chapter 1

Introduction
Childhood overweight: prevalence and problem

Tackling the high prevalence of overweight and obesity is worldwide a major challenge for public health in the 21st century. The onset of overweight and obesity starts at a young age; the prevalence of adolescent overweight in many western countries is above 20%. In the Netherlands, the prevalence of overweight and obesity among youth (2 – 21 year) increased with 5% since 1980 and was 14%, including 2% obesity in 2009 according to the fifth Dutch Growth Study.

Childhood overweight tracks into adulthood and is associated with short and long term health consequences. Compared with healthy weight children, children with overweight or obesity report a lower quality of life and lower self-esteem, more often have psychosocial problems, such as disordered eating, anxiety, and depression and are susceptible to be bullied. When overweight children reach adulthood, they are less likely than healthy weight children to complete college and are more likely to live in poverty. Childhood overweight and obesity are also associated with increased risks for type 2 diabetes, cardiovascular diseases and disorders in the musculoskeletal system before and during adulthood. Because these health problems have a negative impact on the quality of life and are accompanied by high medical and societal costs, prevention of overweight is necessary and should start early in life.

Obesity is the result of a long-term positive energy balance; the energy input through food intake exceeds the energy expenditure by body functions and physical activity. The excess of energy is stored as body fat resulting in overweight and eventually leading to obesity. Although the underlying mechanism of excessive weight gain is a complex system of genetic, hormonal, psychological and environmental factors, prevention of unnecessary weight gain is to be realised by encouraging behaviours that reduce energy intake and increase energy expenditure, which can be referred to as energy-balance related behaviour (EBRB).

Prevention of overweight in adolescents by encouraging a healthy lifestyle

Adolescents form a special group of interest with regard to encouraging a healthy lifestyle to prevent overweight. Healthy behaviour contributes to a healthy growth and development of adolescents, a healthy body weight and short- and long term health. Obesity is associated with an early onset of puberty, which has unfavourable implications for health later in life.

In the transition phase from childhood to adolescence, during which children advance from primary to secondary school, adolescents gradually gain more independency and
autonomy in making personal, behavioural health decisions. Parental control lessens and the influence of peer norms becomes more important to adolescents, especially outside the home environment. As a result, the health behaviour patterns of adolescents change towards more unfavourable behaviours: a decrease in participation in organized sports and other physical activities, an increase of the duration of screen time, an increase of the consumption of snacks and sugared drinks and a decrease of the consumption of fruit and vegetables and eating breakfast. This unhealthy behavioural pattern, developed during adolescence is likely to track into adulthood and to have negative consequences on body weight, health and premature mortality. Therefore, establishing a healthy lifestyle during adolescence may prevent health problems in adulthood. The most promising strategy for gaining or maintaining a healthy weight in adolescents is a combination of both reducing energy intake and increasing energy expenditure.

Understanding and changing energy balance related behaviour

In order to develop strategies to effectively encourage healthy EBRB in adolescents, a thorough understanding of their EBRB is needed. The Environmental Research framework for weight Gain prevention (EnRG) is an appropriate instrument, because it describes the underlying mechanism of EBRB as a combination of individual cognitive mediators, based on the Theory of Planned Behaviour, and environmental factors, based on the ANGELO-framework (figure 1.1). The environmental factors influence EBRB both directly, e.g. by offering opportunities for healthy behaviour and indirectly by affecting cognitive mediators, such as attitude, social norm and perceived behavioural control. Personal or behaviour-related characteristics can moderate the adolescents’ response to individual or environmental factors. By integrating individual and environmental factors, the EnRG-framework advocates for investigating the process of behavioural change as a result of multiple behaviours, in line with the socio-ecological perspective of health behaviour that is widely used in public health. Parents and school staff are key persons in the micro environment of adolescents and influence adolescents’ EBRB directly, by providing opportunities to eat healthy and be physically active and set rules, and indirectly by supporting adolescents in developing a personal attitude, behavioural control and demonstrating a social norm regarding healthy behaviour. The adolescent peer group is also an influential part of the micro-environment. Media and marketing organisations and sports organisations are influential stakeholders in the macro environment of adolescents.
The EnRG-framework is useful for analysing EBRB, but does not systematically link the desired changes in behaviour with appropriate interventions. For this purpose, Michie et al.\(^{(43)}\) have developed a framework, named the behaviour change wheel (figure 1.2). The uniqueness of the framework is the combination of health behaviour in its context, as the starting point for intervention design and the linking of behaviour with appropriate intervention types and policy categories. As an overarching framework for understanding behaviour, the COM-B system is used: the components capability (C), opportunity (O) and motivation (M) interact to generate behaviour (B) that in turn influences these components. Capability is defined as the individual's psychological and physical capacity, such as having the knowledge and skills, to engage in specific, desired behaviour. Motivation includes reflective processes (e.g., conscious decision making) and automatic processes (e.g., habits, emotional and impulsive responses) inducing behaviour. The opportunity component is determined by the physical and the social environment. The middle circle in the wheel involves the intervention functions that can be selected in order to change one or more components of the behaviour system and consequently influence the targeted behaviour. The nine intervention functions are training, enablement, modelling, environmental restructuring, restrictions, education, persuasion, incentivisation and coercion and are applied by several, different intermediaries. The outer wheel provides policy categories.
that can stimulate or discourage the use of certain intervention types by intermediaries. Adolescents’ EBRB is a result of the (inner circle) behaviour system, determined by capability, opportunity and motivation. Parents and teachers are key persons to provide opportunities, develop adolescents’ capabilities and increase their motivation for healthy behaviour (inner circle) by delivering intervention activities (middle circle), thus affecting the behaviour system of adolescents. Policy on health behaviour at the school, local and national level (outer circle) supports the adoption and delivering of interventions.

The EnRG-framework and the behaviour change wheel both appoint several stakeholders at several levels, playing a role in health promotion. The use of a socio-ecological approach to health promotion is much advocated nowadays, considering that interventions targeting one risk factor of behaviour in one setting have limited effects on BMI. A system of interventions is considered more promising, targeting a variety of influences simultaneously in multiple settings and at different levels, which is in line with socio-ecological models for health promotion. In a socio-ecological approach, personal and environmental determinants of behaviour at different levels are interdependent and interact with each other. Thus, if a change is made at one level, other levels may be affected, including targeted individual’s behaviour.

![Figure 1.2 The behaviour change wheel by Michie et al.](image)

*Figure 1.2 The behaviour change wheel by Michie et al.*
The socio-ecological model in figure 1.3 is an adaption of the original model by Bronfenbrenner[46,48] and reflects the environmental influences on tobacco use and nutrition in both youth and adults on the levels individual choice, (biological, psychological), interpersonal and household environment, school and work environments, neighbourhood/community physical and social environments and policy inputs. These environmental levels can also be applied to EBRB in youth as they reflect the living environments of youth. Therefore, the model fits with our approach to overweight prevention by encouraging a healthy lifestyle in adolescents.

The individual choice level represents the health choices made by the adolescent with regard to his EBRB, determined by biological and psychological factors. At the level of interpersonal and household environments, parents are key persons in the lives of adolescents. Considering that parents raise their children, they are primarily responsible for their children’s health behaviour. Parents can have a positive impact on dietary and physical activity behaviour of their children by interventions types in the behaviour change wheel, such as acting as role models and offering opportunities to behave healthy at home.[27,28] The involvement of parents at the school level is desired, because this positively affects outcomes of school-based interventions.[49]

With regard to youth, the school setting is included as a separate level in the socio-ecological model. Schools are considered a strong setting to encourage healthy behaviour in youth because of their potential to reach youth including their parents and their responsibility and capacity to educate youth.[50,51] At school, besides learning academic knowledge and skills, students adopt social-cultural norms that influence health behaviour.[52] In addition, schools can benefit themselves from the healthy behaviour of students considering that health behaviour and a healthy body weight are positively associated with academic achievements. Several intervention types of the behaviour change wheel can be found in the school setting, mostly carried out by teachers, who educate students in health behaviour and physical activity behaviour, supervise school regulations on healthy behaviour and act as role models.

The influence of the physical and social environment of the neighbourhood and community is determined by demographic and societal characteristics as socio-economic status, safety of the neighbourhood, accessibility of recreational facilities and the presences of convenience foods and restaurants.[19, 38, 53, 54] Therefore, interventions to create a favourable physical and social community can contribute to encouraging a healthy lifestyle. Policy inputs consist of laws, regulations and initiatives that support the interventions on the lower levels; in the community, at school and at home. In this thesis, the focus is on the energy balance related behaviour of adolescents and the influences of school staff and parents, who most directly affect the health behaviour of adolescents.
Encouraging healthy behaviour in the school environment

The WHO advocates for a comprehensive school healthy approach, also called health promoting schools, that can be defined as “an internationally recognized framework for supporting improvements in students’ educational outcomes while addressing health in a planned, integrated and holistic way.”\(^{(56)}\) According to this concept, school-based health promotion should concern the whole school environment in which the embedding of health education in the curriculum is combined with a favourable school environment, a school health policy and partnerships with important stakeholders of different levels of the socio-ecological model, such as adolescents themselves, parents, youth care organisations and sports organisations.\(^{(51; 56; 57)}\) Following a comprehensive approach, school-based interventions to prevent overweight in adolescents, targeting dietary and physical activity through education and changes in the school environment have shown positive short term results.\(^{(49; 58; 59; 60)}\) However, long term effects on EBRB and the average BMI of adolescents are limited, because the intervention often is a one time and short-
term event in a school career instead of a continuous learning program that is consistent with the social and physical school environment.\(^{49, 61, 62}\) Also the limited-scale adoption and sustained implementation of interventions are serious barriers for the success rate of school-based interventions.\(^{52, 63, 64}\)

In the process of adoption and implementation of school-based health interventions, teachers are key persons as they deliver interventions in classroom. They have a powerful influence on the learning of students as they translate key objectives into learning goals for their lessons, create the learning environment and determine the focus of the lessons.\(^{65}\) Besides this formal, teaching role, teachers can also be considered important role models in the school setting.\(^{66}\) However, the teachers’ role and behaviour are underexposed in studies on school-based health promotion.\(^{67}\) Determinants that are associated with the implementation of school-based health interventions by teachers are: experienced need and perceived benefits of an innovation, commitment to trying an innovation, attitude towards the innovation, self-efficacy and skill proficiency.\(^{68, 69}\) Also barriers in the school environment, such as lack of endorsement by the school management, colleagues or parents or a lack of facilities, can hamper the teachers’ actions and the effectiveness of classroom-based interventions.\(^{70, 71}\) Involvement of parents, the key persons in the home situation, in school-based health interventions can contribute positively to the effect, especially when the focus is on home related practices.\(^{39, 50, 51, 72, 73}\) However, the quality, dosage and participation rate of parental involvement in school-based health interventions is not often studied. Consequently little is known about the mechanisms behind the effective contribution of parents.\(^{74}\)

When developing a strategy to encourage healthy behaviour, the behaviour of key persons in intervention organisation, development, adoption and implementation needs to be taken into account. Similar to the health behaviour of an individual, the motivation, capability and opportunity of these key persons to fulfil their task should be investigated.

**Dutch secondary education**

The Dutch secondary education system can be characterized by three educational levels: preparing students for university (VWO, 6 years), for higher professional education (HAVO, 5 years) and prevocational education preparing for secondary vocational education (VMBO, 4 years). In addition to mainstream secondary education, students with learning and behavioural difficulties attend secondary special education (VSO), elementary vocational training (PRO) preparing them for entering the labour market or follow a learning support programme (LWOO) provided by a mainstream VMBO school.\(^{75}\)
In the first two school years, students follow a general curriculum. The content of this curriculum is nationally established in 58 key objectives that students need to achieve. Two key objectives relate to health behaviour: knowledge about the human body and health, care and safety for oneself and others. Six key objectives relate to physical activity: development of motor skills, physical performances, introduction to physical activities, fair play, organisation of activities and healthy physical activities (Box 1.1). The Dutch educational system is decentralised, which means that schools have a high degree of autonomy in designing the learning programme in order to achieve the national key objectives. Learning about a healthy lifestyle is mostly part of a separate health education subject or integrated in biology lessons. On average, students have 3 – 4 hours of physical education (PE) per week and 14-19 lesson hours on energy balance related behaviour per year. In 67% of the Dutch schools, predominantly prevocational schools, cooking classes are given with a widespread frequency (0 – 40 hours/year). A written school health policy is present at 19% of the Dutch schools and 5% of the schools has policy on prevention of overweight. Consequently, teachers are predominantly responsible for designing a lesson program to attain key objectives.

In the Netherlands, students are used to bring a home-made lunch to school and 76% of the students cycles or walks to school. Most Dutch schools have a school canteen (91%) and/or vending machines with candy (80%) or soda (89%). In addition to PE lessons, 68% of the schools organize extra-curricular physical activities. Although Dutch secondary schools increasingly put efforts into school-based health promotion with regard to overweight prevention, there is room for improvement.

**Context of this study: JOGG city Zwolle**

In order to tackle childhood overweight, the city Zwolle in the Netherlands (120,000 inhabitants) started in 2006 a community-based program, called ‘Healthy together’ in which several organisations for health, welfare, sport and education worked together to promote a healthy lifestyle and create a healthy environment. The program ‘Healthy together’ can be considered as a precursor of the JOGG approach that the city of Zwolle adopted in 2010. JOGG, meaning Youth on a healthy weight, is the Dutch adaption of the French EPODE-approach. The EPODE-approach proved to be successful in reducing childhood overweight by a joint effort of stakeholders from business, education, healthcare, housing, media, sports and welfare in the local community and serves as a blueprint for other countries.
Key objectives related to health behaviour (domain Man and Nature):

- (objective 34) The pupil learns to understand the essentials of the build and function of the human body, to establish connections with the promotion of physical and psychological health, and to take his/her own responsibility in this respect.
- (objective 35) The pupil learns about care and learns to care for him-/herself, for others and for his/her environment, as well as about how to influence his/her own safety and that of others in a positive way in different situations of life (the living environment, learning, working, going out, traffic).

Key objectives related to physical activity (domain Physical Education and Sports):

To experience physical activity:

- (objective 53) The pupil learns, also in perspective of practicing them outside school, to get familiar in a practical way with different exercise activities from various branches such as play, gymnastics, athletics, movement to music, self-defence and current trends in physical exercise, and explore his/her possibilities in all of them.
- (objective 56) The pupil learns to be a sport during the exercise activities, to consider the possibilities and preferences of others, and to show respect and care for each other.

To improve physical activity:

- (objective 54) The pupil learns, by means of challenging situations of physical exercise, to expand his/her repertoire of exercises.
- (objective 55) The pupil learns to apply the basic principles of the exercise activities at his/her own level.

To organise physical activity:

- (objective 57) The pupil learns to carry out simple organizational tasks that make it possible to practice exercise activities individually and together with other pupils.

Healthy physical activity:

- (objective 58) The pupil learns about the value of physical exercise for human health and well-being and learns to experience this through participation in practical movement activities.

Box 1.1: Key objectives first two years of secondary school in the Netherlands associated with health behaviour and physical activity\(^{(76)}\)
In Zwolle, the focus was at first on primary school children. After a survey, named ChecKid, was carried out, a program was developed and several interventions in the school and the neighbourhood were implemented. Subsequently, a health promotion program, addressing the EBRB of adolescents was on the agenda. Prior to developing an intervention program, the behaviour, perceptions and needs of adolescents with regard to their health behaviour needed to be investigated, taken into account the school environment being a valuable setting for health promotion. This thesis was conducted in order to determine clues for school-based health promotion in secondary schools in Zwolle.

**Aim of the study**

The aim of this thesis is to gain insight in the EBRB of adolescents on schooldays and the perceptions of adolescents, school staff and parents on school-based health promotion in interaction with encouraging health behaviour at home. The personal views, motives and capabilities of key persons, such as parents and teachers, in delivering interventions are often underexposed in studies. However, knowledge about these personal factors can contribute to the development of integrated intervention strategies in which the actions of different key persons match with their motives and abilities are aligned and supported by each other. In connection with the aim of the study, four subquestions were formulated:

1. What perceptions do adolescents in prevocational schools have regarding a healthy bodyweight, EBRB and strategies for overweight prevention?
2. What differences in adolescents’ EBRB can be found between boys and girls, students of different educational levels and students with or without overweight?
3. What perceptions do adolescents, school staff and parents have of the role of parents in strategies for overweight prevention in adolescents and how is this role associated with adolescents’ EBRB?
4. What perceptions do adolescents, school staff and parents have of the role of the school with regard to adolescents’ EBRB?
5. What are the motivation, capability, opportunities and actions of teachers of health-related subjects to encourage healthy EBRB in their students?

The main focus of this thesis is on prevocational students, as overweight tends to be more prevalent amongst this group compared with higher educational level students. A relatively large group of prevocational students are coming from a lower social economic background compared with higher educational level students.
Mixed methods were used to achieve the aim of the study. In focus group interviews on prevocational schools in the region around Zwolle, the Netherlands, adolescents, parents and school staff expressed their beliefs and perceptions on energy balance related behaviour of adolescents and their views on school-based strategies for overweight prevention in adolescents. In collaboration with the local public health service, GGD IJsselland, the CheckTeen study was carried out at 9 secondary schools in Zwolle in order to investigate the adolescents’ dietary and physical activity behaviour (EBRB) and their perceptions of school-based interventions and parental influences. A digital questionnaire on EBRB was distributed in the schools and combined with BMI measures, taken by school nurses during the periodical medical health check among second graders. The periodical medical check is part of the free of charge nationwide Youth Health Care program, in which children’s health is monitored at set ages.(87) Because prevocational education is often embedded in a comprehensive school, students of higher educational levels (senior general secondary education and pre-university education) were included in the CheckTeen study, which enabled us to investigate differences in BMI, EBRB and determinants of behaviour between students of different educational levels. As a follow up on the focus group interviews with school staff, a digital questionnaire was distributed amongst Dutch teachers in health education, including biology, and physical education in order to investigate their motivation and actions with regard to teaching about healthy EBRB.

Outline of the thesis

In chapter 2, the perceptions of second grade prevocational students concerning benefits, barriers and strategies of healthy eating and physical activity as expressed in the focus group interviews are investigated. The awareness and beliefs of school staff and parents regarding adolescents’ overweight and energy balance related behaviour, their motivation for health promoting activities and suggested actions in the school environment are discussed in chapter 3. Chapter 4 reports on the dietary and physical activity behaviour on schooldays and the beliefs about school-based interventions of the 1,084 students of secondary schools in Zwolle, who participated in the CheckTeen study. Differences between students of different educational levels, sexes and BMI-categories are described. The CheckTeen questionnaire also provided information on the parental influence on EBRB of adolescents as perceived by adolescents. In chapter 5, these influences are related to adolescents’ dietary and physical activity behaviour. In chapter 6, the teachers’ awareness of overweight as public health problem, their motivation, actions and perceived barriers with regard to teaching about healthy energy balance related behaviour (EBRB) to Dutch
prevocational students are studied. In Chapter 7, an overview of the general findings is presented and a reflection on the results is given, followed by methodological implications. The chapter ends with recommendations for practice, policy, education and research in school-based health promotion and the final conclusion.
References


26. Bauer KW, Yang YW, Austin SB (2004) "How can we stay healthy when you're throwing all of this in front of us?" Findings from focus groups and interviews in middle schools on environmental influences on nutrition and physical activity. Health education & behavior: the official publication of the Society for Public Health Education 31, 34-46.


