

Dietary habits in adolescence related to sociodemographic factors, physical activity and self-esteem

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Overview

Sociodemographic characteristics, physical activity and self-esteem related to dietary habits in adolescence

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Abstract

Unhealthy eating during adolescence has shown to have multiple negative consequences. The aim of this paper is to acquire knowledge of dietary habits in adolescence and consider how this behaviour varies across different groups of adolescents. Correlations between dietary habits, age and gender have several times been found, in terms of girls eating healthier than boys, and the intake of healthy food decreasing with age. Additionally, adolescents of low socioeconomic position are at higher risk for having unhealthy dietary habits, while adolescents who are physically active seem to eat healthier. Further, it has been shown that low self-esteem in adolescence is associated with eating disorders, representing both restrained eating, but also binge eating. The mentioned correlations can be understood and explained using individual psychological models of health behaviour, like the KAP model and social cognitive theory.

1. Introduction

In order of representing one of the most basic needs for human beings, nutrition is an issue of great importance. Traditionally, hunger and lack of food resources in what is now referred to as low income countries have been a matter of concern, but during the last decades, lots of attention has been paid to the negative consequences of food surplus. The dietary habits have changed considerably during a short period of time due to great economical development, with unhealthy food becoming more accessible and also cheaper than healthy food. This have lead to a great increase in consumption of this type of food, and, in turn, a lot of undesirable health consequences causing a strong and growing concern from health governments and medical specialists (Brannon & Feist 2007, WHO 2004).

A population of special concern is adolescents and their behaviour related to nutrition and health. Driessnack (2006, p. 502) defines adolescence as “*the psychosocial, emotional, cognitive, and moral transition from childhood to young adulthood*”. This time of life

represents a great share of the founding of future health and health behaviour patterns, both biologically, psychologically and behaviourally (Steinberg 2008). It has been shown that health behaviour in adolescence often follows the person into adulthood (Pentz 2009). Longitudinal studies have found that unhealthy nutrition in this period increases the risk of severe disease in adulthood, for instance obesity (The, Suchindran, North, Popkin & Gordon-Larsen 2010, Pentz 2009), depression and anxiety disorders (Anderson, Cohen, Naumova, Jaques & Must 2007), some types of cancer (Fuemmeler, Pendsich & Tercyak 2009, Lubin et al. 2003) and cardiovascular risk symptoms (Reilly & Kelly 2010, Ford, Nonnemaker & Wirth 2008). Further, research supports that inadequate intake of calcium from dietary sources during childhood and adolescence may affect the achievement of bone mass, hence increase the risk of osteoporosis in adult age (Gillespie 2006). Dietary habits also have great implications for the dental health among adolescents, and the increase in consumption of sugar-sweetened drinks during the last decades has led to a raise of dental problems (Åstrøm 2009).

These factors represent great challenges for the public health, and it is therefore important to focus on dietary habits in adolescence. Despite the necessity of healthy eating in this period, research has shown that as the individual enters adolescence, the dietary habits often get unhealthier (Rasmussen et al. 2006, Vereecken, Inchley, Subramanian, Hublet & Maes 2005). Both in Europe and the U.S., the consumption of soft drink, fast food and sugar has increased, while the consumption of fruits and vegetables has decreased among adolescents during the last few years (Moreno et al. 2010).

Figure 1. National recommendations for nutrition by the Norwegian National Council for Nutrition.

- The recommended diet is mainly based on plants and consists of lots of vegetables, fruits, berries, whole-grain and fish, and limited amounts of red meat, salt, added sugar and energy-dense foods.
- A balance between energy intake and expenditure is recommended
- Eat at least 5 portions of vegetables, fruit and berries daily
- Eat at least 4 portions whole-grain products daily
- Eat fish meals 2-3 times a week
- Light dairy products in the daily diet is recommended
- Choose lean meat and limit the intake of red and processed meat
- Choose food oils, liquid margarine or soft margarine

In this paper, the Norwegian national guidelines will be used in order to define healthy dietary habits (Figure 1). In February 2011, new recommendations for nutrition to promote health and prevent chronic diseases were published by the Norwegian National Council for Nutrition. These recommendations are based on a thorough review of research on nutrition and health.

National studies on dietary habits among Norwegian adolescents actually show that the majority has an adequate diet based on the national recommendations, but very few meet the recommendations completely. The greatest weaknesses are first and foremost the high intake of added sugar and the low intake of grains, fruits and vegetables (Bere, Andersen & Klepp 2009, Oellingrath & Nærum 2006, Øverbye & Andersen 2000). Several studies also state that there are great differences between different groups of adolescents. For instance, age (Rasmussen et al. 2006, Vereecken et al. 2005), gender (Ranjit, Evans, Byrd-Williams, Evan & Hoelscher 2010, Roos, Hirvonen, Mikkila, Karvonen & Rimpela 2001) and socioeconomic position (Nilsen, Krokstad, Holmen & Westin 2009, Fahlman, McCaughy, Martin & Shen 2010) have shown to be associated to the dietary habits in adolescence. These factors are individual characteristics that mostly are unchangeable, but aspects regarding behaviour and lifestyle and their relationships dietary habits in adolescence have been examined as well. An important behavioural factor is physical activity, with its strong correlation with healthy eating (Ranjit et al. 2010, Taliaferro, Rienzo & Donovan 2010, Roos et al. 2001). Further, psychological factors like body image and self-esteem and their associations with eating have been investigated (Dae et al. 2002). Self-esteem is associated with weight concerns, which in turn might lead to a higher intake of healthy food and restrained intake of fatty food (Hoare & Cosgrove 1998, Nowak 1998).

The reasons for food choice are, however, complex, and several factors in both the self, the family and the environment are associated with dietary habits. In this thesis, the KAP model (Espnes & Smedslund 2001) and social cognitive theory (Bandura 1986) will be the theoretical basis in order to explain and understand the differences in eating habits in adolescence across age, gender, social background, physical activity and self-esteem.

Literature search

In order to acquire an overview over the existing research on adolescent dietary habits, a literature search was performed. The most frequently used databases were PubMed and Medline, and the main sources for information were scientific articles in English. The

following key words were used in the search: *adolescence, dietary habits, dietary behaviour, social background, demographic, socioeconomic position, physical activity, self-esteem, gender differences, social cognitive theory, knowledge, KAP*. In addition, citations and preference lists of scientific articles were used as starting points.

Research questions

This paper aims to give an overview of the existing knowledge about dietary habits of adolescents and some of the correlating factors, according to empirical findings. The main questions are to investigate

- How do age, gender and social background relate to the dietary habits of adolescents?
- Is physical activity related to dietary habits in adolescence?
- Is self-esteem related to dietary habits in adolescence?

2. Theoretical framework

2.1. The KAP model

Several theories have been used to explain the decision making in food choice that takes place in adolescence. A traditional approach to health promotion and information has been to focus on cognitive mechanisms in the individual as the most important sources of individual behaviour. Within this framework, the KAP model has been central. KAP means Knowledge, Attitudes and Practice, and stresses that to change behaviour, knowledge is required. When people acquire new knowledge, their attitudes will change, followed by a change in their behaviour (Espnes & Smedslund 2001). When investigating the dietary habits of adolescence, this model may contribute to explain the background of food choices, as well as why there are differences between different groups of adolescents. Knowledge of healthy nutrition has shown to be associated with healthy dietary habits (Vereecken et al. 2005). It is further likely to assume that this kind of knowledge is affecting the attitudes. When people know that unhealthy food consumption may lead to disease, while healthy food may improve their health, they will, according to this model, develop a positive attitude towards healthy nutrition. Further, they will start to eat healthy. The KAP model is however often criticized for overestimating the importance of attitudes, ignoring that individuals often act across their own intentions (Espnes & Smedslund 2001).

2.2. Social cognitive theory

The background of dietary habits is complex, and it may be useful to consider factors outside the individual as well. A theory that is focusing on both individual, behavioural and environmental sources of influence on human behaviour, is social cognitive theory, developed by Albert Bandura (1986). Environment, behaviour and the person itself is according to this theory incorporated into a pattern of reciprocal determinism, which means that these three aspects are interacting with each other. First, individuals have personal and cognitive characteristics that influence their behaviour. Age, gender and self-esteem are all found in these categories. Self-efficacy is another central construct of the theory which is also found on the personal level. This can be characterized as a conviction that one can successfully execute the behaviour that is required to produce certain outcomes. When a person is executing certain behaviours, he or she will have outcome expectancies, by estimating that a given behaviour will lead to a specific outcome. The stronger the self-efficacy, the more active are the efforts to change behaviour (Bandura 1982).

Further, the theory takes into account factors regarding behaviour (Bandura 1986). An example may be physical activity, which is shown to be associated with dietary habits in adolescence (Taliaferro et al. 2010). But also factors in the environment, for instance parental educational level, can be related to individual behaviour. Similar to the KAP model, also social cognitive theory is focusing on the importance of knowledge as a predictor of behaviour. This aspect is however brought further to secondary learning, by suggesting that the knowledge acquisition of the individual can be directly related to the observation of others within the framework of social interaction, activities, and outside media influences. On this level we also find social support to execute or change behaviour (Bandura 1986). As later will be discussed, social cognitive theory can be used to explain and understand why sociodemographic characteristics, physical activity and self-esteem cause variations in dietary habits in adolescents.

However, the theory has been criticized for attaching too great importance to self-efficacy (Luszczynska & Schwarzer 2005). Another point of criticism is being too comprehensive and unspecific, containing so many constructs that it is possible to explain almost any phenomenon by using one or more of the constructs. On the other hand, the theory has shown to be helpful in developing health promotion programs, for instance fruit and vegetable programs in schools (Baranowski et al. 2000).

3. Empirical findings of dietary habits and correlating factors in adolescents

3.1. Dietary habits and age

The behaviour affecting food and drink choices seems to change as the children become adolescents. As already mentioned, few adolescents meet the official recommendations for nutrition (Bere et al. 2009, WHO 2004). The consumption of fruits and vegetables often declines when entering adolescence, while the consumption of unhealthy food types increases (Rasmussen et al. 2006, Vereecken et al. 2005). This has been confirmed in studies examining consumption of for instance soft drink (Ranjit et al. 2010, Vereecken et al. 2005) and fast food (Larson, Neumark-Sztainer, Story, Wall, Harnack & Eisenberg 2008, Oellingrath & Nærum 2006). Bauer, Larson, Nelson, Story & Neumark-Sztainer (2008) carried out a longitudinal study with the first measurement in lower secondary school, and a follow-up in secondary school, showing that the fast food consumption had increased significantly for both genders.

Further, research indicates that age is a predictor of dietary habits not only when comparing children and adolescents, but also when consumption in different age groups within adolescence is investigated. Harnack, Stang & Story (1999) found that soft drink consumption increased with age in US adolescents. Almost one of four adolescents aged 15 years were consuming more than 26 oz soft drink per day, while one of three school-aged children consumed more than 9 oz of soft drink per day, both representing the highest consumption in their age group. A Norwegian study on adolescent soft drink consumption among students in primary and lower secondary school found that 10th-graders had the highest consumption of soft drink weekly, also compared to students in 9th grade (Bere, Glomnes, te Velde & Klepp 2006). Also a similar study on fast food consumption found that the frequency of visiting fast food restaurants was higher among students in grade 9-12 (age 15-18) than in grade 7 or 8 (age 12-14) (French, Story, Neumark-Sztainer, Fulkerson & Hannan (2001a).

3.2. Dietary habits and gender

When it comes to food choice and gender, it has been shown in general populations that women are more likely to follow official nutrition guidelines than men (Ueland 2007). However, this seems to be evident among adolescents as well. Boys tend to have higher intakes of energy, fat and protein, while girls are more likely to meet the recommended number of servings of fruits and vegetables (Xie, Gilliland, Li & Rockett 2003). This is confirmed by Nilsen et al. (2009) and Bere, Brug & Klepp (2007), who both found that girls

were eating healthier than the boys in their Norwegian samples of adolescents. This was especially remarkable when comparing the prevalence of daily soft drink consumption, and intake of fruits and vegetables. The same has been found both in the U.S. (Ranjit et al. 2010, Harnack et al. 1999) and in European countries (Vereecken et al. 2005, Roos et al. 2001). It is also found that boys eat significantly more fast food than girls (French et al 2001a).

As mentioned in the previous paragraph, unhealthy eating seems to correlate positively with age. However, it seems like age is of greater importance for the dietary habits in boys than girls (Oellingrath & Nærum 2006). For instance, Larson et al. (2008) found increase in fast food consumption with age to be evident only for boys. Regarding calcium and dairy product intakes, another study by the same authors found that the intake decreased with age for both genders, but still, girls in all age groups had a higher consumption of these products than boys (Larson, Story, Wall & Neumark-Sztainer 2006). As already mentioned, Harnack et al. (1999) both found that boys had a higher soft drink consumption than girls, and that older adolescents had a higher consumption than younger. The gender differences were however only found among 15-year-olds. Ranjit et al. (2010) found that the total consumption of soft drinks among boys increased remarkable from 8th to 11th grade, while the consumption among girls remained steady.

3.3. Dietary habits and socioeconomic position

Lately, social inequality and its consequences for health and illness have come increasingly more in focus. Social inequality can be defined as every kind of persistent and important diversities in acquired health between social positions within the same social structures (Elstad 2000). Of all contextual factors, socioeconomic factors are, according to Davies, Crosby & DiClemente (2009), some of the most formidable and least changeable. Several studies have found that families with low socioeconomic position tend to have a more unhealthy diet than those with higher socioeconomic position (Fahlman et al. 2010, Nilsen et al. 2009). Adolescents from low position families often have a lower consumption of fruits, vegetables (Bere, van Lenthe, Klepp & Brug 2008, Roos et al. 2001, Neumark-Sztainer, Story, Resnick & Blum 1996) and dairy products (Larson et al. 2006) than adolescents with higher socioeconomic position.

Socioeconomic position may however be measured in different ways. For instance, Oellingrath & Nærum (2006) found fathers' occupation to be a determinant of healthy eating.

If the fathers had high occupation status, the adolescents were eating healthier. This tendency was not significant for students in secondary school, indicating that the association between socioeconomic position and dietary habits decreases with age. Socioeconomic differences in dietary habits also seem to vary across gender. In a survey on dietary habits among students in primary and lower secondary schools in Norway, where parental education was used as measure of socioeconomic position, the results showed that the girls with high educated fathers had a significant lower energy share from fat than girls with lower educated fathers. The differences across educational level were not significant among boys (Øverby & Andersen 2000). The findings of socioeconomic position being strongest related to the dietary habits of adolescent girls are confirmed in studies on consumption of fast food (French et al. 2001a), fruits and vegetables (Nilsen et al. 2009, Giskes, Turrell, Patterson & Newman 2002), as well as soft drink (Ranjit et al. 2010).

3.4. Dietary habits and physical activity

Gillespie (2006, p. 262) defines physical activity as “*bodily movement that is produced by the contraction of skeletal muscles and that substantially increases energy expenditure*”. Frequency of exercise often declines as adolescents grow older. The walking distances get shorter, and car driving increases (Pentz 2009). National surveys in Norway indicate that the activity level of the average Norwegian adolescent is below the current recommendations of at least 30 minutes of physical activity a day (Wold 2009). In a national survey, the results showed that the rate of persons meeting the physical activity recommendations fell from 91 % to 54 % for boys and 75 % to 50 % for girls from the age of 9 – 15 (Anderssen, Kolle, Steene-Johannesen, Ommundsen & Andersen 2008). The findings are consistent with another Norwegian survey, which found decreasing levels of physical activity with increasing age, both in girls and boys (Samdal et al. 2009, Klasson-Heggebø & Anderssen 2003). The same result has been found in international studies as well (Pearson, Atkin, Biddle, Gorely & Edwardson 2009, Sallis, Prochaska & Taylor 2000). Additionally, it has been found that adolescents of high socioeconomic position are more physically active than those of lower position (Anderssen et al. 2008, Brodersen, Steptoe, Boniface & Wardle 2007).

The changes in body composition and growth of muscle mass that take place during adolescence lead to physical strength and increased tolerance for exercise for the teenager (Steinberg 2008). Exercise in youth has positive consequences in a long-term perspective, for instance reduced risk for certain cancer types (Fuemmeler et al. 2009) and prevention of

osteoporosis because of increased bone mass and bone density (Khan et al. 2000). Further, participation in physical activity has positive effects on preventing risk behaviours, like suicide and depression (Brosnahan, Steffen, Lytle, Patterson & Boostrom 2004), smoking, alcohol and substance use (Taliaferro et al. 2010) and sexual behaviour and pregnancy involvement for girls (Sabo, Miller, Farrell, Melnick & Barnes 1999). Another important correlate is the area of nutrition, since a healthy lifestyle in adolescence seems to include both healthy eating and being physical active (Wold 2009).

Pearson et al. (2009) found that individuals who exercised regularly tended to eat healthier than those who did not. On the other end of the scale, they found that individuals who skipped breakfast were less physically active than those who ate breakfast regularly. According to Ranjit et al. (2010), both vigorous physical activities, participation in school physical education classes and organized sports activity decreased with level of soft drink consumption. Consumption of the healthier alternative fruit juice, on the other hand, showed positive associations with physical activity measures and healthy food consumption. Further, this study found that regarding soft drink consumption and physical activity, activity level increased with intake of soft drinks without sugar, but decreased with intake of sugar-sweetened soft drink. Several studies have also found a positive correlation between regular physical activity and intake of fruits and vegetables (Taliaferro et al. 2010, Roos et al. 2001).

However, it seems like type of physical activity affect whether the dietary habits are healthy or not. Team sport participation is actually strongly correlated to a higher intake of fast food in secondary school students (Bauer et al. 2008, French et al. 2001a). On the other hand, neither Pearson et al. (2009) nor Sallis et al. (2000) were able to find consistent correlations between regular physical activity and healthy dietary habits in adolescence in their reviews.

3.5. Dietary habits and self-esteem

Adolescence is a time of great changes, of both physiological and psychological character. In this period, the individual tries to determine the exact nature of his or her self, and to consolidate multiple choices into a coherent whole (Coleman & Hendry 1999). Adolescents often become aware that they are not able to meet the expectations of what they should be, both from themselves, family, school, friends and media. This often has implications for their perception of their own value (Steinberg 2008). The definitions within the field of self concept are sometimes unclear, but here the term *self-esteem* will be used, referring to the

acceptance and respect towards the self, and whether one considers oneself as a person of worth (Rosenberg & Kaplan 1982).

Several studies have shown that self-esteem decreases in the transition from childhood to adolescence (Santrock 2008). Self-esteem is closely linked to physical appearance and body size during this period (Barker, Robinson, Wilman & Barker 2000). Low self-esteem has been identified as an important risk factor for developing eating disorders (Kansi, Wichstrøm & Bergman 2003, Daele et al. 2002, French et al. 2001b). Dieting is shown to be very common, and can have physical consequences as delayed growth and puberty (Skeie & Klepp 2002). Many adolescent girls are trying to lose weight or trying to keep from gaining weight, regardless of whether they are overweight or not (Neumark-Sztainer, Story, Hannan, Perry & Irving 2002). Dieting is often associated with restrained eating. For instance, adolescents who diet may reduce the consumption of soft drink (Bere et al. 2006).

Whether self-esteem affects dietary habits or not, seems to depend on age. In a study on self-esteem, body esteem and eating habits in Scottish adolescent girls, it was shown that within the age of 10-16 years, there were great differences in self-esteem and dietary habits between the different age groups. Among the older respondents, eating restraints and lower self-esteem were more common than among the younger girls, and the correlation between these two variables was strong (Hoare & Cosgrove 1998). An Asian study showed that life-satisfaction and self-esteem variables were associated with a consumption of sugar products of “more than once a day” (Honkala, Honkala & Al-Sahli 2006). The students who always felt self-confident, accepted by others, or felt very good looking consumed sugar products more frequently. At the same time, the students who felt nervous on a daily basis or considered themselves too thin also seemed to have higher consumption of sugar products, indicating that low self-esteem may be associated with both restrained and unrestrained consumption of unhealthy food. Another Asian study showed only weak associations between self-esteem and dietary habits, and the only significant association was identified between binge eating and self-esteem. The lower self-esteem, the more frequent was the tendency of binge eating (Soo, Sharif, Taib & Saimah 2008).

Only a few studies using the term self-esteem according to the definition of this concept (Rosenberg 1982) were identified. When including studies involving body image, which has shown to be positively correlated with self-esteem (Abell & Richards 1996), some more

studies can be included. A Norwegian study showed that adolescents with a poor body image had a low intake of fast food and snacks, probably in order to lose weight (Oellingrath 2004). Also Nowak (1998) found that body image was associated with dieting, and that adolescents on diet increased the intake of wholemeal products and low-fat milk. Boys who had intentions of weight loss reduced the intake of sweets and snacks, while concurrently increasing healthy food such as low-fat milk, yoghurt and fruit.

4. Discussion

4.1. Dietary habits and age

One of the aims of this paper was to investigate whether there were associations between adolescent dietary habits and age. According to research, it seems like older adolescents are at higher risk for eating unhealthy than younger adolescents (Ranjit et al. 2010, Nilsen et al. 2009, Vereecken et al 2005). The KAP model suggests that behaviour is a result of knowledge and attitudes (Espnes & Smedslund 2001). Out of this, one should assume that the knowledge of healthy nutrition would be greater among older adolescents, leading to healthier eating. Instead, the opposite pattern is revealed. A great limitation of the KAP model is that it ignores several aspects that also affect human behaviour, for instance impulsivity. There is a great focus on the importance of healthy lifestyle in the society, and it is reasonable to believe that most of the population knows what is considered to be healthy food. Still, people continue to eat unhealthy. Espnes & Smedslund (2001) state that even though knowledge is necessary to change behaviour, it may not be sufficient.

In this perspective, social cognitive theory may present a better explanation, by suggesting that behaviour is a result of an interaction between personal, behavioural and environmental traits (Bandura 1986). It may be that even though older adolescents know that intake of unhealthy food may have negative long-term consequences for their health, preferring the taste of this type of food may be more important than their future health. Preference is a personal factor that has shown to be an important predictor of for instance fruit and vegetable consumption in several studies (Ball et al. 2009, McClain, Chappius, Nguyen-Rodriguez, Yaroch & Spruijt-Metz 2009, Rasmussen et al. 2006, Turrell 1997). Granner et al. (2004) found that adolescents in the age of 15 reported a lower degree of preference for fruits and vegetables than younger adolescents. Further, also the personal factor self-efficacy has shown to mediate age differences in dietary habits among adolescents. The same study also revealed

that 11-year old adolescents reported a higher level of self-efficacy for eating fruits and vegetables than older adolescents (Granner et al. 2004).

On the environmental level, adolescents have to deal with expectations from multiple sources around themselves, both school, friends and family. The family influence is strong on own health behaviors especially in the beginning of adolescence. Davies et al. (2009, p. 392) states that *“norms, values, and models of behaviour introduced in the family serve as building blocks for the development of the adolescent’s personality, beliefs, and attitudes”*. The adolescent is likely to adapt the perceptions of healthy eating that is ruling in the family, and make them their own. This affects both food preferences, self-efficacy for healthful eating and meanings of food (McClain et al. 2009, Story, Neumark-Sztainer & French 2002).

While individuals around the age of 10-12 still are under strong influence from the parents and partake in the family meals, this tendency declines as they get older. For instance, Oellingrath & Nærum (2006) found that occupational status of the father was positively related to healthy eating among children and adolescents, but only for students in primary school. This may indicate that the impact of social background on dietary habits is reduced with age.

A possible reason for this can be that a teenager aged 15 experiences an increased autonomy over food choice, and may have more money because of a part-time job (Steinberg 2008). Additionally, adolescents spend a major amount of time with friends, where eating as behaviour represents an important part of socialization and recreation. Group conformity is considered as an important determinant of food selection because adolescents often are seeking peer approval and social identity (Story et al. 2002). Perceived modeling had the most consistent and positive association with eating in the review of McClain et al. (2009). The peer influence increases and the parental influence declines as the adolescent gets older (Nicklaus & Issanchou 2007). Again the KAP model falls short. Even if adolescents may have knowledge of healthy nutrition and even a wish to eat healthy, this can be given less priority, favoring the desire to be accepted by friends and peers. Gradually, the attitudes of others become one’s own.

The same is the case with availability. Having the right knowledge and attitudes to eat healthy does not work if the healthy food is not available. Availability is a construct of social

cognitive theory that has shown to be important in explaining differences in dietary habits across age (Ball et al. 2009). For instance, the students in secondary schools often have a greater freedom than the primary and lower secondary school students to leave the school ground during lunch breaks to visit kiosks or fast food restaurants. As already mentioned, they may also have more money to spend on vending machines and unhealthy food in the school canteens. Adolescents who work may be affected by the food selection on the workplace as well. Availability of healthy food has shown to be a strong predictor of healthy eating in adolescence, while accessibility to fast food restaurants in the neighborhood and vending machines in school shown to have negative effects (Bere et al. 2006, Sallis & Owen 2002, Story et al. 2002).

However, contradictory findings have been done regarding dietary habits and age. For instance, the review of Rasmussen et al. (2006) showed that intake of fruits and vegetables decreased with age in a majority of the studies included, but still, in 40 % of the studies no correlation was found. The dominant instrument for intake measure in these studies was 24-hour diet recalls, while the studies that found significant correlations mostly used food frequency questionnaires, which gives greater possibility to map out dietary patterns over time. In addition, there is always a risk for over- or underestimating dietary intake, creating a response bias. This is what Pearson et al. (2009) suggest to be one of the reasons of their findings of fruit and vegetable intake increasing with age, unlike previous research (Nilsen et al. 2009, Rasmussen et al. 2006, Vereecken et al. 2005).

4.2. Dietary habits and gender

When investigating dietary habits and gender, it seems like girls have healthier dietary habits than boys (Nilsen et al. 2009, Bere et al. 2006, Xie et al. 2003). The KAP model would then suggest that the reason for this would be that girls have greater knowledge of nutrition and health, and therefore express healthier attitudes than boys (according to Espnes & Smedslund 2001). It is a matter of fact that women in general tend to be more knowledgeable about food, nutrition, health and their relationships, and they exhibit more positive health and food-related beliefs and attitudes than men (Turrell 1997). Vereecken et al. (2005) found knowledge to be a central mediator of the gender differences in healthy food consumption in adolescents. However, the motivation for this behaviour is not necessarily found in knowledge and positive attitudes towards a healthy lifestyle. The authors suggest that adolescent girls are more engaged with healthy food due to societal explanations to the gender roles.

This suggestion is supported by Bere et al. (2007). They found that taste preference was the strongest mediator of the gender differences in fruit and vegetable intake, alone explaining 81 % of the variance. However, the authors suggest that preferences are not only biological traits, but for girls, it may also represent an adaptation of the social expectations of eating healthier to be slim. Adolescence is the time where boys and girls for the first time get confronted with the fact that strength and physical ability differ between the sexes. Even though also boys worry for their body size and performance, like muscles and strength, girls are often especially at risk of developing a negative self-esteem related to their body. In this period, both height and weight increases for both sexes, but muscle tissue grows faster in boys, while body fat increases for girls (Steinberg 2008). A cross-sectional study on adolescent girls showed that as much as 87,3 % were dissatisfied with their own body size (Soo et al. 2008).

The importance of being slim is also representing another aspect of social cognitive theory, namely outcome expectations (Bandura 1986). The motivation for food choice has shown to differ between genders, for instance considering peer acceptance (Nicklaus & Issanchou 2007). Modeling, or observational learning, is according to Bandura (1986) closely linked to this aspect. Several studies have found that boys report a greater importance of social support when choosing their food. On the other hand, girls tend to report a higher level of importance for preventing weight gain (Bauer et al. 2008, Larson et al. 2008, Bere et al. 2007, Granner et al. 2004). The findings on peer influence have however not been consistent. Wouters, Larsen, Kremers, Dagnelie & Geenen (2010) found that peer influence was effecting the snack consumption of adolescents to a certain extent, but only combined with availability, for instance by access to vending machines in schools, and personal characteristics.

4.3. Dietary habits and socioeconomic position

According to research, it seems like high socioeconomic position is associated with healthy dietary habits (Fahlman et al. 2010, Nilsen et al. 2009, Roos et al. 2001). Several studies have found differences in knowledge and attitudes towards nutrition across socioeconomic position, strengthening the assumptions of the KAP model (Espnes & Smedslund 2001). The mother of a family often plays an important role in the family nutrition because she traditionally is the one to do the grocery shopping and make the food. The main findings of Lawrence et al. (2009) were that mothers with low education had less knowledge about healthy nutrition, more environmental barriers for eating healthy, and found little support in

the family for making healthy choices. Therefore, they often bought the food that was cheapest, easiest to prepare and which was most appreciated in the family.

However, constructs of social cognitive theory may again be useful in explaining the tendency of adolescents of low socioeconomic position eating healthier. For instance, self-efficacy has shown to be an important for dietary habits. Fahlman et al. (2010) found that students of low socioeconomic position had a higher intake of fast food and calorie-dense food than their counterparts with high socioeconomic position, while the intake of fruits and vegetables was lower. Self-efficacy to change behavior was explaining a great share of the variation in consumption across socioeconomic position. As with the other sociodemographic characteristics, it has also been shown that adolescents of low socioeconomic position are more likely to report that unhealthy food is available in the home environment (Boutelle, Birkeland, Hannan, Story & Neumark-Sztainer 2007, MacFarlane, Crawford, Ball, Savage & Worsley 2007). This is in accordance with Bere et al. (2008), who found that the strongest mediator of the differences in fruit and vegetable intake among adolescents of parents with high versus low educational level was the perceived accessibility of this kind of food at home.

The tendency of socioeconomic position being associated with dietary habits is shown to be stronger among girls than boys (Ranjit et al. 2010, Nilsen et al. 2009, Giskes et al. 2002, French et al. 2001a). The authors of these studies do not suggest any explanations of this. It is possible that the tendency of peer influence being more important for the dietary habits of boys than girls plays a role (Nicklas & Issanschou 2007), but this issue represents potential for further research.

The mentioned studies have not used the same measures of socioeconomic position, which has to be taken into account when comparing results. Aarø & Klepp (2009) point out that it is often hard to measure socioeconomic position in a good way. Young people tend to show an inaccurate reporting of parental income, education and occupation. They are also in a transitional phase of life where their parents' social position is put up against their own desired position in the future. If these do not match, there might be an opportunity that the reported level does not reflect reality.

4.4. Dietary habits and physical activity

Another of the main questions of this paper is whether dietary habits among adolescents are associated with physical activity. Several studies have shown that physically active adolescents eat healthy according to the national recommendations (Taliaferro et al. 2010, Pearson et al. 2009, Roos et al. 2001). As social cognitive theory suggests, individual behaviour is based on an interaction between personal, behavioural and environmental factors. From this we can state that physical activity, by representing an already existing behavioural pattern in the individual, is contributing in the shaping of another behaviour, namely dietary habits (Bandura 1986).

Gillespie (2006) states that physical activity is more likely to be maintained and initiated if the individual perceives a total benefit of the activity, enjoys the activity, and feels competent. These factors are acknowledged of both the KAP model, in terms of representing attitudes, as well as social cognitive theory. But as with dietary habits, it has been shown that also environmental factors affects physical activity behaviour among adolescents. One example is the socioeconomic position of the family. Level of physical condition and frequency of physical exercise has shown to be positively associated with parental education level (Anderssen et al. 2008, Brodersen et al. 2007). It is likely to believe that family perceptions and attitudes towards physical activity are influencing the perceptions and attitudes of the adolescent (Davies et al. 2007).

Other influences on the environmental level come from friends and peers, and again, the KAP model may not completely explain the background of the relation between dietary habits and socioeconomic position. Pentz (2009) states that as adolescents spend more time away from home, in school and leisure time activities, the influence from peers and the social network is of a great importance for the lifestyle choices. For a teenager, the perceived value of exercising among his or her friends will probably count more than exercising to prevent osteoporosis in older age. Friends act as models both in terms of physical activity behavior and social support for these behaviors (Aarø & Klepp 2009). As social cognitive theory states, modeling may be a central determinant of individual behaviour (Bandura 1986).

However, contradictory results have been found. Sallis et al. (2000) were not able to find consistent correlations between regular physical activity and healthy dietary habits in adolescence in the studies included in their review. The number of studies investigating this

specific topic was however small, and all of them were carried out approximately 20 years ago. The type of physical activity that was measured may also have contributed to the result. It is found that for instance team sport participation is a risk factor for unhealthy diet in adolescence (Bauer et al. 2008, French et al. 2001a). Playing in sport teams allow little time for meals at home and may lead to a higher frequency of eating quick meals out. Both personal and environmental factors can contribute to the explanation of this relationship. For instance, self-efficacy for a healthy lifestyle and activity preferences may be predictors of lifestyle choice. Further, social support from both friends and other players on the team is important. The norms and culture in sports team circles might not approve of healthy eating. Additionally, lack of access to healthy food on sport stadiums may be an essential determinant (Story et al. 2002).

4.5. Dietary habits and self-esteem

The last question of interest is whether self-esteem in any way is associated with dietary habits, either in positive or negative direction. According to previous research, low self-esteem is a risk factor for developing eating disorders, especially among girls (Kansi et al. 2003, Daele et al. 2002, French et al. 2001b). Dieting is very common in this age group, which has implications for the dietary habits through restrained eating and healthier food choice (Oellingrath 2004, Neumark-Sztainer et al. 1996). As the KAP model stresses, it seems like attitudes is of importance for behaviour in this context. Adolescent girls perceive being slim as a central value, and they diet to achieve this goal because they know this as a strategy to lose weight. However, this knowledge and attitude may not be based on reality. It has been shown that dieting is common also among adolescent girls who are not overweight (Daele et al. 2001, Neumark-Sztainer et al. 2002). Social cognitive theory has an alternative approach: the individual is convinced of that he or she successfully can execute the behaviour (dieting) required to produce the outcomes (weight loss). He or she starts dieting, and estimates to a certain degree that this behaviour will lead to weight loss (outcome expectations) (Bandura 1982).

However, another study found self-esteem to be associated with binge eating, but not restrained dietary habits (Soo et al. 2008). The direction of the relationship could not be ascertained, which may indicate that low self-esteem both may cause disordered eating, but can also be the consequence of previously unsuccessful efforts to lose weight. Another weakness of the KAP model is here revealed. The model assumes that the causal connection

only goes in one direction, by attitudes affecting behaviour. Another opportunity is, however, that behaviour may affect attitudes, or that they affect each other mutually (Espnes & Smedslund 2001). The study was however performed among upper class students in Asia, which might result in other findings than in European studies due to cultural traits. Further, the age of the respondents in one of the studies was 11-13 years, which excludes the possibility of examining older adolescents (Soo et al. 2008).

Whether self-esteem affects dietary habits or not, seems to depend on age. Hoare & Cosgrove (1998) found self-esteem to be a stronger predictor of restrained eating and dieting among older adolescent girls than younger. A possible reason for this could be found on several levels, but as mentioned earlier, the time spent with friends increases with age, implicating exposure for friends' weight concerns and dietary habits. Attitudes from peers and observation of their habits have shown to influence both self-esteem and body image in adolescent girls (Meyer & Gast 2008, Taylor et al. 1998), which we in turn can presume effects the dietary habits. As mentioned previously, the modeling principle is according to social cognitive theory a central predictor of individual behaviour (Bandura 1986).

However, predictors of self-esteem and dietary habits can also be found on the environmental level. For instance, media seems to be an important source of influence on food choice (Story et al. 2002). Girls are often exposed for such influence as they grow older, for instance through reading fashion magazines, which in turn might affect their self-esteem (Vereecken et al. 2005, Skeie & Klepp 2002, Rosenberg & Simmons 1982). Field, Cheung, Wolf, Herzog & Gortmaker (1999) found pictures in woman fashion magazines to be a strong source of influence on the self-esteem of teenage girls, with 47 % wanting to lose weight because of such pictures. This seems to affect personal and behavioral factors, like concern for weight and healthy weight strategies, which has shown to be protective against intake of fast food among girls (Bauer et al. 2008).

4.6. Limitations

One important limitation of this overview of literature is that defining healthy dietary habits can be difficult because of conflicting opinions on this area. In this paper, the recommendations from the Norwegian National Council for Nutrition have been used to characterize healthy nutrition because of its foundation of empirical evidence (National Council for Nutrition 2011). When new recommendations were published earlier this year,

they were met with criticism from several persons within health science (Estep 2011). Since these questions are on the outside of the main topic in this thesis, the national recommendations were the most obvious choice.

Dissimilar methodological approaches and instruments can make it difficult to compare different studies, and this aspect has to be taken into account. For instance, 24 hour diet recalls may give other results than food frequency questionnaires (Rasmussen et al. 2006). Measuring physical activity in a correct way may also be challenging (Sallis et al. 2000), as well as socioeconomic position (Aarø & Klepp 2009). For instance, especially younger adolescents may not have knowledge of the correct family income. Additionally, the level of cognitive maturity and expectations of social acceptance might affect the result of studies in adolescent populations using questionnaires as instruments (Pearson et al. 2009).

5. Conclusion

On associations between dietary habits and age, gender, social background, physical activity and self-esteem, the majority of research shows that healthy eating in adolescence mainly is positively correlated with socioeconomic position and physical activity, and negatively correlated with age. Girls tend to eat healthier than boys, but the reasons are complex. Adolescent girls are at greater risk for developing eating disorders, related to low self-esteem. The associations between self-esteem and healthy eating are however not clear, since the research on this topic is limited, both in numbers and methodologically. The KAP model, described in Espnes & Smedslund (2001), can to some extent shed light on the relations between dietary habits and the correlating factors, as well as social cognitive theory (Bandura 1986). Especially taste preferences and availability of healthy food seems to be important predictors of food choice in adolescence. At the same time, both these theories have been criticized and may not completely cover the complexity of dietary habits.

Dietary habits among adolescents represent an important public health issue because of the long-term effects on health and health behaviour. Knowledge of this age group and their dietary habits may provide a good basis for future health promotion initiatives. In this context, this paper may be a contribution.

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Research article

Sociodemographic, physical activity and self-esteem correlates of dietary habits among adolescents in Trondheim, Norway

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Abstract

This paper investigates the associations between dietary habits in adolescents and sociodemographic characteristics, physical activity and self-esteem. Data is from the UngHiT study, which took place in Trondheim, Norway, in 2009. The cross-sectional sample consisted of 4120 adolescents aged 11-18. Dietary habits were assessed with consumption of soft drink, fast food, fruits and vegetables. The results showed that according to national guidelines for nutrition, the sample in general had relatively healthy dietary habits. However, healthy eating declined with age for all the food and drink types, and girls generally ate healthier than boys. Also socioeconomic position, measured by parental education, and physical activity frequency, was associated with healthy eating in the sample. Self-esteem was weakly, but significantly correlated with intake of fruits and vegetables and fast food. The regression analysis showed that age, gender, socioeconomic position and physical activity to a very limited extent were able to explain the variation in intake of these food and drink types. Future research may include other factors that may be related to dietary habits in adolescence, for instance preferences or self-efficacy.

1. Introduction

Adolescence is a period of life often characterized with transition and change (Coleman & Hendry 1999). Both biological and psychological changes take place, often leading to new practices and habits. Research has shown that health behavior patterns developed in adolescence continues into adult life (Pentz 2009). Both because of this fact, and the importance of a healthy lifestyle for growth and development in adolescence, much attention has been paid to the dietary habits of this age group. Unfortunately, it has been shown that many adolescents have a diet of poor quality and that few meet the recommendations for healthy dietary habits (Bere, Andersen & Klepp 2009, Øverby, Lillegaard, Johansson & Andersen 2003). For instance, the intake of both soft drink (Harnack, Stang & Story 1999) and fast food (Larson et al. 2008) is often too high, while the intake of fruits and vegetables

(Oellingrath & Nærum 2006, Øverbye & Andersen 2000) is inadequate, compared to national recommendations.

Traditionally, the Knowledge, Attitude and Practice (KAP) model has been a frequently used instrument for health promotion interventions, suggesting that knowledge of healthy nutrition leads to positive attitudes towards kind of food. On this basis, individuals are to change their behaviour and eat healthier. It is however well acknowledged that adolescent dietary habits are complex and influenced by several factors, and that individuals may act across own intentions (Espnes & Smedslund 2001). Social cognitive theory, developed by Albert Bandura (1986), has often shown to be helpful in understanding adolescent dietary habits, because it includes several constructs that may affect food choice. According to the theory, personal, behavioural and environmental factors related to the individual, interact with each other and provide a basis for establishing or changing behaviours. Knowledge of factors associated with dietary habits is important for instance when health promotion programs among adolescents are to be started.

This paper will consider a selection of factors on personal, behavioural and environmental level, and how they are related to dietary habits. Firstly, it has been shown that age may determine dietary habits, in terms of younger adolescents eating healthier than older (Ranjit, Evans, Byrd-Williams, Evans & Hoelscher 2010, Rasmussen et al. 2006). Gender is another aspect that has shown to represent a distinction, with girls eating healthier than boys. The fruit and vegetable intake is often higher in girls (Bere, Brug & Klepp 2007), while the fast food and soft drink intake is lower compared to boys (Bauer, Larson, Nelson, Story & Neumark-Sztainer 2008). Further, an increased focus on social inequality in health has taken place during the last few years. When it comes to nutrition and its consequences for health and disease, there is an evident distinction between the socioeconomic layers in society favoring the high socioeconomic position group, also in adolescence (Fahlman, McCaughtry, Martin & Shen 2010). For instance, adolescents of lower socioeconomic position have a higher consumption of soft drink (Vereecken, Inchley, Subramanian, Hublet & Maes 2005) and a lower consumption of fruits and vegetables (Giskes, Turrell, Patterson & Newman 2002) than adolescents of high socioeconomic position.

Exercise is a behavioural factor that has shown to correlate positively with healthy eating, indicating that eating is a part of a greater health behavior pattern (Taliaferro, Rienzo & Donovan 2010, Roos, Hirvonen, Mikkila, Karvonen & Rimpela 2001). These studies both found that regular physical activity is associated with a high intake of fruits and vegetables. Additionally, psychological correlates of healthy eating in adolescence are interesting to examine because it is well acknowledged that eating is not only a question of meeting a physiological need, but is also closely linked to complicated psychological processes. (Brannon & Feist 2007). Self-esteem is a psychological measure that has been linked to eating, mostly in terms of dieting and eating disorders (Dae et al. 2002). In this paper, Rosenberg & Kaplan's (1982) definition of self-esteem as respecting and accepting oneself, and consider oneself as a person of worth, will be used. Low self-esteem and concern for weight often lead to restrained eating, which has shown to be protective of intake of unhealthy food, especially in girls (Bauer et al. 2008). However, as different measures and terminology have been used, like *body image*, *self concept* and *self evaluation*, it is hard to conclude whether self-esteem is correlated to food intake in adolescence or not. The interest in self-esteem as a psychological correlate of dietary habits is therefore speculative.

It has not been possible to identify studies that combine age, gender, socioeconomic position, physical activity and self-esteem as correlates of dietary habits in adolescence, and it is therefore interesting to investigate whether they are associated with consumption of some selected food and drink types in our sample. Due to their representing of typical unhealthy and healthy food, and possibilities of comparing with previous research, soft drink, fast food, fruits and vegetables have been selected for analysis. The aims of this paper are:

- Investigate the association between sociodemographic factors (age, gender and socioeconomic position) and the consumption of soft drink, fast food and fruits/vegetables
- Investigate the association between physical activity and the consumption soft drink, fast food and fruits/vegetables
- Investigate the association between self-esteem and the consumption of soft drink, fast food and fruits/vegetables

2. Methods

2.1. Participants

The sample used for analysis is from the Ung-HiT survey (The Youth version of the Health Survey in Trondheim), a health survey performed in Trondheim municipality, Norway, in 2009. The survey was handed out to a total of 8860 students in 6th and 9th grade in primary and lower secondary schools, and 1st and 2nd grade of secondary schools, with a total response of 4289 students (response rate 48.2 %). The range of birth year in the present study was 1986 – 1999, but only respondents born 1991 - 1998 were included in the current analysis, due to the definition of adolescence (Steinberg 2008). When excluding respondents outside the age range 11-18, the number of respondents included in the analysis was 4120.

The distribution of respondents across grade were 979 students (23.7 %) in 6th grade (age 11), 696 students (16.9 %) in 9th grade (age 14) in public school, 1055 students (25.6 %) in 1st grade (age 16), and 1390 (33.7 %) in 2nd grade (age 17-18) of secondary public school. The total distribution of gender was 2023 boys (49.2 %) and 2089 girls (50.8 %). The mean age of the total sample was 14.9 (SD 2.41); for girls 14.7 (SD 2.42), and for boys 15.02 (SD 2.37).

2.2. Procedures

This edition of Ung-HiT is the second, with a similar survey carried out in 2005. The survey was accepted in The Regional Committee for Medical and Health Research Ethics (REK), and the responsible institution for the database is the faculty of Medicine, department of Public Health and General Practice, Norwegian University of Science and Technology (NTNU). The method used for data collection was QuestBack, which is an online service to collect electronic data for surveys. Data collection took place in school setting during the school-day. Participation was voluntary, and the questionnaires were answered anonymously and individually. Informed consent was obtained from all participants, and for students below the age of 16, informed consent was obtained also from parents.

2.3. Measures

2.3.1. Outcome measures

The main issue of the survey was health in adolescence, and the questionnaire consisted of questions about several health issues, for instance smoking, sexual behavior and

psychological health. For this thesis, issues of interest were food and drink consumption, self-esteem and physical activity frequency. Additionally, sociodemographic variables like age, gender and parental education were used in the analysis. To assess food and drink consumption, the respondents were asked to indicate how often they usually consumed eight food types and five drink types. For the current analyses, the following food types were selected: *fast food (from snackbar, kiosk, etc.)*, *fruits* and *vegetables*. The response categories ranged from 1 to 5, where 1 = several times a day, 2 = Once a day, 3 = Every week, but not every day, 4 = Less than weekly and 5 = Never. The drink type of interest for this paper was soft drink (sugar-sweetened). The similar frequency alternatives for drinks were 1 = Seldom/never, 2 = 1-6 glasses/week, 3 = 1 glass/day, 4 = 2-3 glasses/day and 5 = 4 glasses or more/day.

The current analyses are based on a subset of food and drink items based on their representing of typically healthy and unhealthy consumption, which enables comparisons with other studies. The variables *fruits* and *vegetables* were put together due to adequate internal consistency (Cronbach's alpha 0.68). The highest value of one original variable represents the value of the new variable. For instance, if the fruit intake was higher than the vegetable intake, the fruit intake is now representative for both.

2.3.2. Predictor measures

Parental education was measured by this question: *How long education do you think your mother/father has?* The response categories were 1 = Lower secondary school or less 2 = Vocational school or vocational education, 3 = secondary school, 4 = College or university, lower degree, 5 = College or university, higher degree and 6 = Unknown. ANOVA with post hoc test showed no internal differences between the different stages of education from lower secondary throughout secondary school, regarding consumption of the chosen food and drink types. Differences were not either found between college and university level of education. The education variable was therefore recoded to only two representing values, *low* and *high education*. Since distinction between maternal and paternal educational level not was of interest in this thesis, the parent with highest education was representing both. Further, one physical activity question was used in the analysis: *Outside school, how many hours pr. week do you perform physical activity or sports so hard that you get breathless/sweaty?* The response categories were here ranged from 1-6, with the following response categories: 1 =

None, 2 = approx. ½ hour, 3 = approx. 1 – 1 ½ hour, 4 = approx. 2-3 hours, 5 = 4-6 hours and 6 = 7 hours or more.

Self-esteem was measured by using three of ten items from Rosenberg's self-esteem scale (Rosenberg 1982) in the questionnaire. The three items were as following:

- *I take a positive attitude toward myself*
- *I feel I d not have much to be proud of*
- *I feel that I am a person of worth, at least on equal plane with others.*

The response alternatives were 1 = strongly agree, 2 = agree, 3 = disagree and 4 = strongly disagree. These three self-esteem questions were summed, constituting a new variable named *self-esteem*. Range was 0-9, with 9 indicating the highest level of self-esteem. The merging of variables was done to simplify the results and was considered as possible because of satisfying correlation and internal consistency (Cronbach's alpha 0.71).

2.3.3. Statistics

The statistical analyses were carried out by using SPSS version 17.0. Frequencies and descriptive statistics were performed on gender, age and parental education, as well as on the variables about physical activity, self-esteem and dietary habits. In order to investigate the relationship between categorical and continuous variables, for instance gender and physical activity, comparison of means and independent samples t-test were used. Further, the relationship between continuous variables, for instance age and self-esteem, was examined using bivariate correlation and Pearson's r. Level of statistical significance was $p < .05$. For further investigation of the relationship between the predictor variables and the food and drink types, hierarchical multiple regression analysis was carried out. Not all variables were normally distributed, but the discrepancies were acceptable. No multicollinearity was identified.

Three separate regression models were analyzed, with *soft drink*, *fast food* and *fruits/vegetables* as dependent variables, and *gender*, *age*, *parental education*, *physical activity* and *self-esteem* as independent variables. The independent variables were included in the order as above, due to theoretical assumptions of their correlation with dietary habits.

2.3.4. Missing responses

As already mentioned, the response rate was not very high in this survey (total response rate 48.2 %), especially not among students in 9th grade (39 %). Respondents who did not answer the questionnaires, or answered incompletely, represent missing responses in the data material. Some variables have a high missing rate, for instance parental education (missing 33.9 %), where the value “Unknown” is set to missing, and the 6th grade respondents, who did not get this question, also are shown as missing. The missing is however not replaced because of the character of the question, which will make it difficult to make a valid replacement, and still, the sample size is large (n=2723). For all other variables included in this paper, the missing rate was around 2-3 %.

3. Results

3.1. Frequencies

Regarding socioeconomic position, measured by parental education, this information was acquired for 2723 respondents. Of these, 1001 (36.8 %) of the respondents had parents with lower education (secondary school or less), and 1722 respondents (63.2 %) had at least one parent with higher education (college or university). When it comes to physical activity, the majority of the respondents had a frequency of physical activity in leisure time of approximately 4-6 hours pr. week, closely followed by those who performed physical activity approximately 2-3 hours pr. week. The respondents had a mean score of 6.37 on the self-esteem scale (range 0-9), indicating a relatively good self-esteem. On the frequency of soft drink consumption, the mean score was 1.19, indicating that most of the respondents had a consumption of 1-6 glasses weekly. The majority of the sample had a fast food consumption of “*less than every week*”, and a consumption of fruits/vegetables of once a day. Further description of the sample is presented in table 1.

3.2. Associations between predictors and dietary habits

Gender and socioeconomic differences on physical activity, self-esteem and dietary habits are shown in table 1 as well. Gender seemed to be associated with physical activity, in terms of boys being more physically active than girls. On the other hand, girls had a significantly lower mean score than boys on the self-esteem scale. Regarding dietary habits, the boys in the sample had a higher consumption of fast food and soft drink than girls, and a lower consumption of fruits/vegetables.

Table 1.

Gender and socioeconomic differences on physical activity, self-esteem and dietary habits. Total mean scores and SD for age, physical activity, self-esteem and food/drink consumption.

	Range	Gender		t-value	Parental education		t-value	Total mean (SD)
		Girls mean (SD)	Boys mean (SD)		Low mean (SD)	High mean (SD)		
Age	11-18	14.7 (2.42)	15.02 (2.38)	-4.27*	16.30 (1.14)	16.00 (1.22)	6.45**	14.9 (2.41)
Physical activity	0-5	2.76 (1.48)	3.07 (1.58)	-6.48**	2.68 (1.61)	3.15 (1.53)	-7.35**	2.91 (1.53)
Self-esteem	0-9	5.99 (1.91)	6.77 (1.76)	-13.02**	6.22 (1.90)	6.45 (1.93)	-2.91*	6.37 (1.88)
Soft drink	0-4	.88 (.92)	1.52 (1.17)	-18.96**	1.51 (1.21)	1.13 (1.05)	8.23**	1.19 (1.01)
Fast food	0-4	.98 (.68)	1.21 (.77)	-10.02**	1.28 (.75)	1.07 (.67)	7.12**	1.09 (.73)
Fruits/ Vegetables	0-4	3.10 (.86)	2.79 (.93)	10.76**	2.65 (.94)	3.00 (.85)	-9.76**	2.95 (.91)

*p<.005

**p<.001

Socioeconomic position, expressed by parental education, was associated with physical activity, with students of low socioeconomic position exercising less than students of high socioeconomic position. Further, differences in self-esteem between the socioeconomic groups were also found, favoring the students of higher position. Differences in dietary habits were identified as well, with respondents of low socioeconomic position having a higher consumption of soft drink and fast food than the high socioeconomic position group, and a lower consumption of fruits/vegetables. The differences were small, but significant.

Correlations between age, physical activity, self-esteem and dietary habits are shown in table 2. No significant correlation was found between age and physical activity, or age and self-esteem. Age was however positively and significantly correlated with consumption of soft drink and fast food, but the correlations were weak. The correlation with fruits/vegetables consumption was a little stronger, with consumption weakly declining with age. Further, physical activity was positively correlated with self-esteem (Pearson's $r=0,178$, $p=.000$), while weak negative, but significant, correlations were found with consumption of both soft drink and fast food.

Table 2.

Correlation between age, physical activity, self-esteem and dietary habits

	Physical activity	Self-esteem	Soft drink	Fast food	Fruits/ vegetables
Age	0.003	-0.30	0.192*	0.178*	-0.220*
Physical activity	-	0.178*	-0.71*	-0.72*	0.203*
Self-esteem	-0.30	-	-0.004	-0.056*	0.100*

*p<.001

On the other hand, physical activity seemed to be weakly positively correlated with fruits/vegetables consumption. The last predictive variable, self-esteem, seemed to be weakest related to dietary habits in our sample. The only significant correlations were found between self-esteem and fast food (negative) and self-esteem and fruits/vegetables (positive). However, the correlations were extremely weak (table 2).

An overview of the relationship between age, gender, physical activity, self-esteem and dietary habits, as a result of multiple regression analysis, is shown in table 3. Gender was significantly associated to consumption of soft drink, fast food and fruits/vegetables, with boys having a higher consumption of the unhealthy food/drink and a lower consumption of fruits/vegetables than girls. This tendency remained when adjusting for age, but the association became weaker. A further reduction was found when adjusting for parental education, while the association between gender and dietary habits actually became stronger when physical activity and self-esteem were included in model 4 and 5.

According to correlation analysis, age was positively correlated with consumption of soft drink and fast food, and negatively correlated with fruits/vegetables consumption (table 2). This tendency was evident also when adjusting for gender, parental education, physical activity and self-esteem, but the correlations were then very weak (table 3). This was especially remarkable regarding soft drink consumption. Physical activity was negatively correlated with a lower intake of soft drink and fast food, and positively correlated with fruits/vegetables consumption. These correlations were significant also when adjusting for age, gender, parental education and self-esteem, but in model 5, the correlations were weaker. Further, self-esteem had a positive correlation with fruit/vegetable consumption, and a negative correlation with fast food consumption, but was weakest correlated with the dietary habits of all the independent variables.

Table 3. Summary of hierarchical regression analysis for variables associated with soft drink, fast food and fruits/vegetables consumption (n=2140)

	Soft drink				Fast food				Fruits/vegetables			
	B	SE B	β	Adj. R ²	B	SE B	β	Adj. R ²	B	SE B	β	Adj. R ²
<i>Model 1</i>				.111				.032				.037
Gender	.747	.042	.334**		.256	.028	.181**		-.344	.035	-.193**	
<i>Model 2</i>				.122				.044				.063
Gender	-.773	.042	.328**		.248	.028	.175**		-.329	.034	-.185**	
Age	.102	.018	.107**		.066	.012	.110**		-.122	.014	-.163**	
<i>Model 3</i>				.143				.059				.093
Gender	.720	.042	.322**		.241	.027	.171**		-.318	.034	-.178**	
Age	.085	.018	.090**		.057	.012	.096**		-.106	.014	-.142**	
Parental education	-.342	-.044	-.147**		-.181	.029	-.123**		.326	.035	.176**	
<i>Model 4</i>				.149				.065				.138
Gender	.739	.042	.330**		.254	.028	.179**		-.358	.033	-.201**	
Age	.079	.018	.083**		.053	.012	.089**		-.093	.014	-.125**	
Parental education	-.315	.044	-.135**		-.163	.029	-.111**		.270	.035	.146**	
Physical activity	-.060	.013	-.084**		-.034	.009	-.085**		.123	.011	.217**	
<i>Model 5</i>				.151				.068				.148
Gender	.759	.043	.339**		.269	.028	.190**		-.395	.034	-.222**	
Age	.080	.018	.084**		.054	.012	.090**		-.095	.014	-.127**	
Parental education	-.311	.044	-.134**		-.160	.029	-.109**		.261	.035	.141**	
Physical activity	-.055	.014	-.077**		-.034	.009	-.076**		.114	.011	.200**	
Self-esteem	-0.26	.011	-.044		-.021	.007	-.056*		.049	.009	.105**	

* p<.05

**p<.001

Predictor values: Gender (0=girl, 1=boy), age (range 11-18), parental education (0=low, 1=high), physical activity (range 0-5), self-esteem (range 0-9)

The regression analysis showed that the predictor variables age, gender, parental education, physical activity and self-esteem were to a very limited extent able to explain the variation in the consumption of soft drink, fast food and fruits/vegetables in our sample. For soft drink consumption, adjusted R² increased for each model, but altogether, the independent variables were only explaining 15.1 % of the variation. For fast food consumption, the predictor variables explained even less of the variation, with a total of 6.8 %, while the corresponding share for fruits/vegetables consumption was 14.8 %.

4. Discussion

The aim of this study was to investigate the relationship between the consumption of some selected indicators of the dietary habits of adolescents, and factors that according to previous research have shown to be associated to this consumption. The food and drink closer examined were soft drink, fast food and fruits/vegetables, and the factors to which these were linked, were age, gender, social background, physical activity and self-esteem. Given that this consumption was representative for the rest of the diet in the sample, the nutritional status was relatively good, even though the majority of these adolescents did not fully meet the national recommendations (National Council for Nutrition 2011). For instance, at least five portions of vegetables, fruits and berries daily is recommended, and approximately one of three of our sample responded “*several times pr. day*” on this question, which actually can also mean only twice a day, since the next possible alternative is “*once a day*”. On the other hand, the council recommends limited amounts of added sugar and energy-dense foods, and this type of consumption was rather moderate, with 16.4 % never eating and 63.5 % consuming fast food less than weekly. This is in accordance with other Norwegian studies (Oellingrath & Nærum 2006, Øverby & Andersen 2000).

The analysis showed that age was inversely associated with intake of fruits and vegetables, and positively related to intake of soft drink and fast food. This is consistent with the results of several other studies (Ranjit et al. 2010, Vereecken et al. 2005, Bere, Glomnes, te Velde & Klepp 2006). The results go across the KAP model, which suggests that behaviour is a result of knowledge and attitudes (Espnes & Smedslund 2001). It is reasonable to believe that as adolescents grow older, their knowledge of healthy nutrition would increase, and so would their consumption of healthy food. Instead, an opposite pattern is revealed. It has been shown that even though nutritional knowledge may be good among adolescents, the unhealthy food and drink consumption may still be high (Mirmiran, Azadbakht & Azizi 2007). Previous

research has however found that constructs of social cognitive theory (Bandura 1986) to a greater extent may explain the differences in dietary habits among younger and older adolescents. Examples are preferences (Granner et al. 2004), availability of unhealthy food (Ball, MacFarlane, Crawford & Savage 2009, French, Story, Neumark-Sztainer, Fulkerson & Hannan 2001) and peer modeling (Bere et al. 2007). As adolescents grow older, they experience increased opportunities to buy their own food outside home, and they may also spend more time with friends, as well as having part-time jobs where unhealthy food is more available.

The correlations between age and dietary habits in the current sample were however rather weak, for instance regarding soft drink consumption. Even though previous research is reasonably coincident, contradictory results have also been found, both that fruit and vegetable consumption is positively correlated with age (Pearson, Atkin, Biddle, Gorely & Edwardson 2009) and that age has no effect on this type of consumption (Granner et al. 2004). The review of Rasmussen et al. (2006) showed that 10 of 22 papers found fruit and vegetable consumption to decrease with age, but still, there were nine studies that were not able to find any correlation with age. Contradictory results might be caused of different methodological approaches to assess consumption. Overestimation of fruit and vegetable intake has also been identified when using food frequency questionnaires (Pearson et al. 2009).

The boys in our sample had a higher intake of all the unhealthy food and drink indicators, which is consistent with previous research, both Norwegian (Nilsen, Krokstad, Holmen & Westin 2009, Bere et al. 2006, Oellingrath & Nærum 2006) and international studies (Ranjit et al. 2010, Vereecken et al. 2005, Xie, Gilliland, Li & Rockett 2003). The intake of fruits and vegetables were also higher among girls than boys, which is in line with other studies as well (Bere et al. 2007, Vereecken et al. 2005). It is suggested that these gender differences can be explained with different taste preferences across genders, in terms of girls liking the taste of healthy food better than unhealthy food (Wansink, Cheney & Chan 2003, Turrell 1997). This has been found both in studies investigating fruit and vegetable consumption (Bere et al. 2007) and fast food consumption (Bauer et al. 2008). Preference is a personal factor that according to social cognitive theory may predict individual behaviour (Bandura 1986).

Differences in consumption of soft drink, fast food and fruits/vegetables were identified across socioeconomic position, indicating that high parental education is related to healthier dietary habits. The same results have been found for both soft drink consumption (Bere et al. 2006, Vereecken et al. 2005) and fast food consumption (Fahlman et al. 2010, French et al. 2001), as well as fruit and vegetable consumption (Fahlman et al. 2010, Rasmussen et al. 2006, Vereecken et al. 2005, Giskes et al. 2002, Neumark-Sztainer et al. 1996). Also the differences in dietary habits may be explained by constructs of social cognitive theory (Story, Neumark-Sztainer & French 2002). For instance, MacFarlane, Crawford, Ball, Savage & Worsley (2007) found home food environment and food availability to explain a great share of the variation in adolescent fruit and vegetable intake across socioeconomic position. Further, Fahlman et al. (2010) found significant differences in knowledge of healthy food and self-efficacy between the socioeconomic groups, favoring the group of high position. This goes along with the KAP model, by knowledge predicting attitudes and behaviour (Espnes & Smedslund 2001).

The analysis further investigated associations between physical activity frequency and dietary habits, finding weak negative correlations with the consumption of both soft drink and fast food, and a weak positive correlation with fruit and vegetable consumption. The results are supported by previous studies (Ranjit et al. 2010, Taliaferro et al. 2010, Pearson et al. 2009, Roos et al. 2001, Øverby & Andersen 2000). Both the KAP model and social cognitive theory may contribute in understanding this correlation. Knowledge of a healthy lifestyle may lead to positive attitudes towards living healthy, resulting in healthy practices like being physically active, as well as eating healthy. Further, social cognitive theory suggests that personal, behavioural and environmental factors interact with each other as foundations of new behaviours. The current study is cross-sectional, and it is therefore not possible to determine what comes first of physical activity and healthy dietary habits. The only statement is that in this sample, these two aspects are significantly correlated with each other. However, the studies which are here referred to, found stronger correlations, and it is possible distinguishing between different types of sport could have given other results. It is for instance found that team sports participation actually may increase for instance fast food consumption (Bauer et al. 2008, French et al. 2001).

Regarding self-esteem, the analysis showed no significant correlation between self-esteem and consumption of soft drink, while there were weak correlations with the consumption of

fast food and fruits/vegetables. Self-esteem was positively correlated with fruit/vegetable consumption, and negatively correlated with fast food consumption. Only a few studies investigating self-esteem related to dietary habits are identified, but none of these are specifying type of food, as in the current study. Also Liebman, Cameron, Carson, Brown & Meyer (2001) found that self-esteem was negatively correlated with consumption of fat among college students, but these were older than the respondents in this sample. Low self-esteem has however generally been linked to dieting and restrained eating (Kansi, Wichstrøm & Bergman 2003, Hoare & Cosgrove 1998), unlike the present results. Further, self-esteem has shown to be positively correlated with binge eating (Soo, Shariff, Taib & Samah 2008) and a higher intake of sugar products (Honkala, Honkala & Al-Sahli 2006). Like the current study, also Soo et al. (2008) used Rosenbergs' Self-Esteem Scale to measure self-esteem. However, these studies are difficult to compare because of different methodological approaches, issues to be investigated, and dissimilar geographical and cultural settings.

Before analysis, the fruit and vegetable variables were put together to one variable due to internal consistency. It is possible that separate analysis would have given other results. For instance, Neumark-Sztainer, Story, Resnick & Blum (1996) found that adolescents on diet had an inadequate intake of fruit, but not of vegetables. Further, it is also possible that using other terms closely related to self-esteem would have given stronger correlations. For instance, low body image, weight concerns and dieting have shown to predict dietary habits in terms of lower fat and energy intake and higher intake of fruits and vegetables (Barker, Robinson, Wilman & Barker 2000, Nowak 1998). This also seems to be evident regarding soft drink consumption (Bere et al. 2006) and fast food consumption (Bauer et al. 2008).

The analyses do not provide any causal explanations of the correlations between self-esteem and dietary habits. Self-esteem has shown to be closely related to bodily appearance among adolescents (Barker et al. 2000, Abell & Richards 1996), and it is possible that self-esteem increases as a result of using healthy eating as a weight control strategy. However, these results should not be emphasized too much, since the correlations are so weak that there most likely are other factors that are stronger associated with dietary habits in adolescence than self-esteem.

The dependent variables explained a very limited share of the variation in the consumption of soft drink, fast food and fruits/vegetables. In this paper, the KAP model (Espnes & Smedslund

2001) and social cognitive theory (Bandura 1986) have been used in order to explain differences in dietary habits across age, gender, socioeconomic position, physical activity and self-esteem. Some studies have however found constructs of social cognitive theory themselves to have greater effect on adolescent dietary habits than sociodemographic and behavioural factors, for instance taste preferences, availability of food and self-efficacy (Ball et al. 2009, McClain, Chappius, Nguyen-Rodriguez, Yaroch & Spruijt-Metz 2009). If such issues were included in the survey as predictor variables, it is possible that more of the variation in dietary habits would have been explained.

Limitations

The strengths of this study are that validated instruments are used, and that the sample size is large. On the other hand, the response rate was rather low. Originally, the survey comprised approximately 8860 students, but only 48.4 % answered the questionnaire. The response rate was especially low in lower secondary school (39.0 %), and this may be a source of bias when investigating age related to dietary habits. The characteristics of the students who failed to respond is not either known. The sample was additionally reduced when excluding participants who were outside the age of 11-18. However, the size of the sample was still satisfactory (n=4120).

The analysis did not distinguish between paternal and maternal education level, in order to simplify the analysis. The highest education level of the household was representing both parents, which has been done also in previous studies (Xie et al. 2003, Roos et al. 2001). However, this may be a source of error regarding families where the education level is not equal between the mother and the father. This operation also made the group of high educated parents almost twice as great as the group of low educated parents (63.2 % and 36.8 % respectively), which has to be taken into account. Further, considering the education level of mothers and fathers separately could have given indications of who of them is the most important source of influence in the family.

The choice of parental education as an indicator of socioeconomic position can also be questioned. The advantage is that this variable is stable, easy to measure and has high reliability. Educational level can also be used in persons that are unemployed (Anderssen, Kolle, Steene-Johannesen, Ommundsen, Andersen 2008). Xie et al. (2003) state that persons with higher education may not only be more likely to adopt healthy dietary habits themselves,

but may also affect their children. Several studies have concluded that of different indicators for social positions, education is the strongest determinant for healthy dietary habits (Nilsen et al. 2009, Johansson, Thelle, Solvoll, Bjørneboe & Drevon 1999). In addition to this, adolescents tend to report inaccurate income of their parents, both because they do not know and because it may not correlate with their own desired income in the future (Aarø & Klepp 2009). However, measuring socioeconomic position with more than one variable would have given opportunities to validate the results. The same is the case with physical activity, which was assessed only with hours of physical activity in leisure time weekly. For instance, physical activity during school time was here excluded, but is also part of the individual physical activity behaviour.

Further, research on children and adolescents always implicate a risk for bias, for instance due to level of maturity, influence from peers if the respondents are answering the survey in the classroom, and whether the questions are understood. Even though the respondents were in the age of 11-18 and most of the questions were rather clear, such possibilities always have to be taken into account.

5. Conclusion

According to the results of this study, there is a relationship between consumption of selected food and drink types and age, gender, socioeconomic position, physical activity and, to a limited extent, self-esteem, among adolescents aged 11-18 in Trondheim, Norway. It seems like older adolescents consume less fruits and vegetables, and more soft drink and fast food, than younger. Practical implications of this knowledge may be a greater attention to availability and price of healthy food in schools and areas where adolescents spend their leisure time. Further, it seems like girls eat healthier than boys, which is significant across all the selected food and drink variables. It could be interesting to investigate the background for this in future research. One suggested factor may be that girls are at higher risk for developing a poor body image and eating disorders, which is closely related to the evaluation of the self. The girls in the current sample generally had a lower self-esteem score than the boys. More weight should be put on initiatives that strengthen the self-esteem in adolescents, especially girls. Also knowledge of healthy food may explain gender differences, and one suggestion is that food and health to a greater extent should become a part of the school education.

Physical activity has shown to be related to dietary habits, perhaps because both these aspects are representing parts of behavioural patterns. As overweight and obesity increase also among children and adolescents, and because of its preventive effect, physical activity should be encouraged. This is especially important for individuals with low socioeconomic position. In the current sample, these respondents both had unhealthier dietary habits and were less physically active than individuals with high socioeconomic position. Demands of expensive equipment and involvement of parents in the activities may represent barriers to be physically active for this group. Low-threshold activities, that rather stresses the positive outcomes of being active than achievement and sports equipment, should be more accessible.

The associations between the sociodemographic factors, physical activity, self-esteem and dietary habits in the current sample were rather weak. More research on local level on the background of dietary habits and food choice among adolescents is therefore needed if strategies for disease prevention and health promotion are to succeed.

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