

Utrecht University, The Netherlands
Master Child and Youth Psychology

Ready to take responsibility for your own eating behavior?
Self-regulatory predictors of healthy eating behavior among adolescents

Noa Chechover, studentnr. 3084698
June, 2009

A thesis submitted to the Department of Clinical and Health Psychology

Supervisors:

Prof. Dr. Denise De Ridder

Dr. Judith Dubas

Marijn Stok, MSc

Part of the research project Tempest

Preface

This thesis presents results from my master research at the Utrecht University. This study focused on self-regulatory predictors of adolescents' healthy eating behavior, and is part of Tempest (Temptations to Eat Moderated by Personal and Environmental Self-regulatory Tools), a cross-national research project about self-regulation of eating behavior of adolescents.

I want to thank my supervisors Prof. Dr. Denise de Ridder, Dr. Judith Dubas and Marijn Stok, MSc, for their pleasant working atmosphere, encouraging approach and useful advice.

Also I want to thank Peter Symanzig, teacher at the College de Heemlanden high school in Houten, for his positive cooperation and for giving me the opportunity to carry out my research at his school during his lessons. I am also grateful to the students for their serious cooperation and contribution to this study.

Noa Chechover

Utrecht, June 2009

Abstract

Linking self-regulatory perspectives to healthy eating behavior, the present study investigated what kind of ideas adolescents have about their own self-regulation and what aspects are important in order to resist food temptations. Whereas previous studies have focused on general causes of adolescents' unhealthy eating patterns, this study emphasizes their own role in healthy eating behavior, by investigating their self-regulation. Participants took part in the process of concept mapping, by which factors influencing healthy eating behavior were explored. Concept mapping is a structured qualitative method that is used to help groups describe ideas on any subject of interest. Eight main clusters that influence healthy eating behavior were formed and discussed. Subsequently, relations between self-regulation, healthy eating behavior and emotional eating were examined, by letting 89 high school students between the ages of 14 and 18 fill in a questionnaire. Adolescents' daily healthy eating patterns were not related to self-regulation, which was contrary to the hypothesis. However, a relation was found between self-regulation and the self-reported importance of healthy eating behavior. Analyses confirmed the hypothesis that females tend to show more emotional eating behavior than males. In addition, a relation between self-regulation and emotional eating was found, although this relation disappeared when the degree of hunger was controlled for. Since males reported being hungrier than females while filling in the questionnaire, these gender differences in hunger may have affected the levels of self-regulation. The level of adolescents' self-regulation may, in turn, have influenced the level of emotional eating when feeling hungry. These results indicate a possible moderated mediation effect between gender, hunger, self-regulation and emotional eating. Future research is required to examine the direct and indirect effects of self-regulation and to what extent gender and hunger underlie self-regulatory competence in healthy eating behavior.

Keywords: self-regulation, eating behavior, emotional eating, adolescence

Abstract

Door zelfregulatieve perspectieven aan gezond eetgedrag te koppelen, is in huidig onderzoek getracht een duidelijker beeld te krijgen over wat voor soort ideeën adolescenten hebben over hun eigen zelfregulatie en welke aspecten belangrijk zijn bij het weerstaan van voedsel verleidingen. Aangezien eerdere onderzoeken zich hebben gericht op algemene oorzaken van ongezonde eetpatronen van adolescenten, benadrukt dit onderzoek hun eigen rol in gezond eetgedrag, door het onderzoeken van hun zelfregulatie. De participanten hebben deelgenomen aan het proces van concept mapping, om meer inzicht te krijgen in factoren die invloed hebben op gezond eetgedrag. Concept mapping is een gestructureerde kwalitatieve methode, die wordt gebruikt om groepen te helpen ideeën te beschrijven over onderwerpen die van belang zijn. De acht belangrijkste clusters die van invloed zijn op gezond eetgedrag zijn gevormd en besproken. Vervolgens zijn verbanden tussen zelfregulatie, gezond eetgedrag en emotioneel eten onderzocht door 89 leerlingen in de leeftijd tussen 14 en 18 een vragenlijst te laten invullen. Dagelijkse, gezonde eetpatronen bleken niet gerelateerd te zijn aan zelfregulatie, in tegenstelling tot de hypothese. Echter, een verband werd gevonden tussen zelfregulatie en de zelfgerapporteerde belangrijkheid van gezond eetgedrag. De hypothese dat meisjes meer emotioneel eetgedrag vertonen dan jongens, is bevestigd door analyses. Daarnaast is er een relatie gevonden tussen zelfregulatie en emotioneel eten, hoewel deze relatie verdween wanneer gecontroleerd werd op de mate van honger. Aangezien jongens meer honger bleken te hebben dan meisjes tijdens het invullen van de vragenlijst, is het mogelijk dat deze sekseverschillen in de mate van honger invloed kunnen hebben gehad op de mate van zelfregulatie. Daarnaast kan het niveau van zelfregulatie van de adolescenten invloed hebben gehad op het niveau van emotioneel eten, wanneer de adolescenten hongerig waren. Deze resultaten wijzen mogelijk op een gemodereerde mediatie effect tussen sekse, honger, zelfregulatie en emotioneel eten. Toekomstig onderzoek is nodig om de directe en indirecte effecten van zelfregulatie te onderzoeken en daarbij een beter beeld te krijgen in welke mate sekse en honger ten grondslag liggen aan zelfregulatieve competentie van gezond eetgedrag.

Trefwoorden: zelfregulatie, eetgedrag, emotioneel eten, adolescentie

The ability to control and monitor behavior, emotions and attention is one of the most important features of the self. With being in control of our inner states and responses, self-regulation is vital for achieving personally relevant goals. Optimal self-regulation is thus reached by resisting immediate, short-term impulses and temptations, and focusing on long-term goals. Those immediate impulses, however, sometimes seem to have a higher priority because of the instant gratification, and often lead to behavior that is contradictory to the long-term goals (Giner-Sorolla, 2001; Hofmann, Rauch, & Gawronski, 2007).

Self-regulation can be broken down into cognitive regulation and regulation of emotions (Magar, Phillips, & Hosie, 2008), and has been frequently investigated in relation to health behavior during adolescence, including eating behavior (De Ridder & De Wit, 2006; Wills, Isasi, Mendoza, & Ainette, 2007). Improving the eating patterns of adolescents is of great importance, especially because healthy eating habits at an early age have been found to be determinants of eating patterns in later life (Branen & Fletcher, 1999; Martens, van Assema, & Brug, 2005; Shepherd et al., 2006). Problematic eating behavior, such as emotional eating (Macht & Simons, 2000), has been shown to often originate during adolescence (Cartwright et al., 2003; Snoek, van Strien, Janssen, & Engels, 2007). Intervening at that age may thus reduce the chance of unhealthy eating behavior becoming practically impossible to change.

Numerous studies have investigated the causes of unhealthy eating patterns of adolescents (e.g. Story et al., 2002). However, few studies have investigated adolescents' concepts about self-regulation in relation to their own eating behavior. Moreover, only a few studies regarding eating behavior and emotional eating have taken a self-regulatory perspective (Hofmann et al., 2007; Tice, Bratslavsky, & Baumeister, 2001).

The current study has two main goals. It aims to get a clearer view of what kind of ideas adolescents have about their own self-regulation and what aspects are important regarding their food intake and eating behavior. Moreover, it investigates the relation between self-regulation, eating behavior and emotional eating. In order to develop effective preventive interventions and promote healthy eating, it is essential to gain insight into the extent in which adolescents are able to deal with unhealthy temptations.

Self-regulation

Self-regulation is of great importance for the development and maintaining of physical health. Broadly defined, self-regulation refers to the many processes by which individuals exercise control over their behavior, states and inner processes in order to achieve personally

relevant goals (Baumeister & Vohs, 2004). Those goals are representations of desired outcomes and are usually the result of intentions. Those desired outcomes, however, are usually more positive in the long-term than in the short-term. Chocolate, for example, is delicious and gives a good feeling in the short-term, but is fattening in the long-term. Thus, having the intention of watching weight, in order to achieve the long-term goal, one must find ways to resist the short-term temptation, namely eating too many chocolate bars.

Research on self-regulation was greatly influenced by Bandura's view that intentional control of behavior is achieved by two sources of motivation. The capacity to represent future consequences motivates individuals to act in concordance to their future outcomes and guides their actions. A second source of motivation guides individuals' behavior by goal-setting and self evaluation of their own actions (Bandura, 1977, in Bandura & Simon, 1977). This indicates that motivation alone is not sufficient for reaching goals; goal-setting also plays an important role. Furthermore, goal proximity seems to have regulative functions, as Bandura's theory suggests. It distinguishes between subgoals and end goals, where focusing on specific subgoals influence individuals' immediate actions in order to achieve the end goal. In their study about eating behavior, Bandura and Simon (1977) indeed found that the participants who focused on proximal subgoals achieved much greater reduction in their food consumption than did the subjects focusing on distal goals.

As mentioned before, an important part of self-regulation is the regulation of emotions, also known as emotional self-regulation. Emotion regulation refers to the control of affect, drive and motivation (Banfield, Wyland, Macrae, Münte, & Heatherton, 2004). Failures in self-regulation may occur, however, when conflict arises between emotion regulation and impulse control (Tice et al., 2001). When experiencing intense emotions, the tendency to think about the consequences of one's actions decreases. Also, suppression of emotions may lead to a poor emotion regulatory style, which, in turn, also often leads to failure in self-regulation. In times of poor emotion regulation, risk behaviors often take place (Magar et al., 2008).

Health behavior has been an interesting subject for the study of self-regulation and has usually been investigated in relation to various personal problems as a result of unhealthy behaviors, including addiction and substance use, such as excessive alcohol use and cigarette smoking. Self-regulation has also been often investigated in relation to crime, violence and risk behaviors such as illegal or anti social actions (Gardner, Dishion, & Connell, 2008; Magar et al., 2008). However, a self-regulatory perspective, emphasizing unhealthy eating behavior, has been applied less often. In fact, this is also the case with the critical issue of

adolescents as subjects for research about unhealthy eating behavior, which can be seen as a risk behavior as well, as it has serious health consequences.

Self-regulation and eating behavior

A lot of food-related modifications, such as eating behaviors and health changes occur in adolescence, a period characterized by physical, developmental and social changes (Story, Neumark-Sztainer & French, 2002). Furthermore, adolescence is a period of increasing autonomy and independence, which naturally leads to more freedom and risk behaviors. This freedom also manifests itself in what and when to eat. As a result of this freedom, unhealthy eating behavior, such as skipping breakfast, eating fast (high-fat) food, low fruit and vegetable intake, is very common in adolescence. Healthy eating guidelines, on the other hand, include a diet low in saturated fat, choosing a variety of fruits, vegetables and grains each day (Croll, Neumark-Sztainer, & Story, 2001). A longitudinal study about fast food consumption in relation to changes in body mass index (BMI) in the transition from childhood to adolescence has shown fast food consumption to be a predictor of rapid weight gain and overweight in females (Thompson et al., 2004).

During adolescence, time spent with parents usually decreases, while time spent with peers increases. A study about the importance of healthy eating among adolescents showed that adolescents associated unhealthy foods with peers, whereas healthy foods were associated with eating at home with the family (Croll et al., 2001). It has been shown that fruit and vegetable intake was positively related to a high level of self-control, while poor self-control was related to saturated fat intake (Wills et al., 2007). Furthermore, a study about influences of eating patterns of adolescents has shown that adolescents who made their own choices about their food consumption were 25 percent more likely to skip breakfast (Videon & Manning, 2003). Thus, self-regulation becomes increasingly meaningful in adolescence for healthy eating behavior.

As it becomes clear, the message of healthy eating behavior has not been translated into actions by many adolescents. This is in spite of adolescents having sufficient knowledge of healthy eating, and knowing with preciseness the benefits and the importance of it. It was shown that adolescents associate healthy eating behavior with limiting high-fat food and watching fat and calories (Croll et al., 2001). The fact that adolescents are aware of the advantages and care about the health risks is very meaningful; it provides the opportunity of investigating unhealthy eating behavior in the context of difficulties that adolescents encounter regarding food temptations and the corresponding self-regulatory failures. In other

words, it provides the opportunity to investigate the gap between knowing that healthy eating is important and actually behaving in concordance with this knowledge.

Although, as mentioned before, unhealthy eating behavior is common in adolescence, healthy nutrition is of great importance especially during this critical developmental period (Croll et al., 2001). Unhealthy eating patterns have been found to be directly related to chronic diseases, obesity (Larson et al., 2008; Story et al., 2002; Xie, Gilliland, Li & Rockett, 2003) and eating disorders such as bulimia and anorexia nervosa (Rozin, Bauer & Catanese, 2003). The questions arise: What kind of goals do adolescents have regarding healthy eating? What is important to them in order to resist unhealthy food temptations? How do adolescents experience their own role in making wise choices in food consumption? And, maybe most importantly of all: what causes the frequent failure of adolescents to translate these goals and ideas into action?

Although studies in the area of self-regulation have been conducted (Hofmann et al., 2007; Magar et al., 2008; Tice et al., 2001; Wills et al., 2007), until now it is relatively unknown how adolescents perceive healthy eating and which things are important to them. Most research has been carried out by interpreting ‘dry’ scientific data instead of getting ‘fresh’ inside perspectives. By ‘picking the brains’ of adolescents, obtaining direct information from them and thereby getting a clearer view on how *they* handle unhealthy food temptations, an opportunity will be given for adolescents to express their opinions, needs and perceptions. As a result, beneficial interventions will be facilitated and will encourage healthy eating behavior.

Various environmental factors, such as parents, socio-economic status (SES), friends, advertisement and schools are important influencers as well of healthy eating behavior. School food policies have found to be related to student eating behaviors. A study about eating and snacking patterns among adolescents showed that decreased access to foods high in fat and sugar at the schools was related to less frequent purchase of these types of foods (Neumark-Sztainer, French, Hannan, Story, & Fulkerson, 2005). Likewise, Martens and colleagues (2005) pointed out an association between the availability and accessibility of high-fat snacks and the consumption of high-fat snacks. As said before, however, along with environmental factors, personal factors such as self-regulation, attitudes, motivation, knowledge and hedonic aspects also play a role in healthy food consumption. Failure in self-regulation as a result of temptations has been linked to high-calorie foods intake and obesity (Tice et al., 2001).

Self-regulation and emotional eating

Healthy eating contributes to an overall sense of well-being. A natural response to internal signals, feelings of hunger and satiety, would be food intake. Sometimes, however, food is used as a defence for negative affect, also called ‘emotional eating’. Emotional eating can be defined as eating in response to negative emotions, such as anxiety, loneliness, depression and anger (Faith, Allison, & Geliebter, 1997). When experiencing negative emotions, there is an urgent need for making that feeling go away, which often manifests itself in poor emotion regulation.

Multiple studies have investigated self-regulation, which includes emotion regulation, in relation to emotional eating. Self-regulation requires a focus on long-term goals, whereas negative emotions shift priorities to the immediate present. Emotional distress therefore often leads to behavior contradictory to the long-term goals, because of the short-term ‘here and now’ focus on feeling better. Activities that usually ensure immediate pleasure include high-calorie foods, which come at the expense of the long-term goal of maintaining a healthy diet (Tice et al., 2001).

Negative emotions may manifest themselves in a negative mood. A study about students’ eating habits showed a relation between eating according to mood and eating too much (Branen & Fletcher, 1999). Likewise, in a field study of a non-clinical population, negative emotional states have been found to be related to both motivations to eat in order to regulate the emotional state and a high tendency of eating irregularly (Macht & Simons, 2000). Stress has also been associated with an increase in fatty food and snacks, and a decrease in fruit and vegetable intake in adolescents (Cartwright et al., 2003). In contrast to these findings, a study about unhealthy eating behavior in adolescence has shown only a limited relation between emotional distress and unhealthy eating habits (Van Kooten, De Ridder, Vollebergh, & Van Dorsselaer, 2007). Importantly, there are gender differences in emotional eating. A study about eating behavior and overweight in adolescence, showed that females scored higher than males on emotional eating (Snoek et al., 2007).

Present study

The aim of the present study is to investigate what adolescents find important for their own self-regulation regarding their eating habits. By obtaining information about the aspects that are of great importance to adolescents from the adolescents themselves, it will be possible to encourage healthy eating behavior in a more effective, for adolescents appealing, way and reduce unhealthy eating patterns.

Since previous research has found gender differences in emotional eating (Snoek et al., 2007), those differences will be investigated. The first hypothesis is that females tend to show more emotional eating behavior than males. Furthermore, the relation between self-regulation and eating behavior will be investigated, as found in previous studies (Wills et al., 2007). The second hypothesis is that a high level of self-regulation is positively related to healthy eating behavior. Based on previous research (Macht & Simons, 2000), self-regulation will also be investigated in relation to emotional eating. The third hypothesis is that self-regulation is negatively related to emotional eating. Moderator effects will also be examined. The fourth hypothesis is that gender moderates the relation between self-regulation and eating behavior.

This study is part of the research project Tempest (Temptations to Eat Moderated by Personal and Environmental Self-regulatory Tools), a cross-national study about self-regulation of eating behavior of adolescents. The results of this study will be used for Tempest, in order to develop a self-regulation competence scale regarding unhealthy temptations, which lead to unhealthy eating behavior.

Method

Participants

Eighty nine students of College de Heemlanden high school in Houten, the Netherlands, participated in the study. The participants consisted of 31 HAVO¹ and 58 VWO-plus² students. The students were between the ages 14 and 18 ($M = 15.92$, $SD = 1.3$), and consisted of 34 males and 55 females. Of the total number of participants, 76 students were of Dutch origin and 13 students originated from another country.

Procedure

After getting the approval of the principal for the research, informed consent letters were given to the students of the participating classes to hand out to their parents. The study was divided into two parts, and took approximately forty minutes in total per class to complete. Five classes participated in this study, and each class was given the information that the participation in the study is voluntary and could be stopped at any time. The aim of the study, as well as the importance were explained during the introduction, using a PowerPoint presentation.

¹ HAVO (higher general continued education) is the second highest level in the secondary educational system of the Netherlands

² VWO-plus (pre-university secondary education) is the highest variant in the secondary educational system of the Netherlands

In the first part of the study, students took part in the procedure of concept mapping, which is a generic technique which can be applied to various themes in order to help a group describe its ideas on any subject of interest. Before beginning the process, a protocol for the concept mapping process was written. At the same time, a focus question about things that are important in order to ensure healthy eating behavior was developed. The process of concept mapping consisted of three phases: 1. Generating statements. In this phase, the participants brainstorm to create a set of statements about the subject, using the focus question as starting point. 2. Sorting the statements on content and priority. The participants sort the statements into piles of statements that belong together, labeling them in a meaningful way, and rate the importance of each statement. 3. Discussing the results. In the last phase, the maps are discussed with the group (Kane, & Trochim, 2007). Each of the phases was carried out by different classes.

In the first phase, generating statements about the focus question by free association, students of two classes ($N = 15$ and $N = 21$) were asked to complete the following sentence: “Things that are important to me in order to ensure my healthy eating, are...” on a sheet which was given to each of them. The students were given 15 minutes to write their ideas down, and afterwards the sheets were collected. After a procedure of merging the statements with the same meaning, deleting some irrelevant statements, and making a selection of sixty statements, the statements were entered into the computer, and were each printed on separate cards. The statements were divided into two groups of thirty statements each, which were analysed separately.

In the second phase of the concept mapping, each of the students of the next two classes ($N = 15$ and $N = 16$) received a set of numbered cards (from 1 to 30), containing the statements made by the former classes, with every class getting a different set of statements. Samples from the statements made by the participants of the first two classes, and given to the next to classes for the sorting task are “Taking your time to have a good breakfast” and “Asking your parents if they can buy tasty healthy food when going grocery shopping”. The participants carried out two successive sorting tasks. First, the students were asked to cluster the statements on their content by organizing the cards into piles of statements that belong together. The students were given the instruction of individually organizing the statements in a way that makes sense to them, and received forms for writing the numbers of the created groups down, as well as creating a name for each group. The following rules applied to the task: 1. Every card can be only used once. 2. A group has to consist of 2 cards or more. 3. It is not allowed to sort all statements into one pile. 4. All statements have to be placed into a pile.

The participants were given 15 minutes to complete the task of organizing the cards into groups and writing them down. After collecting the forms, rating sheets were handed out for the second task, prioritizing of the statements. The students were given the instruction to individually go through all of the thirty statements on the forms before beginning rating the statements by importance, in order to determine the relative priority of each statement, using the full range of rating values, ranging from 1 (*relatively unimportant*) to 5 (*extremely important*). The students were given 15 minutes for completing the second task. The obtained data of the two classes of both organizing the statements on content and prioritizing the statements were separately entered into the computer, and two concept maps, which is the graphical view of the group opinion, were created. Each map consisted of four clusters of statements.

The third phase of the concept mapping consisted of a discussion of the results of both concept maps, and was performed in one class ($N = 22$). First, the students were asked to read the statements belonging to each of the eight clusters, showed on PowerPoint slides, and were asked to name the clusters. The two maps, each containing four clusters, were then presented on slides. The students had the opportunity to express their opinion about whether the chosen names for the clusters were suitable for each cluster, what the meaning was of the clusters standing close to each other or in a distance, and which one of the maps represented the best way of sorting. Concept mapping is often used when the concept is broad and complex, and can be used to develop a questionnaire about the subject. In this study, concept mapping was used because of the need to get a clearer view on adolescents' ideas on the concept self-regulation regarding their own healthy eating behavior.

The second part of the study was the same for all five classes. The students were asked to complete a questionnaire on self-regulation and eating behavior, which took about twenty minutes, in a classroom during school lessons. After explaining to the students that the questionnaires are anonymous, the instructions were given to remain silent during and after finishing filling in the questionnaire, to work individually and to raise a hand if there were any ambiguities about the questions.

Instruments

All questionnaires were translated from English into Dutch for the students with the method of backtranslation.

Adolescent Self-Regulatory Inventory

The Adolescent Self-Regulatory Inventory (ASRI; Moilanen, 2007) was used to measure short-term and long-term self-regulation of adolescents. The original design includes 36 items, but since 9 items had low item-total correlation, they were discarded from the questionnaire. The 27 remaining items were used from the original design, and include 13 items concerning short-term self-regulation and 14 items concerning long-term self-regulation. It consists of a 5-point Likert scale ranging from 1 (*not at all true for me*) to 5 (*totally true for me*). Samples from the short-term items include: “When I’m bored I fidget or can’t sit still” and “After I’m interrupted or distracted, I can easily continue working where I left off”. Samples from the long-term items include “I lose control whenever I don’t get my way” and “I can find ways to make myself study even when my friends want to go out”. Cronbach’s α was .68 for the short-term items and .71 for the long-term items. For this study, the whole scale was used as a measure for overall self-regulation, and the internal consistency for the total scale was .81.

Eating Pattern Inventory for Children

The Eating Pattern Inventory for Children (EPI-C; Schacht, Richter-Appelt, Schulte-Markwort, Hebebrand & Schimmelmann, 2006) focuses on eating disorder symptoms with the dimensions dietary restraint, external eating, parental pressure to eat and emotional eating. It consists of 20 items measured on a 4-point Likert scale, ranging from 1 (*not at all true*) to 4 (*totally true*). For this study, the subscale of emotional eating was used, consisting of four items. Sample items on the emotional eating scale of the EPI-C include “I eat when I’m unhappy” and “When I am lonely, I comfort myself with food”. Internal consistencies were computed using Cronbach’s α , and were .92 for dietary restraint, .86 for external eating, .65 for parental pressure to eat and .92 for emotional eating.

Sociodemographic data

The adolescents answered questions about age, gender and ethnicity. General questions about the degree of hunger while filling in the questionnaire, and socio-economic status (SES) were added at the end of the questionnaire. Furthermore, six questions about daily healthy eating behaviors were answered by the participants (e.g. “How many portions of fruit do you eat on average per day?”).

Analyses

The Ariadne program for concept mapping was used to perform two types of analyses for each of the two sets of statements (Nederlands Centrum Geestelijke Volksgezondheid & Talcott, 1995). After the first part of the study, the statements made by the participants were entered into Ariadne, forming two sets of each containing thirty statements. After the second phase, a component analysis was performed, positioning the statements on a concept map. The distance between the statements showed how often they have been sorted together. Next, a cluster analysis was performed, grouping the statements in clusters. The most meaningful clusters were then selected from both of the sets. Finally, by using the prioritizing data, the relative importance of the clusters was calculated. This was also calculated for the individual statements. A graphical view, made by Ariadne, was used in order to analyse and discuss the clusters containing the statements.

The analyses of the second part of the study, the questionnaires, were conducted with SPSS (Statistical Package for the Social Sciences, version 15.0). To test correlations between the variables, bivariate correlations were performed. An ANCOVA was conducted to examine gender differences, and a MANOVA was performed to determine relations between variables. To show effects of explained variance, r^2 was used. Finally, a linear regression was conducted to examine moderator effects. For the analyses of the six variables of healthy eating behavior, the variables 'eating snacks' and 'drinking sodas' were recoded. Some items of the self-regulation questionnaire were also recoded (items 2, 6, 7, 8, 10 11, 12, 16 and 17) before starting the analysis.

Results

Concept mapping

Concept map 1

The analysis of the content sorting of the first set resulted in 10 clusters. Since some of the clusters consisted of only one or two statements, a selection was made of the four most notable clusters (see Figure 1 for the map containing the clusters). Calculating the perceived relative importance of the individual statements showed that the statement of the first set rated as most important was "Taking time to have a proper breakfast" ($M = 4.60$).

The first cluster, 'Regularity' ($M = 2.9$), consisted of five statements, emphasizing the importance of having ordered eating patterns. Participants placed statements such as "If you get hungry before dinner, eat fruit instead of a snack" and "Eating regularly and ordered". The second cluster, 'Taking time and making space' ($M = 3.71$), consisted of five statements, and

was located close to 'Regularity'. The cluster consisted of statements such as "Instead of eating only things you already know, try out new healthy food" and "Taking time to have a proper breakfast". The third cluster, 'Avoidance' ($M = 3.32$), consisted of six statements about ways to reduce the chance on unhealthy food temptations, and was located diagonally opposite to the other clusters. The cluster consisted of statements such as "Trying to stay away from food when you are feeling down, in order to avoid temptation" and "Not buying too many unhealthy things, so you don't get tempted to eat them". The fourth cluster, 'Knowledge and awareness' ($M = 3.28$), consisted of seven statements, and was located opposite to the first two clusters on the map. The cluster included statements such as "Knowing that healthy eating helps you feel good" and "Seeking more information about healthy eating".

Concept map 2

The analysis of the second set of statements resulted in 9 clusters. A selection was made of the four most notable clusters (see Figure 2 for the map containing the clusters), since some of the clusters consisted of only one or two statements. The statement rated as most important in the second set of statements was "Eating three good meals a day, so that you'll have less appetite during the rest of the day" ($M = 4.13$).

The first cluster, 'Rules and habits' ($M = 2.1$), consisted of six statements, emphasizing the importance of bringing structure into eating patterns in order for those patterns to become automatic. The cluster consisted of statements such as "Making a habit of eating something healthy every day" and "Making clear plans about how often you are going to eat sweets". The second cluster, 'Making it easier on yourself' ($M = 3.35$), consisted of six statements. The statements in this cluster, such as "Instead of taking the whole bag of potato chips, taking a small bowl" and "Putting not only unhealthy food, but also healthy food next to the computer", emphasized the importance of taking initiative in order to succeed in eating more healthily. The third cluster, 'Awareness' ($M = 2.95$), which resembles the fourth cluster of map 1, consisted of four statements about the importance of consciously thinking about healthy eating behavior and the importance of it, and was located close to the first cluster. The cluster consisted of statements such as "Consciously think about whether you're really hungry before you begin to snack, or whether it is a result of boredom" and "Realize that healthy eating is important for your health". The fourth cluster, 'Avoidance' ($M = 3.34$), as also created in concept map 1, consisted of six statements. Participants placed statements such as

“Not taking money to school so you don’t get tempted to buy something unhealthy” and “Not going to the supermarket during free periods and breaks”.

Discussion of the maps

In the third phase of the concept mapping, the two concept maps were discussed with a class. Before starting the discussion, the students named the clusters of both maps. There was a strong agreement between the names invented by the students and the given names of the clusters. Each cluster was then discussed with the class, giving the students the opportunity to give suggestions about the division of the statements. Most of the clusters made sense to the students, but some clusters included statements that, according to the students, ‘didn’t quite belong’ in the specific cluster. After discussing each cluster separately, the construction of each map was discussed as a whole. During this part of the discussion, the locations of the clusters were discussed, by obtaining ideas the students had about why certain clusters were located close/opposite to each other. Finally, the students expressed their opinion about which of the two maps possessed the most suitable clusters, and in which map the location of the clusters in relation to each other was the best way of sorting. By discussing the maps with the students, it became clear that both maps were accepted by the students, with no map better preferred than the other. The students came up with several explanations for the locations of the clusters in each map, which showed that they had an understanding of different aspects of reasons for clusters being located close/opposite to each other.

Questionnaires

Descriptive statistics

Questionnaires about eating behavior were filled in by eighty nine participants. In the questionnaire about self-regulation, one question was not answered by a participant. These data were coded as ‘missing’ and were not included in the analysis. An overview of the number of participants, mean scores, standard deviations and intercorrelations of the variables is given in Table 1.

Correlations were conducted to investigate the background variables school level and ethnicity in relation to all of the other variables. The results of the correlational test showed no significant relations between ethnicity and any of the variables (all p -values $> .05$). The degree of hunger was related to all of the variables (all p -values $< .05$, see Table 1). Furthermore, the correlation analysis showed a relation between the degree of hunger and age ($r = .33$, $p = .002$). Thus, based on these findings, the degree of hunger during completion of the

questionnaire is used as a control variable in all subsequent analyses, whereas age, ethnicity and school level were not.

Gender differences in emotional eating

To determine whether there were gender differences in emotional eating, an ANCOVA was conducted with emotional eating as the dependent variable, gender as a between-subjects factor and the degree of hunger as covariate. After adjusting for the degree of hunger, gender differences in emotional eating were found, $F(1,86) = 8.81, p = .004$, partial $\eta^2 = .093$. The results showed that females scored higher than males on emotional eating (adjusted means are 1.92 and 1.37, respectively). Furthermore, the results showed that 13.9% of the variance in emotional eating was explained by gender ($r^2 = .139$).

Self-regulation and emotional eating

To test if there was a relation between self-regulation and emotional eating, bivariate correlations were performed. The results showed a negative correlation between self-regulation and emotional eating ($r = -.22, p = .037$), accounting for 4.9 in the variance ($r^2 = .049$). Thus, adolescents with a higher level of self-regulation tended to show less emotional eating behavior, whereas adolescents with a lower level of self-regulation tended to show more emotional eating behavior. However, after performing a partial correlation in order to test if the relation between emotional eating and self-regulation remains after controlling for the degree of hunger, the results showed no correlation between self-regulation and emotional eating ($r = -.18, p = .089$). Thus, when controlling for the degree of hunger, scores on emotional eating did not differ between the levels of self-regulation.

Self-regulation and healthy eating behavior

To test if a higher level of self-regulation is related to healthy eating behavior, a MANOVA was conducted. The variables having breakfast, fruit and vegetables intake, eating snacks, drinking sodas and self-reported importance of healthy food intake, were entered as the six dependent variables. Since self-regulation is a continuous variable and not a categorical independent variable, self-regulation was entered as the covariate. There was not a significant effect of the level of self-regulation on the combined dependent variable of healthy eating behavior, ($F(6,79) = 1.52, p = .183$, partial $\eta^2 = .10$). Moreover, analysis of each individual dependent variable showed that, of the six variables, only the opinion about the

importance of healthy eating behavior varied significantly with the levels of self-regulation ($F(1,84) = 5.44, p = .022, \text{partial } \eta^2 = .06$).

Gender as moderator between self-regulation and emotional eating

Finally, moderator effects were intended to be examined in order to determine whether gender influences the relation between self-regulation and emotional eating. However, since there was no relation between self-regulation and gender ($r = -.05, p = .665$) and the results showed no interaction between gender and self-regulation, the hypothesis stating that gender is a moderator between self-regulation and emotional eating did not have to be tested. Thus, gender is not a moderator between self-regulation and emotional eating.

Discussion

The aim of the first part of this study was letting adolescents express their opinion by using concept mapping and letting them complete the sentence “things that are important to me in order to ensure my healthy eating are...”. Through this means, we were able to explore what ideas they have about their own self-regulation regarding their food intake and eating behavior. Although self-regulation has been researched in relation to healthy eating behavior (De Ridder & De Wit, 2006; Wills et al., 2007), until now it was relatively unknown how adolescents perceive healthy eating and what kind of strategies they have available in order to resist food temptations. The present findings of the first part of the study give insight on the subject of adolescents’ self-regulation in relation to healthy eating behavior.

In this part of the discussion, the obtained results and interpretations brought forward by the class will be reviewed. In the discussion of both concept maps (see also Figure 1, Figure 2 and Appendix A), the adolescents had the opportunity to express their opinion about the suitability of the names for each cluster, the meaning of the proximity or distance of the clusters, and which one of the maps represented the best way of sorting. By letting adolescents be an active part of the process of obtaining information about things that are important to adolescents in order to ensure healthy eating, useful insights were gained.

The first concept map consisted of the four clusters ‘Regularity’ (cluster 1), ‘Taking time and making space’ (cluster 2), ‘Avoidance’ (cluster 3) and ‘Knowledge and awareness’ (cluster 4). Cluster 1 and 2 were located next to each other on the map, which relation was interpreted in the class as changing habits, creating a certain routine of eating healthily and carrying out healthy eating behaviors automatically, that can be achieved by taking time and making space to create a healthy basis. Both of the clusters were located opposite to cluster 4,

which was interpreted as consciously gaining information, knowledge and awareness about healthy eating, and which location symbolized awareness as opposed to behaviors carried out automatically. Cluster 3 was located diagonally opposite to the other three clusters, which was explained as avoiding *unhealthy* food temptations (passively avoiding the negative aspects), which not necessarily means eating healthily, as opposed to the other clusters which focus on seeking ways to succeed in *healthy* eating behavior (active approach of the positive aspects). This indicates that not engaging in unhealthy eating behavior is of a different nature than engaging in healthy eating behavior.

The second concept map consisted of the four clusters ‘Rules and habits’ (cluster 1), ‘Making it easier on yourself’ (cluster 2), ‘Awareness’ (cluster 3) and ‘Avoidance’ (cluster 4). Cluster 1 and 3 were located close to each other on the map, which was interpreted by the students as becoming more aware and conscious about healthy eating behavior and creating rules and habits about it. Both clusters were located opposite to cluster 4, indicating, just as in the first map, that there are two dimensions concerning eating; the avoidance of unhealthy food temptations against seeking ways to succeed in healthy eating behavior. Cluster 4 was located opposite to cluster 2, which also emphasized the avoidance of temptations (e.g. not taking snacks to school) as opposed to the substitutive actions that could be carried out (e.g. taking an apple to school) in order to eat healthily. Cluster 2 was located diagonally opposite to cluster 1 and 3, which was interpreted as the somewhat ‘lazy’ way of making healthy eating easier against the deliberate activity of searching for ways to create and maintain a healthy diet.

The two statements of the concept maps rated as most important were both related to eating proper meals (‘Taking time to have a proper breakfast’ and ‘Eating three good meals a day, so that you’ll have less appetite during the rest of the day’, see also Appendix A). This indicated that watching what and when they eat in order to ensure eating healthily was perceived as more important by the adolescents than not eating unhealthy foods. Interestingly, it is the unhealthy foods eaten outside the house (often in the company of peers, see also Croll et al., 2001) that are ‘the big test’ of self-regulation.

It became clear that there was not only one solution for the concept maps, as the relations between the clusters could be explained through different perspectives. This was also the case when the location of certain clusters containing quite the same content varied. Both maps were accepted by the class, as they both included meaningful and relevant clusters of statements containing self-regulatory aspects that are important in order to ensure healthy eating among adolescents.

The aim of the second part of this study was to examine the relation between self-regulation, healthy eating behavior and emotional eating of adolescents, by letting them fill in a questionnaire. Since only a few studies have examined eating behavior and emotional eating from a self-regulatory perspective (Hofmann et al., 2007; Tice et al., 2001), the main purpose of the current study was obtaining new insights on this matter.

There were a few unexpected findings in this study, which impacted each other and the final conclusion. These findings are discussed below, with an attempt to find plausible explanations for the results. Interestingly, the degree of hunger perceived by the adolescents was related to gender, self-regulation and emotional eating. Adolescents showed lower levels of reported self-regulation as the degree of hunger increased. Also, the adolescents showed higher levels of emotional eating as the degree of hunger increased. Furthermore, males reported being hungrier than females while filling in the questionnaire.

Results investigating gender differences in emotional eating offer support to the predictions based on a study by Snoek and colleagues (2007) with females tending to show more emotional eating behavior than males. Also after controlling for the degree of hunger while filling in the questionnaire, a significant difference between males and females was found, which is in full accordance to previous reports showing that females tend to show more emotional eating behavior than males. It was interesting to discover that males showed a significantly higher degree of hunger during filling in the questionnaire, and scored lower on emotional eating, whereas females had a higher level of emotional eating while feeling less hungry while filling in the questionnaire. This is in concordance with the psychosomatic theory, which states that emotional eaters do not eat in response to hunger and satiety but in response to their emotions. According to this theory, eating is a result of negative emotions, and is not a result of actual hunger (Bruch, 1973, in Snoek et al., 2007). Since females reported having less hunger and yet scored significantly higher than males on emotional eating, these results provide further evidence in support of the theory.

Next, analyses revealed a significant negative relation between self-regulation and emotional eating, though the relation was not strong. However, the significance of the degree of hunger became clear from the fact that the relation disappeared after controlling for the degree of hunger. Apparently, adolescents who were hungry during the participation in this research, reported lower levels of self-regulation and more emotional eating than they would normally report. It may then be that, if the adolescents were tested on a full stomach, they would have shown higher levels of self-regulation. In other words, since it was found that the degree of hunger caused lower levels of reported self-regulation, which in turn caused higher

levels of emotional eating, the level of adolescents' self-regulation may have influenced the level of emotional eating when feeling hungry. Adolescents with a higher level of self-regulation may have controlled their hunger in a better way, which possibly would have resulted in lower levels of emotional eating, whereas adolescents with a lower level of self-regulation may have been less able to control their hunger, leading to higher levels of emotional eating. The findings in this study are not in line with previous reports showing that self-regulation is negatively related to emotional eating. Macht and Simons (2000) did find a direct relation between negative emotions and the tendency to regulate these emotions by eating irregularly and eating tasty foods. They did not control for the degree of hunger, however, which could have influenced the results. However, since there were gender differences in both the degree of hunger and emotional eating, but these gender differences were not found regarding self-regulation, it could be that the degree of hunger played a big role especially for males, and thereby indirectly influencing the strength of the relation between self-regulation and emotional eating. That is, gender differences in the degree of hunger may have affected the levels of self-regulation, while self-regulation, as noted before, may have effected the relation between the degree of hunger and emotional eating.

On the whole, the complex findings described above raise the two following questions: Did self-regulation play a mediating role on the link between hunger and emotional eating? Did gender have a moderating role between the effect of the degree of hunger on self-regulation? Integrating the findings, this would mean that self-regulation may underlie the relation between the degree of hunger and emotional eating. After all, adolescents with higher levels of self-regulation would be able to control their hunger in a better way, which would result in lower levels of emotional eating. Furthermore, the gender differences in the degree of hunger may have had an effect on self-regulation, which, in turn affected emotional eating (see also Figure 3, where the possible explanations are shown). All in all, this possible moderated mediation (Edwards & Lambert, 2007) will need to be investigated before reaching a clear conclusion.

Hunger is a primary physiological need, whereas self-regulation is a coping behavior. According to Maslow's pyramid model of the hierarchy of needs (1943), satisfying the physiological need of hunger is, along with the other physiological needs, the most basic impulse, and thereby essential in order to survive and being capable of achieving personal goals. Hence, it is not surprising that the degree of hunger not only influenced the scores on self-regulation and emotional eating, but even 'sabotaged' the adolescents' performance, even though they might have had good intentions for healthy eating behavior. It seems as if, when

hungry, adolescents ‘forget’ their intentions of monitoring their behavior in order to eat healthily.

Analyses of the role of self-regulation in healthy eating behavior showed that self-regulation was not related to having breakfast, fruit and vegetables intake, eating snacks and drinking sodas. This result is in contrast to previous studies (e.g. Wills et al., 2007), in which a relation was found between both fruit and vegetable intake and a high level of self-control, while poor self-control was related to saturated fat intake. A possible explanation for this result might be that the questions consisted of six separate component items of daily healthy eating behavior, whereas Wills et al. (2007) used a validated inventory to measure healthy eating behavior.

However, a relation was found between self-regulation and self-reported importance of healthy food intake. Adolescents who scored higher on self-regulation regarded healthy eating as more important, whereas adolescents who scored lower on self-regulation regarded healthy eating as less important. Interestingly, a negative relation was found between both snacking and drinking sodas and the importance of healthy eating. Adolescents, who reported consuming more snacks, also reported drinking more sodas. Furthermore, adolescents who scored higher on snacking and drinking sodas regarded healthy eating as less important than adolescents whose scores were lower. It could be, then, that although a direct link between unhealthy eating behaviors and self-regulation was not found in this study, an indirect relation to self-regulation, through the reported importance of healthy eating, exists. In addition, a very intriguing fact was that the hungrier the participants reported to be during filling in the questionnaire, the less important they rated healthy eating. Reviewing these findings, a likely explanation is that because of their hunger, participants showed a lower level of self-regulation, and as a result regarded healthy eating less important as a defense mechanism, and thereby rationalizing and justifying their contradictory behavior of unhealthy eating patterns (Rozin, 1996). This is in line with Bandura’s theory (1977, in Bandura & Simon, 1977), according to which motivation alone is not sufficient in order to reach goals, as goal-setting and self evaluation (eating healthily and how important one regards healthy eating to be) of ones actions (unhealthy eating behavior) also plays a role.

Since there was no relation between gender and self-regulation and the results showed no interaction between gender and self-regulation, the analysis in order to test the hypothesis, stating that gender is a moderator between self-regulation and emotional eating, did not have to be carried out.

Limitations and Suggestions for Future Research

Several limitations of this study may have impacted the generalizability of the results. First, the current sample may not be representative of adolescents between the ages of 14 and 18, as the average educational level was high and not diverse in ethnic characteristics. Future research may include more diverse demographic characteristics, in order for the results to be more representative and generalizable to a larger population.

Also, self-regulation (Magar et al., 2008) and eating behaviors (Hebert et al., 2008) are both subjects quite susceptible to social desirability; after all, people sometimes tend to ‘keep up appearances’ by give answers that are slightly more pleasing than the truthful answers that represent the reality, especially when it comes to eating and control. Data of the current study were obtained through self-report questionnaires of the adolescents, whom might have given socially desirable answers, a factor which was not controlled for.

The fact that the procedure of concept mapping was carried out for the first time, may have influenced the results. Also, the number of participants included in each phase of the procedure was limited. Future research should carry out the procedure of concept mapping a number of times and integrate the findings, in order to achieve a representative image of the aspects that are important to adolescents in order to ensure their healthy eating behavior.

As noted before, the degree of hunger while filling in the questionnaire influenced the results on this study. Future research about healthy eating behavior might consider letting the participants joining the research thirty minutes after eating a meal, thereby reducing the effects of hunger on the results. By reducing such effects, it will be possible discover the effects of the actual self-regulatory competence on healthy eating behavior.

Moreover, items measuring healthy eating behavior consisted of questions about the average amount of daily healthy eating patterns, which may have been difficult for the adolescents to accurately estimate, and therefore may have influenced the results. A suggestion for improvement of this concern might be formulating the questions in a more specific way in the future, and by this means creating more clarity about the meaning of a ‘portion’, for instance. By giving clear explicit explanations it will be easier for the adolescents to answer the questions more accurately.

Finally, considering the results of the present study, a suggestion for future research might be investigating the possible mediator effect of self-regulation on hunger and emotional eating, and the possible moderator effect of gender on hunger and self-regulation, and its effect on emotional eating. As it has been shown in this study, all variables were linked to each other, thereby also influencing each other. Therefore, the found effects must not be

underestimated. Whether the absence of hunger would change self-regulation competence and emotional eating behavior, for instance, is something future research should look into.

Implications

The findings of significant effects for self-regulation in this study indicate that increasing adolescents' self-regulatory competence may have beneficial results for their healthy eating behavior. The finding that the degree of hunger was related to all of the variables can have interesting implications. Eating when hungry is a natural basic impulse, and the questions represented a stimulus that could have increased the hunger impulse. On the other hand, eating healthily is a goal, achieved by applying self-regulatory strategies. It became clear in this study that the impulse (the 'hungry stomach') 'won' from the rational thoughts and goals (eating healthily). Since failure in self-regulation as a result of food temptations have been found to be related to high-calorie foods intake and obesity (Tice et al., 2001) and hunger leads to reduced levels of self-regulation, this information is useful for improvements of school food policies and also at home.

There are several ways by which information about self-regulatory competence and healthy eating behavior can be spread and communicated. First, creating more awareness about the situations where self-regulatory strategies seem to fail more often than other situations may help to improve the application of self-regulatory strategies. Furthermore, schools with a decreased availability and accessibility to high-calorie foods has been linked to less consumption of these types of foods (Martens et al., 2005; Neumark-Sztainer et al., 2005). By knowing that adolescents' self-regulatory competence decreases when hungry, reducing the accessibility of high-fat foods both at home as at schools may reduce unhealthy eating behavior in a most effective way.

Second, as it has been shown that the importance of healthy eating behavior is of great influence on actual healthy eating behavior (e.g. snacking and drinking sodas), this information can be used for health professionals to approach adolescents in such a way, by emphasizing the importance and benefits of healthy eating behavior and maybe even promote healthy eating as a 'cool' thing to do, as peers influence healthy eating behavior as well (Croll et al., 2001).

The current findings are salient for health professionals working with adolescents. Interventions to increase healthy eating behavior among adolescents, including methods and strategies aiming at improving adolescents' self-regulation are required, by making them more aware of the role self-regulation plays regarding their eating behavior. Nevertheless,

more research is needed to balance the framework, derived from integrating self-regulatory competence versus impulses as determinants for the implementation of healthy dietary habits (Hofmann, Friese, & Strack, 2009).

In conclusion

Despite the limitations, this study contributes to the literature concerning self-regulatory processes and adolescent healthy eating behavior, with the eventual aim to improve adolescents' healthy dietary food choices. To some extent, self-regulation plays a role in healthy eating behavior and emotional eating, but the influence of the degree of hunger on the results cannot be overlooked. While more research is still definitely needed, this research contributed to improving knowledge of adolescents' healthy eating behavior by getting information directly from the relevant subjects, namely the adolescents themselves.

As mentioned before, this study was part of the Tempest research project, which aims to improve adolescents' self-regulatory competence and develop more effective preventive interventions for adopting a healthy life style. Prevention programmes, such as public health approaches or individual-educational approaches will be investigated in order to find out how they complement each other in improving adolescents' healthy eating behavior. Also, the insights obtained in this study will be used for further research in order to improve adolescents' healthy eating behavior.

The new insights, obtained on both self-regulatory perspectives of healthy eating behavior and other factors influencing self-regulatory competence, such as hunger, may be of use for future studies in this area. A strong feature of this study was the combination of qualitative and quantitative methods, thereby providing insight for both implementation and research. The current study was another step towards a future where both the effectiveness of interventions and adolescents' self-regulatory competence hopefully will be improved, thereby reducing the number of adolescents showing unhealthy eating behavior. Also this study hopes to contribute to the way researches concerning eating behavior are conducted.

References

- Bandura, A., & Simon, K. M. (1977). The role of proximal intentions in self-regulation of refractory behavior. *Cognitive Therapy and Research*, *1*, 177-193.
- Banfield, J. F., Wyland, C. L., Macrae, C. N., Münte, T. F., & Heatherton, T. F. (2004). The

- cognitive neuroscience of self-regulation (pp. 62–83). In R. F. Baumeister & K. D. Vohs (Eds.), *Handbook of self-regulation: Research, theory, and applications*. New York: The Guilford Press.
- Baumeister, R. F., & Vohs K. (2004). Understanding self-regulation: An introduction. (pp. 1-12) In: Baumeister, R. F., & Vohs K. (eds.). *Handbook of self-regulation: research, theory, and applications*. Guilford Press: New York.
- Branen, L., & Fletcher, J. (1999). Comparison of college students' current eating habits and recollections of their childhood food practices. *Journal of Nutrition Education, 31*, 304-310.
- Cartwright, M., Wardle, J., Steggle, N., Simon, A. E., Croker, H., & Jarvis, M. J. (2003). Stress and dietary practices in adolescents. *Health Psychology, 22*, 362–369.
- Croll, J. K., Neumark-Sztainer, D., & Story, M. (2001). Healthy eating: What does it mean to adolescents? *Journal of Nutrition Education, 33*, 193-198.
- De Ridder, D. T. D., & DeWit, J. B. F. (2006). Self-regulation in health behavior: Concepts, theories, and central issues. In D. T. D. De Ridder & J. B. F. De Wit (Eds.), *Self-regulation in health behavior* (pp. 1–23). Chichester, England: Wiley.
- Edwards, J. R., & Lambert L. S. (2007). Methods for integrating moderation and mediation: A general analytical framework using moderated path analysis. *Psychological Methods, 12*, 1–22.
- Faith, M. S., Allison, D. B., & Geliebter, A. (1997). Emotional eating and obesity: Theoretical considerations and practical recommendations (pp. 439–465). In: Dalton, S. (ed.). *Obesity and Weight Control: The Health Professional's Guide to Understanding and Treatment*. Gaithersburg, MD: Aspen.
- Gardner, T. W., Dishion, T. J., & Connell, A.M. (2008). Adolescent self-regulation as resilience: Resistance to antisocial behavior within the deviant peer context. *Journal of Abnormal Child Psychology, 36*, 273–284.
- Giner-Sorolla, R. (2001). Guilty pleasures and grim necessities: Affective attitudes in dilemmas of self-control. *Journal of Personality and Social Psychology, 80*, 206-221.
- Hebert, J. R., Hurley, T. G., Peterson, K. E., Resnicow, K., Thompson, F. E., Yaroch, A. L., Ehlers, M., Midthune, D., Williams, G. C., Greene, G. W., & Nebeling, L. (2008.). Social desirability trait influences on self-reported dietary measures among diverse participants in a multicenter multiple risk factor trial. *Journal of Nutrition, 138*, 226S-234S.
- Hofmann, W., Friese, M., & Strack, F. (2009). Impulse and self-control from a

- dual-systems perspective. *Perspectives on Psychological Science*, 4, 162-176.
- Hofmann, W., Rauch, W., & Gawronski, B. (2007). And deplete us not into temptation: Automatic attitudes, dietary restraint, and self-regulatory resources as determinants of eating behavior. *Journal of Experimental Social Psychology*, 43, 497–504.
- Kane, M., & Trochim, W. M. K. (2007.). *Concept Mapping for Planning and Evaluation*. Thousand Oaks, CA: Sage.
- Larson, N. I., Neumark-Sztainer, D.R., Story, M. T., Wall, M. M., Harnack, L. J., & Eisenberg, M. E. (2008). Fast Food Intake: Longitudinal Trends during the Transition to Young Adulthood and Correlates of Intake. *Journal of Adolescent Health*, 43, 79–86.
- Lowe, M. R. & Butryn, M. L. (2007). Hedonic hunger: A new dimension of appetite? *Physiology & Behavior*, 91, 432–439.
- Macht, M., & Simons, G. (2000). Emotions and eating in everyday life. *Appetite*, 35, 65-71.
- Magar, E. C. E., Phillips, L. H., & Hosie, J. A. (2008). Self-regulation and risk-taking. *Personality and Individual Differences*, 45, 153–159.
- Martens, M. K., van Assema, P., & Brug, J. (2005). Why do adolescents eat what they eat? Personal and social environmental predictors of fruit, snack and breakfast consumption among 12–14-year-old Dutch students. *Public Health Nutrition*, 8, 1258–1265.
- Maslow, A. H. (1943). A theory of human motivation. *Psychological Review*, 50, 370-396.
- Moilanen, K. L. (2007). The adolescent self-regulatory inventory: The development and validation of a questionnaire of short-term and long-term self-regulation. *Journal of Youth and Adolescence*, 36, 835-848.
- Nederlands Centrum Geestelijke Volksgezondheid & Talcott (1995). *Handboek concept mapping met Ariadne (Handbook concept mapping with Ariadne)*. Utrecht: Nederlands Centrum Geestelijke Volksgezondheid/Talcott.
- Neumark-Sztainer, D., French, S. A., Hannan, P. J., Story, M., & Fulkerson, J. A. (2005). School lunch and snacking patterns among high school students: Associations with school food environment and policies *International Journal of Behavioral Nutrition and Physical Activity*, 2, 1-7.
- Rozin, P. (1996). The socio-cultural context of eating and food choice. (pp. 83-104). In H.J.H. MacFie, & H. L. Meiselman, (eds.). *Food Choice Acceptance and Consumption*. Blackie Academic & Professional: London.
- Rozin, P., Bauer, R., & Catanese, D. (2003). Food and life, pleasure and worry, among

- American college students: Gender differences and regional similarities. *Journal of Personality and Social Psychology*, *85*, 132–141.
- Schacht, M., Richter-Appelt, H., Schulte-Markwort, M., Hebebrand, J., & Schimmelmann, B. G. (2006). Eating Pattern Inventory for Children: A new self-rating questionnaire for preadolescents. *Journal of Clinical Psychology*, *62*, 1259-1273.
- Shepherd, J., Harden, A., Rees, R., Brunton, G., Garcia, J. Oliver, S. & Oakley, A. (2006). Young people and healthy eating: a systematic review of research on barriers and facilitators. *Health Education Research*, *21*, 239–257.
- Snoek, H. M., van Strien, T., Janssen, J. M. A. M., & Engels, R. C. M. E. (2007). Emotional, external, restrained eating and overweight in Dutch adolescents. *Scandinavian Journal of Psychology*, *48*, 23–32.
- Story, M., Neumark-Sztainer, D., & French, S. (2002). Individual and environmental influences on adolescent eating behaviours. *Journal of the American Dietetic Association*, *102*, S40–S51.
- Thompson, O. M., Ballew, C., Resnicow, K., Must, A., Bandini, L. G., Cyr, H., & Dietz, W. H. (2004) Food purchased away from home as a predictor of change in BMI z-score among girls. *International Journal of Obesity*, *28*, 282–289.
- Tice, D. M., Bratslavsky, E., & Baumeister, R. F. (2001). Emotional distress regulation takes precedence over impulse control: If you feel bad, do it! *Journal of Personality and Social Psychology*, *80*, 53-67.
- Van Kooten, M., De Ridder, D., Vollebergh, W., & Van Dorsselaer, S. (2007). What's so special about eating? Examining unhealthy diet of adolescents in the context of other health-related behaviours and emotional distress. *Appetite*, *48*, 325–332.
- Verplanken, B., & Faes, S. (1999). Good intentions, bad habits, and effects of forming implementation intentions on healthy eating. *European Journal of Social Psychology*, *29*, 591-604.
- Videon, T. M., & Manning, C. K. (2003). Influences on adolescent eating patterns: The importance of family meals. *Journal of Adolescent Health*, *32*, 365–373.
- Wills, T. A., Isasi, C. R., Mendoza, D., & Ainette, M. G. (2007). Self-control constructs related to measures of dietary intake and physical activity in adolescents. *Journal of Adolescent Health*, *41*, 551–558.
- Xie, B., Gilliland, F. D., Li, Y., & Rockett, H. R. H. (2003). Effects of ethnicity, family income and education on dietary intake among adolescents. *Preventive Medicine*, *36*, 30–40.

Appendix A

*Concept Mapping Clusters, Statements and Mean Preference Scores**Set 1*

<i>(1) Regularity</i>	<i>Mean Preference</i>
If you get hungry before dinner, eat fruit instead of a snack	3.93
Eating regularly and ordered	3.57
If you get hungry after dinner, eat a healthy sandwich	3.13
Don't finish your candies all at once, eat in small bits	2.60
If you eat something unhealthy, always drink a glass of milk with it	1.47
Cluster Mean Score	2.9

<i>(2) Taking time and making space</i>	<i>Mean Preference</i>
Taking time to have a proper breakfast^a	4.60
Taking time to prepare healthy things to eat	3.93
Always eat your vegetables	3.73
Instead of eating only things you already know, also try out new healthy food	3.21
Eating fruit for dessert	3.00
Cluster Mean Score	3.71

<i>(3) Avoidance</i>	<i>Mean Preference</i>
Don't buy too many unhealthy things, so you don't get tempted to eat it all at once	3.93
Sport more, because you tend to eat less unhealthy foods after sporting	3.80
Drink a lot of water, because it lessens your hunger	3.53
Make sure that you don't have unhealthy food in your room	3.47
Always take a bottle of water and chewing gum with you, so that you can have something if you get hungry/thirsty	2.93
Trying to stay away from food when you are feeling down, in order to avoid temptation	2.07
Cluster Mean Score	3.28

<i>(4) Knowledge and awareness</i>	<i>Mean Preference</i>
Being motivated to eat healthily	4.53
Knowing that healthy eating helps you feel good	4.07
Think about not wanting to get fat	4.07
Knowing that healthy eating helps not getting sick	4.00
Knowing that unhealthy food is often bad for your teeth	2.67
Seeking more information about healthy eating	2.13
Ask your parents and friends what they eat	1.79
Cluster Mean Score	3.32

<i>Remaining Statements</i>	<i>Mean Preference</i>
Vary with food so you don't always eat the same	3.73
If you get hungry, do something that will distract you from your hunger	2.47
Decide in advance how much you are going to eat of something (e.g. cookies), so that you don't eat the whole pack	2.43
Treat yourself to something tasty, if have eaten healthily all week	2.87
Motivate yourself to eat healthily by watching pictures of thin models	1.40
Motivate yourself to not eat unhealthy foods by watching tv-programmes of people whom are too fat	1.47
Taking only healthy snacks to school	3.27

Set 2

<i>(1) Rules and habits</i>	<i>Mean Preference</i>
Making a habit of eating something healthy every day	3.81
Making clear plans about how often you're going to eat snacks	2.31
Making clear rules about how much you want to eat and when	1.93
Keeping track of your snack habits by keeping a 'snacklist'	1.75
Hang up memo's with messages such as 'watch your weight'	1.63
Make rules, for instance, if you eat more than 3 unhealthy things a day, you are not allowed to sit behind the computer that day	1.19
Cluster Mean Score	2.1

<i>(2) Making it easier on yourself</i>	<i>Mean Preference</i>
Make sure you have fruit at home for when you feel like having a snack	3.94
Don't snack too much before lunchtime or dinnertime	3.81
Searching for tasty food that is also healthy (e.g. a smoothie)	3.75
Instead of taking the whole bag of potato chips, taking a small bowl	3.50
Put healthy things that are easy to reach when you're going to watch tv	2.69
Putting not only unhealthy food, but also healthy food next to the computer	2.40
Cluster Mean Score	3.35

<i>(3) Awareness</i>	<i>Mean Preference</i>
Realize that healthy eating is important for your health	3.94
Consciously think about whether you're really hungry before you begin to snack, or whether it is a result of boredom	3.38
Consciously think about the moments in which you eat unhealthy things	2.56
Keeping a certain amount of money on the side for unhealthy food	1.94
Cluster Mean Score	2.95

<i>(4) Avoidance</i>	<i>Mean Preference</i>
Taking your own bread to school, so that you don't have to buy anything there	4.06
Take only healthy foods and beverages to school	3.81
Don't go searching for unhealthy food	3.44
Keep on walking/riding your bike when you come across a temptation (for instance snackbar/bakery store)	3.20
Not going to the supermarket during free periods and breaks	2.94
Not taking money to school, so that you don't get tempted to buy something unhealthy	2.69
Cluster Mean Score	3.34

<i>Remaining Statements</i>	<i>Mean Preference</i>
Balancing fruit with unhealthy food	3.13
Always eat a piece of fruit before you eat something unhealthy	1.75
Asking your parents to bring tasty healthy food when they go grocery shopping	3.31
Go grocery shopping and cook yourself, if your parents don't have time to cook healthily	2.69
Eating a piece of fruit every day on a steady time	2.81
Eating three good meals a day, so that you'll have less appetite during the rest of the day^a	4.13
If you can't stop snacking, brush your teeth	1.88
Make sure that you stay busy (e.g. with a hobby or sport), so that you don't have time to think about food	3.94

^aStatements that were rated as most important in order to ensure their healthy eating by the participants

Appendix B

Daily Healthy Eating Behavior

How many days a week on average do you eat breakfast?

How many glasses of soda, lemonade or sports drink do you drink on average a day? (Do not include: light sodas and mineral water).^a

How many portions of fruit do you eat on average per day?

How many portions of vegetables do you eat on average per day?

How many snacks do you eat on average per day? (For example, one snack counts as: one portion of french fries, one croquette, one hamburger, one big cake, a couple of small cookies, a handful of chips, a couple of candies).^a

How important is healthy eating to you?

^a Inverse coding.

Table 1

Descriptive statistics and inter-correlations of variables

Variables	Gender (1 = Male, 2 = Female)	Self-regulation	Emotional eating	Hunger	Age
Gender					
Self-regulation	-.05				
Emotional eating	.24*	-.22*			
Hunger	-.22*	-.21*	.22*		
Age	-.03	-.08	.17	.33***^a	
<i>N</i>		88	89	89	89
<i>M</i>		3.36	1.71	3.24	15.92
<i>SD</i>		0.43	0.89	1.73	1.29

* = $p < .05$ ** = $p < .01$

^a All of the 9th graders filled in the questionnaires early in the morning, whereas all of the 11th graders filled in the questionnaires at noon, just before lunchtime.

Figure Captions

Figure 1. Concept map and mean preference scores of clusters that are important to ensure healthy eating behavior among adolescents, derived from the first set of statements

Figure 2. Concept map and mean preference scores of clusters that are important to ensure healthy eating behavior among adolescents, derived from the second set of statements

Figure 3. Schematic view of the possible co-occurrence of self-regulation as mediator between the degree of hunger and emotional eating, and gender as moderator between the degree of hunger and self-regulation, in turn affecting its relation with emotional eating

(4) Knowledge
and awareness
 $M = 3.32$

(2) Taking time and
making space
 $M = 3.71$

(1) Regularity
 $M = 2.9$

(3) Avoidance
 $M = 3.28$

(2) Making it easier
on yourself
 $M = 3.35$

(1) Rules
and habits
 $M = 2.1$

(4) Avoidance
 $M = 3.34$

(3) Awareness
 $M = 2.95$

