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Health behaviour in German primary schoolchildren

Master Thesis

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1 ABSTRACT

Background: Children's health governs health throughout life. Adverse lifestyles in childhood are known to foster the development of major chronic diseases, such as obesity and coronary heart disease, which create considerable health and economic burdens for individuals and societies worldwide.

The present study sought to investigate health behaviour in a convenient sample of German primary schoolchildren and to explore social and demographic factors associated with eating and activity behaviour as two major components of lifestyle.

Methods: Within a cross-sectional study, 496 second-grade children from 14 primary schools in Hamburg, Germany, were interviewed regarding their eating and activity behaviour by means of a standardised questionnaire. Height and weight were measured in order to determine the body mass index (BMI). Social and demographic characteristics were collected through parents' written question forms (n=432). Statistical methods included univariate analyses and logistic regression.

Results: Mean age of the schoolchildren was 7.3 ± 0.5 years. Based on German BMI references, overweight was found in 20.6% of the children.

Most pupils showed a high quality of nutrition (90%). 62% reported to watch television (TV) up to one hour per day. Half of the children did sports two to four times a week and only 25% were highly active.

Social, parental and family factors were found to be closely associated with the pupils' eating and activity behaviour. The maternal educational level constituted the main predictor for children's eating behaviour and total physical activity whereas TV consumption was significantly related to family meal patterns. Schoolchildren being overweight were less likely to have a mother with high education. Adverse health behaviours were more prevalent in pupils who attended a school ranked socially disadvantaged.

Conclusions: Health behaviour of primary schoolchildren is significantly determined by the level of maternal education, the patterns of family life and the school environment. Interventions that aim at changing young children's lifestyles should apply integrated approaches of health promotion targeting children *and* parents (especially mothers) within their social and family environment.

2 INTRODUCTION

Life circumstances substantially influence children's ability to develop adequate patterns of health behaviour and to acquire, maintain and sustain good health. After all, it has been shown that experiences and exposures across the course of life have long-term implications for health and may be one of the underlying causes of health inequality in later life (Holland et al., 2000). In order to understand the health and health behaviour of children, it is therefore necessary to explore the social, environmental and psychological influences on health (Currie, 1999). Furthermore, information about context factors of children's health is needed to develop strategies for improving their health.

However, information about health behaviour and its determinants in young schoolchildren is scarce, especially concerning conditions in Germany. The purpose of the present study was to describe key elements of health behaviour in primary schoolchildren and to identify the parental, family and social factors that might be associated with or even predict eating, activity and sedentary behaviour representing typical examples of lifestyle.

3 BACKGROUND

3.1 Health behaviour

3.1.1 Theoretical considerations

In the past, health behaviour has been defined as “Any activity undertaken by a person believing himself to be healthy for the purpose of preventing disease or detecting it at an asymptomatic stage” (Kasl et al., 1966). This definition shows several limitations including the exclusion of such activities that are not explicitly carried out on the purpose of promoting health. Health behaviour does not represent certain attitudes nor customs or patterns of behaviour but is rather embedded in a comprehensive pattern of living of that we call “lifestyle”. The lifestyle of a human being is shaped by a variety of habitual factors including socialization, working and living conditions, social relationships, available time and infrastructure. In view of this, it might be more accurate to refer to “health behaviour” as “behaviour relevant to health” (Siegrist, 2003). The sociologist Max Weber analytically divided the concept of a lifestyle relevant to health into two components: 1) the individual lifestyle relevant to health describing the personal behaviours a human accounts for and 2) the potentials of life relevant to health characterized by social and structural equalities and disparities in view of behaviours affecting health (Abel et al., 1989). Reflecting conditions of individual lifestyles relevant to health and their relationships to the social structure and opportunities of a community might lead to an appropriate understanding concerning the circumstances that have to be considered prior to initiation of preventive measures.

Hitherto, research has focussed on behaviours exerting adverse effects to health (smoking, drug abuse, bad nutrition habits etc.) and defined health-promoting behaviour as avoidance of risk behaviour. In contrast, positive definitions of behaviours relevant to health as an integral part of lifestyle have recently been developed. They include physical and mental health, social factors and individual development (Jessor, 1984). In this context, two important concepts are to be explained: “Protective factor” and “Salutogenesis”. Protective factors are attributes that attenuate or inhibit the effects of a risk factor triggering a disease.

“Salutogenesis” denominates health-promoting biological, mental and social resources of human beings as a whole (Antonovsky, 1979). This concept is not devoted to the origin and maintenance of health as an absolute state. It refers to the fact that all people are to be considered more or less healthy while at the same time being more or less ill. As a consequence, the question is: How does a person become healthier and less ill? In his salutogenic model of health, Antonovsky linked a number of constructs with the origin and maintenance of health. The heart of the model is represented by the term “sense of coherence” (SOC). Antonovsky (1979) defined the SOC as: “. . . a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that one’s internal and external environments in the course of living are predictable and that there is a high probability that things will work out as well as can reasonably be expected”. To his mind, if the external conditions are comparable, the individual state of health depends on the individual cognitive and affective-motivational view on life, influencing the extent to which one is able to use the resources available to preserve health. People with a pronounced SOC are more likely to be in a position to make choices concerning behaviour that promotes health (e.g. a nutritious diet) and are able to avoid acting in ways that endanger their health. As a consequence, the SOC has an indirect influence on health.

As a theoretical framework, salutogenesis has effectuated its greatest importance in health promotion, prevention and health education. It challenges the risk factor model and stands for resource-orientated and competence-raising preventive measures. The ideas of Antonovsky were also reflected in the Ottawa Charter of the WHO (1986) that places the main concern of health promotion on the strengthening of SOC (“empowerment”) and self-perception of self-efficacy as a major element of health.

The preconditions of Antonovsky’s model for health promotion comprise the demand to generate an environment which offers children and adolescents enough resources to develop a strong SOC. In order to achieve this goal, preventive measures have to aim at encouraging numerous individual, social and cultural factors, such as, education, coping strategies, social support and financial opportunities.

However, the concept of salutogenesis as a dimension of preventive measures has not been generated and researched to a sufficient extent. Much criticism has

been expressed within the scientific discourse (Margraf et al., 1998). In addition to motivations, attitudes and competencies, individual health resources also include knowledge relevant to health inducing preventive measures, risk avoidance and increased attention to symptoms (Siegrist, 1995).

3.1.2 Health behaviour and early development in childhood

Two main epigenetic influences affect health in early childhood. On the one hand, the mental and the biological development of infants are shaped by maternal behaviour and environmental factors. In this context, attendant circumstances of pregnancy and early childhood such as nutrition, emotional affection and socioeconomic conditions play a significant role. It has been shown that the basic metabolism as well as hormonally controlled development processes leading to increased liability to diseases in adulthood, are likely to be affected through disordered infantile mother child relations and concomitant social burdens (Fonagy, 1996).

On the other hand, during early childhood, significant learning processes regarding health-related behaviour are formed within the relationship between parents and child. This applies to nutrition habits, formation of taste, hygiene standards etc. Psychoanalytic experience has shown that disturbances of the infantile emotional and sexual development would result in compensatory manifestations concerning behaviours relevant to health, e.g. eating disorders or drug use behaviour (Wirsching et al., 1992).

3.1.3 Adolescence and health behaviour

The impact of early childhood on health behaviour in adolescence constitutes another important issue. Adolescence is a period of substantial change in the physical, psychological and social contexts of health behaviour. Behaviour that compromises, sustains or promotes health in childhood and adolescence is associated with short-term health-related outcomes and predictive of morbidity and health service utilization (Goodman, 1999; Parsons et al., 1999). Patterns of

behaviour established early in life are often maintained into adulthood. Furthermore, health-compromising behaviour may indirectly influence educational commitment and psychosocial development (Koivusilta et al., 2003).

Health-impairing behaviour in adolescence fulfils an important function, that is, supporting a self-concept and self-efficacy susceptible to risk (Siegrist, 2003). A crisis of self-efficacy may arise from the condensed occurrence of problems in adolescence. Coping with such a crisis requires adequate solutions and individual resources that may be limited as a result of incomplete family socialisation in early childhood. Thereby, differentiations are made as follows: 1. structural incompleteness (a member of the nuclear family is missing) and 2. functional incompleteness (deficient parental implementation of socialisation, due to rank-specific modes of education, socioeconomic inequalities or pathogenic family constellations (Wirsching et al., 1992). If capacities of problem-solving are limited, a crisis of self-concept may lead to the development of compensating strategies like health-compromising drug use or eating disorders. Social pressure exerted by peer-groups fosters these proceedings.

3.1.4 Selected examples of health behaviour

“Health behaviour” refers to a variety of behavioural health-compromising and health-protecting factors that influence various areas of life in childhood and adolescence and that are associated with short-term health-related outcomes and predictive of morbidity and health service utilization (Malina et al., 1996; Parsons et al., 1999). Well-known topics are nutrition, physical activity, sedentary behaviour, tobacco smoking, alcohol use, drug abuse, oral health and sexual health. Furthermore, patterns of behaviour established early in life are often maintained into adulthood.

The present paper aims to investigate key items of health behaviour referring to German primary schoolchildren. Overweight represents one of the most important health problems concerning this population. Regarding adults, it is well-known that being overweight or obese is significantly associated with “unhealthy” nutrition habits, lack of physical activity and sedentary behaviour (Siegrist, 2003). However,

similar data describing health behaviour and associated health problems of young schoolchildren are scarce. The present study therefore focuses on the exploration of eating and activity behaviour and their relationships to children's life circumstances, for the purpose of getting appropriate information about determinants of health in young schoolchildren. From this follows that the examples of health behaviour introduced in this chapter are restricted to the areas of eating behaviour, physical activity and sedentary behaviour.

Eating behaviour

Recently, it has been shown that children and adolescents who demonstrate healthy eating habits from early life on have a reduced risk of developing chronic diseases like cardiovascular diseases, non-insulin-dependent diabetes mellitus and osteoporosis (Pirouznia, 2001). Beyond that, an appropriate diet during childhood prevents current health problems, such as overweight, dental caries and constitutional growth delay.

Another important issue is represented by the patterns of eating. Skipping breakfast leads to fatigue and lack of concentration (Pollit et al., 1998) and fosters the consumption of high-fat snacks during the course of the day (Resnicow, 1991). Adolescents who have at least two meals a day exhibit a more nutrient-dense nutrition (Siega-Riz et al., 1998).

Concerning food choice and meal patterning, children and especially adolescents are greatly influenced by their peers and by their wish to gain freedom from parental control (Thomas, 1990)., This is often documented through an increasing frequency of consuming meals (take-away fast foods) outside the home or the school. Other significant influences include comprehensive marketing and advertising targeting children and adolescents.

Physical activity

Various publications have proven that regular physical activity has a significant impact on the health of adults, in such a way that it improves physical and psychological well-being (Bouchard et al., 1994). In addition, being physically active may reduce the risk of developing chronic diseases like cardiovascular

diseases, non-insulin-dependent diabetes mellitus, cancer and overweight. Concerning children and adolescents, comparable data are lacking, although reviews have reported positive effects on selected outcomes, e.g. blood pressure, blood lipids, aerobic fitness and emotional well-being (Riddoch, 1998). It has also been described that physically active children will probably be active adults (Malina, 1996).

Sallis et al. (1999) investigated determinants of young people's physical activity and specified demographic (age, gender) and psychological factors (enjoyment) as well as the social (family support) and the physical environment (availability of facilities). Promoting physical activity in children should therefore target these variables for change.

Until now, the appropriate intensity and duration of physical activity in order to achieve maximum health effects have been widely discussed. Common evidence-based recommendations focus on moderate intensity of physical exercise carried out over a longer period of time (Strong et al., 2005). Recent expert-based guidelines for young people suggest a participation in physical activity of moderate intensity (e.g. brisk walking) 1. for at least 30 minutes per day concerning inactive children and 2. for 1 hour per day concerning all young people (Biddle et al., 1998).

Sedentary behaviour

The media exposure of children has always raised much concern. It has been shown that the average American child watches nearly 3 hours of television (TV) per day (Nielsen Media Research, 1998). A recent survey including a representative sample of German children and adolescents yielded an average TV use of 98 minutes per day (Deutsche Gesellschaft für Ernährung, 2000). 11% of the children aged between 6 and 8 years had a TV set in their bedrooms; this group watched significantly more TV (134 minutes per day).

Few studies presented prosocial and educational benefits from TV viewing (Corporate Research Department, 1991), but significant research has shown negative health effects with regard to several areas (Bar-on, 2000): aggressive

behaviour, sexuality, nutrition and obesity, substance use and abuse patterns. Another study demonstrated significant associations between TV consumption during childhood and poor educational achievement in adulthood (Hancox et al., 2005).

A large number of cross-sectional epidemiologic studies refers to TV viewing as one underlying cause of childhood obesity (Dietz et al., 1985; Robinson, 1999). Primary suggested explanations include a reduced energy expenditure with increasing levels of sedentary behaviour (Andersen et al., 1998) and increased dietary energy intake during television watching or through the effects of food advertising. The *Health Behaviour in School-Aged Children Study* (HBSC) revealed higher television viewing times and lower physical activity levels in overweight adolescents (Janssen et al., 2005). Results of experimental studies have supported the impression that reducing TV viewing may reduce the risk for childhood obesity (Robinson, 2001). Further evidence suggests that TV viewing in early childhood predicts adult body mass index (Viner et al., 2005). One important determinant of children's TV consumption is constituted by the family environment: Salmon et al. (2005) demonstrated that a TV consumption ≥ 2 hours per day is significantly related to parental TV habits and social status.

Other sedentary leisure-time activities comprise the use of computers (computer games) and videos. Extensive computer use has negative effects on psychological well-being (Kraut et al., 1998). A recently conducted meta-analysis revealed small negative relationships between media-based inactivity on the whole and physical activity (Marshall et al., 2004), but the authors pointed out that these correlations might not be explicable using single markers of inactivity like TV consumption or computer use.

3.1.5 The challenge of childhood obesity

One of the greatest public health challenges worldwide is posed through childhood obesity (World Health Organization, 2005). 10 to 30% of European children aged 7 to 11 years and 8 to 25% of adolescents (14 to 17 years) are considered to be obese (Lobstein et al., 2003). Furthermore, prevalence rates have continued to increase since the 1980s: The average annual increase in prevalence rose from 0.6% during the 1980s to 2.0% by the 2000s (World Health Organization, 2005).

The most prevalent health impact of childhood obesity is psychological morbidity (Reilly et al., 2003). In addition, obesity is one of the leading risk factors for the major chronic noncommunicable diseases, such as ischaemic heart disease, stroke and diabetes. It is associated with cardiovascular risk factors among both children and adults, such as high blood pressure, hyperlipidemia, or elevated insulin levels being a risk factor for developing type 2 diabetes (Freedman et al., 1999). If these risk factors were tracked into adulthood, they would substantially increase the risk for earlier cardiovascular disease.

Data from several studies provide evidence that overweight status in childhood, particularly in adolescence, is a key predictor for obesity in adulthood (Goran et al., 2001). In both obese and non-obese children that are under 10 years old, the risk of adult obesity is greater if at least one parent is overweight (Whitaker et al., 1997). The latter shows the importance of family environment in contributing to the increasing prevalence of obesity, but unhealthy diet and increases in caloric intake accompanied by physical inactivity constitute the main contributors to overweight and obesity (Deckelbaum et al. 2001). Increasingly obesogenic environments (e.g. fast food restaurants, TV advertising), supported by the cultural changes associated with globalisation, antagonise approaches to foster healthier lifestyles in children and adolescents.

Prevention and treatment of childhood obesity comprises three levels (Williams, 2001): 1. primordial prevention (maintaining normal BMI throughout childhood), 2. primary prevention (preventing overweight children from becoming obese), 3. secondary prevention (treating obese children to reduce comorbidities).

Treatment strategies will have to include measures that balance energy intake with energy output and replace sedentary behaviour by physical activity (Deckelbaum et al., 2001).

Growing recognition of obesity as a major threat to worldwide health demands public health actions at the national and global levels. In line with this, the World Health Organization recently presented a global strategy for the prevention and control of noncommunicable diseases focusing on the major areas of risk: tobacco use, unhealthy diets and inadequate physical activity (World Health Organization, 2000).

3.2 Children's circumstances of life and health behaviour

3.2.1 The context: Causes of differences and inequity in health

It is well known that differences in people's health emerge from a range of inherent and exposure factors substantially influencing life circumstances. Recently, models have been developed to illustrate the range of determinants and their influence on health. Dahlgren et al. (1992) presented a social model for health ("Dahlgren's policy rainbow") that describes the layers of factors having an impact on an individual's potential for health (Figure 1). These can be summarized as

- age, sex and hereditary factors
- individual lifestyle factors
- social and community influences
- living and working conditions
- general socioeconomic, cultural and environmental conditions.

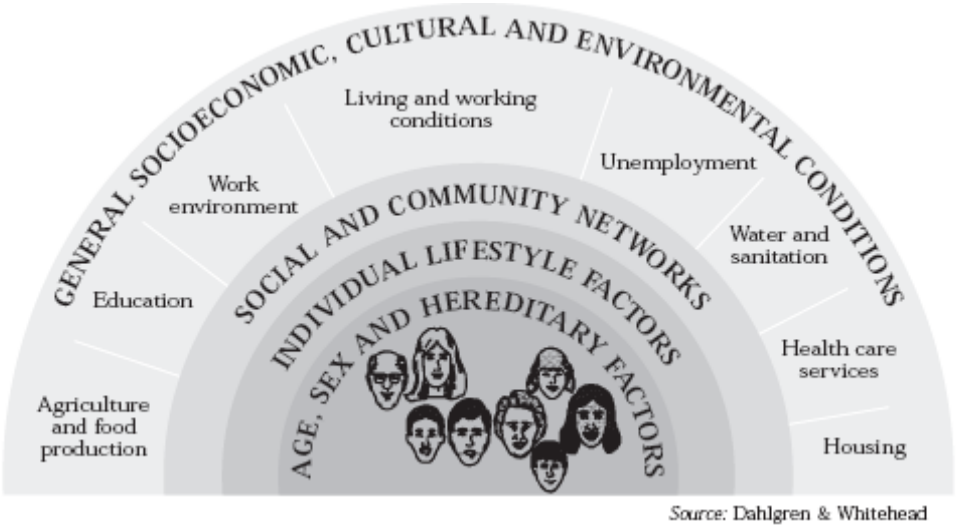


Figure 1: Social model for health

These factors affecting people's health are concurrently regarded as the main determinants of inequity in health (World Health Organization, 1992). The World Health Organization (WHO) uses inequity to refer to "differences in health which are not only unnecessary and avoidable but, in addition, are considered unfair and

unjust" (Whitehead, 1990). Dahlgren's model may be used to formulate policies regarding areas of engagement to manage health inequities (Whitehead, 1990). Public health approaches that aim at creating equal opportunities for health should cover strategies at the individual, environmental and societal levels, for instance health-compromising behaviour (restricted choice of lifestyle), living and working conditions, health-care access and social mobility (World Health Organization, 1992).

The question arises about how much the factors in each layer influence health and what is the likelihood of changing specific factors. In order to act upon factors in one layer that interact with those in others, appropriate proceedings are required. From a research perspective, Dahlgren's model provides a useful framework for developing analytical strategies to test existing theories on the health and health behaviour of children, adolescents and adults, and to support the development of new ones. Research protocols of studies investigating the determinants of people's health should therefore reflect a broad approach to various population groups living in different contexts and circumstances. Regarding the health of young people, there is an urgent need to understand the influences of families, schools, peers and the socioeconomic status (Earls et al., 2001). One important international approach has been constituted by the *Health Behaviour in School-Aged Children Study* (HBSC), established in 1982 (Currie et al., 2001). The HBSC is cross-national research conducted by an international network of research teams in collaboration with the WHO Regional Office for Europe. Its aim is to gain new insight into the understanding of adolescents' health, well-being, health behaviour and social context and to integrate the research results into health promotion and education. The target population includes young people attending school, aged 11, 13 and 15 years. HBSC surveys are carried out at four-year intervals. The 2001/2002 survey is the sixth in the series and was conducted in 35 countries in the WHO regions of Americas and Europe. However, similar information about health and health behaviour in younger, primary schoolchildren in industrialised countries is hardly available. Most studies have focussed on adolescents, infants and disadvantaged groups (migrants, children living in poverty or in developing countries).

3.2.2 Key determinants regarding schoolchildren's health and health behaviour

Socioeconomic status (SES)

Collecting data on SES requires appropriate indicators of this status. Kunst et al. (1994) defined socioeconomic inequalities as "differences in the prevalence and incidence of health problems between individual people of higher or lower SES". They recommended that every monitoring system should perform regular health interview surveys and establish a mortality registry. SES should be measured by three indicators: occupational status, level of education and income level. Altogether, a wide variety of measures may be used to subsume the multitude of socioeconomic inequalities in health.

Bearing these prerequisites in mind, many studies have shown that children and adolescents from families of low SES have more health problems than those of high SES (Reading, 1997; Starfield et al., 2002). Examples comprise mortality (Bremberg, 2002; Olsen et al., 1999; Petrou et al., 2006), injury (Laflamme et al., 2002), the prevalence of diagnosed illness (Mielck et al., 1996), hospital admission rates (Petrou et al., 2006) and health-impairing behaviour (Griesbach et al., 2003; Lowry et al., 1996). Recent HBSC data have confirmed these findings: poorer self-rated health and less participation in physical activity have been shown to be associated with lower family affluence (HBSC, 2004). However, the relationship between SES and health varies according to the health outcomes measured, gender and country.

Other studies have found an absence of evidence for health inequalities in adolescence (Vuille et al., 2001; West et al., 2004). Among British 12- to 14-year-olds, the social gradients in chronic disease and parent-rated health status noted in childhood associated with income, social status and education were lost, but inequalities persisted associated with measures of household occupational status and wealth (Spencer, 2006). As a consequence, a hypothesis on health equalisation over the period of child-youth transition in modern society has been proposed, arguing that influences of youth culture are more important to some health outcomes than family SES (Vuille et al., 2001).

Family

The family constitutes the most important context for the development of the young child, a context in which social behaviour and attitudes are first adopted. It has also been characterized as the most important setting in which health-related concepts arise (Tinsley, 2002). Throughout centuries, the family's most important function remains the same: to attend to the physical and psychological needs of its members. This influence normally continues throughout adolescence and the life-course.

Regarding developed countries, the pattern of family structures has changed throughout the 20th century. Major changes included declining birth rates, increase in separation and divorce rates and decrease in marriage rates. New family set-ups have arisen, such as single-parent families or so-called stepfamilies (blended families) including children from previous marriages or partnerships and children born into the new family. These family structures (single-parent families and stepfamilies) can predict an increased risk for health-compromising behaviour, such as a higher risk of smoking (Granado-Alcón et al., 2001). Single-parent families belong to the more socially disadvantaged groups in society. It is well-known that they are at a higher risk of living in poverty (Whitehead et al., 1990). Other factors contributing to the variability within family environments include: parents' employment status, working hours, educational status, number of siblings and size of dwelling places. Determining the influence of parents and family life on children's health and development requires to consider this broad variety of factors. An example is the HBSC that has investigated household composition and communication between parents and adolescents as an indicator of the "quality" of family life (HBSC, 2004). Results have revealed that most of the young people live with both parents (78%) and that mothers are a more accessible source of social support than fathers in most countries.

Peers

The peer group affects health-related behaviour and attitudes by influencing and confirming norms and values, forming a social identity and providing models of behaviour. Concerning health topics the influence of peers is comprehensive, affording both protective and risk factors. Being liked and accepted by peers is

important to children's and adolescents' health development, and those who are not integrated are more likely to show disturbances in their physical and mental health (Berndt, 1992). It has been proposed that peer group pressure exerted as a part of the communication process may lead to the initiation and maintenance of health-compromising behaviour (e.g. cigarette smoking; Hopkins, 1994; Settertobulte, 2000). This model defines health risks as a collective behaviour, determined by peer group norms and producing values deduced from the need for social integration and group distinction (Connop et al., 1999). However, young people with a high degree of social competence and good communication skills are likely to show resistance to group pressure and to adverse influences on health behaviour, for example, on drug use (Ardelt et al., 2002). The development of protective health behaviour through peer contact has also been described and includes, amongst others, improving social skills, coping with stressful incidents and engaging in sport in company with friends (Berndt, 1999).

School

Children's experiences in school may have distinctive influences on their development of self-esteem, health and health behaviour. As a context of academic achievement and peer interactions, school constitutes one central place where development of children and adolescents takes place. The school environment provides a framework for the formation of risk factors as well as resources of physical and emotional well-being: Poor peer acceptance and unsuccessful school performance may increase risk behaviour (Seiffge-Krenke et al., 2001) whereas supportive peers and good school performance foster physical and emotional well-being (Jessor et al., 1995).

Subjective health complaints are said to be a response to stress. The school environment may constitute one potential source of stress, e.g. schoolwork and social climate (peers, teachers). Studies have shown that positive perceptions of the school environment are associated with a high quality of life and having fewer emotional and health complaints (Samdal et al., 2000). In contrast, low academic and social competence due to negative experiences in school can lead to persistent psychosomatic symptoms during childhood (Walker et al., 2002) and increase the probability of problems in adulthood. In summary, much evidence

suggests that the relationships and experiences undergone in the social environment of school may at least partially influence an individual's health status.

3.3 Schoolchildren: The German perspective

3.3.1 Demographics

In 2001, 12.6 million children and adolescents aged 0 to 15 years (4.0 million aged 5 to 10 years) lived in Germany (Statistisches Bundesamt, 2001), representing 15.6% of the total population. The proportion of migrant children amounted to 10%.

3.3.2 Family environment

Similar to other developed countries, structures of German families have changed throughout the 20th century, with decreasing numbers of children as well as increasing numbers of divorces, unmarried couples and single-parent families. In 2001, most of the children lived together with their married parents (Old Laender 83%, New Laender 67%; Statistisches Bundesamt 2002). A quarter of all German children and adolescents aged 0 to 18 years had no siblings, nearly 70% lived together with 1 to 2 siblings.

Single parents were predominantly female (81%). 64% of the mothers being in charge for underage children were employed. However, the proportion of working mothers decreased with an increasing number of children to care for. The number of employed mothers living in the New Laender was still higher than in the Old Laender (72 vs. 51%). Thereby, part-time employment of mothers was more prevalent in the New Laender.

3.3.3 Self-rated health and symptoms

One of the most significant indicators of health is represented by the individual appraisal of health state. However, data regarding German children and adolescents are scarce. Several studies have shown that most of the children rated their health being satisfactory up to very good (Hackauf et al., 1999; Kolip et al., 1995). Within the “Bielefelder Jugendgesundheitssurvey 1993”, 50% of the interviewed adolescents aged 12 to 16 years characterised their health status as

being “good” (Kolip et al., 1995). Boys were significantly more satisfied with their health than girls. However, when inquired for selecting diseases and symptoms from a list, adolescents reported about a multitude of experienced symptoms during the previous 12 months (e.g. allergic diseases, bronchitis, fractures, migraine, obesity).

3.3.4 Health behaviour

Eating behaviour

Few representative studies investigated the eating behaviour and the nutrient state of German children. On the basis of nutrient protocols, the DONALD (Dortmund Nutritional and Anthropometrical Longitudinally Designed Study) study has ascertained that parents attend to healthy nutrition of infants aged 0 to 3 years (Alexy et al., 1999). In contrast, schoolchildren and adolescents showed an unhealthy eating behaviour being similar to the behaviour patterns of adults, such as an exceeding consumption of proteins, fat and sugar. With regard to food eaten at school, sandwiches, fruits, vegetables and cake are most frequently consumed (Deutsche Gesellschaft für Ernährung, 2000).

Although German children and adolescents are clearly aware of healthy nutrition, their eating behaviour remains uninfluenced (Deutsche Gesellschaft für Ernährung, 2000). Advertising measures markedly impact children’s food preferences.

Concerning eating patterns, it has been shown that 84% of German children aged 8 to 12 years have breakfast at home (Deutsche Gesellschaft für Ernährung, 2000). Lunch represents the most important meal for children and adolescents (62% want to have lunch along with their family). On the other hand, parental employment including irregular working times or different times of class hours of siblings might impede having meals together with the family (Sozialministerium Baden-Württemberg, 2002).

Describing eating behaviour and nutrient state of children and adolescents should obviously include an evaluation of food provided in after-school care centres. Concerning these institutions, the energy density of meals has been shown to be higher than recommended, whereas mineral nutrients, vitamins and unsaturated fatty acids have been under-represented (Deutsche Gesellschaft für Ernährung, 2000).

Leisure time activities, physical activity

Emotional well-being of children and adolescents is closely related to running communication within their peer group and shared leisure activities. 90% of German young people spend their leisure time together with friends; 50% of adolescents aged 13 to 14 years join a sport club once a week (Gesundheitsreferat der Landeshauptstadt München, 1997).

Home-based activities include listening to music, watching TV and reading. The average TV watching time in German children aged 6 to 17 years amounts to 98 minutes per day (Deutsche Gesellschaft für Ernährung, 2000). Having an own TV set in the bedroom is significantly correlated with a longer TV watching time (134 minutes per day). In primary schoolchildren in North Rhine-Westphalia, the time spend on watching TV amounts to an average of 50 minutes per day and 198 minutes per week (Graf et al., 2004). 36% of male adolescents report watching TV for 11 up to 20 hours per week (Gesundheitsreferat der Landeshauptstadt München, 1997).

Going in for sports constitutes a popular kind of leisure time activity, with 60% of adolescents aged 12 to 18 years being active for more than 4 hours per week (WIAD-Study, 2001). Another study has shown that 40% of Bavarian adolescents take exercise several times per week (Gesundheitsreferat der Landeshauptstadt München, 1997). Recently, Graf et al. (2004) pointed out that one third of a cohort including 344 first-grade children (North Rhine region) were regularly active in organized sports as well as outside a club. More obese children had a tendency to be more inactive. However, sport activities always hold certain risks of injuries (Kahl, 1998).

Data with regard to motor abilities and exercise capacity of German children mostly derives from compulsory school-based medical examinations and studies investigating topics of sports medicine. Evidence of increasing deficiencies in motor abilities and muscle function has emerged (Robert-Koch-Institut, 2004), although study results being collected over a period of two decades are hardly comparable due to different methods of measurement. Dordel et al. (1997) documented decreasing abilities of body co-ordination in primary schoolchildren. 5 to 12% of 6-year-old pre-school children showed faulty postures (Dokumentation der schulärztlichen Untersuchungen NRW, 1999) and 25 to 35% of school starters presented with noticeable motor problems (Sönnichsen et al., 1997). Growing up in urban regions seems to support the development of impaired motor abilities (Schott, 2000). Interestingly, children and adolescents tend to overestimate their physical activity (WIAD-Study, 2001).

3.3.5 Overweight

National BMI reference curves for German children have been available since 2001 (Kromeyer-Hauschild et al., 2001). The use of the age- and sex-specific 90th and 97th BMI percentile as cut-point for overweight and obesity are recommended (Deutsche Gesellschaft für Kinder- und Jugendmedizin, 2002). Depending on definitions, the prevalence of overweight and obesity in German schoolchildren and adolescents ranges between 10 and 20% (Robert-Koch-Institut, 2004). Pre-school medical examinations in Bavaria revealed that 10% of the school starters aged 5 to 6 years were overweight (Kalies et al., 2001). According to the “German Nutrition Report 2000” (Deutsche Gesellschaft für Ernährung, 2000), 11% of young schoolchildren (6 to 8 years old) were overweight, 16% were classified as being obese. During 15 years, the proportion of obese boys and girls has significantly increased (5 to 10% and 3 to 7%; Deutsche Gesellschaft für Ernährung, 2000). Recently, the overall prevalence of overweight among German pre-school and first-grade children was reported to be around 12% (Graf et al., 2004; Will et al., 2005).

3.4 Aim of the study

The present study was designed to investigate key elements of health behaviour in German primary schoolchildren and to explore parental, family and social factors associated with eating and activity behaviour representing two major components of lifestyle.

The results are thought to provide comprehensive information that might be integrated in the concept of future health promotion projects targeting young schoolchildren.

4. METHODS

4.1 Study design

In 2003, a cross-sectional study was conducted at 14 primary schools in Hamburg (Germany) forming the original settings of a longitudinal controlled intervention study concerning primary prevention and health promotion in primary schoolchildren. The study population comprised all children in grade two participating in the longitudinal study. Parents were asked to give their written consent.

The schools were pragmatically selected based on the information available for the social background in order to guarantee a balanced mix between low and moderate social classes.

Demographic, family, health behaviour and quality of life data were collected by means of a standardized 44 item-questionnaire administered to the schoolchildren using structured interview by health scientists and student assistants from the University of Life Sciences (Hamburg-Bergedorf). The questionnaire used in this study was not formally tested for reproducibility, reliability, or validity against a gold standard but was chosen for its face validity. In line with the study objectives, quality of life data were not analysed.

All anthropometric measurements of children were performed in the morning. During the measurements the children were dressed in light indoor clothes without shoes. Body weight was determined to the nearest 500 g using an electronic or mechanic non-calibrated scale. Height was measured to the nearest 10 mm using a mobile scale. Parents were asked in writing to fill in a questionnaire concerning their anthropometric and social household data.

4.2 Variables

4.2.1 Anthropometric data (children)

The body mass index (BMI) was calculated as body weight divided by body height squared (kg/m^2). The BMI was classified according to the recently published German percentile graphs (Kromeyer-Hauschild et al., 2001). Children with a BMI < 10. percentile were classified as underweight, ≥ 10. to < 90. percentile as normal weighted, ≥ 90. to < 97. percentile as overweight, and ≥ 97. percentile as obese (Kromeyer-Hauschild et al., 2001). Within the scope of statistical analysis, frequencies in overweight and obesity were added to obtain a comprehensive variable referred to as “overweight” (BMI ≥ 90. percentile).

Information about birth weight (g) and height (cm) was adopted from the parental questionnaire.

4.2.2 Anthropometric data (parents)

The self-reported body weight and height were used to calculate BMI. Overweight was defined as BMI ≥ 25 kg/m^2 and obesity as BMI ≥ 25 kg/m^2.

4.2.3 Demographics (children)

Children were asked about their gender and age.

4.2.4 Family situation

Questions concerning the family situation comprised the number of siblings, the modalities of care after school and the frequency of having meals along with the family.

Number of siblings was derived from question “How many siblings do you have?”. Answer categories were:

1	0
2	1
3	2
4	3
5	4
6	more than 4

In the context of the statistical evaluation, the variable was divided into three categories:

1	0 siblings
2	1 – 2 siblings
3	≥ 3 siblings

Modalities of care after school was derived from question “What are you doing after school?”. Answer categories were:

1	parental or grandparents care
2	day mother or after-school care club
3	other

Categories were retained unchanged.

The *frequency of having meals along with the family* was derived from question “How often did you have meals along with your family during the last week?”. The presence of one family member was considered enough to answer positively. The question was separately posed regarding breakfast, lunch and dinner. Answer categories were:

1	often/always
2	sometimes
3	never/seldom

Answer categories were recoded in such a way that the highest number (3) indicated the term “often/always” whereas the lowest number (1) denoted “never/seldom”. The scores obtained concerning the three types of meals were added to yield a total score that was divided through three (Range 1.00 to 3.00). The resulting score was divided into three categories:

1 never/seldom (≤ 1.67)
2 sometimes (> 1.67 ≤ 2.33)
3 often/always (>2.33)

4.2.5 Social status

Numerous literature has been written about how to measure socio-economic status (SES). Although there exists no standardized method of measuring SES (at least in Germany), income, level of education, and occupational status are generally utilized to define SES. Among these dimensions, single factors are often considered as a reliable indicator of social status (Deonandan et al., 2000). On the other hand, factors like family structure (e.g., number of siblings) and household data (e.g., size of dwelling place) are not normally used describing SES. Since the exact influence of the aforementioned factors to health behaviour in primary schoolchildren remains unknown until now, measuring SES in this study included a wide variety of dimensions being probably representative of SES: demographic family factors, parental educational level, parental employment status and social rank of school. Except for social rank of school, information was taken from the parental questionnaire.

Demographic family factors

Size of flat: This variable was reported in square metres (m^2).

Persons per household: Number of persons per family. The variable was categorized into

1. ≤ 3 persons
2. > 3 ≤ 5 persons
3. > 5 persons

Size of flat/person: This variable was computed by dividing *size of flat* through p*ersons per household* and described the amount of place (m^2) being available for each member of the family.

Parental educational level

Parental educational level was measured separately for mother and father. Answers were categorized into:

1. low level of education (secondary school)
2. moderate level of education (secondary modern school)
3. high level of education (vocational or grammar school)

Parental employment status

Employment status of parents was measured using the following categories:

1. both parents unemployed
2. one parent employed
3. both parents employed

Additionally, employment status of mother and father was characterized by two separate dichotomous variables (yes=1, no=0).

Social rank of school

The social rank of school was defined according to a health report of Hamburg authorities (Freie und Hansestadt Hamburg, 2001). Categories were:

1. socially disadvantaged
2. intermediate social status

4.2.6 Eating behaviour

Questions on food consumption comprised the following food items: potato chips, cheese, fruit, “Nutella”, vegetables, pizza, chocolate, cake/pastries, salted cookies, hamburger, sausage. The *frequency of consumption* was derived from the question “How often did you eat the following foods last week?”. Answer categories were:

1 several times a day
2 daily
3 sometimes/1-5 days a week
4 never/seldom

In order to assign a higher score to a higher consumption frequency of “healthy food” the response categories for “fruit” and “vegetables” were recoded as follows:

1 never/seldom
2 sometimes/1-5 days a week
3 daily
4 several times a day

Categories for the other food items (“unhealthy high-fat food”) remained unchanged so that high scores denoted low consumption frequencies. The scores for “fruit” and “vegetables” were added to obtain a quality score called “fruit/vegetables” whereas the summing-up of scores for potato chips, “Nutella”, pizza, chocolate, cake/pastries, salted cookies and hamburger resulted in a quality score for “low-fat”. The total quality of nutrition was computed by adding the scores for “low-fat” and “fruit/vegetables” to obtain an overall score. The resulting score (range 9 to 36) was divided into three categories:

1 low quality of nutrition (≤ 16)
2 moderate quality of nutrition (> 16 ≤ 25)
3 high quality of nutrition (> 25 ≤ 36)

Quality of nutrition was used as a dependent variable in the context of logistic regression calculations. Therefore, the three categories (low, moderate, high) were dichotomously coded (yes=1, no=0).

4.2.7 Physical activity and sedentary behaviour

Physical activity was characterized by two main questions. Firstly, children were asked about their way to school: “What is your predominant modality to reach school?”. Answer categories were:

1. on foot
2. riding a bicycle
3. going by bus/train
4. going by car (parents)

Categories remained unchanged.

The second question asked about physical activity and sedentary behaviour undertaken in the previous week and covered the following items: riding a bicycle, going in for sports, playing outdoors, playing indoors, playing electronic games (using the computer), watching television (DVD, video). Answer categories were:

1. often/always
2. sometimes/2-4 times/week
3. never/seldom 1x/week

The response categories regarding “riding a bicycle”, “going in for sports”, “playing outdoors” and ”playing indoors” were recoded to assign a higher score to a higher level of physical activity:

1. never/seldom 1x/week
2. sometimes/2-4 times/week
3. often/always

In line with this, the response categories concerning the items “playing electronic games (using the computer)” and “watching television (DVD, video)” were retained unchanged with high scores indicating lower levels of sedentary behaviour.

The item “going in for sports” was selected as a single score for vigorous physical activity since the other items (“riding a bicycle”, “playing outdoors”, ”playing indoors”) did not show sufficient reliability.

The level of sedentary behaviour was derived from the sum score of the items “playing electronic games (using the computer)” and “watching television (DVD, video)” and than characterized as “inactivity”.

Total physical activity was calculated adding the scores of “going in for sports” and “inactivity”; the resulting sum score was divided into three categories:

1. low level of physical activity (≤ 3)
2. moderate level of physical activity (> 3 ≤ 6)
3. high level of physical activity (> 6 ≤ 9)

These categories of physical activity were meant to describe another feature of health behaviour in addition to “quality of nutrition” and therefore constituted additional dependent variables included in the regression analyses. Thus, they were dichotomously coded (yes=1, no=0).

4.2.8 TV consumption

To assess the amount of time watching TV, the programmes watched the day before were recalled by the children as part of the answers to the questionnaire and recorded by the interviewer. The total duration of all programmes watched by the children was then calculated. Response categories were:

1. 0-30 minutes (min)
2. 31-60 min
3. 61-90 min
4. 91-120 min
5. 121-180 min
6. > 180 min

Responses were combined to form three categories:

1. low TV-consumption (≤ 60 min)
2. moderate TV-consumption (> 60 ≤ 120 min)
3. high TV-consumption (> 120 min)

The three categories (low, moderate, high) were dichotomously coded (yes=1, no=0) in preparation for the logistic regression analysis.

4.3 Statistical analyses

Data were analyzed using commercially available software (SPSS version 12.0). All statistical tests were 2-sided; p-values >0.05 were considered nonsignificant. Two-sample t-tests, χ^2 tests, or Wilcoxon two-sample tests were used to examine differences in the descriptive characteristics of the study population.

For not normally distributed variables the non-parametric univariate Mann-Whitney test was used to verify the statistical significance of differences among continuous and categorical demographic, social, family and health behaviour variables.

One-way analysis of variance (ANOVA) with a Bonferroni post-hoc analysis was conducted to determine whether differences derived from the comparison of eating and activity scores among categorical demographic, social and family variables were statistically different. The relationships of dichotomous variables with ordered or non-ordered categorical variables were explored with χ^2 tests.

Demographic and other variables found to be related to health behaviour variables at the univariate level were then entered into a multiple logistic regression equation to identify predictors for health behaviour and overweight by backward stepwise elimination.

5 RESULTS

5.1 Study population

Interview data were collected from 522 schoolchildren. The sample size was reduced to 496 data sets (95.0%) due to missing interview data for some children. 432 parents (82.8%) completed and returned the parental questionnaire.

The statistical analyses were performed on merged data from 496 children (266 boys and 230 girls) and 432 parents.

5.2 Anthropometric and demographic data (pupils)

The anthropometric data of the 496 primary pupils are listed in Table 1. Boys were significantly older (p=0.05), taller (p<0.0001) and weighted more (p=0.01) than the girls. Birth height and weight and BMI demonstrated no differences.

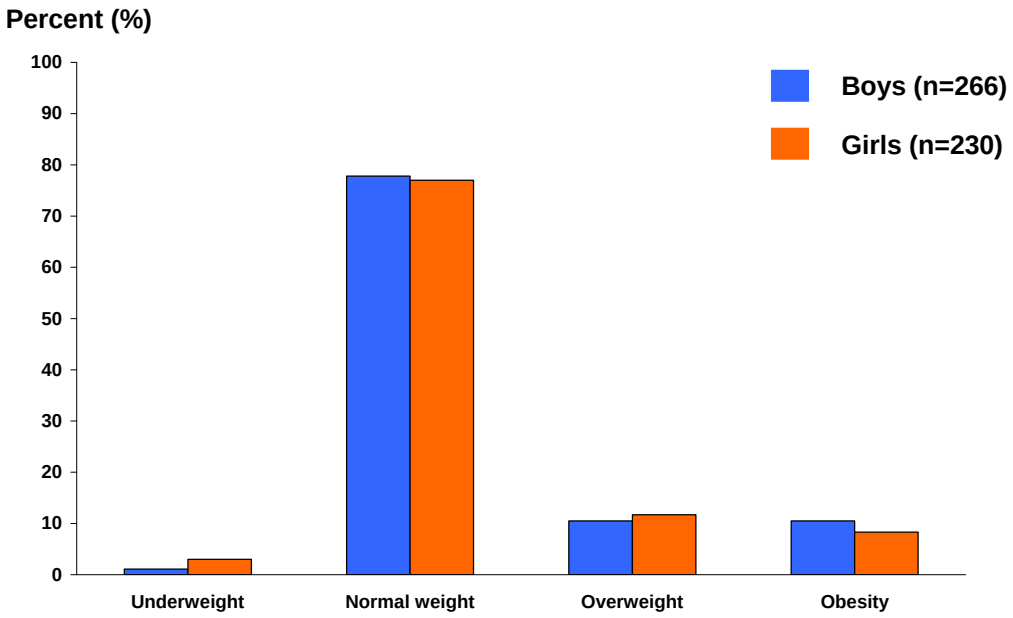
Table 1: The anthropometric and demographic data of the pupils

	Boys			Girls			
	n	***Mean (SD)***	***Range***	***n***	***Mean (SD)***	***Range***	***P-value***
Age (years)	266	7.3 (0.5)	6.0–9.0	230	7.2 (0.5)	6.0–9.0	=0.05
Birth height (cm)	135	51.3 (3.5)	34.0-61.0	127	51.0 (3.7)	30.0-57.0	n.s.
Birth weight (g)	135	3362.0 (600.5)	1090.0-4800.0	128	3319.6 (645.9)	1000.0-4560.0	n.s.
Height (cm)	266	130.4 (5.7)	116.0-158.9	230	128.4 (5.3)	112.0-142.0	<0.0001
Weight (kg)	266	29.5 (5.5)	20.2-49.8	230	28.1 (5.0)	18.3-48.1	=0.01
BMI (kg/m^2)	266	17.3 (2.5)	13.5–27.7	230	17.0 (2.4)	12.0–26.7	n.s.

SD: standard deviation; n.s.: not significant

Based on the German age- and gender-specific BMI reference values (Kromeyer-Hauschild et al., 2001), 9.5% of the pupils were obese, 11.1% overweight, 77.4% normal weight and 2.0% underweight. The distribution of weight classes was not significantly different between boys and girls (Figure 2 and Appendix, Table 1). Applying a broader definition of "overweight" (BMI ≥ 90. percentile; that is, including "obesity"), the prevalence in boys was 21.1% and in girls 20.0% respectively (not significantly different between both groups).

Figure 2: Distribution of weight classes (gender-based)



5.3 Anthropometric data (parents)

Table 2 shows the anthropometric data of the parents. Fathers were significantly taller and weighted significantly more than mothers (p<0.0001 for both). The BMI differed significantly between both groups (p<0.0001)

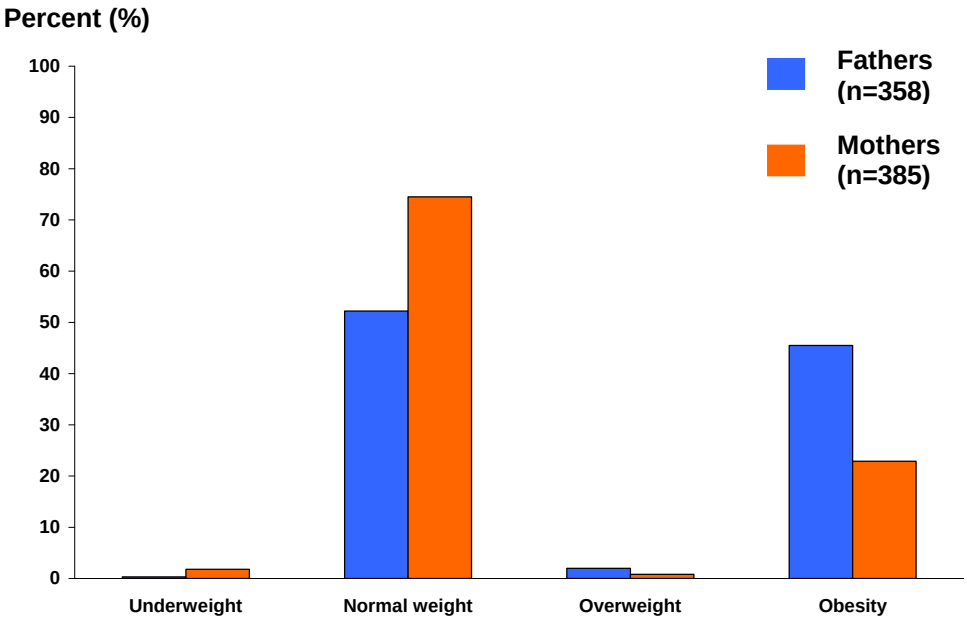
Table 2: The anthropometric data of the parents

	Fathers			Mothers			
	n	***Mean (SD)***	***Range***	***n***	***Mean (SD)***	***Range***	***P-value***
Height (cm)	411	179.6 (7.2)	160.0-205.0	432	167.0 (6.6)	147.0-183.0	<0.0001
Weight (kg)	400	82.5 (11.2)	53.0-132.0	427	67.1 (14.5)	40.0-195.0	<0.0001
BMI (kg/m^2)	399	25.6 (3.1)	18.3-44.6	426	24.1 (5.2)	16.7-76.2	<0.0001

SD: standard deviation.

Comparing the distribution of weight classes between fathers and mothers (Figure 3), the prevalence of obesity in fathers was significantly higher than in mothers; mothers were significantly more normal weighted than their spouses (p<0.0001 for both). When applying the broader definition of “overweight” (BMI ≥ 25 kg/m^2), fathers showed a significant higher prevalence than mothers (41.4% vs. 26%, p<0.0001).

Figure 3: Distribution of weight classes (parents)



5.4 Family situation

5.4.1 Number of siblings

Most of the pupils had 1 – 2 siblings (67.9%); about one quarter reported no siblings (Table 3).

Table 3: Number of siblings, categorized

Number of siblings (Categories)	*Frequency (n)*	*Percent (%)*
I (0)	111**	22.4
II (1 – 2)	336***	67.9
III (≥ 3)	48	9.7
Total	495	100.0

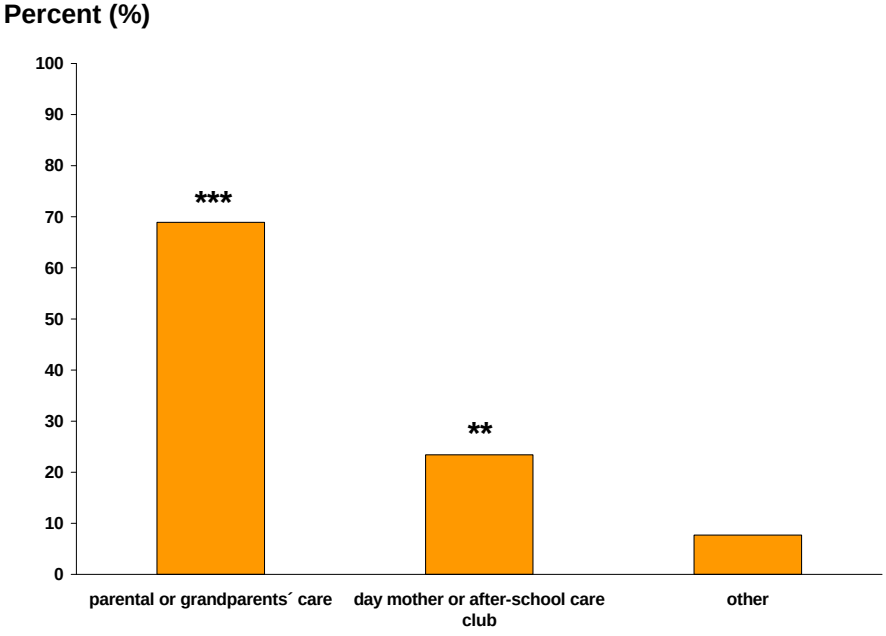
*** significantly different from categories I and II (p<0.0001)

** significantly different from category III (p<0.0001)

5.4.2 Modalities of child care after school

More than two-thirds of the interviewed pupils declared to spend the time after school with their parents or grandparents (Figure 4). Nearly a quarter was supervised by a day mother or in an after-school care club (Figure 4).

Figure 4: Modalities of child care after school (n=495)

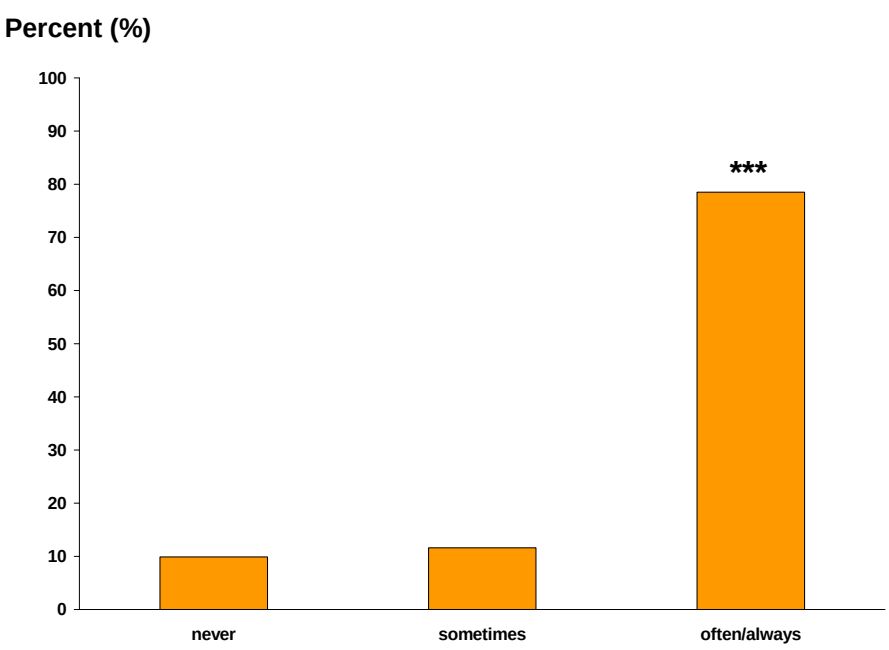


*** p<0.0001 vs. “day-mother” and “other”; ** p<0.0001 vs. “other”

5.4.3 Having meals along with the family

The frequency of having meals (breakfast, lunch and dinner) along with the family is presented in Figure 5. Most pupils said that they often had family company during their meals (78.5%).

Figure 5: Frequency of having meals with the family (n=485)



*** p<0.0001 vs. “sometimes” and “never”

5.5 Social status

5.5.1 Demographic family factors

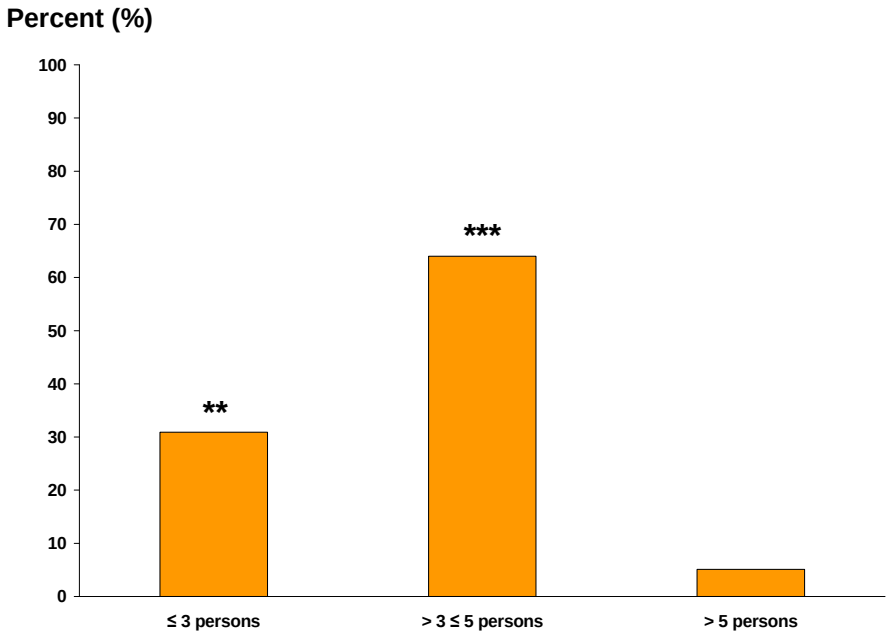
Mean number of persons per household, size of flat and size of flat per person are shown in Table 4.

Table 4: Demographic family factors

	N	*Mean (SD)*	*Range*
Persons in household	434	3.9 (1.0)	2.0-8.0
Size of dwelling place (m^2)	431	95.7 (37.6)	16.0-360.0
Size of dwelling place/person (m^2)	430	25.6 (10.1)	6.0-90.0

Most families consisted of 3 to 5 persons (64%, Figure 6).

Figure 6: Persons per household (categorized, n=434)



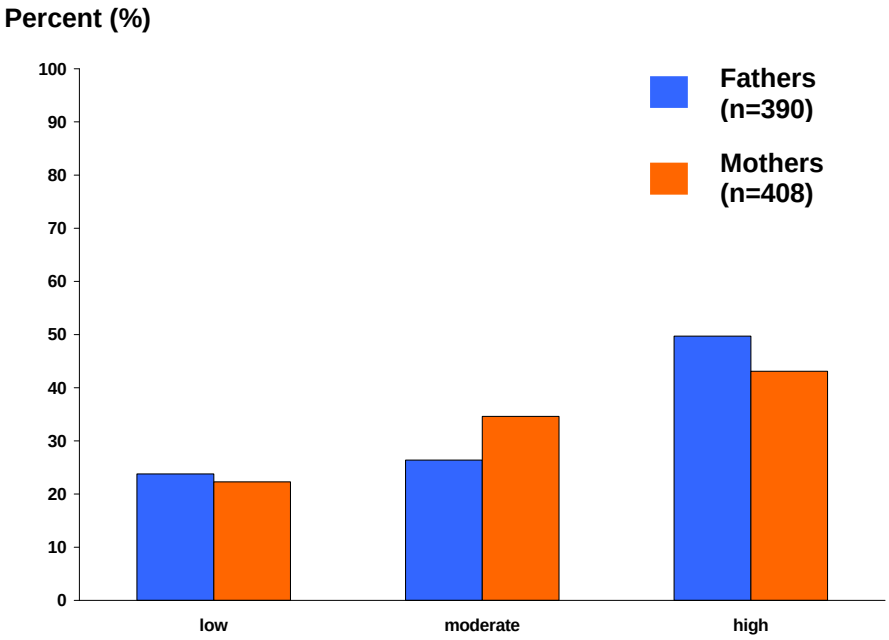
*** p<0.0001 vs. "≤ 3 persons" and "> 5 persons"

** p<0.0001 vs. "> 5 persons"

5.5.2 Parental educational level

Most parents had a high educational level (fathers: 49.7%, mothers: 43.1%: Figure 7). Differences between groups were not significant. A detailed representation regarding parental education is to be found in the Appendix, Table 2.

Figure 7: Parental educational level (categorized)

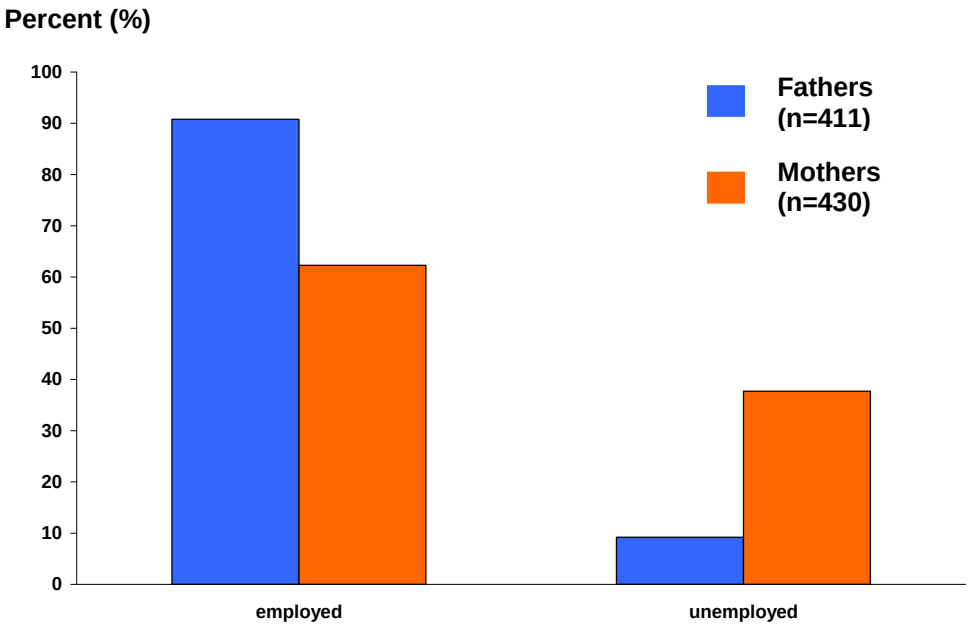


Not significantly different between groups (p=0.539)

5.5.3 Parental employment status

In nearly 60% of the families, both parents were employed (Appendix, Table 3). fathers were significantly more employed than mothers ($p<0.0001$; Figure 8.)

Figure 8: Parental employment status (gender-based)



5.5.4 Schools' characteristics

58% of the interviewed pupils attended a school rated socially intermediate, whereas 42% were assigned to the group of socially disadvantaged schools ($p=0.001$). There were no significant differences regarding the distribution of gender.

Concerning several demographic, family and parental characteristics, pupils attending schools ranked as socially disadvantaged differed significantly from their fellows attending schools being situated in a socially intermediate neighbourhood (Appendix, Tables 4 to 6). The latter lived in larger apartments whereas the average number of persons per household was significantly smaller within this group. The educational levels of parents of children attending a school ranked socially disadvantaged were significantly lower (Figures 9 and 10). The proportion of families with both parents being employed was significantly greater within the

group of pupils attending a school classified as socially intermediate. Overweight parents were significantly more prevalent in association with a socially disadvantaged school neighbourhood.

Figure 9: Distribution of maternal educational level within schools of different social ranks (n=408)

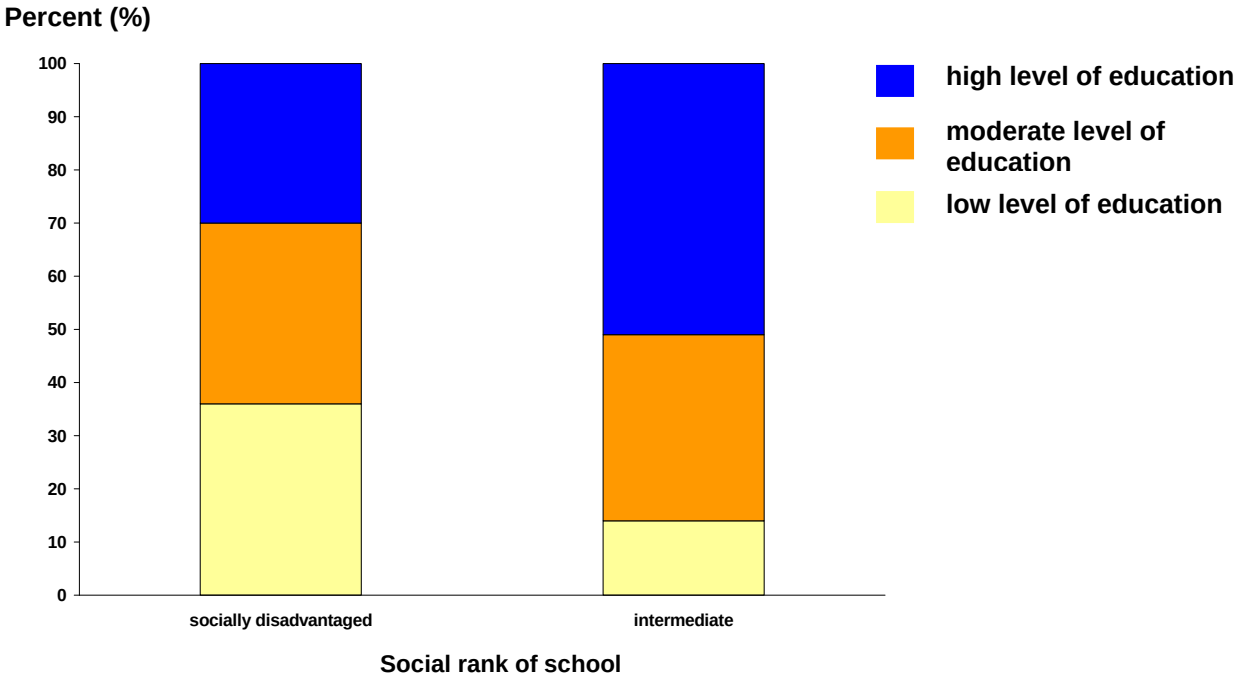
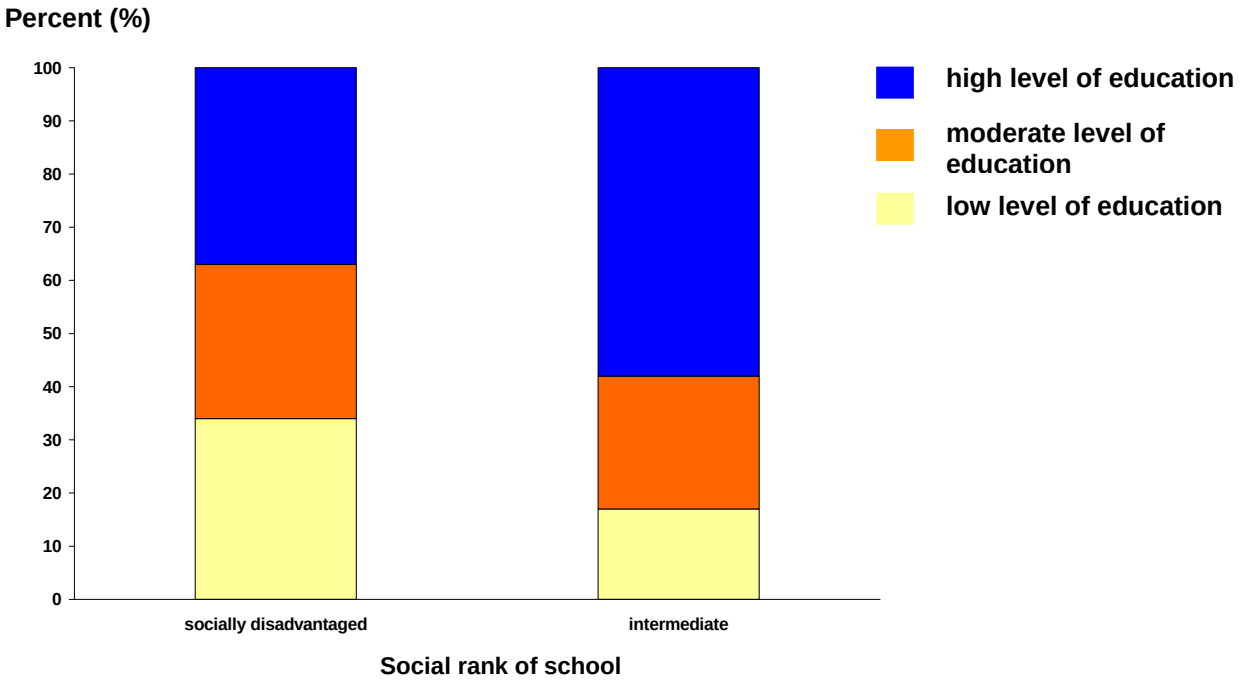


Figure 10: Distribution of paternal educational level within schools of different social ranks (n=390)



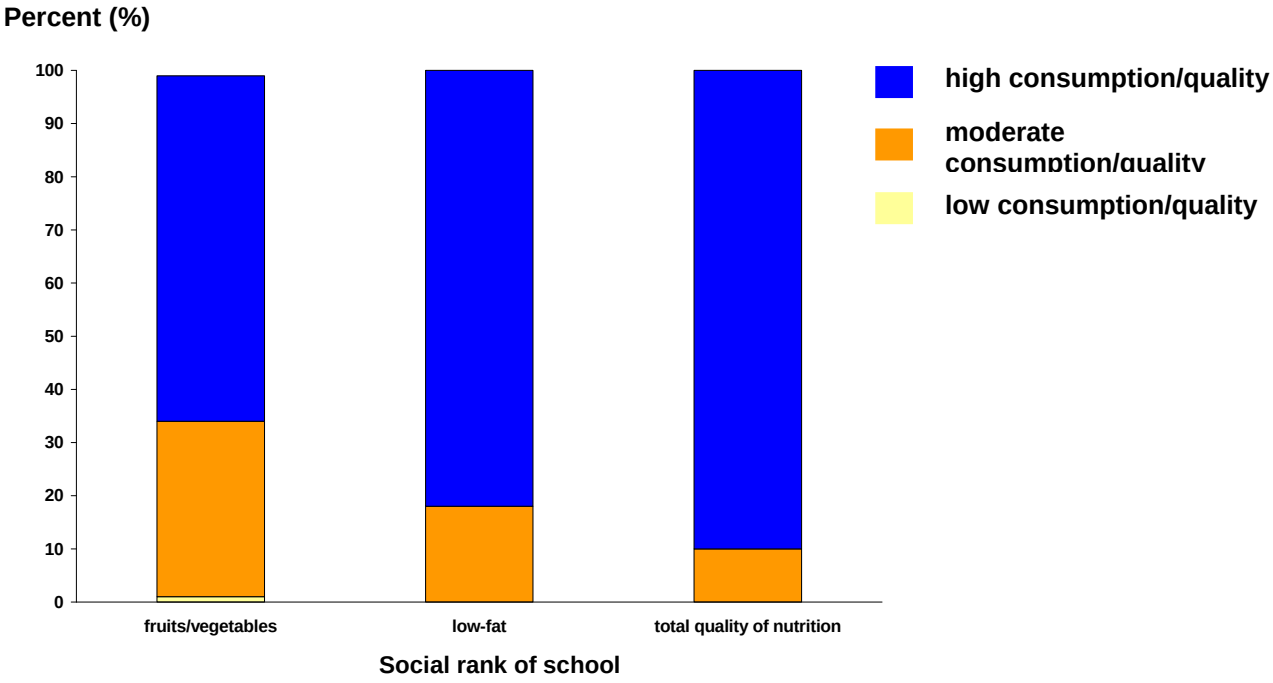
5.6 Health behaviour

5.6.1 Eating behaviour

General findings

Most of the pupils showed a high consumption of fruit and vegetables (65%), a predominantly low-fat diet (82%) and a high quality of nutrition (90%; Figure 11; Appendix, Table 8), indicating daily intake of “healthy” food. Eating behaviour scores were significantly different between pupils attending schools with different social backgrounds (Appendix , Table 9): Within the group of children attending a school ranked socially intermediate, scores for fruit and vegetables, low-fat diet and quality of nutrition were significantly higher.

Figure 11: Categorized eating behaviour scores (levels of consumption/ total quality of nutrition; n=486)



Associations

Pupils´ demographic and activity variables as well as family, social and parental factors were significantly associated with eating behaviour scores (Tables 5 and 6; Appendix, Tables 7 and 10 to 13).

The frequency of eating fruit and vegetables was not different between boys and girls but girls showed significantly higher scores concerning low-fat diet ($p=0.001$). As a result, total quality of nutrition scores were also higher in girls than in boys ($p<0.0001$). Pupils who showed a low physical activity and a high TV consumption had significantly lower scores for fruits/vegetables, low-fat diet and total quality of nutrition ($p<0.0001$). Going to a school situated in a socially disadvantaged area was significantly associated with a lower quality of nutrition ($p<0.0001$). Total quality of nutrition and consumption of low-fat diet were highly dependent from the mother's educational level with a low educational status being related to lower eating behaviour scores ($p<0.0001$).

Family environment significantly influenced eating behaviour through meal patterns, number of siblings and maternal status of overweight ($p\leq0.01$ for each): Frequent meals along with the family, having not more than two siblings and a normal weighted mother precluded low quality of nutrition.

Table 5: Univariate analyses with pupils' demographic and health behaviour variables for the total quality of nutrition scores

	Low-fat Mean score (SD)	*df*	*F*	*Post hoc pairwise comparisons*
Gender		484	12.57****	I < II
boys (I)	28.4 (2.5)			
girls (II)	29.3 (2.6)			
Social rank of school		484	27.98****	I < II
socially disadvantaged (I)	28.1 (2.5)			
intermediate (II)	29.3 (2.5)			
Total physical activity		469	14.92****	I < III; II < III
low (I)	27.8 (2.4)			
moderate (II)	28.6 (2.6)			
high (III)	30.0 (2.3)			
TV consumption		468	30.14****	I > II, III; II > III
low (I)	29.5 (2.5)			
moderate (II)	28.0 (2.4)			
high (III)	26.6 (2.6)			

**** p≤0.0001

Table 6: Univariate analyses with pupils' family, social and parental variables for the total quality of nutrition scores

	Fruit/Vegetables Mean score (SD)	*df*	*F*	*Post hoc pairwise comparisons*
Persons per household		483	3.46*	III < I, II
≤ 3 (I)	28.9 (2.4)			
> 3 ≤ 5 (II)	29.0 (2.6)			
> 5 (III)	27.5 (2.7)			
Number of siblings		483	3.70*	II > III
0 (I)	28.8 (2.3)			
1 – 2 (II)	28.9 (2.7)			
≥ 3 (III)	27.9 (2.4)			
Educational level, mother		399	17.21****	I < II, III
low (I)	27.7 (2.5)			
moderate (II)	29.0 (2.5)			
high (III)	29.6 (2.5)			
Overweight, mother		417	12.09***	I > II
no (I)	29.2 (2.6)			
yes (II)	28.3 (2.5)			

* p≤0.05; *** p≤0.001; **** p≤0.0001

Predictors of eating behaviour

Logistic regression models were used to simultaneously analyse the association between total quality of nutrition and demographic, family, social, parental and other health behaviour variables. In the analysis, the dichotomous variables low to moderate and high quality of nutrition were defined as dependent variables (Tables 7 and 8).

A moderate to high level of maternal education was significantly predictive for a high total quality of nutrition (Odds ratios [OR] = 4.03 and 3.36, respectively) whereas high inactivity and high TV consumption were associated with low to moderate quality of nutrition (OR = 36.92 and 12.86, respectively).

Table 7: Predictors of low to moderate quality of nutrition

Predictive parameters		OR	95%CI	Significance (p-value)
Educational level – mother (cat.)	low	I		
	moderate	***0.25***	***0.09-0.71***	***=0.009***
	high	***0.30***	***0.11-0.79***	***=0.015***
Inactivity (cat.)	low	I		
	moderate	6.70	0.81-52.49	=0.070
	high	***36.92***	***4.56-299.29***	***=0.001***
TV consumption (cat.)	≤ 1 hour	I		
	> 1 ≤ 2 hours	2.30	0.95-5.61	=0.066
	> 2 hours	***12.86***	***3.39-48.71***	***<0.0001***

I = reference category

Table 8: Predictors of high quality of nutrition

Predictive parameters		OR	95%CI	Significance (p-value)
Educational level – mother (cat.)	low	I		
	moderate	***4.03***	***1.41-11.51***	***=0.009***
	high	***3.36***	***1.27-8.89***	***=0.015***
Inactivity (cat.)	low	I		
	moderate	0.15	0.02-1.17	=0.070
	high	***0.03***	***0.003-0.22***	***=0.001***
TV consumption (cat.)	≤ 1 hour	I		
	> 1 ≤ 2 hours	0.43	0.18-1.06	=0.066
	> 2 hours	***0.08***	***0.02-0.30***	***<0.0001***

I = reference category

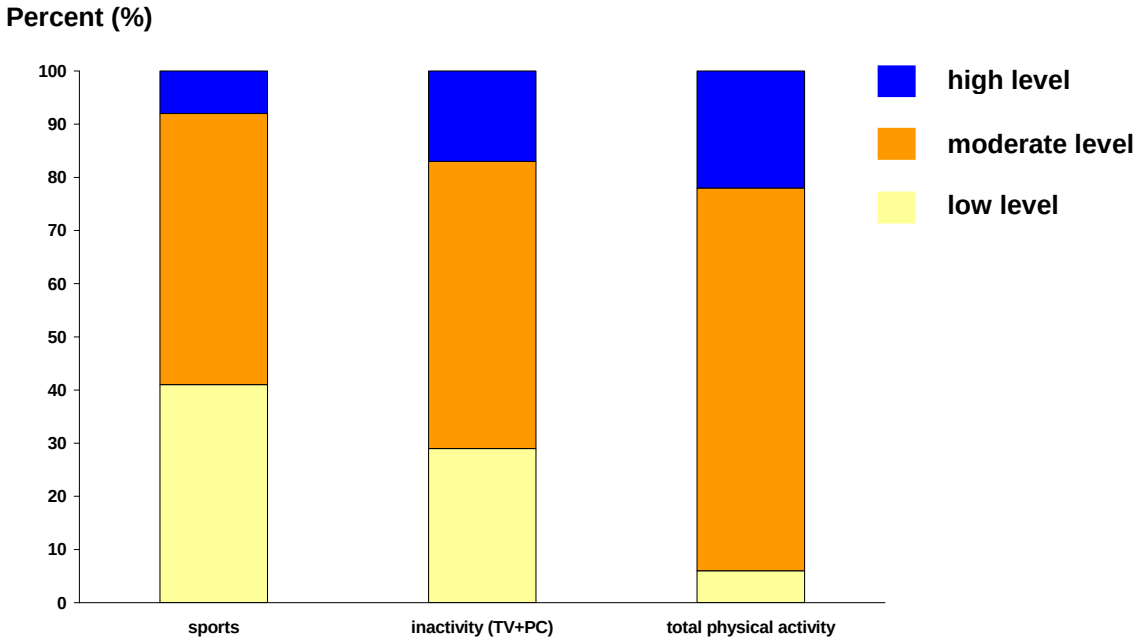
5.6.2 Activity behaviour

General findings

Regarding activity scores, most pupils fell in moderate categories (Figure 12; Appendix, Table 15), indicating that they engaged in vigorous activity 2 to 4 times per week. Approximately 50% of all interviewed children were moderately inactive, a third showed low inactivity. Half of the pupils did sports two to four days a week, but just as many children (40.8%) did sports merely once a week. Total physical activity could be categorised as moderately in most cases (72%) whereas one fifth was highly physical active during a week.

Most frequently, pupils went to school and came back on foot (around 70%; Appendix, Table 16), but a proportion of 20% were regularly taken by car to and from school.

Figure 12: Categorized activity levels (n=479)



Associations

Using univariate analyses, significant associations of activity behaviour scores with demographic, health behaviour, social and parental variables were found (Tables 9 and 10; Appendix, Tables 14 and 17 to 20).

Boys did sports significantly more than girls ($p=0.004$) whereas girls were less inactive ($p<0.0001$), i.e. they spent significantly less time watching TV or videos and computing. Total physical activity scores were significantly higher in girls ($p=0.007$). Being normal weighted and attending a school situated in a socially intermediate neighbourhood was significantly related to less inactivity and higher total physical activity ($p\leq0.05$ for each). More active pupils showed lower TV consumption and higher quality of nutrition scores ($p\leq0.0001$). More inactivity and less total physical activity was significantly associated with mother and father being overweight ($p\leq0.01$ for each). Pupils with mothers with a higher level of education scored significantly higher on sports, inactivity and total physical activity scores ($p\leq0.0001$). Furthermore, children with working mothers were more active ($p\leq0.05$).

Table 9: Univariate analyses with pupils' demographic and health behaviour variables for the total activity score

	Total activity Mean score (SD)	*df*	*F*	*Post hoc pairwise comparisons*
Gender		478	5.86**	I < II
boys (I)	5.3 (1.3)			
girls (II)	5.6 (1.3)			
Overweight of pupils		478	5.80*	I > II
no (I)	5.5 (1.3)			
yes (II)	5.2 (1.2)			
Social rank of school		478	17.92****	I < II
socially disadvantaged (I)	5.2 (1.3)			
intermediate (II)	5.7 (1.3)			
Total quality of nutrition		469	16.96****	I < II
low to moderate(I)	4.8 (1.1)			
high (II)	5.6 (1.3)			
TV consumption		463	13.49****	I > II, III
low (I)	5.7 (1.4)			
moderate (II)	5.1 (1.1)			
high (III)	4.8 (1.2)			

* p≤0.05; ** p≤0.01; **** p≤0.0001

Table 10: Univariate analyses with pupils' family, social and parental variables for the total activity score

	Total activity Mean score (SD)	*df*	*F*	*Post hoc pairwise comparisons*
Educational level, mother		394	10.16****	I < III; II < III
low (I)	5.2 (1.1)			
moderate (II)	5.4 (1.3)			
high (III)	5.9 (1.3)			
Educational level, father		378	5.86*	I < III; II < III
low (I)	5.4 (1.2)			
moderate (II)	5.4 (1.2)			
high (III)	5.8 (1.4)			
Employment status, mother		414	5.46*	I < II
no (I)	5.4 (1.4)			
yes (II)	5.7 (1.2)			
Overweight, mother		410	8.49**	I > II
no (I)	5.7 (1.3)			
yes (II)	5.3 (1.2)			
Overweight, father		384	5.94**	I > II
no (I)	5.7 (1.3)			
yes (II)	5.4 (1.3)			

* p≤0.05; ** p≤0.01; **** p≤0.0001

Predictors of activity behaviour

The associations between total physical activity and pupils' demographic, health behaviour, familiar, social and parental factors were analysed using logistic regression models. Dependent variables were specified as the dichotomously coded variables low to moderate and high total physical activity (Tables 11 and 12).

Fathers who were overweight constituted a significant predictor for low to moderate total physical activity (OR = 1.82). Similar to the results regarding nutrition behaviour, a high level of maternal education was significantly associated with high total physical activity (OR = 3.66). Further calculations demonstrated that pupils showing a high quality of nutrition had a higher probability of being highly active (OR = 9.99).

Table 11: Predictors of low to moderate total physical activity

Predictive parameters		OR	95%CI	Significance (p-value)
Educational level – mother (cat.)	low	I		
	moderate	0.64	0.24-1.72	=0.373
	high	***0.27***	***0.11-0.70***	***=0.007***
Overweight – mother	no	I		
	yes	1.93	0.96-3.91	=0.067
Overweight – father	no	I		
	yes	***1.82***	***1.05-3.14***	***=0.033***
Quality of nutrition	low to moderate	I		
	high	***0.10***	***0.01-0.77***	***=0.027***

I = reference category

Table 12: Predictors of high total physical activity

Predictive parameters		OR	95%CI	Significance (p-value)
Educational level – mother (cat.)	low	I		
	moderate	1.57	0.58-4.24	=0.373
	high	***3.66***	***1.44-9.33***	***=0.007***
Overweight - mother	no	I		
	yes	0.52	0.26-1.05	=0.067
Overweight – father	no	I		
	yes	***0.55***	***0.32-0.95***	***=0.033***
Quality of nutrition	low to moderate	I		
	high	***9.99***	***1.31-76.50***	***=0.027***

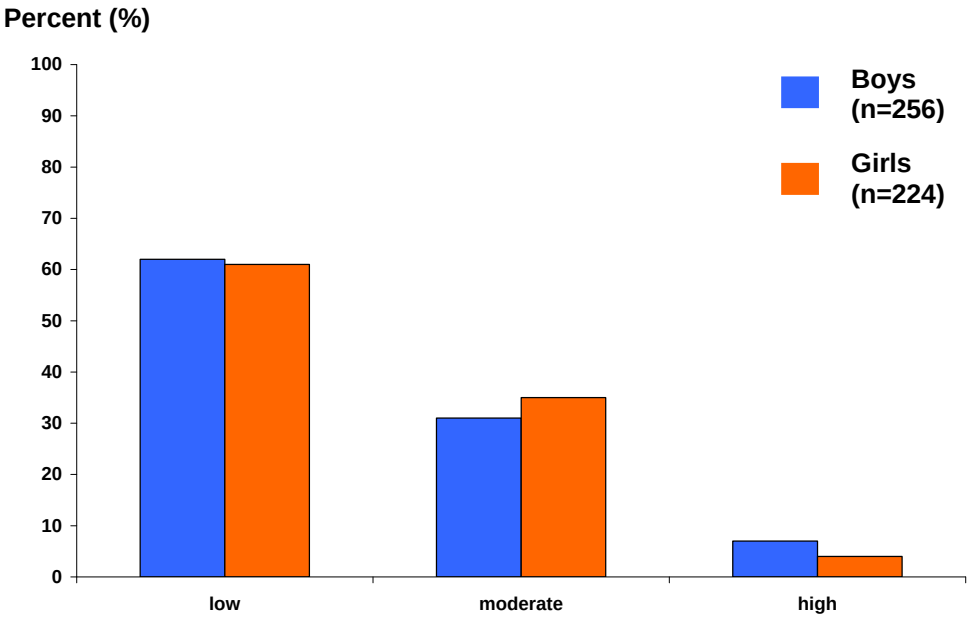
I = reference category

5.6.3 TV consumption

General findings

Almost 62% of the pupils watched TV up to one hour per day and one third had a moderate consumption of TV (1 – 2 hours). Boys and girls did not show significant differences in their average times of TV consumption (Figure 13).

Figure 13: TV consumption (gender-based)



Associations

Pupils' TV consumption was found to be significantly associated with several demographic, health behaviour, social, family and parental variables (Appendix, Tables 21 to 22).

Children showing low inactivity as well as high total physical activity watched significantly less TV than highly inactive pupils (p=0.001 for each). Overweight was significantly associated with higher TV consumption (p=0.023). Pupils with mother and father possessing a higher educational level were more likely to show a low TV consumption (p<0.05 for each; Figure 14). Also, a high quality of nutrition was significantly associated with watching TV for one hour at most (p<0.0001).

Family variables that were related to a moderate to high TV consumption included 1.) having three or more siblings (p=0.004), 2.) having only few meals along with the family (p=0.034) and 3.) maternal overweight (p=0.001). Attending a school ranked socially intermediate was significantly related to lower TV consumption (p<0.0001; Figure 15).

Figure 14: TV consumption in relation to maternal educational level (n=394)

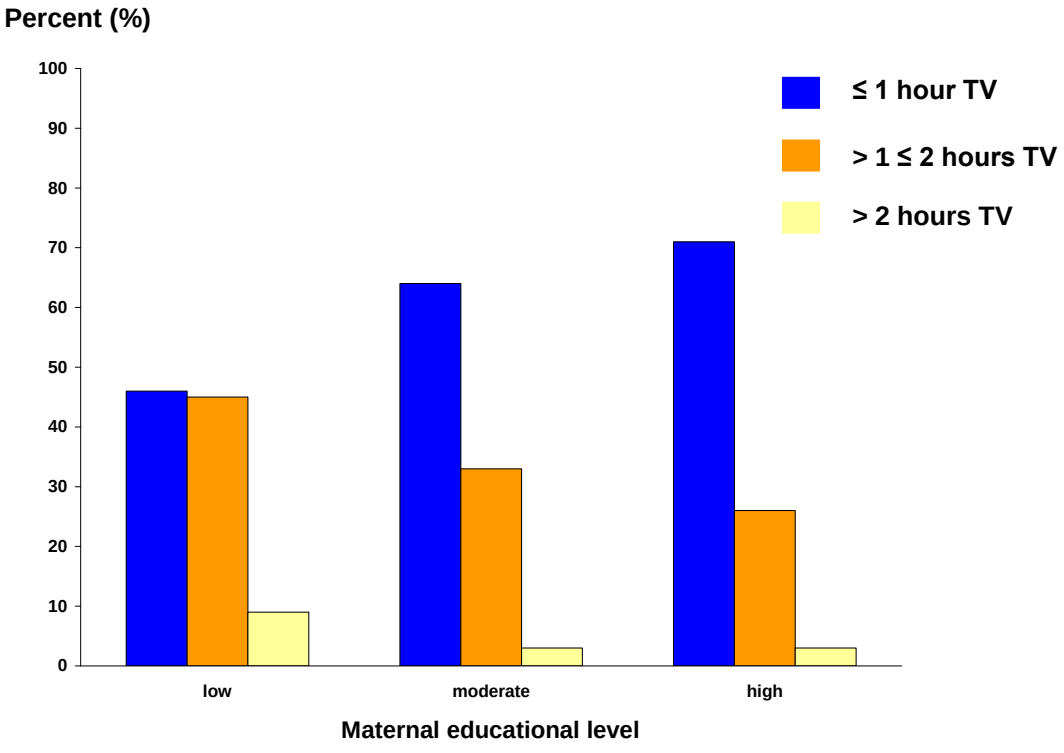
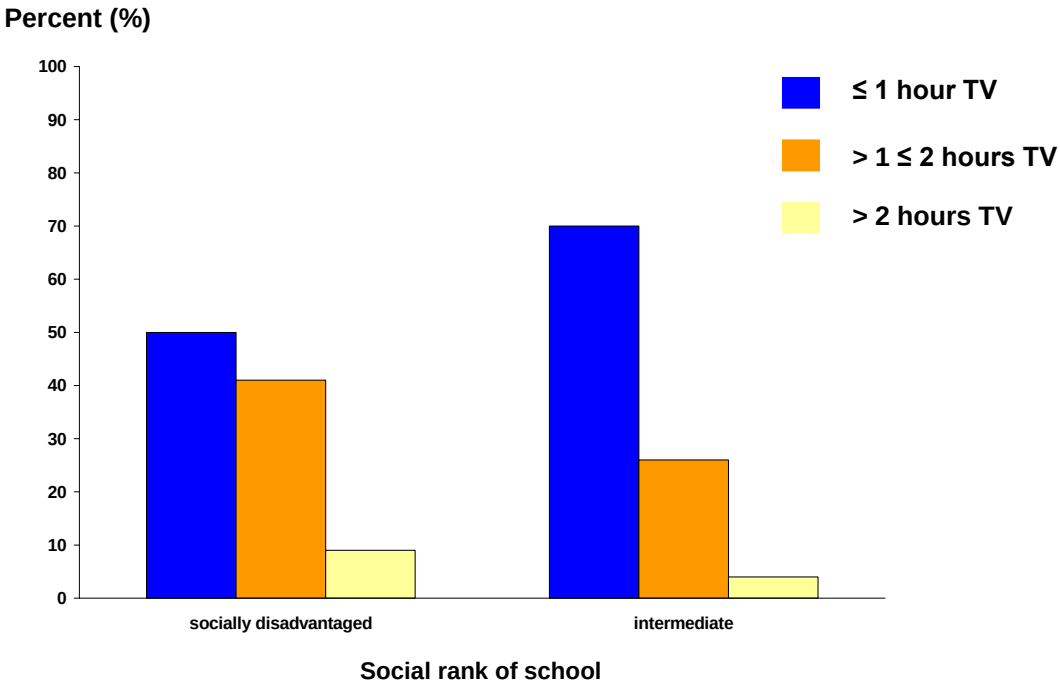


Figure 15: TV consumption in relation to social rank of school (n=480)



Predictors of TV consumption

In order to determine demographic, social and parental predictors of TV consumption, logistic regression models were used. The dichotomous variables low, moderate and high TV consumption constituted the dependent variables.

Strongest predictors of a low TV consumption (Table 13) were a high frequency of having meals along with the family (OR = 2.86) and showing a high quality of nutrition (OR = 3.36). Being moderately to highly inactive precluded low TV times (OR = 0.33 and 0.26, respectively). Watching TV one to two hours per day (Table 14) was significantly influenced by a moderate to high level of inactivity (OR = 2.77 and 3.86, respectively). Pupils who showed a high quality of nutrition were less likely to watch TV more than two hours a day (OR = 0.07; Table 15).

Table 13: Predictors of low TV consumption (≤ 1 hour/day)

Predictive parameters		OR	95%CI	Significance (p-value)
Having meals together with the family	never	I		
	sometimes	2.26	0.74-6.84	=0.151
	often	***2.86***	***1.19-6.85***	***=0.019***
Inactivity (cat.)	low	I		
	moderate	***0.33***	***0.18-0.62***	***=0.001***
	high	***0.26***	***0.11-0.60***	***=0.002***
Quality of nutrition	low to moderate	I		
	high	***3.36***	***1.39-8.13***	***=0.007***

I = reference category

Table 14: Predictors of moderate TV consumption (> 1 ≤ 2 hours/day)

Predictive parameters		OR	95%CI	Significance (p-value)
Having meals together with the family	never	I		
	sometimes	0.38	0.13-1.13	=0.081
	often	***0.37***	***0.15-0.86***	***=0.022***
Inactivity (cat.)	low	I		
	moderate	***2.77***	***1.48-5.18***	***=0.001***
	high	***3.58***	***1.62-7.91***	***=0.002***

I = reference category

Table 15: Predictors of high TV consumption (> 2 hours/day)

Predictive parameters		OR	95%CI	Significance (p-value)
Quality of nutrition	low to moderate	I		
	high	***0.07***	***0.02-0.24***	***<0.0001***

I = reference category

5.7 Overweight children

Health behaviour

In comparison to their normal weighted fellows, total activity of overweight schoolchildren was categorized as moderate and high to a significantly lesser extent ($p \leq 0.05$; Figure 17). Overweight pupils watched significantly more TV ($p \leq 0.05$; Figure 18), whereas normal weight status was significantly more often associated with low TV consumption ($p \leq 0.01$). The distribution of quality of nutrition was not different between overweight and normal weight children (Figure 16).

Figure 16: Status of overweight and total quality of nutrition (n=486)

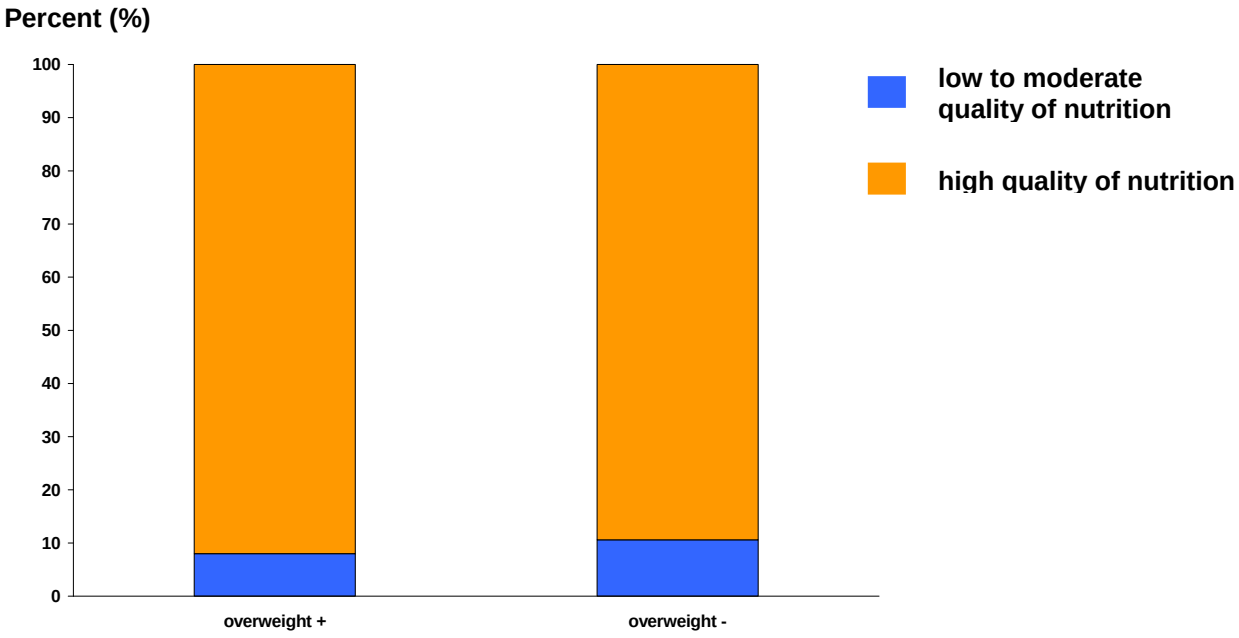


Figure 17: Status of overweight and total physical activity (n=479)

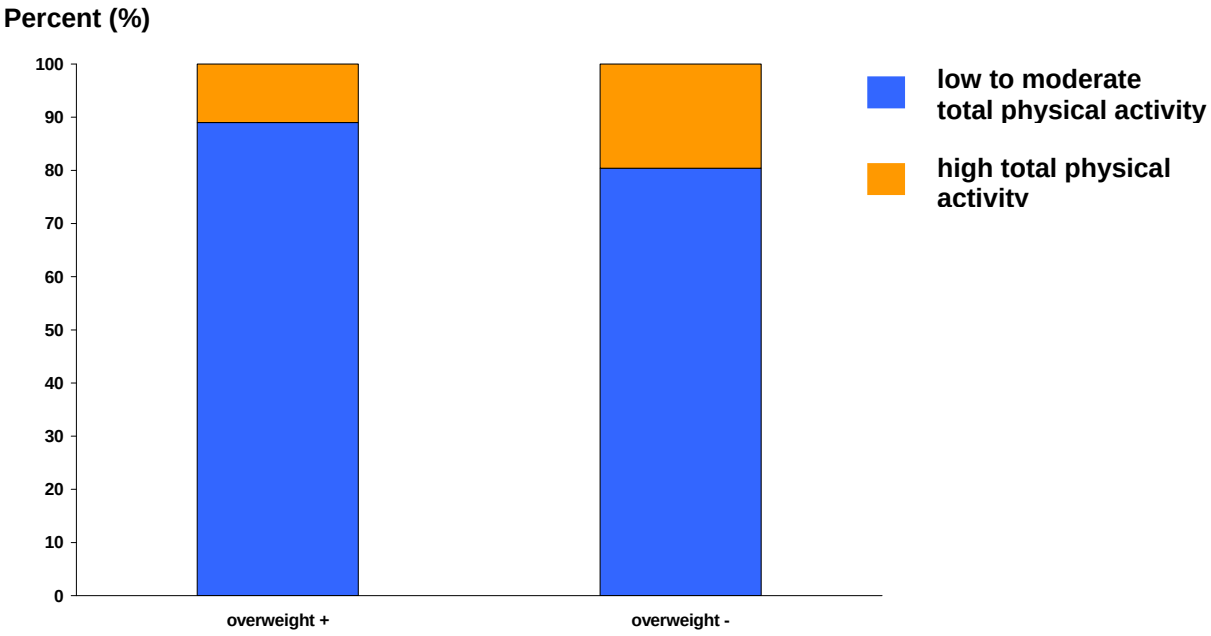
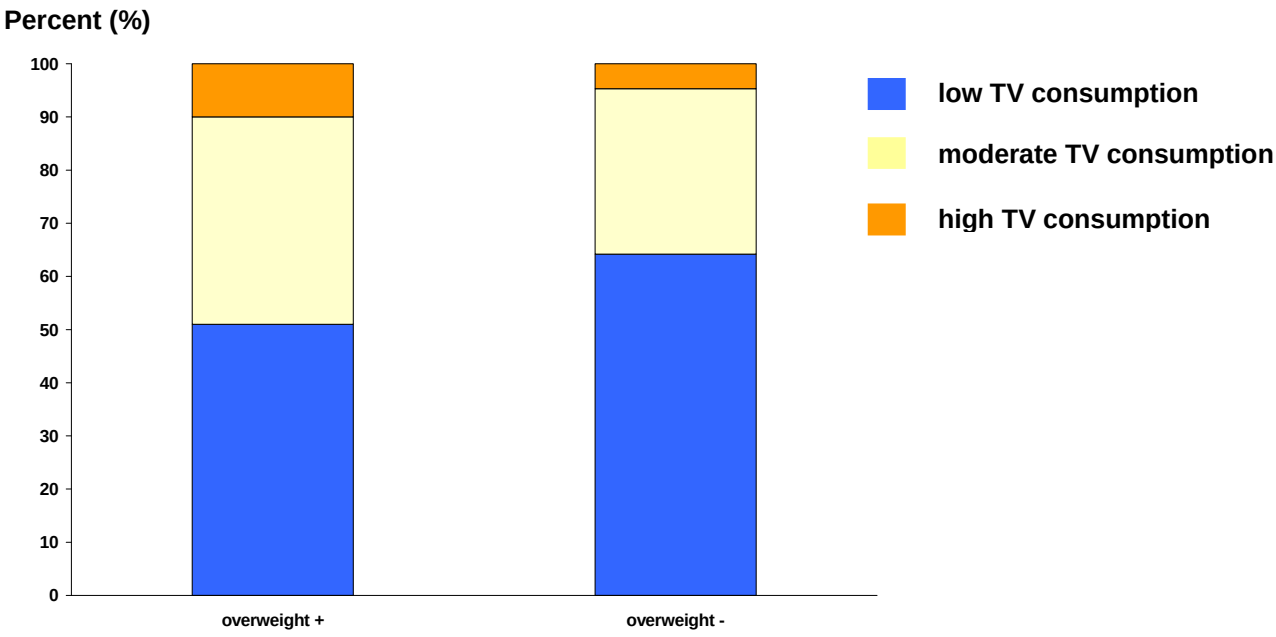


Figure 18: Status of overweight and TV consumption (n=480)



Predictors

Overweight pupils were more likely to have overweight fathers (OR=2.89). A high level of maternal education precluded overweight status (OR=0.39).

Table 16: Predictors of overweight in pupils (BMI ≥ 90th percentile)

Predictive parameters		OR	95%CI	Significance (p-value)
Educational level – mother (cat.)	low	I		
	moderate	0.58	0.28-1.20	=0.143
	high	***0.39***	***0.19-0.81***	***=0.011***
Overweight - father	no	I		
	yes	***2.89***	***1.56-5.34***	***=0.001***

I = reference category

6 DISCUSSION

The present study suggests that health behaviour in primary schoolchildren is strongly influenced by social, parental and family characteristics. As a main social indicator, mother's educational level was consistently and significantly linked to eating and physical behaviour, whereas watching TV was significantly influenced by familiar eating habits and the pupil's global inactivity level. Further, schoolchildren experiencing socially different school environments significantly differed in their eating, physical and sedentary behaviour: children who attended a school ranked socially disadvantaged were more likely to show lower health behaviour scores.

Concerning the broad range of collected data in primary schoolchildren and their parents, this study was the first to provide a comprehensive overview with respect to young German schoolchildren's health behaviour and social, parental and family determinants.

Eating behaviour

Interestingly, pupils' eating behaviour showed high scores indicating a high quality of nutrition with daily consumption of fruits and vegetables. National data (German Nutrition Report 2000) reported similar tendencies in young schoolchildren aged 6 to 8 years (Deutsche Gesellschaft für Ernährung, 2000); around 80% declared that they usually eat fruit during the recess, for instance. With regard to adolescents' food habits, several studies have yielded converse results with fruit and vegetables being below recommended levels (Yngve et al., 2005) and consumption frequencies of sweets being high (Vereecken et al., 2005a). As a matter of fact, eating behaviours of children and adolescents differ considerably which might be attributed to the increasing influence of peers during adolescence. Adolescents seek disengagement from the parental and family environment and therefore tend to reject parental as well as school-based advice concerning healthy lifestyles. Autonomy over food choices increases, with

increasing opportunities to select and purchase own food and drink outside the home (Inchley et al., 2001).

The next findings revealed eating behaviour scores to be different according to pupils' activity behaviour and TV viewing habits. Watching TV for 1 to 2 hours and for more than 2 hours daily was significantly related to lower quality of nutrition. This is consistent with previous studies having shown increased TV viewing time to be associated with increased soft-drink consumption (Giammattei et al., 2003) and reduced consumption of fruits and vegetables (Boynton-Jarrett et al., 2003) in schoolchildren. These results may reflect the relationships between TV viewing, exposure to food advertising and preferences for the advertised foods (Borzekowski et al., 2001). Moreover, the setting of TV viewing encourages frequent snacking (Francis et al., 2003). Within this context, it has been recently shown that a TV viewing time of more than two hours constitutes a useful predictor of schoolchildren's poor diet habits, low physical activity and status of overweight (Salmon et al., 2006).

Social and family factors are well-known to be associated with eating behaviour of children and adolescents (Cooke et al., 2004; Giskes et al., 2002). The results of the present study underline the importance of family eating patterns, such as having regular meals along with the family. This attribute of family life was related to high eating behaviour scores.

Moreover, quality of nutrition was significantly different between individually distinguishable social environments (e.g. mother's educational level, number of siblings, number of persons per household). Families with lower social status usually have less money to spend on food and take costs into account more often (French, 2003), while well-educated parents are more likely to pay attention to health in their choice of food when costs are nonrelevant (Hupkens et al., 2000).

Nevertheless, eating behaviour was not only influenced by individual social status but also by the contextual social environment. Pupils attending a school ranked socially disadvantaged had significantly lower eating behaviour scores. This has already been shown by Vereecken et al. (2005b). It might be difficult to consume healthy food in an environment where other children do not do that. All the more surprisingly, the present study revealed a high quality of nutrition in

pupils attending schools that were classified as socially disadvantaged to intermediate. However, the information obtained was based on the schoolchildren's self-reports. Therefore, it cannot be excluded that they might have been overestimated their healthy food intakes or tended to give “socially desired” answers.

Finally, the logistic regression analysis revealed that a moderate to high maternal educational level predicts high quality of nutrition. This finding is consistent with several other studies. “Less healthy eating” has been shown to be related to fewer maternal qualifications in schoolchildren (Sweeting et al., 2005), and food habits of young children aged 2.5 to 7 years have been described as being significantly different by mother's educational level (Vereecken et al., 2004). These results suggest the need to focus on children *and* mother when introducing nutrition education programmes.

Moreover, high inactivity (daily computing, watching videos and TV) and high TV consumption (> 2 hours per day) were predictors of low to moderate quality of nutrition in this study. These findings confirm the results published by Salmon et al. (2006). As discussed above, sedentary behaviour fosters adverse food habits insofar as children are more likely to snack unhealthy food sitting passively in front of a screen. In line with this, evidence-based recommendations for physical activity in children recommend to reduce sedentary behaviours to < 2 hours per day (Strong et al., 2005).

Activity and sedentary behaviour

Analysis of the schoolchildren’s activity indicated gender-based differences regarding physical activity: boys did significantly more sports whereas girls were significantly less engaged in inactivity behaviour, such as computing, playing electronic games and watching videos. These results are consistent with respect to the fact that gender constitutes the most evident biological correlate of physical activity behaviour. Recent data suggest that 10-year-old boys are twice as active as girls in vigorous physical activities (Trost et al., 1996). It is further assumable that boys are more interested in playing electronic games and computing than

girls. However, this does not translate in a more active behaviour of girls; they rather show a decline in physical activity between ages 10 and 16 years (Strauss et al., 2001).

Beyond that, the study results displayed a considerable lack of regular physical activity in primary schoolchildren. Around 40% did sports merely once a week and only 22% showed a high total physical activity (doing sports very often and playing electronic games or watching videos once a week at most). The World Health Organization consistently stated that less than 40% of European schoolchildren meet the guidelines for an acceptable amount of weekly physical activity (World Health Organization, 2005) Recently, it has been recommended that school-age youth should participate every day in 60 minutes or more of moderate to vigorous physical activity in order to prevent adverse health outcomes (Strong et al., 2005). Potential explanations with regard to insufficient levels of physical activity in schoolchildren might include rising tendencies of omitting school-based physical education as well as the adoption of sedentary lifestyles which are increasingly prevalent these days.

Parental and social factors seemed to exert a crucial influence on schoolchildren's physical activity. The study results indicated that overweight status of parents was associated with less physical activity and more inactivity of the pupils suggesting that modelling might have played an important role. Parents appear to have a strong influence on children's activity behaviour, and as overweight adults tend to show decreasing leisure-time activity (Wilsgaard et al., 2005), it might be conclusive that children imitate this behaviour. In addition, it has been reported that parental involvement in sport is an important correlate of children's participation in physical activity outside school (Cleland et al. 2005). Parents are role models and the usual providers of transport and funding for extracurricular activity. Because they provide a child's contextual environment, they also have to be considered key players in interventions promoting lifestyle changes.

Representing the social status, mother's educational level was associated with the pupil's activity levels and reversely related to inactivity. Kristjansdottir et al.

(2001) have found that upper-class schoolchildren were less sedentary and more physically active during leisure time. However, there are not enough studies to draw conclusions about family socioeconomic status and children's activity (Gustafson et al., 2006). School environment seemed to exert another important influence on the children's activity behaviour: attending a school situated in a socially intermediate neighbourhood was significantly related to less inactivity and higher total physical activity. Similar observations have been made by Pate et al. (2004) who detected that the preschool attended accounted for a substantial fraction of variance in children's activity level. This finding suggests that school policies could exert considerable influence on physical activity levels of schoolchildren and might be used to promote healthy activity behaviour.

Analogous to the subject of eating behaviour, a high level of maternal education was predictive for schoolchildren's high total physical activity. On the other hand, father's overweight determined low to moderate levels of the pupils' activity. Compared to the predictors revealed for eating behaviour, predictors for children's activity behaviour characterize the strong parental influence. Mother *and* father represent role models, with the mother playing the educational part and the father representing the direct model concerning activity behaviour (for example, being overweight and sedentary and vice versa). High quality of nutrition constitutes the third predictor and is likely to be determined by the mother's influence, as we have seen before. In conclusion, results indicated that schoolchildren's activity was significantly determined by maternal (cognitive) influence with paternal (role model) interaction. Until now, only few data showing this distinct interrelation have been available (Kohl et al., 1998).

TV consumption

Most of the schoolchildren stated to watch TV up to 60 minutes per day. This is in line with other German studies; Graf et al. (2004) found out that 7-year-old pupils' TV viewing time averaged 50 minutes per day. In 1999, German children and adolescents aged 6 to 17 years daily spent around 98 minutes watching TV (Deutsche Gesellschaft für Ernährung, 2000). This TV watching time is fairly moderate, compared to the TV habits of U.S. children who generally watch

2 to 3 hours of TV per day (Nielson Media Research, 1998). European young people watch TV on average over two hours a day (Livingstone et al., 2001).

In response to evidence implying the adverse health effects of excessive TV viewing, the American Academy of Pediatrics released guidelines for TV viewing (2001) recommending to limit the total media time of children older than 2 years to no more than 1 to 2 hours per day. In the present sample, only 6% of the children exceeded this suggestion. On the one hand, this might be attributed to the fact that rather young schoolchildren were investigated. On the other hand, two third of the study population had been exposed to five bouts of health promotion (duration of 90 minutes) on general health behaviour or prevention of obesity during the 12 months before the survey was performed because this measure was part of the longitudinal study from which the schoolchildren were recruited. It might be possible that they have transferred the information given concerning healthy lifestyles or that they have at least known the “right” answer if asked about TV watching habits. However, the pupils were asked about the programmes they have watched and TV consumption was calculated from the total duration of all programmes watched; thus this variable appeared to be objective.

Univariate analyses showed considerable interrelationships between family characteristics and TV consumption. TV watching time was higher in pupils who had 3 or more siblings and only few meals along with the family. These children obviously had more opportunities to spend their leisure time in front of the TV screen because joint family life was rather limited. One might speculate that the parents were just not in the position to care for a considerable number of children at the same time because time was lacking: in most of the families, both parents were employed. Several authors have pointed out that the family plays an important role in shaping the children’s TV viewing behaviour, such that parental TV habits promote similar behaviours in their children (Krahnstoever Davison et al., 2005; McGuire et al., 2002). However, most of the studies have solely investigated parental TV watching habits as factors probably affecting TV viewing time in children and adolescents (Gorely et al., 2004; Songul Yalcin et al., 2002). To date, data concerning family life and structure influencing children’s TV

consumption have been scarce. From this point of view, the present study adds new knowledge to this field of research.

Other parental characteristics that were found to be related to the children's TV viewing habits included mother's and father's educational level. In this study, lower TV consumption of the pupils was associated with a higher level of parental education. This relationship is already known (Christakis et al., 2004) and indicates the importance of the social background that determines parental knowledge and literacy in serving as role models for children. Social factors were further reflected by the finding that pupils attending a school ranked socially disadvantaged watched significantly more TV. As discussed earlier, the school environment provides a central place where the development of children's health and health behaviour takes place. Regarding TV viewing habits, peer pressure may play a distinct role through ostracising pupils who are not able to join in a conversation about popular TV programmes they have not watched.

In scientific literature, high levels of TV viewing in childhood and adolescence have been associated with higher BMI or rather obesity (Andersen et al., 1998; Proctor et al., 2003). Similar results were found in the present study with overweight schoolchildren showing higher levels of TV consumption. Underlying mechanisms that have been discussed are displacement of physical activity and increased calorie consumption while watching or food advertising (Robinson, 2001). In line with this, schoolchildren's low inactivity as well as high total physical activity were found to be significantly related to lower TV viewing time within the cross-sectional survey presented here. Moreover, pupils who showed a high quality of nutrition watched significantly less TV supporting the observation that children's unhealthy food consumption and high levels of TV viewing are closely interrelated.

Low levels of inactivity (watching videos, playing electronic games) and regular meal patterns within the family life were found to be the strongest predictors for the schoolchildren's low TV consumption (viewing TV up to one hour per day). Regarding inactivity, several authors have confirmed this finding (Robinson, 1999).

Marshall et al. (2004) reported that physical activity and TV viewing were adversely associated.

Nevertheless, family life constitutes one of the key factors influencing children's TV habits. Providing regular meals along with the family seems to be highly effective in order to reduce excessive TV viewing in young children. In most cases, the mother might be the central person to promote corresponding eating habits. Bearing in mind the close relationship between the mother's educational level and pupils' eating behaviour, this is also reflected by the finding that high quality of nutrition is interrelated with low levels of children's TV watching. Assuming that the mothers constitute the persons responsible for the patterns of family life and meals, they should primarily be involved in interventions designed to change children's TV habits.

Overweight

The overall prevalence of schoolchildren's overweight (including obesity) reported in the study (20.6%) is consistent with data to be found in the German Nutrition Report 2000 that stated prevalence rates around 25% in 279 children aged 6 to 8 years (Deutsche Gesellschaft für Ernährung, 2000). Similar findings were published by Kromeyer-Hauschild et al. (1999) who investigated a representative sample of 1901 schoolchildren in Jena, aged 7 to 14 years: In 1995, the prevalence of overweight (including obesity) amounted to 24.5% in boys and to 30.6% in girls.

However, from 2001 to 2004, compulsory pre-school medical examinations performed in several German Federal States refer prevalence rates around 11% (Robert-Koch-Institut, 2005). Will et al. (2005) reported similar results with regard to 265 German school starters in Bielefeld, Northrhine-Westfalia.

These differences in prevalence rates might be due to using different cut points for overweight and obesity as well as other than national BMI reference data. The present study applied the reference curves for Germany (Kromeyer-Hauschild et al., 2001), as it has been widely recommended (Reilly, 2002). Furthermore, the

lower prevalence rates mentioned above were calculated from relatively small samples that might not fulfil the criteria for representativeness.

In the present study, status of overweight has been found in one fifth of the pupils, demonstrating a considerably high prevalence rate in comparison to national data deriving from studies with similar sample sizes and age structure. One reason might be that the examined schoolchildren could be assigned to low and moderate socioeconomic school environments, based on the fact that the study was primarily conducted in schools ranked socially disadvantaged or intermediate, leaving out a neighbourhood of high social status. Previous studies have confirmed an inverse relationship between overweight and social status (Sobal, 1994). In line with this, prevalence rates of pupil's overweight differed significantly between the schools ranked disadvantaged and intermediate (24.0 vs. 18.0%).

Childhood overweight has shown to be associated with decreased physical activity and increased TV watching (Grund et al., 2001; Ludwig et al., 2004; Rose et al., 2006). Results of the present study confirm this findings insofar as overweight schoolchildren were shown to be less active and to have a higher TV consumption than their schoolfellows. Logistic regression identified the mother's educational level and the father's weight status as key predictors for the children's overweight: Children were more likely to be overweight if the father was overweight whereas a high maternal education precluded children's overweight. Dowda et al. (2001) reported findings that are consistent with these results and highlighted the importance of the family environment regarding the development of overweight in youth. The parental lifestyle probably creates preconditions with respect to an obesogenic environment. Thus, parents are the "key players" in the prevention and treatment of weight-related problems in youth (Golan et al., 2004).

Limitations

Several limitations should be noted. The cross-sectional design of the study could only identify associations between pupils' social, parental and family characteristics and health behaviour, but could not provide causal relation by itself. Further, the study setting (schools ranked socially high were left out) and the convenience sample restrict generalisations that might be made across the German states.

The data collected were based on questionnaires and self-reports which might be disadvantageous in terms of overestimation and unreliability in assessing food frequencies and physical activity.

Finally, around two third of the schoolchildren had already undergone five units of health education during the 12 months before the survey was performed because the study population was part of a longitudinal controlled study evaluating two interventions of school-based health promotion. Therefore, the pupils' answers with regard to eating and activity behaviour might have been influenced by the knowledge acquired during the intervention.

However, most findings of the present study are comparable to those of previous studies indicating that the results provide a reliable basis for understanding and assessing schoolchildren's health behaviour.

Implications

Worldwide, several health education programmes have been performed in order to improve children's health behaviour and to reduce childhood obesity. Unfortunately, most programmes that specially attempt to reduce fat intake and increase physical activity have been ineffective. In contrast, reducing children's TV viewing was found to significantly reduce obesity (Robinson, 1999), underlining the impact of sedentary behaviour with regard to risk factors of obesity. Most studies have been conducted within the school setting in order to reach the children in a supportive environment. However, Lindberg et al. (2006) could only demonstrate increased levels of health knowledge in children subjected to a school-based

health educational programme; health behaviour did not change. In contrast, a multimodal computer-supported approach within a primary health care setting, including a parent intervention based on social cognitive theory and intended to help parents encourage behaviour changes, resulted in considerable improvements of children's diet, physical activity and sedentary behaviour (Patrick et al., 2006). Other authors reported difficulties in integrating parents - by means of a newsletter - in a school programme to prevent obesity in young children (Warren et al., 2003). Obviously, successful health education in childhood must also target parents and be behaviourally focused. Ideally, the whole school environment and the wider community should also be addressed. The present study revealed close relationships between parental and family attributes and children's health behaviour and thereby reinforced the importance of integrating parents and social environment in children's health promotion.

7. CONCLUSION

The results of this cross-sectional study provide evidence for the strong impact of parents and family on health behaviour of German primary schoolchildren. Next to the school environment, the family environment and parental role models influence and shape children's patterns of eating habits and physical and sedentary behaviour. Especially the maternal educational level represents a key determinant of childhood lifestyles. Besides, adverse health behaviours are closely related to social discrimination.

These results provide a conceptual framework for understanding young schoolchildren's health behaviour. Nevertheless, prospective studies that include schoolchildren from all German states are needed to yield understanding of causal relationships between health behaviour and sociocultural environment.

Finally, effective public health interventions that aim at changing adverse health behaviour in young schoolchildren should apply an integrated approach through targeting parents, families and children within their usual and social environment. Mothers are the crucial factor in creating the children's family environment and would particularly benefit from joint measures of health education that include children and their families.

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APPENDIX

1. Children's questionnaire

Fragebogen zur Lebens- und Gesundheitssituation von Kindern in der Grundschule

Code-Nr.: ☐☐☐☐☐☐

Gewicht in KG: ☐☐☐,☐

Größe in cm: ☐☐☐,☐

Persönliche Angaben

1. Geschlecht	1 ☐ Mädchen 2 ☐ Junge
2. Wie alt bist du?	☐☐ Jahre
3. Wie viele Geschwister hast du?	1 ☐ 0 2 ☐ 1 3 ☐ 2 4 ☐ 3 5 ☐ 4 6 ☐ über 4
4. Was machst du nach der Schule?	1 ☐ Betreuung durch Eltern / Großeltern 2 ☐ Betreuung durch Hort / Tagesmutter 3 ☐ Sonstiges

Familiensituation

	oft / immer	manchmal	nie / selten
5. Wie häufig hast du dich in der letzten Woche mit deinen Eltern gut verstanden?	1 ☐	2 ☐	3 ☐
6. Wie häufig hast du dich in der letzten Woche zu Hause wohl gefühlt?	1 ☐	2 ☐	3 ☐
Wie häufig hast du in der letzten Woche mit deiner Familie zusammen gegessen?	oft / immer	manchmal	nie / selten
7. Frühstück	1 ☐	2 ☐	3 ☐
8. Mittagessen	1 ☐	2 ☐	3 ☐
9. Abendbrot	1 ☐	2 ☐	3 ☐

Ernährung

Wie häufig hast du in der letzten Woche folgende Nahrungsmittel gegessen?	mehrmals täglich	täglich	manchmal 1-6x / Woche	nie / selten
10. Pommes	1 ☐	2 ☐	3 ☐	4 ☐
11. Käse	1 ☐	2 ☐	3 ☐	4 ☐
12. Obst (Äpfel, Bananen, Erdbeeren, Mandarinen...)	1 ☐	2 ☐	3 ☐	4 ☐
13. Nutella	1 ☐	2 ☐	3 ☐	4 ☐
14. Gemüse (Erbsen, Möhren, Tomaten, Paprika, Gurke)	1 ☐	2 ☐	3 ☐	4 ☐
15. Pizza	1 ☐	2 ☐	3 ☐	4 ☐
16. Schokolade (Riegel: Mars, Duplo, Twix...)	1 ☐	2 ☐	3 ☐	4 ☐
17. Kuchen / Kekse	1 ☐	2 ☐	3 ☐	4 ☐
18. Knabbergebäck	1 ☐	2 ☐	3 ☐	4 ☐
19. Hamburger	1 ☐	2 ☐	3 ☐	4 ☐
20. Wurst / Würstchen	1 ☐	2 ☐	3 ☐	4 ☐

Schulsituation

Wie kommst du überwiegend zur Schule?

21. Hinweg	1 ☐ Zu Fuß 2 ☐ Mit dem Fahrrad / Roller 3 ☐ Mit dem Bus / Bahn 4 ☐ Mit dem Auto (Eltern)
22. Rückweg	1 ☐ Zu Fuß 2 ☐ Mit dem Fahrrad / Roller 3 ☐ Mit dem Bus / Bahn 4 ☐ Mit dem Auto (Eltern)

	oft / immer	manchmal	nie / selten
23. Wie häufig hast du in der letzten Woche die Aufgaben in der Schule gut geschafft?	1 ☐	2 ☐	3 ☐
24. Wie häufig hat dir in der letzten Woche der Unterricht Spaß gemacht?	1 ☐	2 ☐	3 ☐

Freunde / Freizeit

	oft / immer	manchmal	nie / selten
25. Wie häufig hast du in der letzten Woche mit deinen Freunden gespielt?	1 ☐	2 ☐	3 ☐
26. Wie häufig hast du dich in der letzten Woche mit deinen Freunden gut verstanden?	1 ☐	2 ☐	3 ☐
27. Wie häufig mochten dich in der letzten Woche die anderen Kinder?	1 ☐	2 ☐	3 ☐

Was hast du nach der Schule und am Wochenende gemacht ?	oft / immer	manchmal 2-4x / Woche	nie / selten 1x / Woche
28. Fahrrad gefahren	1 ☐	2 ☐	3 ☐
29. Sport gemacht / Sportverein / Schwimmen gegangen	1 ☐	2 ☐	3 ☐
30. Spielen (draußen)	1 ☐	2 ☐	3 ☐
31. Spielen (drinnen)	1 ☐	2 ☐	3 ☐
32. Computer, Playstation, Gameboy, Nintendo gespielt	1 ☐	2 ☐	3 ☐
33. TV, Video, DVD	1 ☐	2 ☐	3 ☐

34. Welche Sendungen hast du gestern gesehen? (TV, Video, DVD)

.....

.....

.....

35. Wie viele Minuten waren das zusammen? (überschlagen)	1 ☐ 0 – 30 2 ☐ 31 – 60 3 ☐ 61 – 90 4 ☐ 91 – 120 5 ☐ 121 – 180 6 ☐ > 180

Selbstbild			
Wie fühlst du dich?	oft / immer	manchmal	nie / selten
36. Wie häufig hast du in der letzten Woche gelacht und Spaß gehabt?	1 ☐	2 ☐	3 ☐
37. Wie häufig war dir in der letzten Woche langweilig?	1 ☐	2 ☐	3 ☐
38. Wie häufig hast du in der letzten Woche Angst gehabt?	1 ☐	2 ☐	3 ☐
Was hältst du von dir selbst?	oft / immer	manchmal	nie / selten
39. Wie häufig warst du in der letzten Woche stolz auf dich?	1 ☐	2 ☐	3 ☐
40. Wie häufig mochtest du dich in der letzten Woche selber leiden?	1 ☐	2 ☐	3 ☐
41. Wie häufig hast du in der letzten Woche gute Ideen gehabt?	1 ☐	2 ☐	3 ☐
Wie geht es deinem Körper?	oft / immer	manchmal	nie / selten
42. Wie häufig hast du dich in der letzten Woche krank gefühlt?	1 ☐	2 ☐	3 ☐
43. Wie häufig hast du in der letzten Woche Kopfweh oder Bauchweh gehabt?	1 ☐	2 ☐	3 ☐
44. Wie häufig warst du in der letzten Woche müde oder schlapp?	1 ☐	2 ☐	3 ☐

2. Parental questionnaire

Liebe Eltern,

Ihr Kind nimmt an der wissenschaftlichen Begleitstudie zum Projekt „Gesundheitsförderung in der Grundschule“ der Hochschule für Angewandte Wissenschaften Hamburg teil. Im Rahmen dieser Studie benötigen wir noch einige Familienangaben von Ihnen. Ihre Angaben werden den Daten Ihres Kindes zugeordnet. Deshalb finden Sie auf diesem Fragebogen die Kodierungsnummer Ihres Kindes.

Wir bitten Sie, an der nachstehenden Befragung **freiwillig** teilzunehmen und versichern Ihnen, dass diese Daten nur für die wissenschaftliche Auswertung dieses Projektes verwendet werden.

1. Wie groß war Ihr Kind bei der Geburt?

   ..... cm Körperlänge

2. Wie viel hat Ihr Kind bei seiner Geburt gewogen?

   .....Gramm

3. Wie groß sind Sie?

	Mutter	Vater
Größe (in cm)		

4. Wie viel wiegen Sie?

	Mutter	Vater
Gewicht (in Kg)		

5. Sind Sie berufstätig?

Mutter	Vater
O ja / O nein	O ja / O nein

6. Welchen Schulabschluss haben Sie?

	Mutter	Vater
Hauptschulabschluss	O	O
Realschulabschluss	O	O
Fachabitur	O	O
Abitur	O	O
Sonstiges		

7. Wie viele Personen wohnen ständig in Ihrem Haushalt?

   .....Personen

8. Wie groß ist Ihre Wohnung?

   ca. ..... qm

Vielen Dank !!!

3. Basic data

Table 1: Distribution of weight classes (pupils)

	Boys (n=266)		Girls (n=230)	
Weight status	***Frequency***	***Percent***	***Frequency***	***Percent***
Underweight	3	1.1	7	3.0
Normal weight	207***	77.8	177***	77.0
Overweight	28	10.5	27	11.7
Obesity	28	10.5	19	8.3

*** p<0.0001 vs. Underweight, Overweight, Obesity

Table 2: Levels of parental education (categorized)

	Fathers (n=390)		Mothers (n=408)	
Level of education	***Frequency***	***Percent***	***Frequency***	***Percent***
low	93	23.8	91	22.3
moderate	103	26.4	141***	34.6
high	194†	49.7	176*, **	43.1
total	390	100.0	408	100.0

*** significantly different vs. low (p=0.001)

** significantly different vs. low (p=0.001)

* significantly different vs. middle (p=0.05)

† significantly different vs. low and middle (p<0.0001)

Not significantly different between groups (Vorzeichentest, p=0.539).

Table 3: Parental employment status (categorized)

Employment status	***Frequency***	***Percent***
I Both parents unemployed	20	4.9
II One parent employed	155**	38.0
III Both parents employed	233***	57.1
Total	408	100.0

*** significantly different vs. I and II (p<0.0001)

** significantly different vs. I (p<0.0001)

Table 4: Demographic and social variables, differentiated by social rank of school

		Socially disadvantaged		Intermediate	Significance
Parameters	***n***	***Mean (SD)***	***n***	***Mean (SD)***	***p-value***
Age (pupils, years)	209	7.4 (0.5)	287	7.2 (0.5)	=0.004
BMI (pupils), kg/m^2	209	17.3 (2.6)	287	17.0 (2.3)	n.s.
BMI (mother), kg/m^2	173	25.1 (5.9)	253	23.4 (4.5)	<0.0001
BMI (father), kg/m^2	157	26.1 (3.4)	242	25.2 (2.8)	=0.004
Size of dwelling place (m^2)	176	83.5 (26.5)	255	104.2 (41.1)	<0.0001
Size of dwelling place/person (m^2)	175	21.5 (7.8)	255	28.4 (10.5)	<0.0001
Persons in household (n)	178	4.1 (1.1)	256	3.7 (0.9)	=0.002

Table 5: Parental variables, differentiated by social rank of school

	Socially disadvantaged		Intermediate		Significance (p-value)
Parameters	***n***	***Percent***	***n***	***Percent***	
Level of education (mother)					<0.0001
low	56	35.9	35	13.9	
moderate	53	34.0	88	34.9	
high	47	30.1	129	51.2	
Level of education (father)					<0.001
low	51	33.8	42	17.6	
moderate	44	29.1	59	24.7	
high	56	37.1	138	57.7	
Employment status (parents)					<0.001
both unemployed	14	8.6	6	2.4	
one employed	75	46.0	80	32.7	
both employed	74	45.4	159	64.9	
Employment status - mother					<0.001
no	85	48.0	77	30.4	
yes	92	52.0	176	69.9	
Employment status - father					=0.006
no	23	13.9	15	6.1	
yes	142	86.1	231	93.9	

Table 6: Prevalence of overweight, differentiated by social rank of school

		Socially disadvantaged		Intermediate		Significance (p-value)
		n	***Percent***	***n***	***Percent***	
Overweight (pupils)	no	158	75.6	366	82.2	=0.046
	yes	51	24.4	51	17.8	
Overweight (mothers)	no	104	60.1	193	76.3	<0.0001
	yes	69	39.9	90	23.7	
Overweight (fathers)	no	64	40.8	131	54.1	=0.006
	yes	93	59.2	111	45.9	

Table 7: Eating behaviour scores (gender-based and total)

	Boys			Girls				Total	
	n	***Mean (SD)***	***Range***	***n***	***Mean (SD)***	***Range***	***p-value***	***n***	***Mean (SD)***	***Range***
Fruit/ Vegetables (score)	265	5.1 (1.3)	2.0-8.0	229	5.2 (1.2)	2.0-8.0	=0.134	495	5.1 (1.2)	2.0-8.0
Lowfat diet (score)	262	23.4 (2.2)	16.0-28.0	225	24.0 (2.2)	17.0-28.0	=0.001	488	23.7 (2.2)	16.0-28.0
Total quality of nutrition (score)	261	28.4 (2.5)	22.0-35.0	224	29.3 (2.6)	21.0-34.0	<0.0001	486	28.8 (2.6)	21.0-35.0

Table 8: Categorized nutrition scores (levels of consumption/total quality of nutrition)

	Boys		Girls		Total sample	
	Frequency	***Percent***	***Frequency***	***Percent***	***Frequency***	***Percent***
Fruit/ Vegetables						
low	5	1.9	2	0.9	7	1.4
moderate	95	35.8	70	30.6	165	33.4
high	165	62.3	157	68.6	322	65.2
total	265	100.0	229	100.0	494	100.0
Low-fat diet						
low	0	0	0	0	0	0
moderate	53	20.2	35	15.6	88	18.1
high	209	79.8	190	84.4	399	81.9
total	262	100.0	225	100.0	487	100.0
Total quality of nutrition						
low	0	0	0	0	0	0
moderate	29	11.1	20	8.9	49	10.1
high	232	88.9	204	91.1	436	89.9
total	261	100.0	224	100.0	485	100.0

not significantly different between boys and girls for all categorized scores

Table 9: Mean eating behaviour scores, differentiated by social rank of school

		Socially disadvantaged		Intermediate	Significance
Parameters	***n***	***Mean (SD)***	***n***	***Mean (SD)***	***p-value***
Fruits/vegetables (score)	209	5.0 (1.2)	285	5.2 (1.2)	=0.05
Low-fat diet(score)	206	23.1 (2.2)	281	24.1 (2.2)	<0.0001
Total quality of nutrition (score)	206	28.1 (2.5)	279	29.3 (2.5)	<0.0001

Table 10: Univariate analyses with pupils' demographic and health behaviour variables for the fruit/vegetables scores

	Fruit/Vegetables Mean score (SD)	***df***	***F***	***Post hoc pairwise comparisons***
Overweight of pupils		493	3.90*	I > II
no (I)	5.2 (1.2)			
yes (II)	4.9 (1.3)			
Social rank of school		493	3.83*	I < II
socially disadvantaged (I)	5.0 (1.2)			
Intermediate (II)	5.2 (1.2)			
Total physical activity		476	3.15**	I < III
low (I)	4.8 (1.2)			
moderate (II)	5.1 (1.2)			
high (III)	5.3 (1.2)			
TV consumption		477	11.30***	I > II, III; II > III
low (I)	5.3			
moderate (II)	4.9			
high (III)	4.5			

* p≤0.05; ** p≤0.01; *** p≤0.0001

Table 11: Univariate analyses with pupils' family, social and parental variables for the fruit/vegetables scores

	Fruit/Vegetables Mean score (SD)	*df*	*F*	*Post hoc pairwise comparisons*
Meals along with the family		481	6.39**	I < III
never (I)	4.7 (0.9)			
sometimes (II)	4.9 (1.3)			
often/always (III)	5.3 (1.2)			
Number of siblings		492	6.86***	III < I, II
0 (I)	5.3 (1.3)			
1 – 2 (II)	5.2 (1.2)			
≥ 3 (III)	4.6 (1.2)			
Overweight, mother		423	7.04**	I > II
no (I)	5.3 (1.3)			
yes (II)	4.9 (1.2)			

** p≤0.01; *** p≤0.001

Table 12: Univariate analyses with pupils' demographic and health behaviour variables for the low-fat diet scores

	Low-fat diet Mean score (SD)	*df*	*F*	*Post hoc pairwise comparisons*
Gender		486	10.76***	I < II
boys (I)	24.0 (2.2)			
girls (II)	23.4 (2.2)			
Social rank of school		486	25.45****	I < II
socially disadvantaged (I)	23.1 (2.2)			
intermediate (II)	24.1 (2.2)			
Total physical activity		471	12.25****	I < III; II < III
low (I)	23.0 (2.1)			
moderate (II)	23.5 (2.3)			
high (III)	24.6 (1.9)			
TV consumption		470	18.94****	I > II, III
low (I)	24.1 (2.1)			
moderate (II)	23.1 (2.2)			
high (III)	22.0 (2.4)			

*** p≤0.001; **** p≤0.0001

Table 13: Univariate analyses with pupils' family, social and parental variables for the low-fat diet scores

	Low-fat diet Mean score (SD)	***df***	***F***	***Post hoc pairwise comparisons***
Educational level, mother		401	15.07****	I < II, III
low (I)	22.7 (2.2)			
moderate (II)	23.9 (2.2)			
high (III)	24.3 (2.1)			
Educational level, father		385	3.04*	I < III
low (I)	23.3 (2.3)			
moderate (II)	23.6 (2.3)			
high (III)	24.0 (2.2)			

* p≤0.05; **** p≤0.0001

Table 14: Activity scores (gender-based and total)

	Boys			Girls			Total		
	n	***Mean (SD)***	***Range***	***n***	***Mean (SD)***	***Range***	***p-value***	***n***	***Mean (SD)***	***Range***
Sports (score)	266	1.7 (0.6)	1.0-3.0	229	1.6 (0.6)	1.0-3.0	=0.004	495	3.2 (0.9)	1.0-3.0
Inactivity/ TV+PC (score)	258	3.6 (1.2)	2.0-6.0	221	4.0 (1.2)	0.0-4.0	<0.0001	479	3.8 (1.2)	2.0-4.0
Total activity (score)	258	5.3 (1.3)	3.0-9.0	221	5.6 (1.3)	3.0-9.0	=0.007	479	7.0 (1.5)	3.0-9.0

Table 15: Categorized activity scores (levels of activity)

	Boys		Girls		Total sample	
	Frequency	***Percent***	***Frequency***	***Percent***	***Frequency***	***Percent***
Sports*						
low	91	34.2	111	48.5	202	40.8
moderate	152	57.1	99	43.2	251	50.7
high	23	8.6	19	8.3	42	8.5
total	266	100.0	229	100.0	489	100.0
Inactivity/TV+PC**						
low	57	22.1	82	37.1	139	29.0
moderate	148	57.4	110	49.8	258	53.9
high	53	20.5	29	13.1	82	17.1
total	258	100.0	221	100.0	488	100.0
Total physical activity						
low	16	6.2	13	5.9	29	6.1
moderate	196	76.0	149	67.4	345	72.0
high	46	17.8	59	26.7	105	21.9
total	258	100.0	221	100.0	479	100.0

* significantly different between groups (p=0.013)

** significantly different between groups (p=0.009)

Table 16: Modalities of ways to school and back from school

Way to school	***Frequency***	***Percent***
on foot (n=496)	352	71.0
by bicycle (n=496)	68	14.0
by bus/train (n=496)	23	5.0
by car (n=495)	110	22.0
Way back from school	***Frequency***	***Percent***
on foot (n=496)	376	74.0
by bicycle (n=495)	67	14.0
by bus/train (n=496)	25	5.0
by car (n=496)	93	19.0

Table 17: Univariate analyses with pupils' demographic and health behaviour variables for the sport score

	Sport Mean score (SD)	***df***	***F***	***Post hoc pairwise comparisons***
Gender		494	6.83**	I > II
boys (I)	1.7 (0.6)			
girls (II)	1.6 (0.6)			
Social rank of school		494	6.80**	I < II
socially disadvantaged (I)	1.6 (0.6)			
intermediate (II)	1.7 (0.6)			

** p≤0.01

Table 18: Univariate analyses with pupils' family, social and parental variables for the sport score

	Sport Mean score (SD)	***df***	***F***	***Post hoc pairwise comparisons***
Educational level, mother		406	3.81*	I < III
low (I)	1.6 (0.7)			
moderate (II)	1.7 (0.6)			
high (III)	1.8 (0.6)			

* p≤0.05

Table 19: Univariate analyses with pupils' demographic and health behaviour variables for the inactivity score

	Inactivity Mean score (SD)	*df*	*F*	*Post hoc pairwise comparisons*
Gender		478	15.34****	I < II
boys (I)	3.6 (1.2)			
girls (II)	4.0 (1.2)			
Overweight of pupils		478	4.96*	I > II
no (I)	3.9 (1.2)			
yes (II)	3.6 (1.0)			
Social rank of school		478	11.45***	I < II
socially disadvantaged (I)	3.6 (1.2)			
intermediate (II)	3.9 (1.2)			
Total quality of nutrition		469	29.48****	I < II
low to moderate(I)	2.9 (1.0)			
high (II)	3.9 (1.2)			
TV consumption		463	20.59****	I > II, III
low (I)	4.0 (1.2)			
moderate (II)	3.4 (1.1)			
high (III)	3.0 (1.0)			

*** p≤0.001; **** p≤0.0001

Table 20: Univariate analyses with pupils´ familiar, social and parental variables for the inactivity score

	Inactivity Mean score (SD)	*df*	*F*	*Post hoc pairwise comparisons*
Educational level, mother		394	5.86***	I < II; II < III; III > I
low (I)	3.6 (1.1)			
moderate (II)	3.8 (1.2)			
high (III)	4.1 (1.2)			
Employment status, mother		414	3.93*	I < II
no (I)	3.7 (1.2)			
yes (II)	3.9 (1.2)			
Overweight, mother		410	6.69**	I > II
no (I)	3.9 (1.2)			
yes (II)	3.6 (1.1)			
Overweight, father		384	6.16**	I > II
no (I)	4.0 (1.2)			
yes (II)	3.7 (1.2)			

* p≤0.05; ** p≤0.01; **** p≤0.0001

Table 21: Associations between demographic and health behaviour variables and TV consumption (chi-square)

	TV consumption (% of associated parameter)			*Significance (p-value)*
	low	***moderate***	***high***	
Overweight of pupils (n=480)				=0.023
no	64	31	5	
yes	51	39	10	
Social rank of school (n=480)				<0.0001
socially disadvantaged	50	41	9	
intermediate	70	26	4	
Total quality of nutrition (n=469)				<0.0001
low to moderate	29	48	23	
high	65	31	4	
Inactivity (n=464)				<0.0001
low	81	18	1	
moderate	55	39	6	
high	48	38	14	
Total physical activity (n=464)				=0.001
low	62	24	14	
moderate	56	38	6	
high	78	19	3	

Table 22: Associations between family, social and parental variables and TV consumption (chi-square)

	TV consumption (% of associated parameter)			*Significance (p-value)*
	low	***moderate***	***high***	
Meals along with the family (n=468)				=0.034
never	46	41	13	
sometimes	55	36	9	
often/always	65	31	4	
Number of siblings (n=479)				=0.004
0	60	34	6	
1 – 2	66	29	5	
≥ 3	36	55	9	
Educational level, mother (n=394)				=0.001
low	46	45	9	
moderate	64	33	3	
high	71	26	3	
Educational level, father (n=376)				=0.018
low	52	43	5	
moderate	56	39	5	
high	71	25	4	
Employment status, mother (n=415)				=0.039
no	54	41	5	
yes	67	29	4	
Overweight, mother (n=411)				=0.001
no	68	28	4	
yes	49	46	5	

Certificate of Originality

I hereby certify that the paper I am submitting is fully and completely original to me and that I neither copied, improperly used, nor otherwise violated any rights of any third party in preparing and submitting the paper and that it was not partially or in whole written, revised, or substantially edited by anyone other than me.

Dr. med. Michaela Behnke
Ahrensburg, February 2006