an example of a quote is ”...First have to peel the skin of an orange before you can eat it...”. The texture, taste and smell of some vegetables also were barriers as it did not appeal to some (e.g. broccoli; cauliflower and avocado) either when it was cooked or raw. Most children prefer the vegetables they eat cooked with some exceptions, examples of quotes were “Cooked potato because it is nice...”; “Raw, because if it is cooked some of the good stuff is lost”; and “Cooked because if you eat it raw you can get sick”. In general children’s attitude towards and motivation for eating healthy food was determined by personal taste preference (which seems to be both a motivational factor and a barrier). In the review of Blanchette and Brug (2005) it was concluded that taste preference was probably the most important personal determinant for fruit and vegetable consumption for children between the age of 6 and 12 years. Within the current study, girls indicated that they have a greater preference for fruits and vegetables than boys. This finding is in line with results from others, a review by Rasmussen *et al*. (2006) found that in 27 out of 49 quantitative studies; girls tend to have a higher and/or more frequent intake of fruit and/or vegetables than boys. Possibly because of its association with reaching and maintaining a desired body image (Wardle *et al.*, 2003).

5.3.2.3 Body weight concerns

Within the current study most children perceived unhealthy food as a source of sugar and fat and, therefore, if you eat too much of it you can become overweight. The general remark towards unhealthy foods was “It makes you fat”, this was more prevalent amongst older girls than the other age and gender groups. Some also reported doing physical activity for the main reason to become thin and if one does not do any physical activity you will become fat. The results are similar to those of others who found that weight concerns can be a motivational factor for healthy eating and physical activity (Dixey *et al*., 2001; McKinley *et al*., 2005; Sheperd *et al*., 2006; Kaye *et al*., 2011).

5.3.2.4 The desire to be healthy

Similarly to the results of Kaye and co-workers (2011), most children in the current study wanted to eat healthy foods purely to be healthy. Some quotes include “Fruits, it is healthy and gives you more vitamins”, “Vegetables ensure that you don’t get spots on your skin”, “You need to eat a lot of fruits and vegetables in order to be healthy”, and “It makes you strong and healthy”. Additionally, boys perceived being healthy as either being physically strong or having enough energy and, therefore, they wanted to be more physically

active and participate in sport activities. Most girls on the contrary perceived being healthy to be related to following a healthy diet and therefore staying in shape (positive body image). This was also shown by Wardle *et al*. (2003) who found that girls' desire to eat specific foods (i.e. fruit and vegetable) can be contributed to the role of social desirability and that they attach a greater importance to the role of diet, especially in terms of body image. Others (McKinley, *et al*., 2005) also found similar perceptions and attitudes towards health awareness (for both boys and girls) and reason for participation in physical activity amongst 11-12 year old children in Northern Ireland and England.

Children of the current study reported possible consequences associated with unhealthy eating to be overweight, unfit, or an increased risk to become ill. Whether the intensity of this risk behaviour is strong enough at this particular age to change dietary and physical activity behaviour is still debatable.

5.3.2.5 Cravings for unhealthy foods

Many children in the current study had a positive attitude towards unhealthy food and reported that they craved for it or liked it and that the television played a role in stimulating their desired to eat it even when they know it is not healthy. Some quotes include "Even if I know it is not healthy, I still like it and therefore will continue to eat it", "I have a craving for it now", and "I would like to eat it every day". Similarly Kaye and co-workers (2011) found primary school children to use words such as 'craving' and 'addiction' in their focus group discussions when talking about junk foods. Children in the current study also indicated that when they see a picture of food or a food advertisement on television they want to eat it immediately, because it immediately appeals to their senses. This was noted as a possible barrier to overcome when trying to change their *attitude* towards unhealthy eating. From these results it is clear that one should educate children on how to handle cravings towards unhealthy foods and self-regulate the intake of unhealthy foods when they get a visual stimulus thereof.

5.3.2.6 Availability of healthy and unhealthy foods

The availability and/or accessibility to healthy or unhealthy foods have been shown to be motivators of or barriers to choosing healthy foods amongst children (Cullen *et al.*, 2001; Shepherd *et al.,* 2006; Damman & Smith, 2010). Children in the current study preferred to take a lunch box to school rather than to buy something from the school tuck shop. Similarly a cross-sectional survey in the Western Cape (South Africa) found that younger learners (10-12 years old) preferred to take a lunch box to school than buy food at the tuck shop (Abrahams *et* al., 2010). The availability of healthy foods are often more in the home setting than the school setting, thus lunch boxes are often more healthy than foods bought from school tuck shops (Kaye

et al., 2010). Abrahams and co-workers (2010) also found that South African children that carried a lunchbox seem to be exposed to a greater variety of healthy foods and had more food available at home, possible due to more finances. In the current study we did not ask about the content of lunch boxes and can therefore not compare it with the types of food available at the school tuck shops, however, most children did state that their mothers were the ones that were in charge of feeding the household and for motivating them to eat healthy, thus it is most probable that lunch boxes would consist out of healthy food items.

All children in the current study across all focus groups perceived the food that is available at the school tuck shop to be unhealthy. This suggests that most of the foods available at tuck shops are unhealthy and also that children are able to identify unhealthy foods. Thus the availability of unhealthy foods in the school setup can be seen as a barrier to eating healthy foods and something one will have to consider when planning a nutrition education intervention at these schools, as well as when one would like to facilitate change in eating behaviour through a NEIP. Popular food items sold in some South African schools include cool drinks, chips, cheese curls and fried cakes (Kruger *et al*., 2005), all being unhealthy foods.

5.3.2.7 Being physically active

To be physically active was enjoyed by most children and associated with health and not being overweight. Some girls did however have negative *attitude* towards physical activity which can be seen as a barrier and will need to be addressed if one would like to implement a physical activity component as part of a nutrition education intervention in schools, some quotes included "I don't like exercise; it is too much stuff to do", and "I like everything, expect the sport boys participate in". Eating healthy and being physically active has also been linked to one another in the study by Kaye and co-workers (2011), their children said that when unhealthy foods are eaten it may prevent them from being physically active because it can make you nauseous or lazy.

5.4 OVERALL CONCLUSION

Even though some children's *attitude* did change in the desired direction after the implementation of a unique and fun NEIP and standard school curriculum, most children's *attitude* towards healthy eating, unhealthy eating and physical activity remained unchanged. This might have been due to a measurement tool that was not sensitive enough to detect subtle changes. Various motivational factors for and barriers to healthy eating, unhealthy eating and physical activity were identified that could play an important role in the successful implementation of a NEIP aimed to facilitate change in *attitude* and behaviour regarding healthy eating, unhealthy eating and physical activity. This is one of a few studies that documented 'true' motivators and

barriers of children towards healthy eating, unhealthy eating and physical activity through the use of focus group discussions and can, therefore, contribute to the existing literature in this field.

5.5 RECOMMENDATIONS

Future studies investigating the effect of a **only** NEIP on the *attitude* of children with regard to healthy eating and physical activity, should include a control group that is in a different school (mainly to prevent cross-contamination), ensure that sufficient time is allocated for more in-depth conversation, and have individual focus group discussions to prevent peer pressure to influence outcomes. In order to facilitate change in *attitude* and behaviour a NEIP should preferable be longer and have a larger parental component since younger children are often dependant on food availability at home and their parent's *attitude* to and behaviour of healthy eating. Additionally, considering each child's and parent's stage of change as previously described in the stages of change model theory for behaviour modification may improve the success of a NEIP on change of *attitude*. Additionally, research is needed to identify the best possible and most applicable assessment tool to determine the effect of a NEIP on the *attitude* of children towards healthy eating, unhealthy eating and physical activity. It will also be interesting to investigate whether different cultures have different motivators for and barriers to healthy eating which can be investigated by having focus groups that consist out of black compared to coloured and white children. For these focus groups it will be important to have focus group leaders of the same ethnicity and gender than the children to ensure the correct information is gathered from discussions.

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ADDENDUM I

Written manual for the Musical Play

This project is sponsored by the South African Sugar Association (SASA)

Compiled by: Karlien Kruger

Michelle Harris

Guideline: Eat 5 small meals a day
Enjoy a variety of foods

Message:

Individuals, including children need specific nutrients to maintain a healthy lifestyle. Nutrients are the building blocks for the body that each provides a different type of nourishment for the body. For your body to absorb all the different nutrients, you need to take in a variety of foods on regular time intervals.

A variety of foods include the different food groups within the food pyramid (e.g. starches, fruits and vegetables, meat and meat products, milk and milk products as well as fats). Whenever you don't consume a variety of foods, your body develops a deficiency and cannot function properly. A deficiency can be seen as (i) a puzzle that shorts one piece; therefore the picture seen is incomplete or (ii) as a house without all the building material; therefore also incomplete.

The reason for taking these foods on regular time intervals is to maintain your energy levels and to ensure that you don't overeat at one specific time. Energy can be defined as the power your body needs to function properly. When you overeat at one specific time without the same amount of exercise, your energy intake exceeds your energy expenditure; therefore your body stores the excess foods as fat.

Visual material:

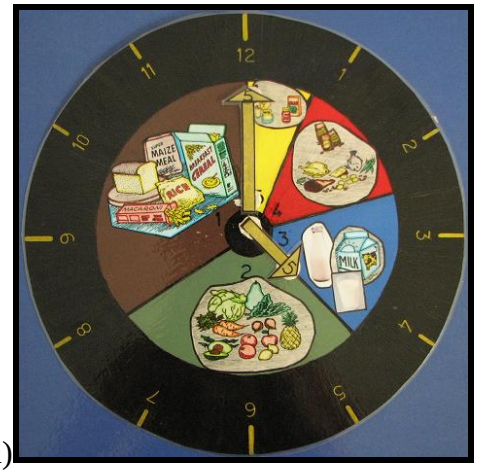
Food pyramid
Carton boxes are used for the five different groups within the food pyramid. Each level of boxes are painted a different colour; each representing a different food group. Flash cards of the different foods within each food group are then stuck onto the appropriate level of boxes.

- *Level one*: the starches are represented by the colour brown. This level is the longest and forms the basis of the pyramid because of two reasons (i) starch is the body's main energy source and (ii) starch should form the basis of each meal.

- *Level two*: fruit and vegetables are represented by the colour green. This level following starches is second due to its importance in providing vitamins and minerals which our body needs to be healthy.
- *Level three and four*: these two levels consists of milk and milk products as well as meat (animal protein) and meat products. Milk and milk products are represented by the colour blue, where as the animal protein is represented by the colour red. These two food groups are mainly the building blocks for muscles, teeth and bones.
- *Level five*: fats are represented by the colour yellow. This food group should be used sparingly. Sugar and salt is also associated with level five in regards to the recommended amounts of consumption (sparingly).

Food-time wheel

This time wheel (a) consists of the five food groups within the food pyramid. Each food group starts at a different time which indicated the five recommended times to eat. The colours used in the food-time wheel are similar to the colours used in the food pyramid.

(a) 

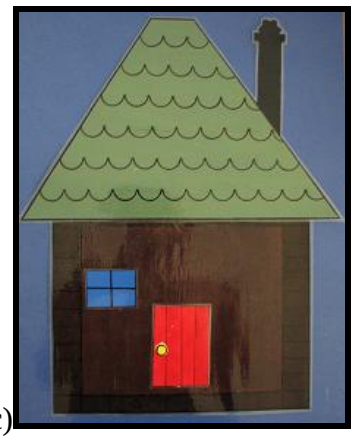
The puzzle

The puzzle (b) is represented by a picture of a face. This face consists of five facial features which represents the five food groups. These facial features are also colour coded according to the food pyramid. If one facial feature (food group) is left out, the picture is seen as incomplete. When the picture is seen as incomplete, it suggests that the body lacks some nutrients due to the consumption of an unbalanced diet.

(b) 

The house

The house (c) also consists of five basic components; also representing the five food groups. These components (food groups) cannot stand alone; therefore, if one component is left out, the house is also seen as incomplete. When the picture is seen as incomplete, it suggests that the body lacks some nutrients due to the consumption of an unbalanced diet.

(c) 

Movements:

1. *The Squat movement (representing 5 meals a day: prevents blood sugar dipping)*

The Squat movement consists of three simple steps: (1) right leg steps to the right corner, (2) squat down with both hands on knees while bringing the left leg to the right leg, and (3) stand-up straight facing the left corner. This movement repeats itself towards your left side.

2. *The Jive movement (represents 5 meals a day: the hour hand)*

The second movement representing a variety of foods is called the Jive movement. This movement is demonstrated by pulling down the right arm while lifting the left shoulder; then repeating the movement to the other side and ultimately lifting the left hand upwards while pulling the right arm down. Both arms are kept straight throughout the movement.

3. *The Variety movement (represents eating a variety of foods)*

The Variety movement consists of three movements performed in sequence. The start and end position for these movements are a stance with feet together facing the front. The first movement is demonstrated by stepping backwards with the right foot and stepping back to the starting position. This movement is repeated to the front to form a second movement. The third movement consists of a circular motion around yourself. This circular motion is done by a repeated action of stepping forward (within an imaginary circle) with the right foot and then brining the left foot to the right foot. Throughout the whole sequence of movements, the hands are clapped whenever the left foot are brought towards the right foot. In some cases only the third movement are used to demonstrate a variety of food due to the degree of difficulty of performing the three movements in sequence.

Placement (reinforces knowledge)**:**

To reinforce the concept of the food pyramid and the house, the children are placed on stage in a shape of the base of a house.

Music and dialog:

These two guidelines are performed on "*Whole again*" from the artist Atomic Kitten.

The name of each movement is called out just before the movement is performed to inform the audience of what is being demonstrated. Several children leave the pyramid during a certain point within the song;

thereby causing the house to collapse (demonstrating a shortage of energy). All the children call out “5 meals a day” whenever movement (2) is done.

Props:

Masks (d) are used which represents the different food groups within the food pyramid. Children are wearing different coloured gloves, also representing the different food groups within the food pyramid; therefore representing a wide variety of foods.

(d) 

Decor:

The food pyramid (e) is placed on stage as well as a model of the house (f).

(e) 

(f) 

Guideline: Make starchy food the basis of most meals

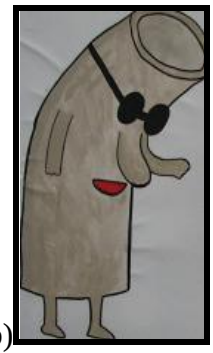
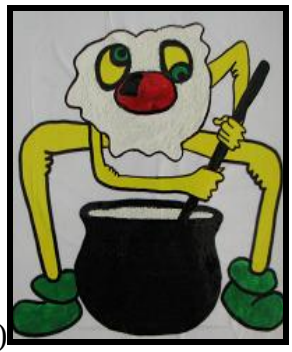
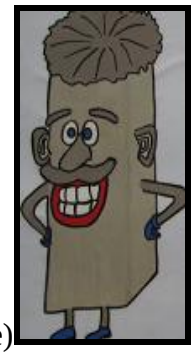
Message:

Starchy food is mainly responsible for providing energy to the body. Energy can be defined as the power our bodies need to be able to function properly or to be physically active. Unrefined starchy foods are the best choice of starches to include into your diet. The reason for this is that starches contain fibre that helps the bowel function properly and keeps blood glucose levels constant. Fibre can be defined as the roughage that you find in food that slows down the digestion process (the process of breaking down complex carbohydrates into simple blood glucose). The result of this slowed down digestion is that it makes your stomach feel full for a longer time period; therefore, you won't get hungry easily and will have energy (power) available for a longer period of time.

Visual material:

The main concept that needs to be transferred is that different types of starches provide energy that can be used for different types of physical activity, and therefore needs to be included in most meals to keep energy levels constant. The following types of starches are examples of energy giving foods that needs to be taken in for performing different tasks:

(a) Spaghetti doing a ripple movement over the lath during his high jump attempt.
(b) Macaroni stretching side-to-side.
(c) Potato doing a long jump.
(d) Stirring a pot of porridge.
(e) Dancing like a Rusk.

(a)  (b)  (c)  (d)  (e) 

The importance of fibre in the diet is also then emphasized through the use of an example of one white- and one whole grain bread that rises during the baking process. This rising action can also be associated with the starting position of a race; therefore, the white and the whole grain bread are aiming to race against each other after rising into the starting position. At first it will seem as if the white bread is going to win the race (a lot of energy for a short period of time), but at last the whole wheat bread wins the race since he had energy available for a longer period of time. Two children (characters) act as the white and whole wheat bread.

Movements:

1. *The Starch movement (representing energy gained from consuming different starchy foods)*

This movement consists of four simple steps: (1) bend your right arm 90º sideways with your hand upwards, (2) bend your left arm 90º sideways with your hand upwards while holding the right arm in its position, (3) rotate both arms in its current position downwards towards the ground, and (4) use both arms and show thumbs-up with both hands shoulder height. While doing this movement all the examples of

starchy foods are named two at a time through using the following cry: e.g. “bread and porridge make me strong”

2. *The Melting movement (representing a Rusk melting when dipped into coffee or tea)*

The movement starts from a standing position and then progresses through relaxing the whole body until it collapses to the ground.

3. *The Baking bread movement (representing bread rising while being baked)*

The movement is initiated through pushing the upper body upwards while pressing on the elbows. The starting position is lying flat on your tummy with elbows bend and hands under the forehead.

4. *The Macaroni ripple movement (representing macaroni)*

This ripple action starts from a standing position until a bend knee crouching position.

5. *The Stirring porridge movement (representing a pot of porridge being stirred)*

The movement is performed through a clockwise circular motion with your right hand. While making circles in front of your body, the right foot steps sideways to the right when the right hand is closest to the body; followed by the left foot stepping right when the right hand is the farthest away from the body.

6. *The Shaking rice movement (representing a packet of rice being shaken by pulling the top corners of the packet)*

Rice is demonstrated through pulling the right shoulder and ear towards each other, followed by the left shoulder and ear which are pulled towards each other while relaxing the right shoulder to its starting position. Throughout this movement the hands are kept in a fist-position.

7. *The Snake movement (representing long, thin and flexible spaghetti)*

The hands are used to demonstrate an upwards S-shaped-movement above the head. Throughout this movement the hands are held together (palms inward).

Placement:

The placement for this guideline will be based entirely on the entertainment value of the movements.

Music and dialog:

This guideline is performed on "*Net die een vir my*" from the artist Nicolas Louw.

Props:

Children are using (f) wooden spoons to stir the imaginary pot of porridge.

(f) 

Decor:

Polystyrene models of (g) the white bread and (h) the whole wheat bread are placed on stage to reinforce the message that the two characters are aiming to bring forward.

(g)  (h) 

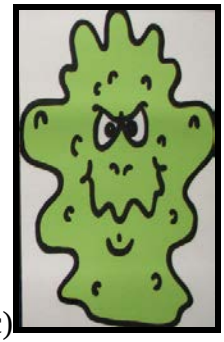
Guideline: Eat plenty of fruits and vegetables

Message:

Fruits and vegetables contain a lot of vitamins and minerals. Vitamins are nutrients within foods which protect the body. Minerals are nutrients which the body needs to function properly. Vitamins and minerals are seen as the soldiers within the body that protect you against diseases (bacteria). Therefore, vitamins and minerals increase the body's immunity. Immunity of the body is the body's ability to fight of diseases (bacteria). Therefore, the more fruits and vegetables you eat, the more soldiers your body has to protect it against diseases (bacteria) and the higher your body's immunity will be.

Visual material:

Two characters are used to explain the importance of fruits and vegetables: (a) an ill character ("arme Sakkie" / poor Bill) that doesn't eat fruits and vegetables and (b) a healthy character ("gesonde Gert" / healthy Alphy) that eats plenty of fruits and vegetables. Within the musical these characters are introduced as (c) bacteria ("die Kiem" / the Germ) versus (d) vitamins and minerals ("die Soldaat" / the Soldier) within the fruits and vegetables. The vitamins and minerals will fight of the bacteria and will eventually win when standing alongside the bacteria (lying on the floor) with arms raised above the head.

(a)  (b)  (c)  (d) 

Movements:

1. *The Spinning apple movement (representing an apple spinning round and round)*

This movement therefore involves spinning around yourself while holding your arms bended sideways, demonstrating the roundness of an apple.

2. *The Banana split movement (representing peeling off a banana)*

The Banana split movement can be demonstrated through tucking your bended arms into your sides while keeping the wrists relaxed. Throughout this movement the head is moving side to side on the beat of the music. The arms during this movement represent the skin of the banana being peeled off.

3. *The Watermelon wiggle movement (representing a watermelon)*

The Watermelon wiggle is demonstrated through lifting your bum into the air and wiggling it sideways. The arms are placed on the ground for stability in order to prevent injuries. While wiggling the bum, the feet are kept together.

4. *The Slicing oranges movement (representing slicing an orange)*

The Slicing oranges movement basically implies that you jump from a standing position where the feet are against each other, to a position where the feet are far apart, mimicking a scissor-jump.

5. *The Growing bean stalk movement (representing a bean stalk starting to grow)*

This movement consists of a basic upward hand movement simulating the growing action. At the beginning of the movement the hands are held shoulder width apart, in front of the chest, with fingers spread out. The movement then progress as both hands continuously perform figure-eight movements in front of the face.

6. *The cauliflower fingers movement (representing cauliflower)*

In order to demonstrate this movement both hands are imagined to be cauliflower cobs. The arms are raised upwards in a v-shape and the elbows are locked. The hands are held above the head while each fingertip moves individually. The body then sways from side to side.

7. *The Pumpkin head movement (representing a pumpkin)*

The Pumpkin head movement basically entails grabbing your head with both arms and elbows pointing sideways.

The vegetable namely, a carrot is demonstrated by four concepts: (8) simulates the growing of a carrot, (9) represents the chopping of a carrot, (10) shows a little rabbit wanting to eat the carrot, while (11) demonstrates the carrot being eaten by the rabbit.

8. *The Growing carrot movement*

The movement starts in a crouching position and slowly progresses into a standing position, simulating growth.

9. *The Chop till you drop movement*

The Chop till you drop movement begins in a standing position followed by a slow downwards jerking motion into a drop to the ground where the movement ends in a crouching position.

10. The Rabbit dance movement

In order to represent a little rabbit, you need to act and look like a rabbit. Therefore, the Rabbit dance movement is demonstrated through pulling yourself into a small bundle on the ground while tucking-in your legs underneath your body. This then is followed by placing the hands in front of your head with only the index fingers pointing upwards, simulating rabbit ears. In this position the rabbit now bounces up and down (small movement) on the beat of the music.

11. The Grinding carrot movement

The Grinding carrot movement can be demonstrated by bringing the left hand to the mouth as if eating the carrot while the right hand makes imaginary forward circles around the right ear. This circular motion aims to simulate a grinding action of the carrot.

12. The Boxing beetroot movement (representing a beetroot boxing the germs)

The Boxing beetroot movement is demonstrated by a downwards boxing action. The arms are alternating and held alongside your body throughout the boxing action.

Placement (reinforces knowledge)**:**

The children are divided into two groups (i) germs and (ii) soldiers. The whole song will represent a fight between the two groups with the soldiers ultimately winning the fight and thereby reinforcing the knowledge that fruits and vegetables keeps your body healthy by fighting of bacteria and illness.

Music and dialog:

These movements are performed on "*Pampoen*" from the artist Steve Hoffmeyer.

Props:

The children wear masks representing (e) the germs and (f) the soldiers (fruits and vegetables). The children not wearing masks are wearing (g) fruit and vegetable bandanas.

(e)  (f) 

(g) 

Decor:

Large polystyrene food models (h) are used to present some of the fruits and vegetables representative of this guideline.

(h) 

Guideline: Meat, fish, chicken or eggs can be eaten every day
Drink milk every day

Message:

Proteins are the main building blocks of muscles in the body. Examples of proteins that can build the body's muscles are red meat, fish, chicken and eggs (animal proteins). Animal proteins contain a lot of fat (especially saturated fat – so called "bad fat"), and must therefore be eaten in small quantities (Remember to remove all visible fat from meat). Two to three portions of meat and meat products can be eaten daily. A portion meat is the size of a match box and as thick as your thumb. Red meat is also a source of iron. The body needs iron (iron can be visualize as a small boat and water as blood) to carry oxygen around in the body. If the body would develop a deficiency (small quantities of iron-boats carrying oxygen), it can lead to feeling tired (not enough oxygen). Food with a content of high quality iron, include organ meat, red meat, fish, and chicken. Spinach, broccoli and beans have an iron content of low quality.

Milk and milk products as well as the bones of pilchards are a good source of calcium, which is important for strong bones and teeth. Two to three portions of milk and milk products can be eaten daily. One portion of milk is a cup (250ml).

Visual material:

Meat

The character (a) "Popeye" is used to demonstrate that the protein within meat builds muscles and that red meat is a good source of iron which is also found in spinach which makes "Popeye" very strong. A picture of an "iron" boat carrying oxygen (b) is used to demonstrate that iron carries oxygen in the blood throughout the entire body. A picture of "Popeye's" arm (c) is used to demonstrate the recommended number of meat portions and the size of a portion of meat. Another character's arm (d) is used to demonstrate the result of excess meat intake (more portions than recommended) or the result of the intake of fatty meats.

Two characters are used to demonstrate strong bones and teeth gained from daily milk intake (adequate Calsium): (e) “Oom Kallie Kalsium” is used as an example of an older person with a week bone structure due to little calcium intake and (f) “Frikkie vrot asem” / “Bad Breath Bob” is used as an example of a person with bad teeth also due to little calcium intake.

(a)  (b)  (c) (d) (e) (f) 

Movements:

Meat

1. *The Cow movement (representing beef)*

The Cow movement can be demonstrated through crawling around on the ground while making a “moo” sound.

2. *The Little lamb movement (representing lamb)*

The Little lamb movement is performed through bending over while elevating the right shoulder and depressing the left shoulder. This movement is then repeated so that the left shoulder is elevated and the right shoulder depressed. Throughout this movement, the arms are kept straight, but not locked at the elbows. While performing this movement the “mê” sound is made.

3. *The Pig snore movement (representing pork)*

The Pig snore movement entails bending forward with arms wide and round sideways while making the sound of a pig.

Fish

4. *The Fat fish movement (representing fish)*

The Fat fish movement is a fast, swift movement made by the head (the head dips sideways towards the ground and rise again). Throughout the entire movement the hands are held in front of the ribs, palms touching each other.

Chicken

5. *The Chicken cry movement (representing chicken)*

The Chicken cry movement is performed by placing the thumbs underneath the armpits, flapping the elbows as if flying and lifting the legs one by one. During the movement the sound of a chicken is made.

Eggs

6. *The Egg bounce movement (representing eggs being boiled in water)*

The Egg bounce movement is preformed through making round arms sideways and jumping up and down.

7. *The Breaking egg movement (*the action of breaking an egg in order to make scrambled or fried eggs)

The Breaking egg movement is performed through imagining yourself as the egg and your arms as the egg shell, breaking while bending the knees and lowering the hands sideways from the shoulders to the ground.

Milk

8. *The Milkshake movement (representing a bottle of milk being shaked)*

The Milkshake movement is performed by holding the arms round and wide to the front as if aiming to hold a big bottle of milk against your chest. This bottle of milk is then shaken by bending the body repeatedly to both sides.

9. *The Flowing milk movement (representing milk flowing out of a bottle)*

The Flowing milk movement is performed through holding both arms shoulder height sideways and lifting the right shoulder while lowering the right hand, thereby pulling the body to the right. The body then ripples back to the left through lifting the left shoulder while lowering the right shoulder. The left hand is then also lowered and the body is pulled to the left.

10. *The Strong teeth movement (representing strong teeth as a result of regular milk intake)*

The Strong teeth movement is demonstrated by standing on your knees while making strong arms as if aiming to show-of your muscles and showing your teeth through a big smile.

Placement:

Children are placed in four groups behind the four farm animal used as decor.

Music and dialog:

These movements will be performed on “Old Mc Donald had a farm” from the artist.

Props:

No props are used for these guidelines.

Decor:

Four farm animals [(g) a cow, (h) a lamb, (i) a pig and (j) a chicken] are place on stage as examples of these guidelines.

(g) (h) (i) (j)

Guideline: Eat fats sparingly

Message:

There are different types of fats: (i) *good fats* (mono- and poly-unsaturated fats; mostly *plant fats*) and (ii) *bad fats* (saturated and Trans fatty acids; mostly *animal fats*). These fats have certain roles within the body: (i) source of energy, (ii) for growth, (iii) for protection against illness, (iv) for body warmth, and (v) for the absorption of fat-soluble vitamins (ADEK). High fat intake is associated with the following health risks: (i) obesity, (ii) diabetes mellitus, (iii) hypertension, and (iv) heart problems.

It is not only the type of fat that is important to your health, but also the amount that you take in and the method of food preparation. The amount of fat that is recommended is 2 to 3 portions per day. Regarding the preparation of food, there are healthy and unhealthy methods: (i) healthy preparation methods include boiling, steaming, roasting, pan frying (if moderate amounts of fats are used) and grilling whereas (ii) unhealthy preparation methods include deep frying.

It is also of importance to note that the sources of fat is not always only the fats you can see and identify, but can also include fats hidden within other foods (e.g. fats hidden in meat).

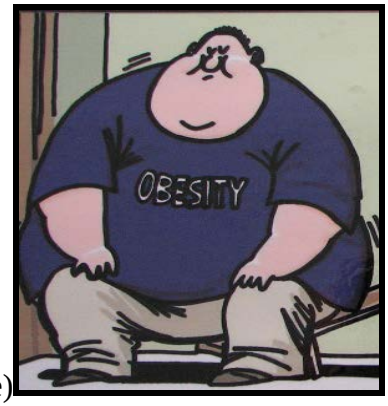
Visual material:

A five pointed star is used to represent the 5 roles of fats within the body. The different types of fat, the preparation methods as well as the different sources of fat are each influence the brightness of the star according to the effect it has on the different roles of fats within the body. Whenever these factors influence the roles of fats within the body negatively, (a) the star's brightness dims. Whenever these factors influence the roles of fats within the body positively, (b) the star shines bright.

(a) 

(b) 

The amount of fat recommended per day is introduced by a balancing scale. This scale balances (c) whenever the right amount as well as type of fat is taken in. Whenever more or less fat than recommended is taken in or the wrong type of fat, (d) the scale tips over and thereby indicate an unhealthy diet. Whenever the five pointed star is dim and / or the scale is of balance, there are certain health risks that can occur [Obesity (e), diabetes mellitus, hypertension and heart problems].

(c) 
(d) 
(e) 

Flash cards of underweight, normal weight, over weight and obesity are be used to explain the term obesity. The key mechanism is used to explain diabetes mellitus. A bloated balloon is used to demonstrate pressure within the veins. Whenever the pressure gets to high, the vein (balloon) bursts; leading to a stroke. Heart problems are demonstrated by a blocked straw representing a blocked vein / artery; which can lead to a heart attack.

Movements:

1. *The Fatty veins movement (representing a blocked vein)*

The Fatty veins movement represents the result of fatty foods on the body and is performed through relaxing the body to the left-hand side in a standing position.

2. *The Too fat movement (representing the result of fatty foods on the body: being overweight or obese)*

This movement is demonstrated through trying to get up from the ground from a straight leg sitting position through aiming to push yourself upwards on one hand while stretching the other hand upwards as if your tummy is preventing your arm from lowering down over your body.

3. *The Wobbling chip movement (representing oily chips)*

The Wobbling chip movement is demonstrated by bending the knees, bending the body slightly forward while leaning backwards and walking forwards with a bounce.

4. *The Move like meat movement (representing fatty meat)*

During this movement the body is imagined to be a piece of meat that is being pulled alternatingly on in the top two corners while being marinated. Therefore, the same leg and arm is lifted while the other leg is firmly on the ground. Thereafter the arms and legs are changed so that the leg that was lifted are brought to the ground as the other arm and leg are lifted into the air.

5. *The Eating too much movement (representing eating a huge hamburger)*

The Eating too much movement is performed through simulating eating a very big hamburger. The hamburger is taken to the mouth which is wide open trying to consume this big hamburger. After eating the hamburger, the arms are held wide and big around an imaginary big tummy, demonstrating weight gain after eating too much.

6. *The Pizza walk movement (representing a slice of pizza)*

The Pizza walk movement is demonstrated through placing the arms in a triangle above the head simulating a triangular pizza slice, while walking forward with bend knees, swinging hips and feet turned inwards.

7. *The Butter glide movement (representing aiming to walk on butter or margarine)*

This gliding walk is demonstrated by stepping forward with the right leg and twisting both feet to the right as the left leg steps forward towards the right leg.

8. *The Jumping vetkoek movement (representing a vetkoek)*

The Jumping vetkoek movement is performed through jumping up and down in different directions while imagining yourself holding a big fat vetkoek in your arms.

9. *The Chock walk movement (representing a stiff block of chocolate trying to walk)*

This walk is demonstrated by swinging yourself forward with stiff legs through every step while changing direction with every step.

Placement:

The placement for this guideline will be based entirely on the entertainment value of the movements.

Music and dialog:

These movements will be performed on "*Build me up buttercup*" from the artist Mean Mr Mustard.

Props:

No props are used for this guideline.

Decor:

Empty boxes of different take-away foods (f) are placed on stage as examples of fatty foods.

(f)

Guideline: Eat dry beans, split peas, lentils and Soya often

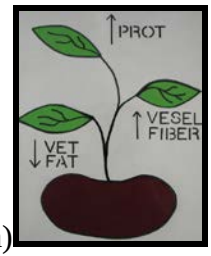
Message:

Beans, lentils, split peas and soya products are good alternatives for meat and meat products due to the fact that (i) it contains good quality proteins, (ii) it is low in fat and sodium, (iii) it is high in fibre as well as (iv) it is a cheap alternative for meat.

Beans, lentils, split peas and soya products also have several health advantages including: (i) it makes your stomach feel full for a longer time period, (ii) it keeps blood glucose levels constant, (iii) it increases intestinal tract motility (movement), (iv) it can be eaten daily if you want to lose weight as well as (v) it keeps blood cholesterol (”bad fat”) low.

Visual material:

A picture of a bean germinating (a) are used to explain the advantages of beans, lentils, split peas and soya products.

(a) 

Movements:

1. *The Growing beans movement (representing a bean stalk growing)*

The Growing beans movement is done by rising up from a bend-knee position to a straight-leg position. Throughout this upward movement the arms make parallel sideways waves in front of the body. When the straight-leg position is reached, both hands are relaxed downwards to the right hand side simulating the beans on the bean stalk.

2. *The Cooking beans movement (representing beans twirling in boiling water)*

This Cooking beans movement is demonstrated by twirling around yourself to your right from a bended position to a straight-standing position.

3. *The Dancing peas movement (representing peas)*

The Dancing peas movement is done through walking sideways to the right-hand side while hopping the body up and down. The hands are in front of the chest whenever the feet are together and the hands lead the sideways movement of the body through an upward circular movement.

4. *The Lentil leap movement (representing lentils)*

The Lentil leap movement is performed by swinging from side to side in a star-position.

5. *The Soya sway movement (represents soya products)*

This Soya sway movement is done by swaying the whole body from side to side while the hands are hanging beside the sides of the body.

Music & dialog:

These movements will be performed on “Loslappie” from the artist Kurt Daren.

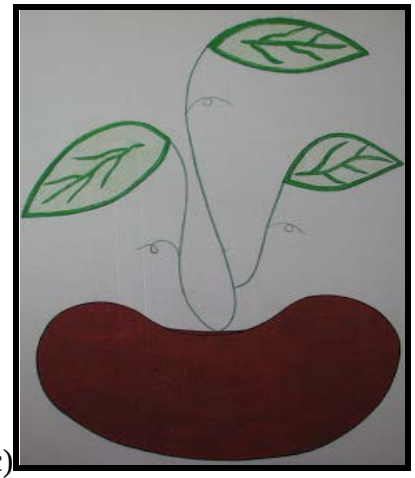
Props:

Shakers made with dried beans, lentils, split peas and soya are used to demonstrate these products and to simulate the sound made when shaking these products.

(b) 

Décor:

A three leave polystyrene “plant” are placed on stage to represent the three components of dried beans etc. (low in fat, high in fibre and high in protein).

(c) 

Guideline: Use foods and drinks containing sugar sparingly and not between meals

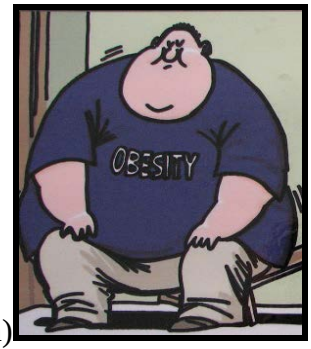
Message:

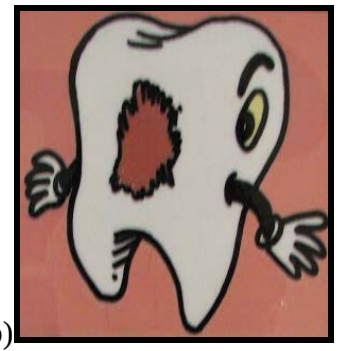
Sugar and sugar containing drinks and foods are high in energy. If these foods and drinks are consumed in large amounts it can easily lead to a feeling of satiety, and this in result lead to a diet lacking in variety and balance between the five different food groups. Since sugar and sugar containing drinks and foods are high in energy, and most of the time is also high in fat this can easily lead to obesity in the absence of the required physical activity. Sugar and sugar containing drinks and foods must rather be consumed in small amounts after meals in order to ensure that the body consume all the necessary and appropriate nutrients.

Sugar is also associated with teeth decay. Whenever sugar is consumed (especially sticky toffees that stay stuck on teeth) and teeth are not brushed regularly, teeth starts to decay.

Visual material:

The same characters used for obesity (a) and teeth decay [named Bad Breath Bob: (b)] are used to demonstrate this guideline of sugar and sugar containing drinks and foods.

(a) 

(b) 

Movements:

1. *The Tooth ache movement (representing tooth ache as a result* of the consumption of too many sweets)

The movement is done by grabbing your right cheek with both hands while bouncing up and down with bend knees and a relaxed body. This movement is repeated to the left side.

2. *The Thumbs down movement (representing the consumption of too many sweets as bad)*

The Thumbs down movement is performed by circling the arms inwards with thumb down while shouting “too much sugar”.

3. *The Lolly pop movement (representing a lolly pop)*

The Lolly pop movement is demonstrated by standing straight and lifting the arms (rounded) above the head so that the finger tips touch while moving up and down and / or side-ways.

4. The Birthday party movement (representing a birthday cake)

The Birthday party movement is performed by walking forward with a semi-bended posture while the hands are placed on the head with palms facing inwards and the finger tips pointing upwards.

5. The Twisted movement (representing a koeksister)

This movement is demonstrated by bending forward, hooking the left arm behind the right leg, and finally stretching the right arm upwards while looking to the front.

6. *The Toffee factory movement (representing a sticky toffee)*

The Toffee factory movement is performed by standing straight with the arms at the side, then lifting the left arm and lowering it again, and finally lifting the right arm and also lowering it again. Throughout the movement the arms are lifted against imaginary resistance to simulate the stickiness of a toffee.

7. *The Jelly belly movement (representing a jelly tot)*

This movement is done by sitting with your legs crossed while rubbing your tummy and bouncing your head to the sides.

Placement:

The placement of this guideline is entirely based on the entertainment value of the song.

Music:

This guideline are performed on *“My Boy Lollipop”* from the artist Milie Small.

Props:

Small shakers (c) are used to simulate the sound of a great amount of sugar falling into a bucket as the main ingredient in the manufacturing process of sugar containing drinks and foods.

(c) 

Decor:

Polystyrene models of sugar containing foods (d) are placed on stage.

(d) 

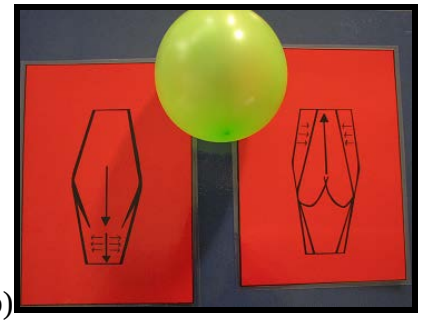
Guideline: Use salt sparingly

Message:

When consuming too much salt certain health risks occur: high salt intake causes (1) high blood pressure which leads to (2) a stroke and also (3) heart failure.

Visual material:

A pair of Glasses (a) is used to look into a blood vein where the blood pressure is increased. The glasses simulate salt pots that throw salt into the body's blood veins which increases the blood pressure within the body. The health risks that occur due to excessive salt intake are presented in picture form (b) and are demonstrated by a balloon bursting (a stroke), a blocked straw (heart attack) and two sponges (1) dried out and (2) soaked in water (water retention and kidney failure).

(a)  (b) 

Movements:

1. *The Blood spike movement (representing high salt intake resulting in high blood pressure)*

The Blood spike movement is demonstrated by taking both hands against the sides of the body from the hips to above the head while making small jerking movements with the hands.

2. *The Sprinkling salt movement (representing salt)*

The Sprinkling salt movement is performed through writing the letter “W” in front of your face. During this writing action the fingertips are moved individually.

3. *The Salt pot movement (representing salt thrown out of a salt pot)*

This movement is done by flicking the head twice to the right from a straight standing position.

4. *The Throwing salt movement (representing salt)*

The Throwing salt movement is performed by taking the right hand horizontal to the floor from the right side to the left side, followed by a shaking action of the right fist (thumb downwards) also from the right side to the left side.

Placement:

The placement of this guideline is entirely based on the entertainment value of the song.

Music:

These movements will be performed on "*Soos bloed*" from the artist Theuns Jordaan.

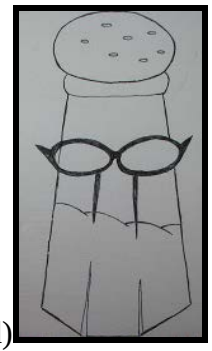
Props:

Each child will wear a pair of sunglasses (c) representing the concept of glasses looking into the vein and seeing the blood pressure rise.

(c) 

Decor:

A salt pot wearing sunglases made out of polystryene (d) is placed on stage to strengthen the concept taught.

(d) 

Guideline: If you drink alcohol, drink it sensibly (adults)

No alcohol allowed under the age of 18 years (children)

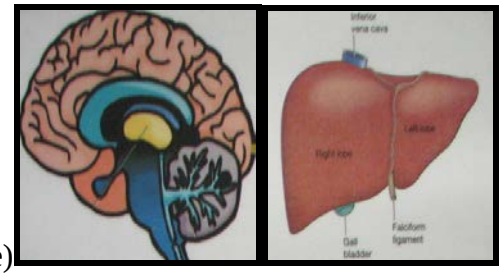
Message:

Children under the age of 18 years are not allowed to drink alcohol. Alcohol abuse may lead to brain and liver damage as well as personality changes. Alcohol can cause a person to become aggressive, tired, foolish (do things that you do not usually do) and / or drunk.

Visual material:

Pictures of the different outcomes of alcohol usage for example (a) drunk driving and sleepiness, (b) becoming drunk, (c) getting angry, (d) foolishness and (e) organ damage (brain and liver) are used to explain the effects of alcohol.

(a)  (b)  (c)  (d) 

(e) 

Movements:

1. *The Drunkard movement (representing a person drinking too much)*

The movement is performed through walking zic-zac to the left. With every cross-over step with the right foot, the right hand is brought to the mouth as if drinking alcohol. After too cross-over steps are completed, the head is shaken sideways while standing on both feet close together.

2. *The Toe touching movement (representing a drunken person falling after aiming to touch his / her toes)*

The Toe touching is demonstrated by aiming to reach your toes and then falling down just as the hands reach the ankles. The hands are used to brake the fall and to assist in gently lowering the body to the ground.

3. *The Headache movement (representing a person with a hangover after drinking too much)*

This movement is rather simple and is performed by holding the head with both hands while swinging the upper-body around.

4. *The Passed out movement (representing passing out due to alcohol abuse)*

The Passed out movement is done by walking around as if you are drunk and then lifting one leg forward in order to lower the bum to the ground and finally fall to the ground until you lie flat on your back.

5. *The Foaming beer movement (representing beer as an example of an alcohol containing beverage)*

This movement is performed by moving the body sideways downwards and then upwards. The hands are held palms down in front of the ribs with bended arms.

Music & dialog:

These movements are performed on "*Bring vir die Harlekyn nog wyn*" from the artist Sonja Herald.

Placement:

The placement of this guideline is entirely based on the entertainment value of the song.

Props:

Glasses with foaming beer (f) are used too demonstrate this guideline.

(f) 

Decor:

A model of a car (g) will be made and placed infront of the smaller children which will strengthen the movement of falling asleep in a car.

(g) 

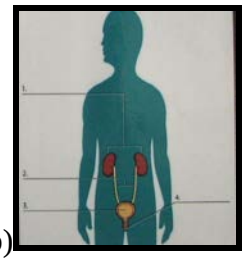
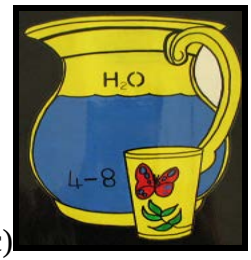
Guideline: Drink lots of clean, safe water

Message:

The biggest part of our body (organs) consists out of water. This water is easily lost through the body regulating processes of sweating (especially after exercising) and urinating. In order to regulate the body's hydration status, it is important to drink lots of clean, safe water during the day (4-8 glasses of water).

Visual material:

Two water bottles filled up with water to different levels are used. Each of these bottles are representative of the body in a hydrated (70% filled up with water) and dehydrated (less than 70% filled up with water) status. Pictures of a boy before and after exercise (a) are used to show how water is lost through the temperature regulating process of sweating. A picture of the urinary system (b) is also used to show that water is also lost through urinating. A picture of a jug and a glass of water (c) are shown to indicate the applicable amount of water that needs to be drunk every day by an individual (child).

(a)  (b)  (c) 

Movements:

1. *The Waves movement*

The Waves movement is rather simple to perform and requires both arms to move alternating in a wave-like motion. Therefore, when lifting the right arm the left arm is lowered. The shoulders lead the action and palms face downwards during the lifting of the arm and upwards during the lowering of the arm. Throughout the entire movement, the arms are semi-relaxed and maintained in a rounded position.

2. *The Water hands movement*

This Water hands movement entails a basic folding action preformed by the wrists. The wrists form an x-shape (right hand in front) in front of the chest to start the movement. The right wrist leads the action through circling around the left wrist towards the body. At the same time, the left wrist circles around the right wrist away from the body. The wrists are rubbed against each other throughout the entire movement.

3. *The Raindrops movement*

The Raindrops movement is a continuous downwards and upwards movement of the hands attended with simultaneous individual movements of the fingers. The downwards movement starts with stretched hands above the head and stops when the hands reached the shoulders, initiating the upwards movement.

4. The Steam movement

Steamed water represents a form of safe clean water and is demonstrated by means of the movement called Steam. In this movement the little fingers face the front when the hands are held in front of the chest right before the movement starts. Both hands are rippled upwards simulating steam being evaporated. During the movement the hand never cross each other and are held parallel towards each other throughout the motion.

5. The Tap-tap movement

Safe water from a tap is demonstrated by the movement called the Tap-tap (figure 4.78). This movement just shows a tap being opened, water being poured into a cup and finally water being drunk. The right hand is used to open the imaginary tap by turning it to the left. Thereafter, the right hand is held underneath this imaginary tap as if holding a cup. After filling the cup, it is brought towards the mouth for the purpose of drinking the water. As the cup is tipped over, the head is held backwards simulating the drinking action. Note that the rugby ball has no significant meaning. The only reason why the rugby ball features within this photo is that this movement followed the activity movement performed within the same workshop session.

6. *The Healthy water movement*

The Healthy water movement is used to demonstrate the purpose of safe, clean water, namely, to drink (consume) and to clean yourself. The movement's starting position is crossing the hands over the chest as if aiming to hold your heart. The movement then progresses into the remaining three phases of the movement. The second phase is performed by raising the right hand to the mouth for simulating water being drunk. The third phase is washing yourself using both hands to rub your shoulder, arms and tummy. The final phase is lowering the hands further to the sides of the thighs. The movement is carried out on the following cry: "I drink water and wash myself clean".

Music and dialog:

This guideline is performed on *"Raindrops falling on my head"* from the artist B.J. Thomas

Placement:

The placement of this guideline is entirely based on the entertainment value of the song.

Props:

Umbrellas (d) are used to demonstrate rain as a form of clean water. Water bottles (d) are also used to show that water should be drunk regularly.

(d) 

Decor:

An examples of a polystyrene glass filled with water (e) is placed on stage. This glass indicates the amount of water that needs to be consumed each day per individual (child).

(e) 

ADDENDUM II

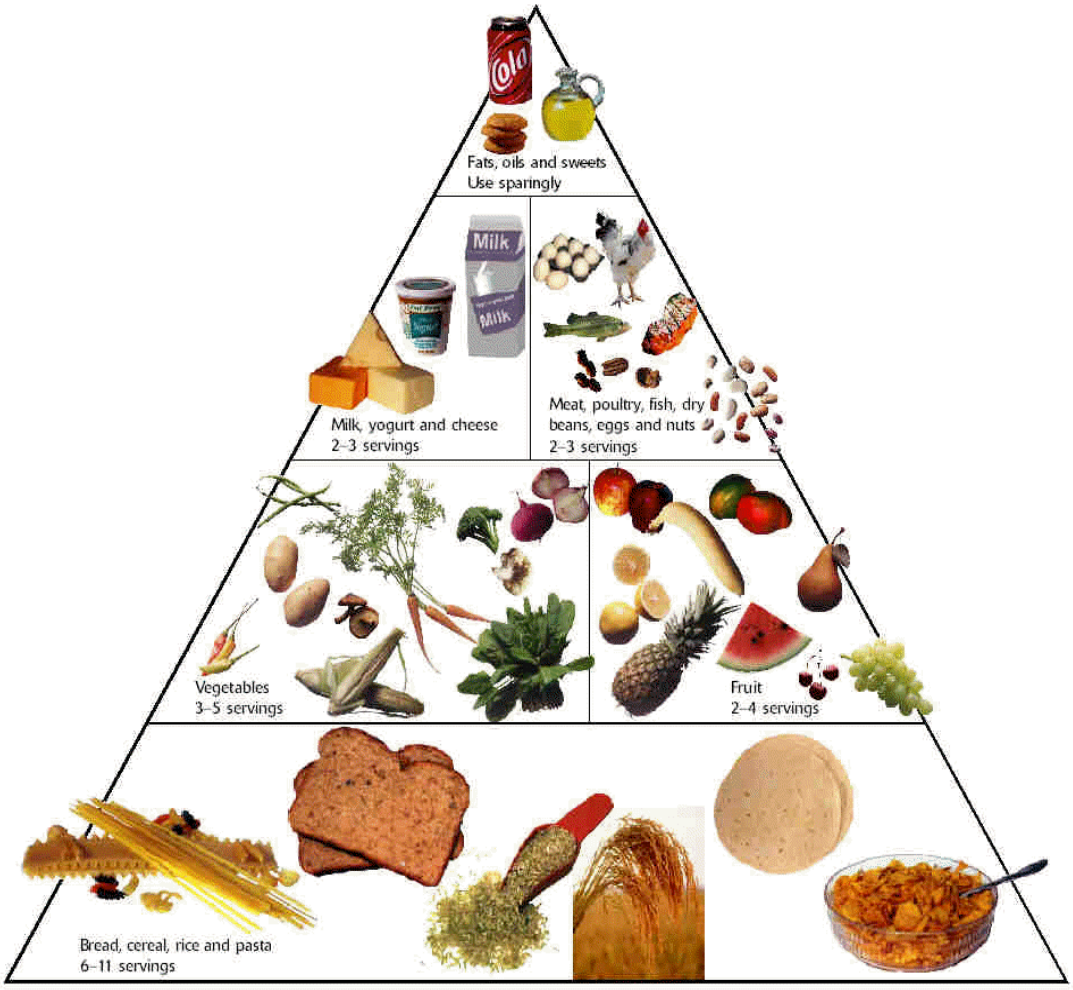
Education material strengthening the Musical Play

(Programme book & Pamphlets)

Voeding Projek / Nutrition Project

Me K. Kruger

Me M. Harris



• Getting it right • Re dira sentle • Ons doen dit reg

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
POTCHEFSTROOM CAMPUS

Agtergrond oor hierdie projek

(i) Wat is die doel van hierdie projek?

Obesiteit, veral kinderobesiteit is een van die grootste epidemies van die dag. Die twee mees algemene faktore wat bydra tot obesiteit is 'n ongebalanseerde dieet en onaktiwiteit. Die musiekspel spreek beide hierdie faktore aan, deur voedingkennis rakende die Suid-Afrikaans voedselgebasseerde dieet riglyne asook die fisieke aktiwiteitsvlakke van kinders te verbeter. Deur voedingkennis te verbeter kan voedingpraktyke ook aangespreek word en daardeur kan obesiteit moontlik bekamp word.

(ii) Waar kom die bewegings en liedjies vandaan?

Gedurende 2007 was verskeie werkswinkels gehou waartydens laerskool kinders met verskillende bewegings en liedjies vorendag moes kom wat hulle assosieer met die Suid-Afrikaanse Dieet Riglyne. Hierdie bewegings is agterna aangepas en ingesluit in die musiekspel wat u kind die afgelope 5 weke aangeleer en ingeoefen het.

Background to this project

(i) What is the aim of this project?

Obesity, especially obesity amongst children, is becoming a worldwide epidemic. The two most general factors contributing to obesity is poor dietary habits and physical inactivity. Both these factors are addressed within this musical play by means of increasing nutritional knowledge regarding the South African food-based dietary guidelines and physical activity levels. By increasing nutritional knowledge, nutritional practice can be addressed and thereby promoting the prevention of obesity.

(ii) Where do the movements and songs come from?

During 2007 several workshops were held during which primary school children came forward with different movements and songs which they associated with the South African Food Based Dietary Guidelines. These movements were adapted afterwards and were included into the musical play which your child have learned and exercised for the last 5 weeks.

Die Suid-Afrikaanse voedselgebasseerde dieet riglyne

1. Geniet 'n verskeidenheid voedsels.
2. Eet vyf klein etejies 'n dag.
3. Maak stysel die basis van jou maaltye.
4. Eet baie groente en vrugte elke dag.
5. Vleis, vis, hoender en eiers kan elke dag geëet word.
6. Drink melk elke dag.
7. Gebruik vet spaarsamig.
8. Eet droë bone, erte, lensies en soja gereeld.
9. Gebruik suiker en suikerbevattende voedsels spaarsamig.
10. Gebruik sout spaarsamig.
11. Geen alkohol vir kinders onder 18
12. Drink genoegsaam skoon, veilige water.
13. Wees aktief.

The South African food-based dietary guidelines

1. Enjoy a variety of foods.
2. Eat five small meals a day.
3. Make starches the basis of most meals.
4. Eat plenty of vegetables and fruits every day.
5. Meat, fish, chicken and eggs can be eaten every day.
6. Drink milk every day.
7. Eat fats sparingly.
8. Eat dry beans, peas, lentils and soya often.
9. Use sugar and sugar containing foods and drinks sparingly.
10. Use salt sparingly.
11. No alcohol for children under 18
12. Drink plenty of clean, safe water.
13. Be active.

1) Enjoy a variety of food:

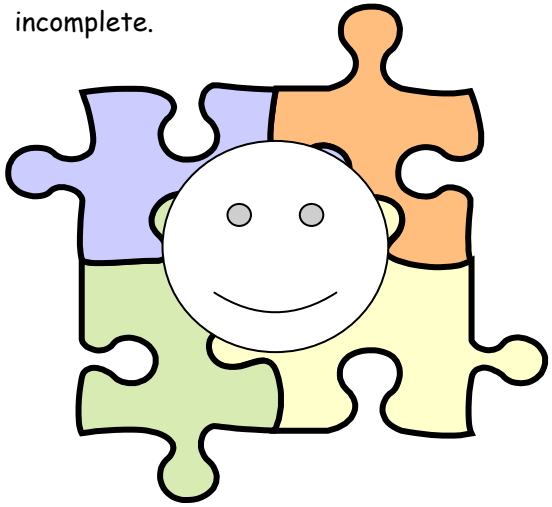
Individuals, including children need specific nutrients to maintain a healthy lifestyle.
Nutrients are the building blocks for the body that each provides a different type of nourishment for the body. For your body to absorb all the different nutrients, you need to take in a variety of different foods on regular time intervals.

A variety of foods include the different food groups within the food pyramid:

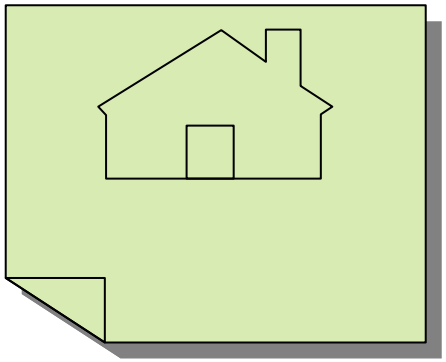
Level 1: Starches. (At the bottom of the food pyramid)
Level 2: Fruits and vegetables.
Level 3: Meat and meat products & Milk and milk products.
Level 4: Fat (at the top of the food pyramid).

Whenever you don't consume a variety of foods, your body develops a deficiency and cannot function properly.
A deficiency can be explained according to the following two examples:

1.) As a puzzle that is short in one piece; therefore, the picture seen is incomplete.



2.) A deficiency can also be explained as a house without all the basic building material (building blocks, e.g. windows); therefore, the house is also incomplete.



2) Eat 5 small meals a day:

The reason for taking these foods on regular time intervals is to maintain your energy levels (blood glucose) and to ensure that you don't overeat at one specific time.

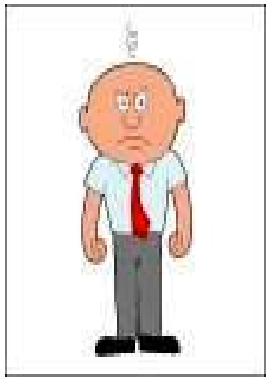
Energy can be defined as the power your body needs to function properly. When you overeat at one specific time without the same amount of exercise, your energy intake exceeds your energy expenditure (the amount you use); therefore, your body stores the excess foods as fat.

Here is an example of a food plate and how it should be divided between the five different food groups according to the recommended amount for consumption:

3.) <u>No alcohol under the age of 18 years</u>.

The results of too much alcohol:

1. Alcohol can make a person become aggressive.

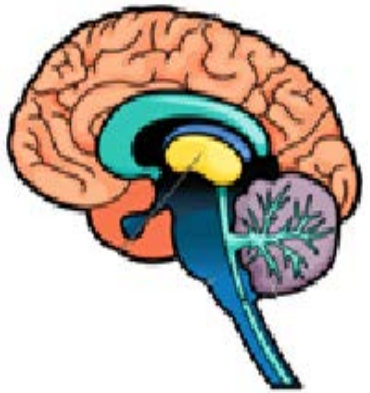


2. It can change a person's behaviour and make you do things that he/she would not normally done.

3. Alcohol can negatively influence a person's concentration (easily get tired) and coordination (estimating distance) which could be dangerous if a person is driving a motor vehicle.

4. Alcohol can also damage a person's brain and/or liver.

Brain:



Liver:

Guideline 4: Make starchy foods the basis of most meals.

- Starchy foods (refined- and unrefined starchy foods) are mainly responsible for providing energy to the body.

- Energy can be defined as the power our bodies need to be able to function properly or to be physically active.

- Unrefined starchy foods are the best choice of starches to include into your diet. It contains fibre that helps
  - with regular bowel function
  - keeping blood glucose (blood sugar) levels constant
  - it makes your stomach feel full for a longer time period (you won't get hungry easily)
  - having energy (power) available for a longer period of time

- Refined starchy foods are broken down quickly to provide energy only for a short period of time. This will cause the body to feel tired quickly because of variations in the blood glucose levels (a sudden increase in blood glucose levels followed by a sudden decrease in blood glucose levels).

The following examples indicate better choices of starchy foods due to their fibre contend

Wholegrain- / Brown bread White bread

Brown rice White rice

Brown rusks White rusks

All bran Wheetbix Corn flakes Rice crispies

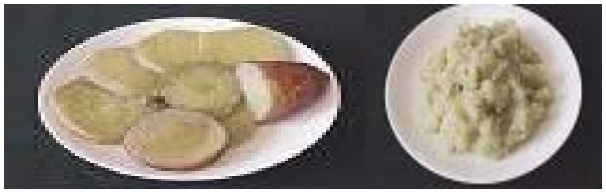
Pronutro Maltabella "Krummelpap" Porridge

Provita / Ryvita Biscuits

Popcorn Chips

Pasta, macaroni, spaghetti 2 minute noodles

Sweet potatoes with skin Sweet potatoes mashed with butter and cinnamon

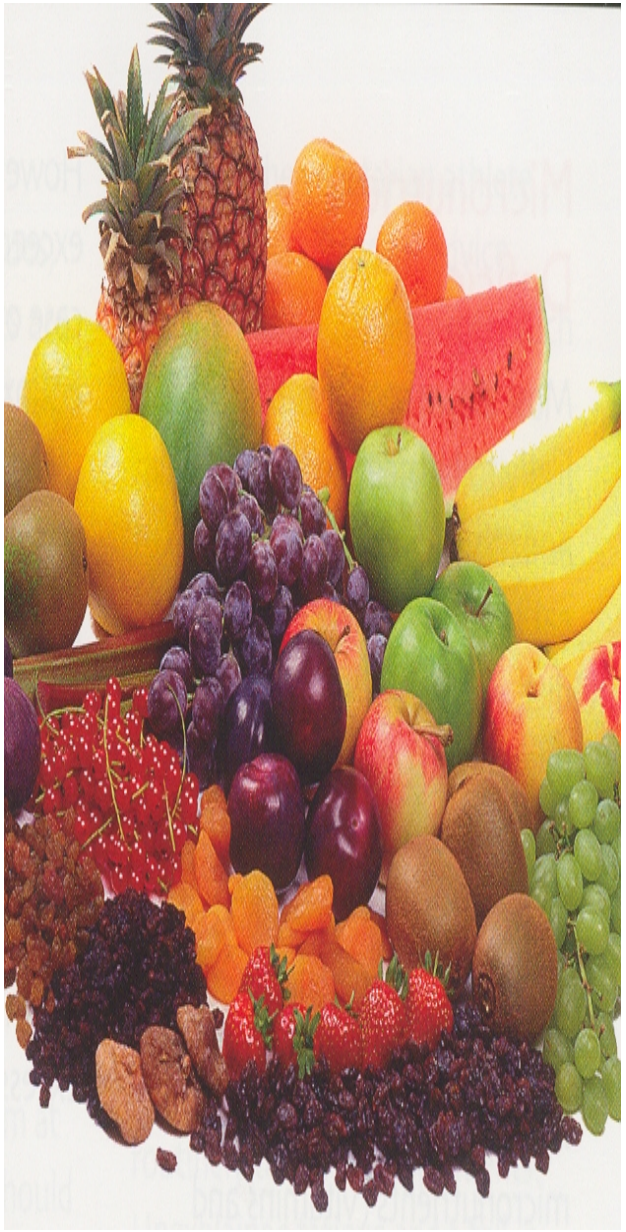


Potatoes with skin Mash

Guideline 5: Eat plenty of fruits and vegetables.

- Fruits and vegetables contain a lot of vitamins and minerals.
- Vitamins are nutrients within foods which protect the body.
- Minerals are nutrients which the body needs to function properly.
- Vitamins and minerals are the soldiers within the body that protect you against diseases (e.g. bacteria).
- Therefore, vitamins and minerals increase the body's immunity. Immunity of the body is the body's ability to fight of diseases (e.g. bacteria).
- Therefore, the more fruits and vegetables you eat, the more soldiers your body has to protect it against diseases (e.g. bacteria) and the higher your body's immunity will be.

Fruits

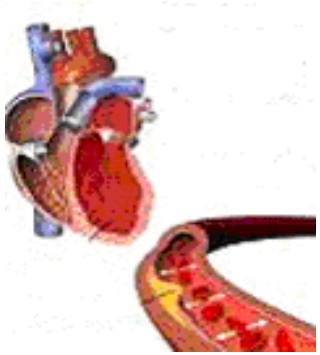


Vegetables

Guideline 6:
Use salt sparingly

When consuming too much salt certain health risks can occur:

- High salt intake can cause high blood pressure.



Whenever large amounts of salt are consumed the pressure within the blood veins increases and therefore the risk for a stroke or a heart attack increases. In order to prevent these attacks you should consume little amounts of salt and have your blood pressure checked regularly.

- High blood pressure in turn can cause a stroke.

Whenever a large amount of salt is consumed and the blood pressure increases, your risk for a stroke increases. When the blood pressure within the blood veins becomes too high, the veins literally burst – this is the stroke.

- High salt intake can also cause heart failure (a heart attack).

The high blood pressure increases also the risk for a heart attack.

7.) <u>Meat, fish, chicken & eggs can be eaten daily</u>.

Proteins are the main building blocks of muscles in the body.

Examples of proteins that can build the body's muscles are red meat, fish, chicken and eggs (animal proteins). Animal proteins contain a lot of fat (especially saturated fat – so called "bad fat"), and must therefore be eaten in small quantities (Remember to remove all visible fat from meat).

Red meat is also a source of iron. The body needs iron (iron can be visualize as a small boat and water as blood) to carry oxygen around in the body. If the body would develop a deficiency (small quantities of iron-boats carrying oxygen), it can lead to feeling tired (not enough oxygen).

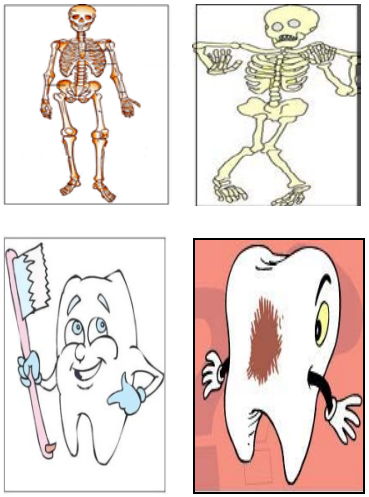
= **Iron**

Food with a content of high quality iron, include organ meat, red meat, fish, and chicken. Spinach, broccoli and beans have an iron content of low quality.

8.) <u>Milk can be drink daily</u>.

Milk and milk products as well as the bones of pilchards are a good source of calcium, which is important for strong bones and teeth.

A strong bone structure and teeth in comparison to a frail bone structure and bad teeth:



2 – 3 portions of the meat and meat products, as well as the milk and milk products can be eaten daily.

<u>Examples for the recommended amount of intake</u>:

- 400-500 ml / 2 cups of low fat milk and / or low fat yoghurt per day.
  (1 portion – 250ml, 1 cup)
- 3 portions fish per week.
  (1 portion – 120g)
- 4 eggs per week.
- 560g meat per week.
  (1 ½ portion - 80-90g/per day).

*30 g is the size of one match box.

Guideline 9: Eat fats sparingly

- Fats have certain roles within the body:
  (1) source of energy
  (2) help with growth
  (3) protect against illness
  (4) help with body warmth
  (5) help with absorption of fat-soluble vitamins (ADEK).

- There is three aspects of fat that is important to your health:

  (1) The type of fat
  There are different types of fats:
  a) good fats (mono- and poly-unsaturated fats; mostly plant fats)
  b) bad fats (saturated and Trans fatty acids; mostly animal fats)

  (2) The amount of fat
  The recommended amount of fat is 2 to 3 portions per day.

  (3) The method of preparation
  There are healthy and unhealthy methods of preparing food:
  a) healthy preparation methods include boiling, steaming, roasting, pan frying (if moderate amounts of fats are used) and grilling.
  b) unhealthy preparation methods include deep frying.

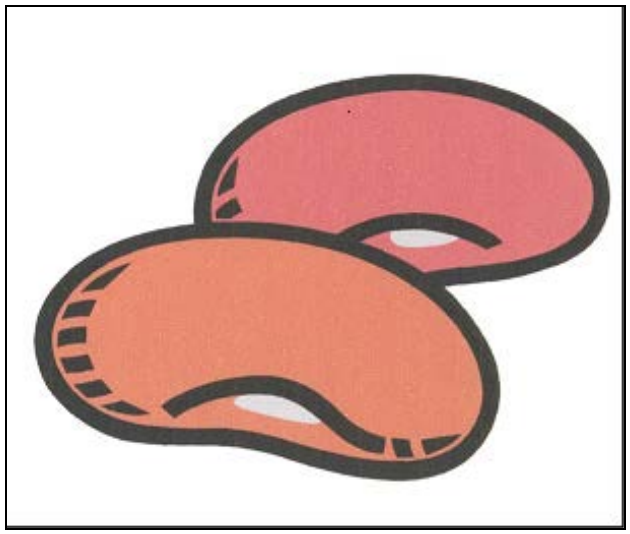
- The sources of fat can be:
  (1) visible fat (the fats you can see and identify) and/or
  (2) invisible fat fats hidden within other foods (for example the invisible fat within meat)

- The health risks that are associated with a high fat intake (especially saturated fat) are the following:
  (1) obesity
  (2) diabetes mellitus
  (3) hypertension
  (4) heart problems

Guideline 10: Use foods and drinks containing sugar sparingly and not between meals

Sugar and sugar containing drinks and foods (give a few examples – same as the representative movements that are used) are high in energy. If these foods and drinks are consume in large amounts it can easily lead to a feeling of satiety, and this in result lead to a diet lacking in variety and balance between the five different food groups. Since sugar and sugar containing drinks and foods are high in energy, and most of the time is also high in fat this can easily lead to obesity in the absence of the required physical activity. There will also be referred back to sugar's association with teeth decay. It will be stressed that sugar and sugar containing drinks and foods must rather be consumed in small amounts after meals in order to ensure that the body consume all the necessary and appropriate nutrients.

11.)Dry beans, split peas, lentils and soya products can be eaten regularly.



Why are beans, lentils, split peas and soya products good alternatives for meat and meat products?

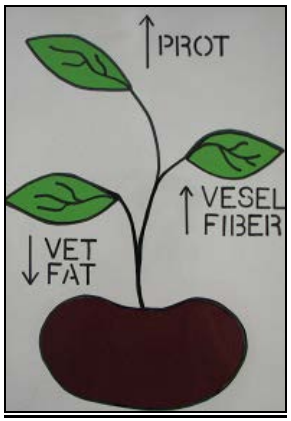
- It contains good quality proteins.
- It is low in fat and sodium.
- It is high in fibre.
- It is a cheap alternative for meat.

What are the health advantages of beans and soya?

- It makes your stomach feel full for a longer time period.
- It keeps blood glucose levels constant.
- It increases intestinal tract motility (movement).
- It can be eaten daily if you want to lose weight.
- It keeps blood cholesterol ("bad fat") low.

Examples of how you can include beans and soya into your diet:

- In soup.
- As a side dish.
- As an alternative for meat.
- Also in combination with starches, like for instance lentils with rice and beans with samp.



Example of a recipe that includes beans:

- 250 ml cooked, white or brown beans 1 x 410 g tin KOO Sugar Beans or KOO Butter Beans.
- 250 ml cooked, shell noodles.
- 3 large gherkins, chopped.
- 1 onion, finely chopped.
- 2 stalks of celery, chopped.

Dressing:

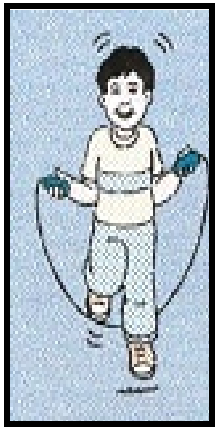
- 250 ml buttermilk or yoghurt.
- 125 ml low fat mayonnaise.
- 5 ml mustard powder,
- 5 ml sugar.
- 50 ml chives or parsley, chopped salt and pepper to taste.

1.) Mix the ingredients for the salad.
2.) Mix and beat the ingredients for the dressing.
3.) Pour the dressing over the salad.
4.) Mix well and chill until served.

12.) Drink lots of clean, safe water:

The biggest part of our body (organs) consists out of water. This water is easily lost through the body regulating processes of sweating (especially after exercising) and urinating. In order to regulate the body's hydration status, it is important to drink lots of clean, safe water during the day (4-8 glasses of water).

13.) Be active:



To be active, means that you need to do certain activities that will move your muscles. If you are regularly active, it will not only lead to that you feel good, but also help to increase your body's muscle percentage and decrease your body's fat percentage.

Everybody, depending on your age needs to do a certain amount of exercise per day. A minimum of 30 minutes/day are recommended for most of the days of a week.
To exercise does not mean that you only need to go to the gym, or do sport, it also includes basic household activities such as cleaning the house and washing the car.

ADDENDUM III

Nutrition knowledge and behaviour questionnaire

NUTRITION KNOWLEDGE AND PRACTICE QUESTIONNAIRE

Interview date: (DD/MM/YY) __/ __/**Subject number:**_____

NB: THE FOLLOWING QUESTIONS MUST BE COMPLETED BY THE CHILD

Please choose the most correct answer for each question

1. Which statement is true about starches (e.g. Bread, porridge, rice, potato)?

A	They are not important for your health
B	Even eating small amounts can cause weight gain
C	They cause diseases
D	None of the above

2. Which food has the most fibre (roughage)?

A	White bread
B	Whole-wheat bread

3. How many fruits and vegetables should you eat a day?

A	1 fruit and/or vegetable a day
B	3 - 4 fruits and/or vegetables a day
C	5 or more fruits and/or vegetables a day
D	There is no need to eat fruits and/or vegetables daily

4. Being physically active (to exercise) means…

A	Going to the gym
B	Walking a lot
C	Playing sport like soccer or netball
D	All of the above

5. Do you agree or disagree with the following statement: Exercise is good for your health.

A	Agree
B	Disagree
C	Don't know

6. Which foods contain a lot of calcium?

A	Chicken and eggs
B	Milk and yoghurt
C	Canned fish with the bone, e.g. pilchards
D	B and C are both correct

7. The reason why dry beans, peas, lentils and soy are good for you is that they:

A	contain only small amounts of fat
B	contain a lot of fibre
C	can protect you from some diseases
D	All of the above

8. Which of the following is a low fat snack?

A	“Simba” chips
B	Popcorn
C	Fried chips
D	“Niknaks”

9. Which of the following foods contain little fat?

A	Whole-wheat toast with thinly spread margarine
B	Weetbix with 2% low-fat milk
C	Fried bacon and egg
D	A and B are both correct

10. How old must you be before you can drink alcohol?

A	6 – 12 years
B	12 – 17 years
C	18 years and older

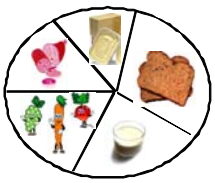
11. What can too much alcohol do to a person?

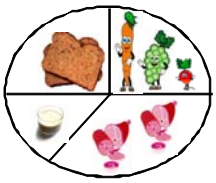
A	Makes you become aggressive
B	Harm your liver and brain
C	Makes you become happy and joyful
D	A and B are both correct

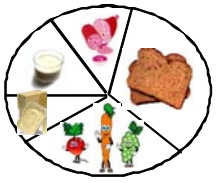
12. The key to a healthy way of eating is to:

A	Eat many different kinds of foods
B	Do not eat too much of any of these foods
C	Eat only certain kinds of foods
D	A and B are both correct

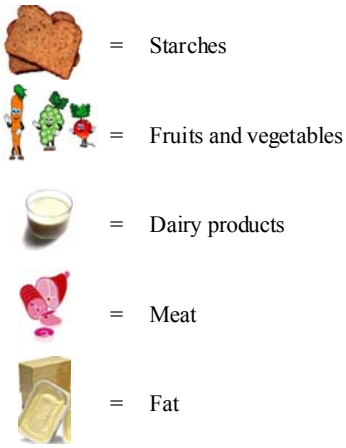
13. Choose the most correct picture that presents the composition of a well-balanced diet.

A 

B 

C 

D None of the above



Please choose true (correct) or false (incorrect) for the following questions:

14. Starchy foods (bread, potatoes, rice) are energy giving foods.

A	True
B	False

15. Cooked vegetables are healthier than raw vegetables.

A	True
B	False

16. Vegetables can be eaten in the place of meat because they also build the body.

A	True
B	False

17. Vegetables are foods that protect your body against diseases.

A	True
B	False

18. People who are overweight (fat) should not exercise.

A	True
B	False

19. If you are eating a healthy diet there is no need for you to exercise.

A	True
B	False

20. It is necessary to drink fresh milk or maas every day.

A	True
B	False

21. You can eat as much meat as you want every day.

A	True
B	False

22. If you are eating a healthy diet there is no need for you to exercise.

A	True
B	False

23. It is necessary to drink fresh milk or Maas every day.

A	True
B	False

24. You can eat as much meat as you want every day.

A	True
B	False

25. Dry beans, peas, lentils and soy should be eaten often.

A	True
B	False

26. Dry beans, peas, lentils and soy can be eaten instead of meat.

A	True
B	False

27. You should add extra salt to your cooked food before you eat it.

A	True
B	False

28. You should eat little sugar and/or foods containing sugar (e.g. sweets and candy).

A	True
B	False

29. It is not healthy to eat lots of fat or fatty foods.

A	True
B	False

30. I should eat different kinds of foods every day, but not too much of any of them.

A	True
B	False

31. All water is safe to drink.

A	True
B	False

ADDENDUM IV

Socio-demographic and physical activity behaviour questionnaire

Demographic questionnaire

(All information in this questionnaire is kept confidential)

Subject number: _____ Birth date (DD/MM/YY):_____
Interview date (DD/MM/YY):_____
School: _____ Grade: _____

NB: THE FOLLOWING QUESTIONS MUST BE COMPLETED BY THE CHILD'S PARENT/CAREGIVER

Child's Name: _____ Gender: M _____ F_____
Address_____ Religion: _____
_____ Home language: _____
Tel No (H) _____ Ethnic group: _____
Tel No (W) _____ Cell No: _____

***If there is any uncertainty about a question, circle the question number and we will contact you to help complete it.**

Please mark where applicable:

1. **The caregiver is less than 18 years old. _____**
2. **The child does not eat and sleep at this house for 4 or more days a week. _____**
3. **The caregiver has been looking after the child for more than 3 months. _____**

Please complete the following questions in as much detail as possible:

1.) Relationship to child: (Please mark with a cross)

Mother: ____ Father: _____ Grandparent_____ Sibling _____
Aunt/uncle: _____ other: _____

2.) Household composition:

Names of household members	Age (yrs)	Gender		Family relationship to the child	
		Male	Female	Relationship	Code*

*** For office use only.**

3.) Marital status of mother (Tick one):

1	2	3	4	5	6	7
Unmarried	Married	Divorced	Widowed	Living together	Traditional marriage	Other. Please specify:

4.) Marital status of father (Tick one):

1	2	3	4	5	6	7
Unmarried	**Married**	**Divorced**	**Widowed**	**Living together**	**Traditional marriage**	**Other. Please specify:**

Tick one block for every question.	**Father**	**Mother**	**Sibling**	**Grandma**	**Grandpa**	**Aunt**	**Uncle**	**Cousin**	**Friend**	**Other**
5. Who is mainly responsible for food preparation in the house?	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
6. Who decides on what types of food are bought for the household?	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
7.Who is mainly responsible for feeding / serving the child?	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
8. Who is the head of the household?	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
9. Who decides how much is spent on food?	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

Tick one block for the following question.

10. How often do you dine out or buy take-away food?	**1**	**2**	**3**	**4**
	Daily	**Weekly**	**Monthly**	**Seldom**

Consider now the household where the child lives.

11. Type of dwelling (You can tick more than one block if necessary)	**1**	**2**	**3**	**4**	**5**
	Brick, concrete	**Traditional mud**	**Tin**	**Plank, Wood**	**Other. Please specify:**
12. Number of people sleeping in the house for at least 4 nights per week?					
13. Number of rooms in the house (Excluding bathroom, toilet and kitchen, if separate).					

14. Number of people per living/sleeping room?(Tick one)	**1**	**2**	**3**
	1-2 Persons	**3-4 Persons**	**More than 4**

15. Where do you get drinking water most of the time?(Tick one)	1	2	3	4	5
	Own tap	Communal tap	River, dam	Borehole, well	Other. Please specify:

16. What type of toilet does the household have? (Tick one)	1	2	3	4
	Flush	Pit	Bucket, Pot	Other. Please specify:

17. What fuel is used for cooking most of the time?(You can tick more than one)	1	2	3	4	5
	Electric	Gas	Paraffin	Wood/ Coal	Other. Please specify:

Tick one box only:

18. Does the child's home have a working:				
a. Refrigerator/Freezer	1	2	3	4
	Refrigerator	Freezer	Both	None
b. Stove	1	2	If yes, specify:	If yes, specify:
	1 Yes	2 No	Gas□ Coal□ Electricity□	With oven□ Without oven□

a. Primus or paraffin stove	**1**		**2**	
	Yes		**No**	
b. Microwave	**1**		**2**	
	Yes		**No**	
c. Hot plate	**1**		**2**	
	Yes		**No**	
d. Radio or television	**1**	**2**	**3**	**4**
	Radio	**TV**	**Both**	**None**

Please indicate the most appropriate answer with a cross.

19. Education level of parent/caregiver (Tick one).	**1**	**2**	**3**	**4**	**5**	**6**
	None	**Primary School**	**Std 6-8**	**Std 9-10**	**Tertiary Education**	**Don't know**
20. Parent/caregiver's employment status (Tick one).	**1**	**2**	**3**	**4**	**5**	**6**
	At home by choice	**Un-employed**	**Self-employed**	**Wage earner**	**Other Specify**	**Don't know**
	1	**2**	**3**	**4**	**5**	
21. How many people contribute to the total income? (Tick one box only).	**1 person**	**2 persons**	**3-4 persons**	**5-6 persons**	**More than 6**	
22. Household income per month (including salary, wages, rent, state grants) (Tick one box only).	**1**	**2**	**3**	**4**	**5**	**6**
	None	**R100-R500**	**R500-R1000**	**R1000-R3000**	**R3000-R5000**	**Over R5000**
23. Is this the usual income of the household? (Tick one box only).	**1**			**2**		
	Yes			**No**		
24. Is this more or less the income that you had over the past six months?	**1**			**2**		
	Yes			**No**		

Answer question 25 a or b according to your situation.

25. a) How much money is spent on food weekly?	**1**	**2**	**3**	**4**	**5**
	R0-R100	**R100-R250**	**R250-R350**	**R350-R450**	**R450-R500**
b) How much money is spent on food monthly?	**1**	**2**	**3**	**4**	**5**
	R500	**R500-R1000**	**R1500-R2500**	**R2500-R3000**	**More than R3000**

The following questions should be completed by the child with assistance from the parent / caregiver: (Please mark with a cross).

26.) a. Do you regard yourself as physically active?

Yes_____ No_____ Don't know_____

b. Do you participate in any kind of sport?

Yes_____ **No_____**

c. If you have answered yes in question 26b, please indicate in what type of sport/s you participate?

1. Rugby		**2. Netball**	
3. Soccer		**4. Athletics**	
5. Cricket		**6. Gymnastics**	
7. Hockey		**8. Other (Please, specify)**	
9. Tennis			

d. Please indicate how often do you exercise or participate in the above mentioned sport/s per week?

1. Once a week.		**2. 2 – 3 times a week.**	
3. More than 3 times a week.			

e. How long do you exercise/participate in the chosen sport/s at one time?

1	2	3	4
‹ 30 minutes	**30 minutes**	**30 - 60 minutes**	**› 60 minutes**

f. Will you prefer to watch television or to play outside? (Mark one).

Watch television	
Play outside	

g. How long do you watch television and/or play, play station each day?

1	2	3	4
30 minutes	**1-2 hours**	**More than 2 hours**	**Only during weekends**

h. How long do you play computer games and/or use the internet per day?

1	2	3	4
30 minutes	**1-2 hours**	**More than 2 hours**	**Only during weekends**

ADDENDUM V

24-hour dietary recall questionnaire

24-HOUR RECALL

Interviewer: _____ Date: ____/ ____/ 200__
School: _____

Tick what the day was yesterday:

Sun	Mon	Tue	Wed	Thur	Fri

Would you describe the food that you ate yesterday as typical of your habitual food intake?

Yes	No

Do you take a lunch box

Yes	No

to school daily?

I want to find out about everything you ate or drank yesterday, including water. Please tell me everything you ate from the time you woke up to the time you went to sleep. I will also ask you where you ate the food and how much you ate.

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Time (approximately)	**Place (home, school, etc.)**	**Description of food and preparation method**	**Amount**	**Amount (*g*)**
From waking up to going to school, or starting the day's activities				
During the morning at school (Lunch box / Tax shop) or at home				
Lunch box				

Time (approximately)	**Place (home, school, etc.)**	**Description of food and preparation method**	**Amount**	**Amount (*g*)**
Tuck shop				
Middle of the day (lunch time)				
During the afternoon				

Time **(approximately)**	**Place** **(home, school, etc.)**	**Description of food and preparation method**	**Amount**	**Amount** ***(g)***	
At night (dinner time)					
After dinner, before going to sleep					
Do you take any vitamins or minerals (tablets or syrup)?				Yes	No
Give the brand name and dose of the vitamins or minerals:			**Name**	**Dose**	

ADDENDUM VI

Anthropometric measurements and control card

CHILDREN 6 – 12 YEARS

Subject's nr:

Name & surname: _____ Grade: _____

Date of birth: _____ Parents contact no: _____

Gender: _____ Group: R E

Station	**Description**	**Control**	**Signature**
Permission	Signed permission form		
Nutrition	Knowledge and Practice Questionnaire		
	Focus group Discussions		
	24-Hour recall		
	Demographic Questionnaire		
	Anthropometry		

Supervisor: _____

ANTHROPOMETRICAL MEASUREMENT

Name of measurement	**Measurement 1**	**Measurement 2**	**Measuerment 3**
Length (cm)			
Weight (kg)			
Mid-circumfence (mm)			

ADDENDUM VII

Focus group interview schedule

Focus group interview schedule:

Give the following background: The reason for this talk is to find out more about your attitude towards eating healthily and being physically active (exercise).

Opening question (Each person must answer this question)

1. **Tell us who you are, in which grade you are and what you enjoy doing most.**

Introductory questions

2. **What do you think it means to be healthy?**

Each transition question is followed by the appropriate key question in order to complete each concept before moving on to another.

Transition questions (Use flash cards with facial expressions + presentation boards with picture examples of healthy food items; unhealthy food items and different physical activities)

3.1 How do you feel about eating healthily?

4.1 How do you feel about eating unhealthily?

5.1 How do you feel about being physically active?

Key questions

3.2 What do you think about healthy eating?
3.3 What and/or who motivates you to eat healthy foods?
3.4 What and/or who prevents you from eating healthy foods?

3.5 Which one do you prefer most, fruits or vegetables? Please motivate your answer.
3.6 How do you like to eat your vegetables? Please motivate your answer.
4.2 What do you think about eating unhealthily?
4.3 Who and/or what motivates you to eat healthily?

4.4 Who and/or what prevents you from eating unhealthily?

4.5 How would you describe the type of food that is available at the school tuck shop?

4.6 How do you feel about a lunchbox to school?

1.2 What do you think about being physicaly active? Who and/or what motivates you to be physically active? Who and/or what prevents you from being physically active?

<u>Ending question</u> (Each person must answer this question)

6.1 What do you think can or will happen if you do not eat healthily, and also do not exercise?

<u>Oral summary of the discussions</u>.

Participants will be asked about the adequacy of the summary. (Did I correctly describe what was said?)

Overview of the purpose of the intervention. (Is there anything that we should have talked about or add but did not?)

ADDENDUM VIII

Presentation boards with examples of healthy food; unhealthy food and physical activity

a.) **Presentation board with examples of healthy food:**

b.) **Presentation board with examples of unhealthy food:**

c.) <u>Presentation board with examples of physical activity</u>: