Eating behaviour and weight status of adolescents and their families

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Families on the balance:
Eating behaviour and weight status
of adolescents and their families

Een wetenschappelijke proeve op het gebied van de Sociale Wetenschappen

Proefschrift

ter verkrijging van de graad van doctor
aan de Radboud Universiteit Nijmegen
op gezag van de rector magnificus prof mr. S.C.J.J. Kortmann,
volgens besluit van het college van decanen
in het openbaar te verdedigen op vrijdag 15 januari 2010
om 13.00 uur precies

doord

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te Zaanstad
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Print: Ipskamp
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CHAPTER I
General overview of literature, objectives, and results
Introduction

Central in this dissertation are three eating styles: Emotional eating which is the tendency to eat in response to emotional (dis)stress, external eating which is the tendency to eat in response to food cues such as sight and smell of food, and restrained eating which is the tendency to restrict food intake in order to lose weight or prevent weight gain.

The three eating styles have been extensively studied in adults, and theoretically all three eating styles are assumed to be related to overeating. For adolescents, there are numerous (prospective) studies addressing the associations between restrained eating and weight status, but prospective studies on emotional and external eating are lacking. Further, previous studies on restrained eating did not always address the reciprocal nature between dieting and weight; that is, dietary restraint may not only lead to weight gain, but higher body weight may also result in higher dietary restraint. In the first part of this dissertation we aimed to fill these gaps. The associations between the eating styles and weight status are studied in a large young adolescent high school sample (n = 10,087) and a prospective family study (n = 428).

In the second and third part of this dissertation we will look at two important socio-cultural influences on eating behaviours: family and media. Childhood and adolescence are periods in which food-related behaviours and attitudes are shaped. This has long-term effects on health and well-being, especially in late-adolescence when health behaviours begin to solidify and may track into adulthood. It is therefore important not only to study how eating behaviour relate to weight status, but also the factors that influence and shape these behaviours.

Family members influence each other’s behaviours through several ways, including modelling and direct transmission, general parenting (i.e. parental support and control), and more behaviour-specific parenting; those parenting behaviours that specifically relate to eating and food choice. Modelling and transmission of eating behaviours result in similarities between family members. Several studies addressed family similarities in restrained eating and dieting behaviours, but prospective studies are more scarce and subject to several methodological constraints. Only few studies looked at family similarities in emotional and external eating. We therefore looked at family similarities in eating behaviours as well as at prospective influences on restrained eating the family study; a full family design, containing two siblings and both biological parents.

General parental support and control have been related to various behaviours in children and adolescents. We looked at their associations with emotional eating. Next, we looked at two important food-specific parenting behaviours: First, parental dissatisfaction in relation to adolescents own body dissatisfaction and second, parental restriction in relation to young children’s food choices. The thin ideal in our society puts high pressure on youngsters, and many of them are quite dissatisfied with their body. Among other social influences, parents affect their children’s body satisfaction through, for example, criticism and pressure to be thin. So far, no other studies than ours have directly measured fathers’ and mothers’ satisfaction with their children’s figures, and have related this to adolescents’ own body figure satis-
faction. Finally, parental restriction over food intake of young children is strongly debated, because of their possibly unintended (negative) effects on children’s food choices. Our studies add to the current discussion by using an innovative design: a structured role-play combined with observations of maternal behaviours in addition to the commonly used (and criticized) questionnaires to measure parental control.

One specific media source, television and television viewing (TVV) has been linked to overweight and higher (snack) food intake. In the third part of this dissertation we looked at whether the three eating styles can provide a framework for explaining individual differences in the magnitude of the association between TVV and food intake, and tested their moderating effects on the association between TVV and snacking.

In this overview, we will discuss the current state of research, followed by the aims and main research questions of this dissertation, and will give a summary and overview of the main results, conclusions, limitations and suggestions for future research. For this purpose we have divided the dissertation in three sections: “weight status and individual characteristics”, “family influences”, and “media influences”. Finally, characteristics as well as limitations and strengths of the sample, measures, and designs will be discussed and this overview will be concluded with and a concise general conclusion.
Part one: Weight status and individual characteristics

Overweight and obesity in Dutch children and adolescents

The prevalence of overweight among children and adolescents has alarmingly increased in the Netherlands (2001), a tendency that also can be observed worldwide (Seidell, 1997; World-Health-Organization, 2002). Currently, about 11% of the Dutch youths (2-20 years) are overweight, and 2.5% are obese (Statistics-Netherlands, 2007). Obesity in childhood has a great impact on both immediate (in childhood) and long-term (later in life) health risks. Immediate risks include increased risk of diabetes type II, gallstones and sleep disorders, but also psychosocial consequences such as teasing and discrimination. Childhood obesity is also associated with cardiovascular disease risk factors in childhood and adulthood (Must & Strauss, 1999). Due to the high and still increasing prevalence of childhood obesity and accompanied negative effects on health in most western societies, the prevention and treatment of obesity have become major public health issues (Ebbeling, Pawlak, & Ludwig, 2002; Health-Council-of-the-Netherlands, 2003; International-Obesity-TaskForce, 2002). It is therefore pivotal to examine obesity-associated behaviours, such as eating behaviour styles. In this section we will focus on three types of eating behaviour: emotional, external, and restrained eating, and their relation to weight status in adolescence.

Description and historic perspectives on emotional, external, and restrained eating

The concept of emotional eating originates from the psychosomatic theory of obesity (Kaplan & Kaplan, 1957). This theory states that through experiences early in life, in which food has been associated with emotional distress, distress will evoke feelings of hunger later on. In the same line, Bruch (1973) stated that experience of hunger is not innate, and body awareness needs to be learned. Emotional eaters have not learned to rely on their feelings of hunger and satiety but rather learned to associate emotions with distress. This is due to early experiences in which, for example, their mothers used food to comfort their child when it was in pain or in emotional distress (Bruch, 1973). Kaplan and Kaplan (1957) proposed that people with weight problems use food as an emotional defence to face negative affects, whereas normal-weight persons use other coping strategies. Therefore, early studies on emotional eating mostly compared the eating behaviours of overweight and normal-weight participants. These studies have been reviewed by Ganley (1989) who concluded that the results did not conclusively showed higher emotional eating in overweight subjects compared to normal weight subjects. The most convincing evidence was found for overeating of high palatable foods, induced by diffuse, uncontrollable anxiety emotions. Greeno and Wing (1994) elaborated on the concept of emotional eating which they described in the individual differences model. This model considers loss of appetite to be the normal response to emotional arousal and distress, while emotional eaters respond differently; that is, by excessive eating which consequently results in weight gain (Bruch, 1973; Greeno & Wing, 1994; Kaplan & Kaplan, 1957; Schachter, Goldman, & Gordon, 1968). This is in contrast to the general effect model
that postulates that all organisms react to stress by eating more. A model that, according to Greeno and Wing (1994), has only been supported in animal studies.

The assumption that overweight subjects are not responsive to internal signals led to the idea that they are more responsive to external signals. A second theory, focusing on external eating, states that certain people are more sensitive to external food cues than others, and that they eat in response to a variety of external stimuli (Schachter & Rodin, 1974), such as time manipulations, taste, visibility, and accessibility of food. This theory has strongly been criticized by Rodin (1981) and Ruderman (1986) who both concluded that the internal-external distinction was too simplistic and food-related behaviour is a multifactor process that is a consequence of the interactions between different stimuli, both internal and external (for example physical reactions to the smell of palatable food). A second point of critique was that in all weight groups there are people who are responsive to external stimuli and the evidence that externality would be attributable to people with overweight is not convincing. This critique seemed to have ended most research on the externality theory, however, attention for people's vulnerability to external cues of food intake later regained popularity as external cues are often mentioned as an explanation of some of the detrimental effects of the obesogenic (toxic) environment. For example, in a recent review Polivy, Herman, and Coelho (2008) concluded that (p. 733) "the super-abundance of food cues in our society has created a 'toxic environment' that promotes overeating and overweight, not under-eating and weight loss." As unhealthy foods are usually exposed more frequently than healthy foods – due to the economic interests in marketing processed foods high in sugar and fat – greater sensibility to external food cues could affect food intake towards unhealthy eating and subsequent higher weight. In addition, foods high in sugar are generally perceived as more palatable, which can affect external eaters more strongly as taste is one of the aspects in external eating. In this recent review, Herman and Polivy (2008) also introduced a new perspective to the concept of external eating by differentiating between normative (i.e. indicators of appropriate intake such as portion size) and sensory (i.e. the hedonic appeal of food such as palatability) external cues.

According to a third theory, the restraint theory, dieting can cause overeating and therefore a higher weight. People who diet, cognitively suppress their feeling of hunger and eat less. However, the chronic attempt to control food intake makes them prone to disinhibition of their restraint and subsequent overeating in a variety of situations (Herman & Polivy, 2004; Polivy, 1996). Restrained eating, or dietary restraint, has been defined as the tendency to restrict food intake in order to achieve weight loss or to prevent weight gain (Herman & Polivy, 1980). When cognitions are undermined (disinhibition) by, for example, distress, intoxicants, alcohol, and the consumption of high caloric food such a pre-load in an experimental setting (the disinhibitors), restrained eaters are more vulnerable to overeating than non-dieting individuals; this is called counter-regulation (Herman & Polivy, 1980; Polivy & Herman, 1985; Ruderman, 1986). Another way to describe this proposed mechanism is the boundary model: Normally people's food intake is regulated by hunger (lower limit) and satiety (upper limit). Restrained eaters, however, ignore their hunger limits and have replaced this by an artificial self-imposed diet limit that is above the
hunger limit. If this boundary is crossed, for example after having eaten a high-calorie preload in an experimental setting, there is no more restriction until the lower (aversion) limit. This has also been called the “what the hell effect.” People overeat because their diet is spoilt anyway (Herman & Polivy, 1984). The restraint theory is based on experimental work by Herman & Polivy and colleagues (Herman & Mack, 1975; Herman & Polivy, 1980) in which participants with obesity inadequately compensated their energy intake after a preload. In contrast, they ate more after they ate a high energy preload. Both experimental and epidemiological studies have further addressed these behaviours in participants of different weight status.

The three theories have been developed at different periods in history and from different angles. However, they are neither unrelated nor determinative; individuals can score high (or low) on all three behaviours. Based on cut-off points the individuals can be categorized as for example restrained or unrestrained. However, the score is a continuum and everyone is an emotional, external, and restrained eater to a certain degree. Generally, emotional and external eating is highly correlated. They do, however, represent theoretically distinguished aspects of overeating (van Strien & Schippers, 1995). Van Strien argues that dieting is often linked to high emotional and external eating (renamed to overeating tendencies) and possible unsuccessfulness of restrained eating is due to these overeating tendencies. Also Herman and Polivy (1980, 2008) argued that dieting should not be viewed separately from the other eating behaviours. They proposed that chronic dieters – like obese people in Schachter’s theory – are more responsive to salient external food cues than non-dieters. They also consider emotional eating to be connected to restrained eating in the sense that emotional distress is a disinhibitor for restrained eaters (i.e., they eat more) while for unrestrained eaters it is not. But, there is controversy on this point. Both Braet (2008) and Wardle, Sanderson, Guthrie, Rapoport, and Plomin (2002) found that higher dietary restraint was associated with lower external eating in school children and speculated that restrained eating intentions might down-regulate external responsiveness, thus higher restraint is a motivation not to give in to external cues. Also, other factors might provide alternative explanations. For example, in a large-scale study among 1,177 adolescent girls, Johnson and Wardle (2005) found that associations between restrained eating and emotional eating (as well as binge eating) both cross-sectional and over a one year period was mainly attributable to body dissatisfaction (F. Johnson & Wardle, 2005). In conclusion, there are ample indications that the three eating styles are connected although there are no conclusive results on how they are related.

**Eating behaviours and weight status in adolescents**

Based on the underlying theories one would expect positive relations between overweight on the one hand, and emotional, external, and restrained eating on the other. A recent study by van Strien, Herman, and Verheijden (2009) in a large, national representative sample of Dutch adults found that dietary restraint and emotional eating were significantly related to higher levels of overweight, but external eating was significantly related to lower levels of overweight (only if the associations with emotional eating were statistically controlled for). This sample ranged in age
from below 20 to over 41 and since age is related to both weight status and eating behaviour it is not clear how these patterns can be translated to youth. This dissertation and the overview of previous survey studies below are therefore focusing on children and adolescents.

Concerning children and adolescents, there are only few studies that concentrated exclusively on emotional or external eating and their relation to weight. Emotional overeating (measured with the Child Eating Behaviour Questionnaire) was positively associated with weight in a sample of 406 7- to 12-year-old children (Wardle et al., 2002). In contrast, Nguyen-Rodriguez, Chou, Unger, and Spruijt-Metz (2008) found no differences in emotional eating between normal weight and overweight adolescents: 26% of normal weight participants were classified as emotional eaters versus 18% of the overweight participants. In a recent study by Jahnke and Warschburger (2008), young (3-6 years) overweight children scored higher on external eating and food responsiveness but not on emotional eating.

For restrained eating, cross-sectional studies generally revealed a positive association with overweight status. Hill, Oliver, and Rogers (1992) found that highly restrained girls were 17% heavier and 2% taller than the unrestrained girls. In contrast, mean weight of dieting 13- to 15-year-old high school students did not differ from non-dieting pupils in a large sample Dutch study (Brugman et al., 1997). Several longitudinal studies found a positive association between restrained eating and weight gain in adolescents (Field et al., 2003; Stice, 1998, 2001; Stice, Cameron, Killen, Hayward, & Taylor, 1999; Stice, Presnell, Shaw, & Rohde, 2005). In a sample of 13- to 17-year-olds, Stice et al. (2001) found that dieting predicts weight gain and the risk of obesity over a period of four years. Similar results were found by Field et al. (2003) in pre-adolescents and adolescents over three years time, and by Neumark Sztainer, Paxton, Hannan, Haines, and Story (2006), who found that dieting was associated with increases in BMI over a five year period. Additional analyses also revealed that the relation between restrained eating and BMI was partly mediated by higher binge eating (Neumark Sztainer, Wall, Haines et al., 2007), thus providing evidence for the disinhibition theory.

Research that tested the multivariate relations between all three types of eating behaviours and weight status in children and adolescents did not support the hypotheses in all aspects (Lluch, Herbeth, Mejean, & Siest, 2000; Wardle et al., 1992). Overweight was found to be positively related to restrained eating, but negatively related to external eating (only for girls) and non-related to emotional eating (Lluch et al., 2000). Similarly, average body mass index (BMI) was higher in restrained, and lower in external eaters, whereas no relationship was found between emotional eating and BMI (Wardle et al., 1992). Another study found that underweight girls had the higher mean rating on emotional eating, while overweight girls scored lower than children with average weight, and both the means of overweight girls and boys for external eating were lower than those of the comparison groups (Hill, Draper, & Stack, 1994). In a somewhat older group of 69 female students (18 and 19 years) emotional and restrained eating were unrelated to weight increases during the first year of college (Lowe et al., 2006). The studies by Wardle et al. (1992), Hill et al. (1994) and Lluch et al. (2000) consisted of heterogeneous samples with relatively small numbers
per age group, making it hardly possible to draw firm conclusions about the links between eating behaviours and overweight. A recent study by Braet et al. (2008) fills this gap by including a large sample of 1,200 normal weight and of 1,274 overweight children and adolescents. They found that restrained eating was consistently associated with overweight status for boys and girls and for both children and adolescents. Overweight adolescent girls showed higher emotional eating and overweight boys showed higher external eating than their non-overweight peers. For children, however, the opposite was found with less emotional and external eating in overweight boys and girls. Due to the cross-sectional design of this study, no conclusions can be derived on the direction of these associations.

Studies that used a parent version of the Dutch Eating Behaviour Questionnaire (DEBQ) found that parental perceptions of their children's emotional, external, and restrained eating were higher for overweight than normal weight children (Braet & van Strien, 1997). In contrast, another study found only higher restrained but no differences in emotional or external eating in 72 overweight and obese, compared to 240 normal-weight Italian pre-adolescents (Caccialanza et al., 2004).

In conclusion, the most convincing evidence for a positive association with weight status in survey studies was found for restrained eating, as only few studies found no association, and actually none found a negative associations with BMI or weight status. However, even longitudinal studies can not prove causality, and overweight people tending to engage in dieting and restrained eating could explain the associations between restraint and weight status (Hill, 2004; Stice & Agras, 1998). There is some support for the latter relation (de Lauzon-Guillain et al., 2006; Shunk & Birch, 2004; Stice, Mazotti, Krebs, & Martin, 1998), however, thorough testing for reciprocity in the associations between restraint and weight status was not conducted in most previous studies. Therefore, longitudinal analyses on adolescents to test cross-lagged links between restrained eating and weight status are required to answer this question.

Studies on the associations between external eating and weight also show a clear pattern with lower external eating in the higher weight categories. However, the number of studies is less than on the other eating behaviours, and longitudinal studies are lacking. This in contrast to experimental studies. In line with both emotional and external eating theories, children with weight problems have been found to show lower responsiveness to internal signals (Fisher & Birch, 2002; Fisher et al., 2007). Overweight children consumed 14% more energy in the absence of hunger than non-overweight children (Fisher et al., 2007). Similarly, girls who ate large amounts of snack foods in the absence of hunger at the age of 5 and 7 years were 4.6 times as likely to be overweight at both times (Fisher & Birch, 2002). In addition, normal-weight children ate less after having eaten a preload and after intense exposure to the smell of tasty food, whereas the overweight children did not reduce their intake after facing both food cues. They even ate slightly more after the intense exposure to the smell of tasty food (Jansen et al., 2003). On the other hand, Moens and Braet (2007) found that after having eaten a typical meal, one-third of the total sample did not eat of the presented free-access snack foods. Overweight girls were less likely to eat snack foods in the absence of hunger, while as many boys of both
weight groups ate in the absence of hunger. For emotional and external eating, both, large-scale cross-sectional and longitudinal studies are needed to describe associations between these eating behaviours and weight status.

**Eating behaviour in adolescence**

Little is known about how emotional, external, and restrained eating develop during adolescence, and about the incidences at different ages and in different subgroups, such as sex, *SES*, and ethnic groups. In young children very low scores on emotional eating have been found. Most children show a biologically natural reaction to emotional stressors: that is loss of appetite when feeling lonely, depressed or afraid (van Strien et al., 2009; van Strien & Oosterveld, 2008). Braet et al. (2008) found different patterns between eating behaviours and overweight status for children (under 13) and adolescents. However, average scores on the measures were not consistently higher for the adolescents compared with the children (Braet et al., 2008). In contrast, Hill, Oliver, and Rogers (1992) found that emotional eating was higher in 14-years- compared to 9-year-old girls, whereas the younger girls had higher external eating scores, and no different restrained eating scores. Comparing groups of different ages gives an indication but can not establish insight into development of eating behaviour in individuals over time. Ashcroft, Semmler, Carnell, van Jaarsveld, and Wardle (2008) measured eating behaviour (reported by the mother) of 322 children at ages 4 and 10. They revealed that emotional overeating increased over time. Replication studies on all three types of eating behaviours in adolescents are necessary.

**Research aims and main questions**

First, descriptive results are reported on the differences between boys and girls and between age, ethnic, and *SES* groups in mean scores of emotional, external, and restrained eating. Also, average scores over four annual waves were compared to see how eating behaviour develops over the course of adolescence (Appendix B).

Next, the associations between eating behaviours and weight were examined, both cross-sectional and longitudinally. Based on the development of *BMI* over the four waves we identified clusters of individuals within a population that followed distinct developmental trajectories and predicted these trajectories by the three styles of eating behaviours. Also, reciprocal influences between restrained eating and *BMI* over time were tested (see Appendix A for more details on the sample). Summarized in research questions:

1. Do adolescents of different age, sex, socio-economic status, and ethnicity differ in their degrees of emotional, external, and restrained eating? (Chapter 2)
2. Do emotional, external, and restrained eating scores differ between age groups and do they increase during adolescence? (Chapter 3, 4, and Appendix B).
3. How is eating behaviour related to weight in adolescents?
   3.1. Are emotional, external, and restrained eating associated with
       higher weight status? (Chapter 2)
   3.2. Are emotional, external, and restrained eating associated with a
       different BMI trajectories over time? (Chapter 3)
   3.3. Does restrained eating predict BMI and/or does BMI predict
       restrained eating over time? (Chapter 4)

Summary and discussion of main results

Demographics: Age, SES, ethnicity

Descriptive results show that girls score higher on emotional and restrained
eating, and lower on external eating, compared to boys. Most eating behaviour
scores were higher in older age groups. These gender and age differences have also
been found in previous studies (Brugman et al., 1997; Hill et al., 1992; Lluch et al.,
2000; Sanchez-Carracedo, Saldana, & Domenech, 1996; Wardle et al., 1992). On
the other hand, Braet et al. (2008) found no consistent age differences in eating
behaviours, and Hill, Oliver, and Rogers (1992) found that younger girls had higher
external eating scores. These simultaneous comparisons of different age groups
provide certain evidence for the increasing scores on eating behaviours with growing
age. The finding that degrees of emotional, external, and restrained eating change
over time within the same culture complicates its interpretation. By comparing
similar groups at different times, van Strien et al. (2009) found that emotional eating
strongly increased over the past two decades in Dutch adults, while restrained and
external eating showed moderate and low increases. In line with these findings, and
as adolescence is generally considered as a period in which eating problems emerge,
one would expect increases in eating problems within persons over time. However,
with analyses on a four-wave three-year prospective study covering a considerate
period in adolescence, we found no confirmation of substantial increases in eating
behaviours (Appendix B). In contrast, repeated measures test of within subjects
effects showed an inconsistent pattern about changes within subjects over time.
Emotional and external eating increased for younger adolescent girls only, while exter-
nal eating decreased for older boys. Restrained eating, however, increased signifi-
cantly for older boys while it decreased for the younger ones.

For boys, educational level was negatively associated with emotional and re-
strained eating. This negative association between eating style and SES is in line with
one previous Dutch study. Girls of low-educated fathers more often reported diet-
ing than girls of high-educated fathers (Brugman et al., 1997). Drewnowski, Kurth,
and Krahn (1994), in contrast, found that desire for thinness and restrained eating
were positively associated with socioeconomic status. Eating behaviour scores also
differed among ethnic groups. We found that Dutch adolescents generally scored
lower on restrained eating. This is in line with a previous Dutch study: nearly twice
as many Turkish and Moroccan girls were dieting compared to Dutch girls ((Brug-
man et al., 1997). In conclusion, our results provide some evidence for high-risk groups with elevated levels of restrained and emotional eating in ethnic minorities and youngsters with a lower educational level. This is in line with previous Dutch research. More studies that specifically address these groups are needed to reveal underlying processes.

**Eating styles and weight status**

Cross-sectional associations between eating behaviours and overweight status show that higher restrained eating is associated with a higher chance of being overweight, while higher external eating is associated with a lower chance of being overweight and emotional eating is unrelated to weight status. Higher restrained eating is also related to a greater chance of being in the highest BMI trajectory over a four-year period. This is in line with previous cross-sectional (Hill et al., 1994; Lluch et al., 2000; Wardle et al., 1992) and prospective (Field et al., 2003; Stice, 1998) research showing that higher restrained eating is associated with a higher chance of being overweight. However, restrained eating did not affect the course of BMI development. Emotional and external eating was unrelated to the probability of membership of a specific BMI trajectory. For emotional eating, previous cross-sectional studies have been inconsistent with some that showed negative associations in certain age and sex groups (Braet et al., 2008; Hill et al., 1992), while others did not reveal significant associations between emotional eating and weight status (Braet et al., 2008; Lluch et al., 2000; Nguyen-Rodriguez et al., 2008; Wardle et al., 1992). The latter is consistent with our null findings. For external eating, the null finding is consistent with Hill (1994), who found no associations between external eating and weight status, whereas most previous (cross-sectional) studies found a negative association (Braet et al., 2008; Lluch et al., 2000; Wardle et al., 1992).

When examining the reciprocal nature of the associations between restrained eating and BMI over time, it appears that BMI predicts restrained eating more consistently than the other way around. So, restrained eating is related, cross-sectional, to both a higher weight status and a higher BMI trajectory over time, but this association is probably mainly due to the fact that heavy individuals are more likely to diet. Interactions between the eating styles did not affect the results. Emotional and external eating combined (renamed overeating tendencies) did not influence the associations between restrained eating and weight. This suggests that for adolescents – in contrary to research by Van Strien and colleagues in adults and adolescents (Ouwens, van Strien, & van der Staak, 2003; van Strien et al., 2009; van Strien et al., 2007) – the successfulness of restrained eating does not depend on the number of high emotional and/or external eaters in the sample.

**Implications and directions for future research**

In the light of the current high overweight prevalence and related health problems, it is important to identify factors associated with weight status. For a general population of adolescents’ emotional, external, and restrained eating do not seem to have high predictive value for the development of overweight. Also, eating
behaviours did not consistently increase within persons, in the course of adolescence (see Table 2, Chapter 5 and Appendix B).

Probably, eating styles develop at a younger (childhood) or older age (young adulthood). Dieting is already an issue at a young age (Hill et al., 1992), whereas average scores on emotional eating are low in adolescents and even lower in young children, indicating that for children emotional eating is rare (van Strien & Oosterveld, 2008). There are no studies that followed the development of emotional eating from childhood/adolescence to adulthood, but the scores of mothers in our sample were higher than those of their daughters, suggesting that increases might occur somewhere in young adulthood. External eating on the other hand seems to be normative behaviour for people of all ages. Braet et al. (2008) found that in the subgroups of overweight children, only 10.5 per cent had a score of 3 or more (on the scale of 1 to 5) for emotional eating, while 38.4 per cent scored 3 or higher on external eating.

Emotional and external eating may, in young children or adolescents, not (yet) be associated with overweight or weight gain. However, both types of overeating have been shown to be related to disordered eating in adolescents (Braet et al., 2008), whilst emotional eating was also positively associated with binge-eating (Stice, Presnell, & Spangler, 2002), and loss-of-control eating episodes (Tanofsky-Kraff et al., 2007). Thus, identifying high-risk groups of adolescents with elevated emotional and external eating tendencies, and targeting research as well as prevention of further disordered eating and treatment of these groups is probably more useful than studying the relations between these behaviours and weight in a general population. As discussed by Braet et al. (2008), the children that score high on these eating behaviours will need self-control skills to cope with food in the absence of hunger, (external eating) and another (a smaller) group will need coping skills to deal with emotional eating.

The negative associations between external eating and weight status in our and other survey studies are in sharp contrast with experimental research that showed that susceptibility to food cues, such as food advertisements in media, is related to direct food intake in children (Anschutz, Engels, & van Strien, 2009) and to food intake and being overweight in adults (Herman & Polivy, 2008; Wansink, Payne, & Chandon, 2007; Wardle et al., 1992). The contrasts in findings between survey and experimental studies might be due to limitations of the questionnaires, or due to differences between the experimental settings and real life. In real life other factors are present that will influence behaviour, such as parental actions aimed at reducing food cues and availability (i.e. the opportunity to give in to food cravings). Interestingly, cross-sectional findings provide some evidence that higher weight is a reason for parents and/or children to suppress intentions to give in to food cues, and especially for overweight children parents might be more controlling. Future studies should test whether parents indeed suppress a (higher) tendency of their overweight children to give in to food cues by using observational designs in which this behaviour is provoked. Also, experimental studies could be combined with long-term prospective surveys.

Our results are not supportive for the restraint theory. Restrained eating was related to higher weight, but this relation seemed to be mainly the result of overweight
adolescents’ having higher restrained eating scores. This has implications for interventions and treatment. Diets are generally unsuccessful in reducing weight gain (Mann et al., 2007) and a recent review by Birch and Ventura (2009) concluded that most childhood obesity prevention programmes focused on school-aged children and have had little success. Others found more promising results: School-based lifestyle interventions aimed at preventing obesity and overweight in children and adolescents; intervening on diet or activity-related behaviours, on the other hand, have accomplished good results with regard to reducing BMI or body fat (Doak, Visscher, Renders, & Seidell, 2006). It seems that despite the promising results of some school-based interventions more work in this area is needed to identify which aspects of these interventions are successful. If overweight youngsters already display specific minimal efforts to control their weight, treatment and prevention programmes should recognize this and anticipate on the tendency of overweight youngsters to restrain their food intake (Braet et al., 2008). Probably, young people’s weight loss strategies start with a mild form of dieting. However, failures of restraint behaviour could cause distress, which in turn might promote more rigid weight loss strategies. By helping youngsters to adopt healthy weight loss strategies (i.e. changes in dietary patterns and physical activity) and anticipate their tendency to adopt unsuccessful dieting practices, weight successes could be accomplished rather than slipping into the negative spiral of unsuccessful dieting, feelings of guilt, harsher dieting methods, and even eating pathology.

**Food intake and overeating**

The theories on eating behaviours suggest differences between overweight subjects (Herman & Polivy, 1980; Schachter & Rodin, 1974), but they mainly addressed differences in overeating behaviours; that is, overeating in response to internal signals, external signals, and disinhibition. Common-sense assumptions imply that (non-compensated) overeating will lead to a positive energy balance and therefore weight increase, although even this is being debated (Tremblay & Chaput, 2008). Additionally, in adolescence weight is influenced by multiple factors including growth and pubertal timing. Through life, energy needs vary and therefore the same eating patterns may have different weight outcomes later in life. Therefore, studies that related emotional, external, and restrained eating to food intake showed other results than those for weight status: a positive or negative association between eating behaviour and food intake does not necessarily correspond with a similar association to weight status. Findings of Wardle et al. (1992) and Lluch et al. (Lluch et al., 2000) showed that external eating is positively related to food intake, while restrained eating is associated with lower intake of energy, carbohydrates, and protein (only significant for boys) (Lluch et al., 2000; Wardle et al., 1992). Another study found that restrained eating was associated with lower intake of sweets, whereas external eating was associated with higher intake of sweets and soft drinks in children (Elfhag & Morey, 2008). In a study among predominantly Latino adolescents, emotional eating was associated with increased frequencies of intake of sweet as well as salty high energy-dense foods, and soda (Nguyen-Michel, Unger, & Spruijt-Metz, 2007). In addition, boys and girls seem to differ in their food restrictions, for boys
who attempted weight loss reduced sweet foods and snacks, while concurrently increased healthy food intake. Girls on the other hand reduced a larger range of foods, including bread, breakfast, and lunch in general and fatty foods specifically (Nowak, 1998). In conclusion, external and emotional eating have been related to higher food intakes and restrained eating to lower food intake. Research, as a result, shows that the three types of eating behaviours are differently related to food intake than to weight status. More studies are needed that address the long-term associations between eating styles and weight status and the possible mediation of this relation by actual food intake (or intake of specific foods). In addition, other factors that influence weight, such as physical activity and non-habitual food intake (fasting and binging) should also be taken into account in future studies. Overeating does not translate itself automatically into overweight and this may in particular hold true for children and adolescents.

**Limitations**

The studies described in this dissertation are the first large-scale longitudinal studies in adolescence that included all three types of eating behaviours. However, the use of self-reported data in the present study is the most important limitation. Our measured values at the third wave on adolescent weight and height provided substantial validation for the self-reports in at-home contexts; most importantly, they show that underreport of weight and over-report of height is not specific to a certain weight group. Still, we cannot rule out that, for example, those with the highest increases of weight in the past year will underreport more, due to social desirability or ignorance about how tall or heavy one actually is. Self-reports are always subject to more bias than measured height and weight values. Similarly, social-desirability could also affect the eating behaviour scores. Being overweight is stigmatized in our society, therefore it could be socially desirable for overweight subjects to endorse questions about being on a diet and not to endorse those about emotional and external eating (van Strien & Ouwens, 2003b). Profound pros of this study are the long period (five annual waves) reducing the effect of incidental misreport, and the high retention rates across waves.

Our sample was not representative for the Dutch population and generalisability is therefore limited. Most importantly, this sample only consisted of intact families and family members were relatively high-educated. Also, compared to national data we found lower overweight percentages. There are several possible explanations for these lower prevalence figures. First, the earlier mentioned underreport of weight and over-report of height, due to self-reports. Second, comparison is difficult as national studies usually report overweight percentages over a wide age range, prevalence during adolescence might differ from that in childhood. Third, we used the IOTF (Cole, Bellizzi, Flegal, & Dietz, 2000) cut-off points that could result in lower percentages than for example Ideal Body Weight (IBW) like Braet and van Strien used (Braet & van Strien, 1997). The IOTF definition approximates to the 99th percentile of BMI for obesity and the 91st percentile for overweight, thus less than 1% of the population is obese and around 9% is overweight according to these definitions (Caccialanza et al., 2004). In contrast, previous studies often used percentile such as...
85 (Braet et al., 2008) to define overweight resulting obviously in higher percentages. The use of the cut-off points proposed by Cole and colleagues (Cole et al., 2000) have three important advantages: 1. they are specific for age and gender, 2. they are based on several samples from different countries and are therefore internationally accepted and used, and 3. these cut-off points correspond with those for adults (BMI > 25 is overweight and > 30 is obese). The second and third point are the main reasons why we preferred to use the cut-off point instead of using, for example, the .95 percentile as a cut-off point for overweight. When using percentile scores, a norm group is needed – usually a large-scale national growth study – which means that .95 percentiles differ per country and also depend on the percentage of overweight subjects in the norm group. This makes for example comparisons over time more complicated.
Part two: Family influences

In the second part of this dissertation, the role of the family in adolescents’ eating styles and body dissatisfaction is addressed, as well as parental influences on young children’s food choices. Parents play an important role in children’s food preferences and eating behaviours. The environment in which children grow up largely shapes the child’s food preferences, since children like and eat what is familiar to them (Fisher & Birch, 2002), what is available, and what their parents eat (Ritchie, Welk, Styne, Gerstein, & Crawford, 2005). This has an influence for the rest of the children’s lives, since dietary habits formed in childhood are likely to persist into adulthood (Clark, Goyder, Bissell, Blank, & Peters, 2007; Kelder, Perry, Klepp, & Lytle, 1994; Klesges, Stein, Eck, Isbell, & Klesges, 1991). Food habits during childhood and family context are therefore widely assumed to be crucial in the establishment of healthy dietary habits (Wardle, 1995). These parental influences are transmitted in several ways. Firstly, weight status, food choices, food preferences, and eating behaviour “aggregate” within families (Davison, Markey, & Birch, 2000; Faith, Keller et al., 2004; Rankinen & Bouchard, 2006), which suggests processes of modelling of all these factors. Secondly, parents can influence their children through food-related parenting practices, and these parenting behaviours occur within the context of parents’ general parenting styles (called general parenting). Parents also have a more direct influence on their off-spring by making certain foods available and accessible and reducing access to other foods (Ritchie et al., 2005). Of course, biological parents shape their child’s genetic makeup, but this transference is beyond the scope of this dissertation.

This part of the dissertation will discuss modelling of eating styles by parents and siblings. Further, I will address some current important issues in parenting and eating behaviour. More specifically, parental support and control in relation to emotional eating, parental dissatisfaction with adolescents’ figures in relation to adolescents’ body satisfaction, and parental food restriction and its relation to young children’s food choices.

Similarities and transmission between family members – modelling

In addition to their own taste and preferences, children’s eating behaviours can be influenced by social agents, such as parents and peers, as well as the media. Especially for young children family factors are of great importance. Family similarities can be the result of genetic factors, but it also seems reasonable that children tend to eat more of the foods their parents eat. This is exposed to them and available in their homes. Indeed, dietary intake aggregates within families (Vauthier, Lluch, Lecomte, Artur, & Herbeth, 1996) and it appears that family resemblance persists into adult age (Stafleu, 1994). Children not only model their parents’ food intake and preferences, but also it was found that mothers and their adult daughters resemble each other in nutrition knowledge and attitudes (Stafleu, 1996). Similarly, children might model their parents’ attitudes towards food and reasons behind eating behaviours (Brown & Ogden, 2004).
Ample studies addressed the associations between parents (mostly mothers) and children's (mostly daughters) restrained eating and dieting. The general belief is that children resemble their parents in dieting behaviours; even though the numerous studies that addressed this issue did not provide convincing evidence for aggregation of dieting behaviours within families. Null findings were reported by several studies (Benedikt, Wertheim, & Love, 1998; Keel, Heatherton, Harnden, & Hornig, 1997; Ogden & Elder, 1998; Ogden & Steward, 2000), while others found significant associations between mothers and daughters (Hill, Weaver, & Blundell, 1990; Ruther & Richman, 1993; Steiger, Stotland, Ghadirian, & Whitehead, 1995), but not between sons and parents (Ruther & Richman, 1993) or between fathers and children (Steiger et al., 1995). All these studies were cross-sectional. Another complication for the interpretation of studies on family similarities and influences is the lack of a consistent measurement of dieting behaviours: Not all previous studies used validated questionnaires to measure dieting behaviours or used different scales for parents and children. Two studies reported longitudinal data, but found no significant transmissions of dieting between mothers and their children over a 1-year period (Byely, Archibald, Graber, & Brooks Gunn, 2000; Field et al., 2001). However, these longitudinal studies used self-constructed items to measure dieting behaviours and did not include both fathers and mothers and sons and daughters. Two prospective studies thus showed no transmissions of dieting behaviours by family members over time; cross-sectional and retrospective studies were mixed, both in design and results, and a number of studies had serious methodological limitations (see appendix C for an overview of the study characteristics). So far, no studies on restrained eating had been conducted that used validated scales and multi-source data with a full-family longitudinal design.

Few studies on modelling of emotional eating have been reported so far. Mothers who scored high on emotional eating themselves were found to have a more emotional feeding style (Wardle et al., 2002). According to Bruch (1973), mothers who have an emotional feeding style (that is, using food as comfort) are not responsive to their children's needs and therefore children learn not to rely on their own feeling, which might result in an emotional eating style. However, the study by Wardle et al. (2002) did not address this hypothesis directly as children's own emotional eating was not measured. A recent study by Jahnke and Warschburger (2008) using a sample of 142 3-6 years old children and their mothers found significant associations between mothers and sons, but not between mothers and daughters emotional eating. Obviously, the current state of research is not conclusive in whether children do or do not model their parents' emotional eating.

Compared to studies on modelling of parents' eating behaviours, very little is known about modelling of eating behaviours between siblings. The findings of studies on peers suggest that siblings’ eating behaviours might be related, especially for girls and especially for restrained eating. Many adolescent girls discuss body weight and dieting with their friends (Desmond, Price, Gray, & O’Connell, 1986; Wertheim, Paxton, Schutz, & Muir, 1997), and exposure to peer dieting techniques significantly accounted for their variance in dieting (Levine, Smolak, Moodey, Shuman, & Hes-
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It seems plausible that similar to peer influences, siblings might also affect each other through comparable mechanisms.

Parental control and support and emotional eating

As mentioned before, parents can also influence their children’s behaviours more directly through parenting (Birch & Fisher, 1998; Minuchin et al., 1975; Tata, Fox, & Cooper, 2001). In the development of the psychosomatic theory (that describes emotional eating) early observational studies have led to the suggestion that parental behaviour might play an important role in the development of emotional eating in childhood (Bruch, 1973). It was proposed that especially an emotional feeding style (i.e., feeding in response to emotional distress) might enhance emotional eating. More recent studies found some evidence for associations between parenting and emotional eating: Young girls’ perceptions of parental pressure to eat more were positively associated with emotional eating, whereas restriction was unrelated to emotional eating (Carper, Fisher, & Birch, 2000). In contrast, Brown and Ogden (2004) found that ‘parental control over children’s diet’ and ‘parental levels of control over their child’s behaviour using food’ were unrelated to children’s scores on the short version of the DEBQ emotional eating scale. In a recent study by van Strien and Bazelier (2007), perceived restriction to eat was negatively related to emotional eating and perceived pressure to eat was positively related to emotional eating in boys only. Other studies on modelling or parenting effects on emotional eating in children or adolescents are lacking, despite the importance to identify factors that determine the development and initiation of these eating behaviours. Parenting refers to food-specific parenting or feeding practices, but also covers general parenting (Hughes, Power, Fisher, Mueller, & Nicklas, 2005). This is the context in which parenting practices occur, and it is often operationalized by the dimensions control and support (Baumrind, 1971). For general parenting, the control dimension varies from supervision and monitoring to more manipulatively suppressive control, while the support dimension refers to the affective and supportive behaviour of parents (Finkenauer, Engels, & Baumeister, 2005; Lamborn, Mounts, Steinberg, & Dornbusch, 1991). Those two dimensions have been related to children’s behaviours, including health risk behaviours and internalizing problem behaviours (Maccoby & Martin, 1983). Generally, behavioural control (active supervision of, and acquiring knowledge about, what children are doing) was found to be a protective factor for problem behaviour while psychological control (harsh, suppressive, and manipulating control including behaviours such as guilt induction, love withdrawal, and excessive pressure for change) was a risk factor (Finkenauer et al., 2005). Furthermore, psychological control is suppressive and authoritarian and therefore more likely to undermine the child’s autonomy and ability to self-regulate food intake (Birch & Fisher, 1998). Parental support on the other hand has been associated with less problem behaviour and emotional problems in children (Finkenauer et al., 2005). Studies on eating problems and obesity are generally in line with these findings. Lack of parental support and parental caring have been related to disordered eating and body dissatisfaction (Littleton & Ollendick, 2003; McVey, Pepler, Davis, Flett, & Abdolell, 2002) as well as obesity (Lissau & Sorensen, 1994). The support and control
dimensions can also be combined into four parenting styles. An authoritative parenting style (high control, high support) is preferable to an authoritarian (high control, low support), permissive (high support, low control), or neglectful (low support, low control) parenting style in terms of child behavioural outcomes. Indeed an authoritarian feeding style has been related to a higher fruits and vegetables consumption (Kremers, Brug, de Vries, & Engels, 2003) and lower overweight status compared to the other parenting styles (Rhee, Lumeng, Appugliese, Kaciroti, & Bradley, 2006). In summary, parental behavioural control and support generally have been positively associated with weight and eating behaviours, whereas psychological control might be a negatively associated influence.

Food-specific parenting and adolescents’ body dissatisfaction

Next to general parenting styles, parents' behaviours can be specific to certain domains, such as eating which will be referred to as food-specific parenting. During adolescence normative weight increase related to puberty occurs. Since our society so much emphasizes appearance and thinness, adolescents who are going through changes in their bodies are vulnerable to feedings of body dissatisfaction (Neumark-Sztainer, 2005a). Body dissatisfaction can refer to discontent with any aspect of one's appearance, for girls this mostly brings about the wish to be thinner, whereas for boys it can be either the wish to be thinner or the wish to be larger.

Reviews by Stice (1994, 2002) on the risk and maintenance factors of eating pathology supported the sociocultural model in which social pressure to be thin is assumed to foster the thin ideal as well as body dissatisfaction. Sociocultural pressures are exerted by parents, peers, and the media, and include (direct or indirect) pressures to lose weight, a focus on dieting and physical attractiveness, parental control over their children's weight, and pressure to restrict food intake. In their review study, Cafri, Yamamiya, Brannick, and Thompson (2005) concluded that internalization of the thin ideal and the perceived pressure to be thin are indeed affecting body satisfaction.

When looking at the role of parents specifically – rather than socio-cultural influences at large – previous studies showed that parents have substantial impact on the weight-related attitudes and behaviours of their adolescent children. In a model of risk and protective factors for eating disorders, family contextual factors, including parenting and parent-child attachment) and family characteristics, such as parental weight status and weight concerns are marked as risk factors for low self-esteem and low body image (Striegel Moore & Cachelin, 1999). More specifically, parents may influence their children's body dissatisfaction through explicit communications that include criticism, teasing, and pressure to be thin (Stice, 1994, 2002). Also, family studies generally show clear associations between perceived parental encouragement to diet, weight-related criticism, and teasing (etc.) and weight-related behaviours and levels of body dissatisfaction of their offspring (Keel et al., 1997; Keery, Boutelle, van den Berg, & Thompson, 2005; Levine et al., 1994; Schreiber et al., 1996; Wertheim, Martin, Prior, Sanson, & Smart, 2002). However, prospective research on parental behaviours has provided inconclusive support for their impact on adolescent's own body dissatisfaction.
Despite the extensive volume of research into specific parental behaviours and their relationship to their children's body dissatisfaction, only few used parents' reports of their dissatisfaction with their children's figures rather than the indirect measurements of the children's perceptions of their parents' dissatisfaction. Only one study directly measured parents' perceptions of the current and ideal appearance of their children and their satisfaction with their children's figures (Pike & Rodin, 1991). Thus, despite ample research on the thin ideal and sociocultural pressures to be thin, how parents perceptions of their adolescent children's figures prospectively relate to adolescents' own perceptions is yet unknown.

**Food-specific parenting and young children's food choices and weight status**

The majority of research on food-specific parenting focuses on control of food intake (pressure to eat, restriction, and monitoring – also named feeding styles) and most of these studies included pre-school and primary-age children (Clark et al., 2007). Restriction over food intake is parents' attempt to control their children's eating by restricting access to foods. Pressure to eat is prompting, pressure or encouragement to eat more healthy foods or more food in general, particularly at mealtimes. Finally, monitoring food intake is the extent to which parents report watching their children's consumption of (energy-dense) foods. A series of experiments by Birch and Fisher in young children (Birch & Fisher, 2000; Fisher & Birch, 1999a, 1999b, 2000) showed that food restrictions were associated with unintended outcomes, such as higher preference for and intake of the restricted foods and lower ability to self-regulate intake (Fisher & Birch, 1999a). Similar results on snacking were found by Brown and Ogden (2006), while Johannsen, Johannsen, and Specker (2001) found that fathers’ controlling behaviour was associated with higher body fat percentages in girls. Others found null results or negative associations between parental control and food intake (de Boudeaudhuij, 1997) or weight status (Robinson et al., 2001) (Spruijt-Metz, Li, Cohen, Birch, & Goran, 2006). Prospective data revealed no significant longitudinal associations between restriction, monitoring or pressure to eat and fat mass (Spruijt-Metz et al., 2006) or inconsistent findings dependent on overweight risks (maternal weight) (Faith, Berkowitz et al., 2004). Also, review studies have not been conclusive. Clark et al. (2007) concluded that restriction of children's eating has most frequently and consistently been associated with weight gain and they also stated that there is substantial evidence of a causal relationship. Wardle and Carnell (2007), on the other hand, concluded that results of the studies they reviewed suggest that greater parental control either leads to lower adiposity in the long-term or has minimal impact on weight for the majority of the children.

For the measure of parental control there are several methodological issues to consider. One of the most commonly used questionnaires on food specific parental restriction of children is the Child Feeding Questionnaire (CFQ) (Birch et al., 2001). Although the CFQ showed good psychometric characteristics in some studies (Carper et al., 2000), it is still an unresolved issue how scores on the CFQ are related to parents’ actual behaviours. Moreover, no clear correspondence between child and mother’s reports on the CFQ scales has been found indicating discrepancies between
parents’ reports and children’s perceptions of their parents’ behaviour. Carper, Fisher, and Birch (2000) found that while only 26% of the parents indicated that they pressured their daughters to eat, 61% of the daughters reported to perceive some degree of parental pressure. This raises questions whether mothers generally give a fair and realistic report of their behaviour when it comes to complex behaviours like how they handle the food intake of their children. Observational designs might be a good alternative way to study mother-child interactions on food, especially since young children cannot adequately report on perceptions of their parents’ behaviours. We therefore used an innovative paradigm of a structured role-play, in which children role-played adults and shopped in a miniature grocery shop (Dalton et al., 2005).

**Research aims and main questions**

First, similarities between family members in eating behaviours will be addressed, as well as processes of transmission over time. Next, for adolescents, we will look into the roles of general parenting control and support in relation to emotional eating, and to more specific parental behaviours, such as parental dissatisfaction with the adolescent’s figure in relation to adolescent’s body dissatisfaction. For young children, we examined the associations between maternal restriction and the food choices children made during a structured role-play. Mother-child interactions in a second role-play were also related to children’s food choices. Summarized in research questions:

4. Are adolescents’ eating styles influenced by eating styles of family members?
   4.1. Do adolescents resemble their parents in restrained eating and/or are they influenced over time by their parents’ eating behaviours or the other way around? (Chapter 5)
   4.2. Do adolescents resemble their parents in emotional eating? (Chapter 6)
   4.3. Do adolescents resemble their siblings and/or are they influenced over time by their siblings’ emotional, external, and restrained eating? (Chapter 7)

5. Is parenting related to adolescents’ eating behaviour and body dissatisfaction?
   5.1. Is general parenting related to adolescents’ emotional eating? (Chapter 7)
   5.2. Is parental dissatisfaction with adolescents’ figure related to adolescents’ BMI and own body dissatisfaction? (Chapter 8)

6. How does maternal control over food intake relate to young children’s food choices?
   6.1. Do young children with and without overweight differ in what they see as an acceptable food parcel? (Chapter 9)
   6.2. Is maternal restriction and pressure to eat related to young children’s food choices in a shopping task when role-playing adults? (Chapter 9)
6.4. Are maternal behaviours and mother-child interactions during a shopping task related to children’s food choices? (Chapter 10)

Summary and discussion of main results

Similarities in eating behaviour of parents and adolescents

Cross-sectional associations were found between parents’ and adolescents’ restrained eating, but overall no transmission of restrained eating was found between family members over time. Thus, although adolescent children resemble their parents in restrained eating, during adolescence there seems to be no direct transmission. This result is surprising given the important role that has been ascribed to parents for the development of eating behaviours in general. This is, however, not in contrast with several previous cross-sectional studies, that showed mixed results on family similarities in dieting behaviours, together with two longitudinal studies that reported no transmissions between mothers and children (Byely et al., 2000; Field et al., 2001). The findings further showed that higher levels of emotional eating by parents were related to higher levels in adolescents’ emotional eating. Interestingly, these associations did not differ regarding to sex of the adolescents. Between siblings moderate cross-sectional similarities in eating behaviours were found, while over time younger siblings had a small impact on older siblings’ behaviours but not the other way round. In the associations between siblings’ eating behaviours, we also found no differences between boys and girls.

In conclusion, we found support for family similarities in restrained, emotional, and (for siblings) external eating. However, less support was found for transmission over time. According to the social learning theory, engagement in a behaviour is more likely if one is exposed to significant role models of that behaviour (e.g., Bandura, 1977). Our results suggest that adolescents resemble their parents and siblings in eating behaviours, but there seem to be no transmission during the adolescent period.

Parents and siblings could still be role models for eating behaviour, since transmission may have occurred at an earlier age and therefore family members resemble each other even though there is no current transmission. This might hold especially for restrained eating as dieting has found to start at a very young age (Hill & Robinson, 1991). However, for emotional eating it is less likely. In adults, eating more versus less in response to stress (emotional eating) is considered an individual characteristic that is highly consistent over time and varies more between than within individuals (Stone & Brownell, 1994), research on the development of emotional eating in childhood and adolescents is lacking. Young children score lower on emotional behaviour, indicating that this behaviour develops somewhere in time. With our data we can not determine when exactly, but the differences between adolescents and parents’ emotional eating scores suggest an increase somewhere in (young) adulthood. A second explanation is that familial similarities are due to factors other than transmission, e.g. to cultural variation or to genetics. Recently, a genetic component
has been found for emotional eating and twin studies showed great importance of genetic factors for restrained eating of young adult males (Tholin, Rasmussen, Tynelius, & Karlsson, 2005). Third, parents may influence their children's eating behaviours in ways other than modelling and irrespective of their own weight and eating behaviour. For example, by helping the child to diet (Striegel Moore & Kearney Cooke, 1994) or by enforcing pressure to diet or to be thin (Stice et al., 1998) parents can encourage their children's dietary restraint even though they might not be taking their own advice and were not high restrained eaters themselves.

Similarities in restrained eating were higher between daughters and mothers compared to sons and mothers. However, for emotional eating and sibling similarities, no sex differences were found, and also, the prospective associations between parents and adolescents’ restrained eating did not differ for boys and girls. Quality of relationship did not seem to affect parent-adolescent similarities and had only influence in sibling’s similarities in emotional eating. The social learning theory suggests that people are more likely to imitate someone whom they resemble, look up to, or have a good relationship with. Therefore, we expected higher similarities between family members of the same sex such as mothers and daughters or sisters. Also, we expected higher similarities between family members who have a good quality relationship. Our data was not supportive for these expectations, or for the social learning theory.

The conclusion that parents do not matter for the development of eating behaviours during adolescence would be too far-fetched, since parenting practices were not included in the present study. Ideally, studies should include genetic, modelling, and parenting factors and follow children or adolescents over an extended period of time. However, such a study would also be very costly, therefore, short-term longitudinal studies in specific age groups can give an indication whether many shifts in behaviour will occur at that age. Our results do not provide evidence that adolescence is a key time-period in the development of eating styles, therefore, it might be more interesting for future studies to investigate transmission of eating behaviours between family members at a younger age.

**General parenting and emotional eating**

Higher maternal support was associated with lower emotional eating in younger adolescents, while higher psychological control was associated with higher emotional eating in younger and older (trend) adolescents. This is in line with previous studies that found positive influences of support and negative influences of psychological control on children's (eating) behaviours. Unexpectedly, perceived maternal behavioural control was associated with higher emotional eating in older adolescents. Earlier studies that addressed emotional eating found no significant associations with parental control (Brown & Ogden, 2004; Carper et al., 2000), whereas findings on other domains suggest it is essential to establish not only whether parents control at all, but also how they enforce control. Psychological control is suppressive and authoritarian and therefore more likely to undermine the child's autonomy and ability to self-regulate food intake (Birch & Fisher, 1998; Johnson & Birch, 1994). But from our results, it appears that also behavioural control can have
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(unintended) negative effects. This was only found for older adolescents and might be attributable to experienced over-control. Alternatively, as these data are cross-sectional, higher behavioural control can be a response of parents to the perception of emerging eating problems in their children. Finally, the role of parenting dimensions might be more complex, and interactions between the dimensions should perhaps also be considered. Galambos, Barker, & Almeida (2003), for instance, found that parental psychological control was positively related to adolescents’ externalizing problems, but only if parents also reported higher behaviour control.

We did not find a consistent pattern for all reporters on the role of parenting practices on adolescent emotional eating. In contrast to adolescents’ reports, parents’ reports of parenting were not significantly associated with adolescent’s emotional eating. The discrepancy in results based on parent or adolescent reports can either be the result of biased answers by the children (shared rater bias) or by the parents (who are more susceptible for social desirability) or differences in perception (Engels, Finkenauer, Meeus, & Dekovic, 2001).

In conclusion, for emotional eating, moderate but significant associations were found between parents and adolescents, and evidence was found for the relations with general parental support and control. Future studies on parental influences on emotional eating might include both general and more specific parenting behaviours, and should additionally look at the interactions between parenting dimensions.

**Parental behaviours and adolescent body dissatisfaction**

The results showed that roughly 10 to 20 per cent of the fathers and mothers indicated their wish for their children to be thinner or, to a lesser degree, larger. In line with our hypotheses, cross-sectional results showed a weak but significant relation between parental and adolescent dissatisfaction, however, this relationship was not replicated in the longitudinal data. Yet, initial levels of parental dissatisfaction did influence adolescents dissatisfaction over time in an indirect manner in that it was related to adolescents’ body dissatisfaction at wave 1, which in turn predicted adolescents’ body dissatisfaction at waves 2 and 3. As discussed by Neumark-Sztainer (2005a), it is a challenge for parents to help their children keep a healthy weight and at the same time promote a positive body image. Adolescents who have high body dissatisfaction are more likely than others to engage in unhealthy dieting practices (Neumark-Sztainer et al., 2006; Stice, 2002). They may develop eating pathologies (Crow, Eisenberg, Story, & Neumark Sztainer, 2008; Johnson & Wardle, 2005; Kostanski & Gullone, 1998; van den Berg, Wertheim, Thompson, & Paxton, 2002), and possibly develop psychosocial disturbances (e.g., stress, anxiety, low self-esteem, depression, and suicidal behaviour) (Davison et al., 2000). It is important that parents foster a safe home environment (Neumark-Sztainer, 2005a) and future studies might focus on what parents actually can do to help children control their weight in positive ways.

A limitation of our body dissatisfaction measure is that positive scores on our measure indicated the extent to which one wanted to be thinner with, conversely, wanted to be larger resulting in negative scores. Thus, both ends of the scale indicate
dissatisfaction (Davison et al., 2000), but the reasons and motivations behind the wish to be thinner can differ from the wish to be larger. Our measure does neither account for differences in age and sex, nor addresses muscularity or changes associated with puberty. Clearly, more studies are needed that will use direct measures of parental dissatisfaction and also address the distinctions between the desire to be thinner or larger, as well as include muscularity.

Do parents play a role in adolescents’ eating behaviour?
As mentioned before, we found evidence for moderate similarities in eating behaviour though not in body dissatisfaction. In addition, we found that general and specific parenting behaviours seem to affect at least some of the eating and weight-related behaviours. Future research should especially focus on a combination of general and food-specific parenting and their interactions. A complication in this is that there is not a consistent use of methods to measure food specific parenting and most questionnaires are not well validated. Third, more studies need to address the differences between parent and child’s reports of parental behaviours, both in scores and in impact on behaviour.

We find it most striking that we found so little sex differences, both in similarities and in associations with parenting. Boys and girls strongly differed in eating styles (see part one) and we found girls to be consistently more dissatisfied with their bodies than boys. Parents also more often wished for their daughters to be thinner, whereas for their sons they wished them to be both thinner and larger. However, the ways in which boys and girls were influenced by parents did not differ between the sexes. Also, our results showed that fathers should not be neglected, especially since parents might strengthen or buffer each other’s as well as their other family members’ behaviours. Mothers are still considered to be primary care takers when it comes to household, cooking, and eating, and spend more time on child feeding than fathers. For future studies, it might be interesting to see whether and how fathers and mothers still have different roles in child feeding in Dutch families nowadays, and whether their influences on children’s eating and weight-related behaviours are played in a different way. Also, specific behaviours that might differ between the sexes could be identified and included, for instance dissatisfaction with specific body parts or types of dieting behaviours. A design that is more focussed on sex differences is necessary to conform suggestions of our data that parents influence their boys’ and girls’ eating behaviours similarly.

Parental restriction and young children’s food choices
In the first observation study it was found that overweight children tend to buy more products in general and more high-caloric foods than their normal weight peers, implying positive associations between children’s body weight and the caloric value of what they find normal to consume. Mother-reported and child-reported restriction did not differ between mothers of overweight and non-overweight children and had little main or moderating effects on the children’s food choices. In the second role-play, mothers seemed successful in influencing their children’s food choices, since these were healthier compared to when the child shopped alone. This
is in accordance with previous studies that found positive effects of maternal presence or expected presence on children's food choices (Klesges et al., 1991). Results further showed that mothers used a range of controlling and encouraging behaviours to influence their children's food purchases. Observation of these behaviours in our study revealed two underlying factors, namely “monitoring control” which included support, monitoring, and directive control (pressure and restriction), and “authoritarian control” which included enforcing control (pressure and restriction).

The influence of maternal control might depend not only on the type of control, but also on its level. Lack of sufficient control (permissiveness) is believed to have a negative influence on children's behaviour, whereas over-control is not good either. Bruch (1973) already observed that for the development of healthy eating behaviour, it appears to be essential for normal development that stimulation coming from outside and confirmation of impulses originating in the child itself are well balanced.

Parents of young children are often the focus of public health interventions aimed at reducing overweight risks and/or improving diets. However, the focus of prevailing interventions is on what parents feed their children and not on how they feed them (Clark 2007). There is however little consensus among researchers, especially regarding control. Our results provide additional evidence that a certain degree of control is necessary, and suggest that when children are dominant, parents should also actively be involved in food choices. The way parents enforce control is not that important as long as they do not withdraw from the interaction and allow children to take control and make their own choices. More studies, however, are needed to replicate our findings and look at the long-term effects.

A few factors complicate the associations between food-specific parenting and children's weight and eating. One factor that gets more and more attention in literature is that the associations between parenting and child's weight and eating is likely to be reciprocal: An overweight status or increases in weight can elicit certain parental behaviours (Ventura, Loken, & Birch, 2009). For example, higher child adiposity is been related to higher restriction (Fisher & Birch, 1999a). Similarly, Faith, Berkowitz et al. (2004) found that (among children predisposed to obesity) elevated child weight appears to elicit restrictive feeding practices, which in turn may produce additional weight gain. Parents may adopt child-feeding behaviours in response to child weight, or perceived child weight (Clark et al., 2007). The influence of children's weight on parental behaviour is further complicated by the fact that parents do not always have an accurate perception of their child's weight status and do not always recognize their children's overweight. For example, Etelson Brand, Patrick, and Shirali (2003) found that parents of overweight children invariably underestimated their children's weight. Only 10.5% of parents of overweight children perceived their child's weight accurately compared with 59.4% of other parents. Perception of child's weight (and of parents own weight) is measured by the CFQ and several studies addressed its relation to weight status and parental feeding behaviours (Birch & Ventura, 2009). Surprisingly, few studies, however, addressed the question why parents do accurately report their child's weight status. Is it because it is difficult to recognise overweight in general? Is it because parents want to give a social desirable answer – they do not want to say anything bad about their own chil-
dren? Is it because they think it is only temporary or normal for a child of that age to be a bit round? Or is it because parents are not able to judge their own children objectively?

Third, maternal restriction has been linked to various maternal characteristics, such as own weight concern and restrained eating (Clark et al., 2007). Fisher and Birch (1999) found that parental own restrained eating was related to higher restriction of their 3-5 years old children. Similarly, mothers’ dietary restraint was related to maternal control, which in turn was related to higher 24-hour recall food intake and higher weight in 5-year-old daughters (Birch & Fisher, 2000). So, in addition to maternal behaviours being a reaction to children’s characteristics, these behaviours can also partly be a response to their own characteristics and weight preoccupations.

Finally, some limitations of our observational paradigm should also be mentioned. First, this was not a naturalistic setting and generalizability was therefore limited. Second, we only included mothers. McHale, Crouter, McGuire, and Updegraff (1995) postulated that mothers are of particular interest on children’s eating behaviours since they have been shown to spend significantly more time in direct interactions with their children than fathers across several familial situations, including meal-times. However, fathers’ behaviours also play important roles in children’s eating and including both fathers and mothers in the study would give a more complete picture of family influences.

The measure of parental control over food intake

Ogden, Reynolds, and Smith (2006) stated that research on parental control is confusing and used a narrow conceptualisation of the ways in which parents control what and when their children eat. In addition, different forms of control may influence different areas of eating behaviour. In a review, Faith et al. (2004) concluded that, compared to measurement in which maternal feeding restrictions were explicitly assessed, measures of global parental feeding styles (including controlling efforts) did not seem to be sensitive enough to detect associations between parental behaviours and children’s weight. However, also questionnaires for food-specific control and children’s weight or food intake are subject to methodological problems. Our results showed that observation of maternal controlling behaviours of children’s food intake revealed two factors: “Monitoring control” and “Authoritarian control”. This is in line with the distinction made in general parenting and does also support the critique on the CFQ that it includes both monitoring and more psychological control items and does not account for differences in controlling behaviours (Brown & Ogden, 2004; de Boudeaudhuij, 1997; Robinson, 1999; Saelens, Ernst, & Epstein, 2000). Pressure to eat was not a separate factor, which is in contrast to the distinction made in the Child Feeding Questionnaire. Overall, it seems that at least in relation to children’s food choices there is still some way to go in the development of a behaviour-validated questionnaire on food-specific parenting. In a sample larger than ours scores on the CFQ could be linked to the observed maternal controlling behaviours and this could help to validate and/or adjust parts of the questionnaire.
Limitations

A limitation is that our family data consisted solely of intact families with both biological parents, who were relatively highly educated. This was not a nationwide representative sample, especially when it comes to other family compositions, such as single-parent families, and the underrepresented ethnic minorities.

Second, we did not include peers as important social influences on the adolescents’ behaviour. When children grow older they obtain more autonomy and independency from their parents and are influenced more strongly by their peers. Still, parents have been found to be an important influence next to peers for externalising and internalising problem behaviours, and drinking behaviour (Galambos et al., 2003; van der Vorst, Engels, Dekovic, Meeus, & Vermulst, 2007). A multitude of different factors within the individual, familial, peer, school, community, and societal domains interact with each other to influence the onset and maintenance of weight-related problems (Neumark-Sztainer, 2005b). Despite the importance of parents, acknowledging parents, peers and other socio-cultural influences (such as media) would be a good suggestion for future research.

Eating behaviours are affected by genetic, environmental and individual characteristics. Our full-family design does not permit differentiation of these factors, and as a result some of the behavioural transmission and even parenting effects may be influenced by gene-environment interactions (Moffitt, 2005; Rutter, Moffitt, & Caspi, 2006). Future research should employ a genetic informative design to disentangle modelling from heritability effects and look at the interplay between genetic predisposition and environmental influences.
Part three: Television viewing

Media influences are considered a pivotal socio-cultural influence on eating behaviours and attitudes. This overview focuses on the role of one specific media influence: Television, and on how the three eating styles relate to the influence of television viewing on adolescents’ snack consumption.

Ample research examined the associations between children’s television viewing (TVV) and weight. Cross-sectional studies, a few intervention studies (Robinson, 1999), and some longitudinal studies (Francis, Lee, & Birch, 2003; Hancox, Milne, & Poulton, 2004; Kaur, Choi, Mayo, & Harris, 2003; Proctor et al., 2003) have shown a positive relationship between hours of TVV and weight (increase) during childhood and adolescence (Coon & Tucker, 2002). Two primary mechanisms by which TVV contributes to obesity have been suggested: Reduced physical activity and increased energy intake (Epstein, Paluch, Consalvi, Riordan, & Scholl, 2002). This overview will mainly focus on energy (food) intake.

TVV is associated with higher intake of energy (Crespo et al., 2001; R. W. Jeffery & French, 1998) and fat (Coon, Goldberg, Rogers, & Tucker, 2001; Robinson & Killen, 1995), and is assumed to promote snacking (Francis et al., 2003; Halford, Gillespie, Brown, Pontin, & Dovey, 2004) and consumption of nutritionally poorer diets (Coon et al., 2001; Coon & Tucker, 2002). There are two major hypotheses about the mechanism by which TVV exactly promotes food intake. First, TVV is believed to provide food cues (e.g., food advertisements) that may alter the viewer’s food preferences and intake. Second, weight-related messages on TV like thin idealizations and stigmatization of overweight people (Greenberg, Eastin, Hofschire, Lachlan, & Brownell, 2003), as well as showing contradictory messages of slim actors who eat unhealthy without gaining any weight (Coon & Tucker, 2002) could cause negative emotions and overeating in persons who are preoccupied with weight. Such theories, however, assume that people react similarly to food cues and to negative emotions, and do not explain individual differences in eating behaviours. The objective of this part of the dissertation is to see whether the three eating styles central in this dissertation can provide a framework to explain individual differences in the magnitude of the associations between TVV and food intake and to test their moderating effects on the associations between TVV and snacking.

TVV and external eating

TV provides food cues, for instance by food advertisements. The associations between advertisement and food intake have been studied extensively. Watching TV commercials was found to be associated with children’s preferences for the advertised foods (Borzekowski & Robinson, 2001), and persuading parents to buy those foods (Brody, Stoneman, Lane, & Sanders, 1981). As said, it seems unreasonable to assume that everyone is affected by this exposure to advertisements in the same way. External eaters are more sensitive to external cues and more likely to respond to those food advertisements by eating. Inter-personal differences in sensitivity for TV food cues have been studied by Halford et al. (2004). In their study, obese subjects recognized more food advertisements than lean subjects, and this was associ-
ated with higher food intake following exposure to these food advertisements. No significant interaction of advertisement recognition with external eating was found, but this might have been due to their small sample (Halford et al., 2004). In our study, the positive associations between TVV and food intake were hypothesized to be stronger in subjects who scored higher on external eating.

**TVV and restrained eating**

There is some evidence that weight-related media messages can act as disinhibitors (that is, cues for restrained eating to give up their diet and overeat) similar to the effects of other disinhibitors such as food preloads and alcohol (Ruderman, 1986), and also weight related media messages. Restrained participants had a higher food intake than unrestrained subjects after seeing a video-tape or magazine advertisements containing stereotypical images of thin attractive females (Mills, Polivy, Herman, & Tiggeman, 2002; Seddon & Berry, 1996) or after viewing diet-oriented TV advertisements (Anschutz, van Strien, & Engels, 2008). Cool, Schotte and colleagues (1990, 1992) showed that watching a frightening movie was associated with negative affect, which triggered overeating among restrained participants. When participants were exposed to a neutral film, however, food intake decreased with increasing levels of dietary restraint (Cools, Schotte, & McNally, 1992; Schotte, Cools, & McNally, 1990). Weight related media messages are linked with negative feelings, such as body dissatisfaction and low self-esteem (Groesz, Levine, & Murnen, 2002). Some evidence has been found for the associations between TV messages, negative mood, restrained eating, and food intake. TVV may be a disinhibitor for restrained eating and therefore the combination of high-restrained eating and high TVV is hypothesized as a risk factor for higher food intake.

**TVV and emotional eating**

In adult studies, TVV has also been associated with negative emotions, such as loneliness, feelings of failure and guilt, and depression (Dittmar, 1994; Sidney et al., 1996). Such negative emotions have been related to overeating in high emotional eaters (Ganley, 1989; Slochower, 1983). To the best of our knowledge there are no studies linking emotional eating to TVV. Assuming that TVV is associated with negative emotions (Dittmar, 1994), high TVV might especially be associated with overeating in subjects that eat in response to those negative emotions (i.e. high emotional eaters).

**Research aims and main question**

In the final part of this dissertation the role of TVV on intake of snacks is addressed. The possibly moderating role of eating behaviour in the associations between TVV and snacking was tested. Formulated in one research question:

7. Does emotional, external, and restrained eating moderate the association between TVV and snacking in adolescents? (Chapter 11)
Summary and discussion of main results

As expected, TVV was positively associated with snacking. High external, low restrained, and high emotional eaters (only boys) seem to be more susceptible to the positive effects of TVV on snacking. In a different setting and older (student) age group Anschutz, Engels, and van Strien (2008) similarly found that all three eating styles were positively related to thin ideal media susceptibility (measured with The Sociocultural Attitudes Towards Appearance Scale-III). In our study, the interactions with emotional and external eating were in line with our hypothesis. In contrast, restrained eating moderated the associations between TVV and snacking contrary to our expectation and the findings by Anschutz et al. (2008) who found that high restrained eaters seem more affected by to thin ideal media susceptibility.

External eating and TVV

Consistent with our hypothesis, the association between TVV and snacking was stronger in high external than in low external eaters. Externality and TVV have been studied previously by Halford et al. (2004). They found no differences in external eating between normal-weight, overweight and obese children and no associations between external eating and advertisements recognition or intake after food advertisements exposure. As mentioned before, this lack of significant findings could have been due to the small size sample. In our study, we did find interaction effects of external eating on the relation between TVV and snacking, suggesting that external eating plays an important role in the effects of TVV on food intake. Based on this finding, we would expect that, in experimental studies also, adolescents who score high on external eating are more sensitive to food cues on TV. It seems therefore important to consider subjects’ external eating scores in further research on the associations between TVV and food intake.

Restrained eating and TVV

Contrary to our prediction, we found that snack intake was lower in high-restrained subjects, and that restrained eating attenuated the associations between TVV and snacking. This is in contrast with the results of previous experiments that showed that thin stereotype messages can induce disinhibition in restrained subjects (Mills, 2002; Seddon & Berry, 1996; Strauss, Doyle, & Kreipe, 1994). The problem with experimental studies, however, is that in most studies exposure to TV messages was immediately followed by exposure to food and even “obligation” to eat those foods for reasons of the taste experiment or at least easy access to snack foods. In real-life watching television and purchasing food does not always occur within a short period of time and snack food is not always easy accessible especially for children and adolescents. It is therefore important to be cautious in interpreting the effects of those TV induced mood changes on long-term food patterns. In a study by Anschutz, van Strien, and Engels (2008) highly restrained students who watched a movie interrupted by commercials with slim models and diet-related products ate less snacks while watching, whereas less restrained eaters ate slightly more after seeing these commercials. This supports the reinhibition theory that proposes that
diet and weight-related messages on TV remind restrained eaters of their diets and makes them eat less. Finally, the reaction of restrained individuals to thin idealizing messages could be more complicated than the common assumption that those messages lead to negative emotions in high-restrained subjects. They can also have a short-term inspiration effect, e.g., restrained eaters reported a thinner ideal body size and thinner current body size following exposure to idealized body images (Mills et al., 2002). Our findings suggest that restrained eating (cognitive suppression of food intake) seems to be a protective factor against overeating as a result of TVV in our study. In line with Anschutz et al. (2008), this supports the reinhibition theory but more studies are needed to address this issue. Especially studies that measure food intake, emotions, and diet motivations while watching (different) television messages, and also look at their short-term (disinhibition or reinhibition) and long-term influences on dieting and food intake.

**Emotional eating and TVV**

The associations between TVV and snacking were stronger for boys who scored high on emotional eating compared to those who scored low. For girls, no interactions of TVV and emotional eating on snacking were found. The findings were consistent with our hypothesis, but only for boys. Previous studies found positive associations between TVV and negative feelings (Dittmar, 1994). The cross-sectional design of these studies did not allow interpretation about whether negative feelings were the cause or the result of TVV. But even if higher TVV were the consequence of negative feelings, it is supposed to maintain or even increase those feelings. Negative emotions associated with TVV could increase food intake in high emotional eaters. Alternatively, both high TVV and emotional eating might be the consequences of the inadequacy of certain people to deal with negative emotions (Dittmar, 1994). Interestingly these coping mechanisms also seem to differ between men and women. While adolescent girls scored higher on emotional eating than boys, and previous studies found highest TVV in depressed women compared to non-depressed women or to depressed men, we only found significant TVV and emotional eating interactions on snacking for boys. It may be interesting to further investigate gender differences in the mechanisms by which negative emotions, TVV, and emotional eating interact. For example, women, might have watched different programmes when they experienced negative emotions or might have had compensating behaviours (such as dieting) that influenced their food intake.

**Limitations**

In this study snacking was measured with a questionnaire that was derived from a validated scale (van Assema, Brug, Ronda, & Steenhuis, 2001). Although common food intake measurements (e.g., food records, dietary histories, and repeated 24 hour recalls) would have been more accurate, those methods are also costly and time consuming and therefore less suitable for large-scale studies. Moreover, measuring intake of nutrients was beyond the purpose of this study, in which we focussed on snacking behaviour. A second limitation is that we cannot rule out the possible effect of socially desirable answers. Being overweight is stigmatized in our society.
It is therefore socially desirable to endorse questions of being on a diet as well as to underreport snacking, and not to endorse questions about emotional and external eating. Another limitation of the study is that the data are cross-sectional and no causal inferences from the data can be drawn. Also, we did not measure food intake or emotions during eating, which might have supported the proposed mechanisms.

Finally, the large sample of this study might provoke the suggestion that even small differences in snack intake between groups are significant, due to the high power. However, TVV is such a widespread activity, that even small effects can have great significance on the population level. The difference in snack intake between, for example, high and low external eaters (½ snack per day) can have great impact on the energy balance and subsequently on the adolescents’ weight when this eating pattern is consolidated over many years.

**Implications**

In conclusion, high external, low restrained, and high emotional eaters seem to be more susceptible for the positive effects of TVV on snacking and these eating behaviours should therefore be considered when studying the associations between TVV and food intake. Moreover, the theories on underlying mechanisms of eating behaviours can provide some insight into the complex mechanisms by which TVV can increase food intake.

Television has been criticized for its bad influence on many domains, including smoking and alcohol portrayal, aggression, and violence. Benefits, in turn, of a lower weight seem to be accomplished by reducing screen time. However, only very short commercials can already influence children’s behaviours: 30 seconds effect (Borzekowski & Robinson, 2001) and the thin ideal promoted by television is deeply embedded in our culture and also communicated through other media (magazines, bill-boards etc.). Our results suggest that it is important to identify vulnerable adolescents not only by the hours they spend behind the screen but also by their individual characteristics.
General limitations

For the studies in this dissertation, we used several designs (see also Appendix A); a cross-sectional survey study with a very large sample, a prospective survey study with a somewhat smaller but full-family design (family study), as well as a small-scale in-depth observation study (role-play study). Also, a wide range of statistical analyses was used. Each of these methods have their specific limitations, I will shortly address the most important limitations of our measures, samples, and designs.

First, in both the family study and the adolescent student sample self-reports of height and weight were used which is always subject to more bias than measured anthropometrics (Larsen, Ouwens, Eisinga, Engels, & van Strien, 2007). Also, the three types of eating behaviours were measured through self-reports and for several reasons might not exactly reflect actual behaviour. Again, social desirability might play a role: Especially overweight individuals might under-report on emotional and external eating and over-report on restrained eating items, since reporting high food intakes do not correspond with the thin ideal. The Dutch Eating Behaviour questionnaire is a widely used validated questionnaire (van Strien, 2002) in adults and to lesser extend in children and adolescents. Halvarsson and Sjoden (1998) provided preliminary evidence for the validity of the DEBQ in children. For young children there was some question about the comprehension of some items (Braet et al., 2008), but for adolescents no such problems were reported. There was however a debate on whether common dietary restraint scales were valid measures of short-term dietary restriction as they were largely uncorrelated with short term acute caloric intake (Stice, Fisher, & Lowe, 2004). Others criticized their findings and interpretations: Acute caloric intake was measured on single occasions (meals) and the study settings might not provoke disinhibition. Therefore, according to van Strien, Engels, van Staveren and Herman (2006) no conclusions can be drawn from these finding about associations between restrained eating and long term food patterns and about the validity of the restrained scales in general.

Second, as mentioned before, generalizability of findings in our family sample is limited since the sample is not representative of the Dutch population. We can also not translate these results to high-risk groups of people with, for example, eating pathologies or obesity. However, testing associations between eating styles and weight status in a general (community) sample might have important implications, since obesity and overweight are no longer problems limited to a small high-risk group of individuals.

Third, with regard to designs and statistics: The cross-sectional studies cannot determine the direction of associations, and survey studies in general cannot prove causality. In longitudinal structural equations models behaviour is usually strongly predicted by earlier behaviour, which results in high stability paths leaving less variance to explain for other factors. Small effects might therefore, sometimes not appear to be significant. Finally, hidden factors or third variables could explain some of the associations we found. For example, personality traits have been related to the three eating styles and weight status in adult women (Elfhag & Morey, 2008; Gendall, Joyce, Sullivan, & Bulik, 1998; Heaven, Mulligan, Merrilees, Woods, & Fairooz,
van Strien, Frijters, Roosen, Knuiman-Hijl, & Defares, 1985) and might also influence parenting. Also, genetic factors can relate to both adolescents’ and parents’ characteristics and behaviours, and to the similarities between them.
General conclusion

Emotional, external and restrained eating were not associated with elevated weight increases during adolescence. Emotional eating was unrelated to weight status and high external eating was associated with a lower chance of being overweight. Restrained eating was associated with higher weight status in cross-sectional analyses and also related to a higher BMI trajectory over time. However, this association is probably mainly due to the fact that heavy individuals are more likely to diet rather than the other way round. Thus, for a general population of adolescents, emotional, external, and restrained eating did not seem to have high predictive value for the development of overweight. Previous studies have linked these eating behaviours to all kinds of eating pathology. Therefore, identifying high-risk groups of adolescents with elevated emotional and external eating tendencies, and targeting research as well as prevention of further disordered eating and treatment of this group is probably more useful than studying these behaviours in relation to weight problems in a general population. Also, prevention programs must take into account the fact that overweight youngsters already are engaged in restrained eating behaviours, which seems harmless for weight increases but is unsuccessful in weight management and a risk factor for eating pathology.

Moderate family similarities in restrained, emotional, and (for siblings) external eating were found. However, less support was found for parent-adolescent similarities in body dissatisfaction. Also, for restrained eating prospective influences between parents and children were not found. Thus, adolescents resemble their parents and siblings in eating behaviours, but these similarities are not strong and during the course of adolescence there seems to be no direct transmission (modeling) of eating behaviour. General and specific parenting behaviours seem to affect at least some of the eating and weight-related behaviours. Adolescents who perceived less parental control and higher behavioural and psychological control reported higher emotional eating. Parental dissatisfaction was cross-sectionally associated with adolescents’ own dissatisfaction which in turn predicted adolescents’ body dissatisfaction over time. Our results further suggest that when mothers are permissive and enforce little control, while their children are highly dominant, these children will make more unhealthy food choices. Some degree of control therefore seems indispensable. Future research should especially focus on a combination of general and food-specific parenting and their interactions. In addition, observation studies proved to be very useful in thoroughly studying maternal control over young children’s food choices.

Positive associations between TVV and snacking were stronger in adolescents who scored high on external and (only for boys) emotional eating, whereas restrained eating weakened these associations. The three types of eating behaviours seem to be related to susceptibility to influences of TVV on food intake, and should therefore be considered when studying the associations between TVV and food intake. Moreover, the theories of eating behaviour can provide insight into the complex mechanisms by which TVV increases food intake.
Emotional, external, restrained eating and overweight in Dutch adolescents

Abstract

The purpose of this study was to determine how emotional, external and restrained eating behaviour and other health-related lifestyle factors were associated with overweight in adolescents. Moreover, demographic and ethnic differences in eating behaviour have been examined.

The respondents were 10,087 Dutch adolescents aged 11-16 years (M = 13.0, SD = 0.8). Self-reported eating behaviour was measured with the DEBQ. Health-related lifestyle was determined by physical activity, breakfasting, fruit consumption and snacking.

High restrained, and low external eating were positively associated with overweight, whereas no significant association between emotional eating and overweight was found for girls, and a negative association for boys. Adolescents who ate breakfast at a daily basis were less likely to be overweight than those who ate breakfast irregularly or never. Overweight was positively associated with fruit consumption for girls and negatively with physical activity for boys.
Introduction

The prevalence of childhood overweight and obesity is increasing worldwide (International-Obesity-TaskForce, 2002, 2003; Seidell, 1999), and has great impact on both immediate (in childhood) and long-term (in later life) health risks. Immediate risks include increased risk of diabetes type II, gallstones and sleep disorders but also psychosocial factors like teasing and discrimination. Childhood obesity is also associated with cardiovascular disease risk factors in childhood and in later life (Must & Strauss, 1999). Due to the high and still increasing prevalence of childhood obesity and accompanied negative effects on health, prevention and treatment of obesity have become major public health issues (Ebbeling et al., 2002; International-Obesity-TaskForce, 2002; Statistics-Netherlands, 2007).

Although obesity has a strong genetic component (Maffeis, 2000), the high increase in obesity in the past two decades shows that whatever the genetic liability, environmental influences play a key role in development of overweight. The obesogenic environment, with restricted opportunities for physical activity, and high availability and active promotion (like advertising and marketing) of high fat, sugar and energy density foods, is often blamed for the high increase in obesity. Cultural changes in food patterns like shifts from meals to snacking, and higher outdoor food consumption (Zizza, Siega-Riz, & Popkin, 2001) might also contribute to the development of overweight (Ebbeling et al., 2002; International-Obesity-TaskForce, 2002; Swinburn, Caterson, Seidell, & James, 2004). The question remains, however, why some individuals in this obesogenic environment are able to keep their weight in balance for years, while others become overweight even as a child. Physical activity has an important role in body weight and adiposity (DiPietro, 1995; Swinburn et al., 2004), but the main focus of this study was on the other scale of the energy balance: Food intake and eating behaviour. In an attempt to find out why some people eat more than others, three psychological theories on triggers of overeating have been developed over the past decades.

The psychosomatic theory focuses on “emotional eating”, which states that emotional eaters do not eat in response to internal signals, feelings of hunger and satiety but in response to their emotions. In case of emotional arousal or stress, emotional eaters respond by excessive eating, while normally emotional arousal and stress would result in loss of appetite (Bruch, 1973; Greeno & Wing, 1994; Kaplan & Kaplan, 1957; Schachter et al., 1968). A second theory, focusing on external eating, states that certain people are more sensitive to external food cues than others, and eat in response to those stimuli, regardless of their internal state of hunger and satiety (Schachter & Rodin, 1974). According to a third theory, the restrained eating theory, dieting can cause overweight through binging. People who diet suppress their feeling of hunger cognitively and eat less. However, when cognitions are undermined (dissipation), restrained eaters are more likely to overeat than non-dieting individuals; this is called counter-regulation (Herman & Polivy, 1980; Polivy & Herman, 1985; Ruderman, 1986).

Based on these theories one should expect a positive relation between overweight and emotional, external, and restrained eating. However, the few studies that have
investigated those relations in children and adolescents did not support the hypotheses in all aspects (Lluch et al., 2000; Wardle et al., 1992). In a French family study, overweight was positively related to restrained eating, but negatively related to external eating (only for girls) and nonrelated to emotional eating (Lluch et al., 2000). In a study by Wardle et al. (1992) average body mass index (BMI) was higher in restrained, and lower in external eaters, whereas no relationship was found between emotional eating and BMI (Wardle et al., 1992). The studies by Wardle et al. (1992) and Lluch et al. (2000) consisted of heterogeneous samples with relatively small numbers per age group, making it hardly possible to draw firm conclusions about the links between eating behaviour and overweight. Besides, these studies did not include physical (in)activity, which is an important determinant for overweight. In the current study, we assessed the scores of emotional, external, and restrained eating in a large, nationwide sample (n = 10,087) of Dutch adolescents (11-16 year). This large sample allows us to estimate the relation between eating behaviour and overweight, and also to determine age, gender, socio-demographic, and ethnic differences with regard to overweight and eating behaviours.

Further, we determined health related behaviours of overweight and non-overweight adolescents. A recent study showed that consumption of fruits and vegetables among Dutch young adults was inadequately meeting recommendation levels (Hulshof et al., 2004). Also, dietary fat intake and intake of saturated fats was too high (Hulshof et al., 2004). Snack foods generally have low nutritional value, and energy intake from snack foods increased in the same time period that the prevalence of overweight had increased (Zizza et al., 2001). A positive association between snacking and weight change during childhood and adolescence has not consistently been found in previous studies (Field et al., 2004; Phillips et al., 2004), but snacking was a risk factor in families that are at greater genetic and environmental risk of overweight (Francis et al., 2003). An unhealthy lifestyle was therefore operationalized as low physical activity and unhealthy eating habits (i.e., breakfast skipping, high snacking and low fruit consumption). The association of these factors with being overweight was studied.

**Methods**

**Participants**

The respondents were 10,087 adolescents aged 11-16 years (M = 13.0, SD = 0.8). We randomly selected 55 secondary schools from four regions in the Netherlands (North, South, East and West) to obtain a national sample. The majority of the school boards (34) agreed to participate. If schools joined the project, all 1st and 2nd grade students attending the school were asked to fill in questionnaires at school (in total 11,124 students). Data collection took place in January and February 2003. On the day of assessment, only 15 students explicitly refused to cooperate, 507 students were absent or had left school, 455 questionnaires where not filled out for unknown reasons and 60 questionnaires were left out of the analysis due to incompleteness.
The total response was 91.9%. The medical ethics committee CMO Arnhem-Nijmegen approved the study's design.

**Sample characteristics**

The sample consisted of approximately equal numbers of boys (49%) and girls (51%). The average age of the participants was 13.0 years (range 11-16 years). Most of the adolescents (96.6%) were aged between 12 and 14 years. As only a few subjects were 11 or 16 years old, we combined the ages 11 and 12 and the ages 15 and 16 in further analysis. The native country of the parents decided ethnicity: If one or both parents were born outside the Netherlands, the respondent was included into that ethnic group. The sample consisted of all major ethnic groups in the Netherlands; 81% of the respondents were Dutch, 19% were from other ethnic groups. Students from all levels of secondary school education that are classified in the Netherlands took part in this study. The majority, 55% of the students, attended lower level education (preparatory college for technical and vocational training; in the Dutch school system: LWOO, VMBO), and 45% higher level education (preparatory school for college or university; in the Dutch school system: Havo, Vwo, atheneum, gymnasium).

**Procedure and measurements**

The questionnaires were filled out during normal school hours under supervision of a teacher, who had received a written explanation about the procedure. The questionnaire consisted of questions on demographic variables, height and weight, eating behaviour and health-related lifestyle.

**BMI, overweight and obesity.** BMI was calculated based on self-reported height and weight. To determine whether a child was overweight or obese we used international cut-off scores (Cole et al., 2000). The cut-off points are age and sex specific and based on curves that reach BMI scores of 25 and 30 at the age of 18. We computed whether respondents had a BMI above the overweight and obesity cut-off scores for their age. Scores higher than the first curve (BMI at age 18 = 25) were considered overweight; this also includes obesity. Scores higher than the second curve (BMI at age 18 = 30) were considered obese. No underweight group was specified, thus all scores under the BMI 25 curve were nominated “not overweight”.

Eating behaviour. Eating behaviour was assessed using the Dutch Eating Behaviour Questionnaire (van Strien, Frijters, Bergers, & Defares, 1986a) (originally published in Dutch (van Strien, Frijters, Bergers, & Defares, 1986b)). This questionnaire consists of 33 items, which measured emotional (13 items), external, and restrained eating (both 10 items). All items had to be rated on a 5-points scale from 1 (never) to 5 (very often). Examples of items were: “Do you have a desire to eat when you are irritated?” (emotional eating), “If foods smells and looks good, do you eat more than usual?” (external eating) and “Do you try to eat less at mealtimes than you would like to eat?” (restrained eating). The DEBQ scales have high internal consistency, high validity for food consumption, and high convergent and discriminative validity (van Strien, 2002).

Emotional and external eating have been found to be good predictors for actual food intake in a laboratory setting (Ouwens, 2005). In a real life setting negative life
events were associated with relative weight loss in low emotional eaters and with relative weight gain in high emotional eaters (van Strien, Rookus, Bergers, Frijters, & Defares, 1986). Other studies found associations of DEBQ scores with a biological substrate (Volkow et al., 2003) and with food intake measured with food frequency questionnaires, 24-hours recall, 24-hours food records or 7-days records in adults (Green, Rogers, Elliman, & Gatenby, 1994; Laessle, Tuschl, Kotthaus, & Prike, 1989; Wardle et al., 1992), children (Hill & Robinson, 1991) and adolescents (Lluch et al., 2000; Wardle et al., 1992). The DEBQ is easy to fill out by adolescents and have been used in other adolescent studies (Lluch et al., 2000; van Strien, 1996).

Cronbach's alpha's in our study were: .92 (emotional eating), .84 (external eating) and .92 (restrained eating). Support for factor integrity was provided after subjecting DEBQ scores to factor analysis (principal component, varimax rotation) using a 3-factor solution. For both girls and boys, almost all of the 33 items loaded exclusively on the appropriate factor. One emotional eating item and, only for boys, one external eating item loaded on both the first (emotional eating) and third factor (external eating). Factor 1 (Emotional Eating) accounted for 25 and 27 % of the variance, factor 2 (Restrained Eating) 19 and 17 %, and factor 3 (External Eating) 7 and 6 % for girls and boys respectively.

The intra-scale correlation was high between emotional and external eating: .57 for boys and .55 for girls. Correlations between emotional and restrained eating were 0.16 and 0.08, and between external and restrained eating -0.08 and -0.13 for boys and girls respectively (all correlations were significant at $p < .01$). The high correlation between emotional and external eating is similar to those found in previous studies. One study found that both emotional and external eating were grounded in the personality constructs neuroticism and conscientiousness (Heaven et al., 2001) indicating a single personality construct. However, the presupposition that subscales measure theoretically different aspects of overeating was supported by the findings that emotional eating, but not external eating, was related to levels of dopamine D2 receptors in the brain (Volkow et al., 2003), emotional distress and problems with relationships (van Strien & Schippers, 1995). Moreover, in line with the psychosomatic theory, emotional eating was related to impulsivity (Fischer, Smith, & Anderson, 2003) and to alexithymia in overweight women (Larsen, van Strien, Eisinga, & Engels, 2006).

Health-related lifestyle. The Godin-Shephard questionnaire (Godin & Shephard, 1985) was used to measure physical activity. This questionnaire measures the habitual number of activities per week at various levels of intensity: Light (e.g., walking), moderate (e.g., badminton) and strenuous (e.g., basketball). A total physical activities score was calculated using the following formula: (9 x strenuous) + (6 x moderate) + (3 x light). The scale had been validated for adolescents and children (Godin & Shephard, 1985; Sallis, Buono, Roby, Micale, & Nelson, 1993). Health-related lifestyle was further determined by measuring eating habits: how many times per week adolescents consumed fruit and snacks, and how much, and how often they ate breakfast. Fruit consumption was measured by the number of fruits respondents usually ate on a day and snacking by the number of sweet and/or savoury snacks respondents usually ate on a day. Two items were derived from a larger questionnaire measuring
total and saturated fat intake (van Assema et al., 2001). These items assess “how many days a week students and parents consumed sweets and savoury snacks” and “the number of servings of sweets and savoury snacks they consumed on such days”, and have been used in an adolescent sample before. The distribution of ratings on the “days per week” items was highly skewed (i.e., 90% of the children consumed snacks daily), therefore we only used the “snacks per day” item.

Physical activity scores were divided in three groups: low (lower quartile), high (upper quartile) and moderate (middle group). Fruit and snack consumptions were divided into two groups with 2 pieces of fruit (minimum advised fruit consumption according to national guidelines) and 3 snacks per day (which corresponded roughly with the upper third) as cut-off points. Breakfasting was also divided in three groups; those who ate daily breakfast, those who never ate breakfast and those who ate 1-6 times breakfast per week (irregular breakfasters). The healthiest lifestyle is defined by moderate to high levels of physical activity consuming at least 2 pieces of fruit per day, limited amount of snacks, and daily breakfast.

Statistics

Average BMI, percentage overweight and obesity, and mean scores on emotional, external and restrained eating were calculated per sex, age, educational level and ethnic group. Differences between demographic groups in prevalence of obesity and overweight had been computed by Chi square analyses. Differences in BMI and DEBQ scores were analysed using t tests (sex, education level) or one-way ANOVA (age, ethnicity) with Scheffe post hoc tests. We conducted logistic regression analyses to further investigate the relation for overweight with eating behaviours, and health-related lifestyle factors (eating habits and physical activity). The classification ‘being overweight or not’ served as the dependent variable, and eating behaviours and health-related lifestyle factors as explanatory variables. The first analyses were univariate with separate regressions per explanatory variable (eating behaviours and health-related lifestyle factors). In the second phase of analysis, we also conducted separate regression analysis for the separate eating behaviours and health-related lifestyle factors, but these variables were entered into the second step of analysis. In the first step we corrected for age, educational level and ethnicity. The third phase of analysis was multivariate with background variables in the first step and all eating behaviour and health-related lifestyle factors in the second step of the regression analysis. Boys and girls were analysed separately. The level used to establish significance in all tests was $p < .05$. All analyses were performed using SPSS (version 11.5).

Results

Table 1 shows average BMI, percentage overweight and obesity, and average scores on emotional, external and restrained eating per sex, age, ethnicity and educational level of the adolescents.
Table 1: BMI, percentages overweight and obesity and mean scores on emotional, external and restrained eating per sex, age, ethnicity and educational level of Dutch adolescents (means (M) standard deviations (SD))

<table>
<thead>
<tr>
<th></th>
<th>BMI</th>
<th>Overweight 1</th>
<th>Obesity 1</th>
<th>Emotional eating 2</th>
<th>External eating 2</th>
<th>Restrainted eating 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>M (SD)</td>
<td>%</td>
<td>%</td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
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<td>Gender</td>
<td></td>
<td></td>
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<tr>
<td>Boys</td>
<td>4430</td>
<td>18.7 (2.7)</td>
<td>11.0</td>
<td>0.9</td>
<td>1.85 (0.74)</td>
<td>2.75 (0.72)</td>
</tr>
<tr>
<td>Girls</td>
<td>4581</td>
<td>18.6 (2.6)</td>
<td>7.1</td>
<td>0.8</td>
<td>1.97 (0.71)</td>
<td>2.66 (0.67)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 - 12</td>
<td>2618</td>
<td>18.0 a</td>
<td>18.0 a</td>
<td>11.0</td>
<td>1.83 (0.73)</td>
<td>2.73 a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.6)</td>
<td>(2.5)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>13</td>
<td>4173</td>
<td>18.6 b</td>
<td>18.6 b</td>
<td>11.2</td>
<td>1.83 (0.73)</td>
<td>2.73 b</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.6)</td>
<td>(2.5)</td>
<td></td>
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<tr>
<td>14</td>
<td>1944</td>
<td>19.3 c</td>
<td>19.4 c</td>
<td>10.2</td>
<td>1.89 (0.75)</td>
<td>2.82 c</td>
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<tr>
<td></td>
<td></td>
<td>(2.6)</td>
<td>(2.7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 - 16</td>
<td>257</td>
<td>20.1 d</td>
<td>19.7 d</td>
<td>13.5</td>
<td>1.92 (0.77)</td>
<td>2.16 d</td>
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<tr>
<td></td>
<td></td>
<td>(2.6)</td>
<td>(2.6)</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>Ethnicity</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dutch</td>
<td>7239</td>
<td>18.5 a</td>
<td>18.5 a</td>
<td>10.2</td>
<td>1.86 a</td>
<td>2.75 a</td>
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<td></td>
<td></td>
<td>(2.6)</td>
<td>(2.5)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Surinam/Antillean</td>
<td>319</td>
<td>18.6 a</td>
<td>19.6 a</td>
<td>9.5</td>
<td>1.67 a</td>
<td>2.70 a</td>
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<td>(2.8)</td>
<td>(3.3)</td>
<td></td>
<td></td>
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<tr>
<td>Moroccan</td>
<td>90</td>
<td>18.8</td>
<td>19.7</td>
<td>10.9</td>
<td>1.90 (0.78)</td>
<td>2.18 b</td>
</tr>
<tr>
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<td></td>
<td>(2.2)</td>
<td>(2.8)</td>
<td></td>
<td></td>
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<tr>
<td>Turkish</td>
<td>298</td>
<td>20.1 a</td>
<td>20.2 a</td>
<td>18.7</td>
<td>1.94 a</td>
<td>2.89 a</td>
</tr>
<tr>
<td></td>
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<td>(2.6)</td>
<td>(3.0)</td>
<td></td>
<td></td>
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<tr>
<td>Other</td>
<td>883</td>
<td>19.2 a</td>
<td>18.8 a</td>
<td>15.1</td>
<td>1.84 (0.72)</td>
<td>2.74 a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.8)</td>
<td>(2.6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational level</td>
<td></td>
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<td></td>
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<td></td>
</tr>
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<td>Lower</td>
<td>4504</td>
<td>18.9</td>
<td>18.9</td>
<td>12.6</td>
<td>1.89 (0.74)</td>
<td>2.76 a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.8)</td>
<td>(2.8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher</td>
<td>4254</td>
<td>18.4</td>
<td>18.3</td>
<td>8.8</td>
<td>1.80 (0.72)</td>
<td>2.75 a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.5)</td>
<td>(2.4)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Based on self-reported height and weight
2 Average scores on 5 point scale from 1 (never) to 5 (very often)

Note: For main effects of gender, age, ethnicity or educational level in the ANOVA’s, significant differences effects are marked: * p < .05; ** p < .01; *** p < .001 (n = 4430 boys and 4581 girls). Differences between age and ethnic groups have been tested with post hoc tests (Scheffe) and significant differences (p < .05) are marked with a, b, c.
Prevalence of overweight and scores on eating behaviour

The cut-off scores to determine overweight and obesity differ per sex and between age groups (Cole et al., 2000). Although boys and girls did not differ significantly in reported BMI, the prevalence of overweight was higher in boys than in girls. No gender differences were found in the prevalence of obesity. Average BMI became higher with increasing age for both girls and boys, whereas no differences were found in percentages for overweight and obesity between the age groups. In total, the average reported BMI was 18.7 for boys and 18.6 for girls, 11.0% of the boys and 7.1% of the girls were overweight, and obesity percentages were 0.9% and 0.8% respectively.

In general, average scores on eating behaviours per gender group ranged between 1.85 (emotional eating for boys) and 2.75 (external eating for boys) on 5-points scales (see Table 1). The scores differed between boys and girls, implying that boys scored higher on external eating, while girls had higher scores on emotional and restrained eating. For girls, higher mean score on all three eating behaviour scales were found for older compared to younger participants. Girls’ emotional eating scores showed significant higher scores in the age group 14 compared to 11-12 years. External eating scores were lower for 11-12 than for 13 years old girls, and restrained eating scores were lower for girls aged 11-12 compared to those aged 13, 14 and 15-16. For boys only the difference in external eating between 12 and 14-year-olds was significant, with higher scores in older boys. No significant differences in emotional and restrained eating were found for boys of different age groups (Table 1).

Socio-demographic and ethnic differences

There was a clear association between educational level and BMI. Boys and girls with lower levels of education had a higher average BMI, and a higher prevalence of overweight and obesity than those with higher levels of education. Boys with lower levels of education scored higher on emotional and restrained eating than boys with higher levels of education. No dissimilarities were found for scores on emotional, external, and restrained eating for girls of different educational levels.

Ethnic differences were found in scores on BMI, overweight, obesity for girls, restrained eating, emotional eating for boys, and external eating for girls. Dutch adolescents had the lowest BMI scores, and lowest percentages of overweight and obesity. Turkish adolescents had the highest BMI scores as well as the highest prevalence of overweight and obesity, followed by Moroccans and Surinamese/Antilleans. Girls and boys showed the same pattern. Turkish boys scored higher on restrained eating than other ethnic groups (except Moroccan boys). For girls, highest scores were found for Turkish girls and significant lower scores for Moroccan and Dutch girls. No clear ethnic differences were found for emotional and external eating; the only significant difference was a lower score on emotional eating for Surinamese/Antillean boys compared to Dutch and Turkish boys.

In an ANOVA analysis with age group, ethnicity, and educational level in one model, demographic differences in BMI and eating behaviours were replicated.
Table 2: Univariate and multivariate analyses on overweight; effect of eating behaviour and health-related lifestyle in Dutch adolescents (odds ratio’s (OR) and 95% interval)

<table>
<thead>
<tr>
<th></th>
<th>Univariate</th>
<th>Univariate with background variables</th>
<th>Multivariate with background variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
</tr>
<tr>
<td></td>
<td>OR (95%)</td>
<td>OR (95%)</td>
<td>OR (95%)</td>
</tr>
<tr>
<td>Emotional eating</td>
<td></td>
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<tr>
<td></td>
<td>0.84*</td>
<td>0.81*</td>
<td>0.81**</td>
</tr>
<tr>
<td></td>
<td>(0.73-0.97)</td>
<td>(0.68-0.95)</td>
<td>(0.70-0.93)</td>
</tr>
<tr>
<td></td>
<td>0.77*</td>
<td>0.73*</td>
<td>0.73**</td>
</tr>
<tr>
<td></td>
<td>(0.63-0.93)</td>
<td>(0.68-0.96)</td>
<td>(0.67-0.94)</td>
</tr>
<tr>
<td>External eating</td>
<td></td>
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<tr>
<td></td>
<td>0.65**</td>
<td>0.60**</td>
<td>0.63**</td>
</tr>
<tr>
<td></td>
<td>(0.57-0.75)</td>
<td>(0.50-0.71)</td>
<td>(0.55-0.73)</td>
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<tr>
<td></td>
<td>0.73**</td>
<td>0.72**</td>
<td>0.72**</td>
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<tr>
<td></td>
<td>(0.58-0.88)</td>
<td>(0.56-0.88)</td>
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<td>Restrained eating</td>
<td>2.43**</td>
<td>1.92**</td>
<td>2.43**</td>
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<td></td>
<td>(2.17-2.73)</td>
<td>(1.70-2.15)</td>
<td>(1.65-2.09)</td>
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<td></td>
<td>1.79**</td>
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<tr>
<td>Moderate</td>
<td>0.72**</td>
<td>0.73</td>
<td>0.78</td>
</tr>
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<td>(0.56-0.92)</td>
<td>(0.69-1.25)</td>
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<td></td>
<td>0.74*</td>
<td>1.43</td>
<td>0.74*</td>
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<td>(0.56-0.97)</td>
<td>(1.00-1.43)</td>
<td>(0.56-0.96)</td>
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<td>(0.60-0.90)</td>
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<td>0.74*</td>
<td>1.31</td>
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<td>Breakfast:</td>
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<tr>
<td>Every day</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1-6 days/week</td>
<td>1.58**</td>
<td>1.73**</td>
<td>1.46**</td>
</tr>
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<td>1.37*</td>
<td>1.97</td>
<td>1.37*</td>
</tr>
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<td>(1.04-1.80)</td>
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<td>2.01**</td>
<td>1.90**</td>
<td>1.15</td>
</tr>
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<td>1.78</td>
<td>0.99*</td>
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<td>Snacks:&lt;3/day</td>
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</tr>
<tr>
<td></td>
<td>3</td>
<td>1</td>
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</tr>
<tr>
<td></td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>≥3/day</td>
<td>0.66**</td>
<td>0.75*</td>
<td>0.60**</td>
</tr>
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<td>(0.53-0.81)</td>
<td>(0.57-0.97)</td>
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<tr>
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<td>0.84*</td>
<td>0.90</td>
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<td>Fruits:&lt;2 pieces/day</td>
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<td>1</td>
<td>1</td>
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<td>1.06</td>
<td>1.08</td>
<td>1.06</td>
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<td>≥2 pieces/day</td>
<td>1.12**</td>
<td>1.27*</td>
<td>1.12*</td>
</tr>
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</tr>
</tbody>
</table>

a BMI based on self-reported height and weight, overweight was determined by international BMI cut-off points based on age and gender and corresponding with BMI above 25 at the age of 18 (Cole et al., 2002).

1 Different analyses were performed with BMI or age standardized BMI scores as outcome variable, these showed identical results except from physical activity, which was significant for girls but not for boys.

2 No significant interaction effects were found between background variables (age, ethnicity, educational level) and other model variables on overweight.

* p < .05; ** p < .01; *** p < .001, n = 4430 boys and 4581 girls.
Overweight in relation to eating behaviours and health-related lifestyle

Table 2 shows the findings of logistic regressions on the relationship between overweight and eating behaviours, and health-related lifestyle. Separate regressions (univariate analysis) were conducted on the relations between the scores on eating behaviours and overweight. High restrained boys and girls were more likely to be overweight (odds ratios 2.43 and 1.92 respectively) than adolescents with lower restraint scores. For emotional and external eating, the result was the opposite, as adolescents with higher levels of emotional and external eating were less likely to be overweight compared to less emotional and external eaters.

With regard to health-related lifestyle univariate analyses showed that adolescents with moderate or high levels of physical activity were less likely to be overweight than those with low levels of activity (significant only for boys). Eating breakfast every day was negatively associated with overweight. Adolescents who ate breakfast on a daily basis were less likely to be overweight than those who ate breakfast irregularly and (for boys) twice less likely than those who never ate breakfast. Unexpectedly, girls who ate 2 or more pieces of fruit per day were more likely to be overweight compared to those who ate less fruits. High snacking (three or more snacks per day) was associated with a lower chance of being overweight compared to lower snacking.

After correcting for background variables, inserting age, ethnicity, and educational level in the first step of the regression analyses, we found the same relations between eating and health-related behaviour and overweight. However, the significant lower chance of overweight for boys with high physical activity scores compared to those with low and moderate scores disappeared after this correction for background variables.

When we conducted multivariate analyses, with background variables in the first step and all eating behaviour and lifestyle factors in the second step of the analyses, almost all univariate relations with overweight remained, however, the significant negative association with overweight for high snack consumption and for high emotional eating (for girls) disappeared.

Discussion

This study showed that being overweight was positively associated with restrained eating, and negatively associated with external and (only for boys) emotional eating, whereas no significant association with emotional eating was found for girls. Being overweight was associated with low physical activity and irregular or no breakfasting for boys, and with irregular breakfasting and eating more than 2 pieces of fruit per day for girls. No associations between snacking and overweight were found in multivariate analyses.
Prevalence of overweight and obesity

BMI scores in our study have been based on self-reported height and weight. Few studies found that overweight children, and especially girls, were more likely to underreport their weight (Shannon, Smiciklas-Wright, & Wang, 1991). However, the results on the validity of self-reported weight are mixed, in a number of studies self-reported measurements have been found to differ relatively little and correlate highly with measured height and weight (Brener, McManus, Galuska, Lowry, & Wechsler, 2003; Strauss, 1999; Stunkard & Albaum, 1981). Self-reported height and weight have been found highly reliable for predicting obesity related morbidities and behaviours (Strauss, 1999). Although not as accurate as measured weight and height it remains the most cost-efficient way to assess overweight in large-scale epidemiological studies.

The ethnic differences in anthropometrics in our study are consistent with previous Dutch studies, which show higher ratings on BMI and higher percentages of overweight for Turkish and Moroccan children (Fredriks et al., 2003; Spee-van der Wekke, Meulmeester, Radder, Verloove-Vanhorick, & Schalk-van der Weide, 1994). Because cut-off scores for BMI are age and gender specific, differences in age and gender cannot explain ethnic differences in prevalence of overweight. It has been argued however, that the relationship between body fat percentage and BMI differs for ethnic groups and that cut-off points for overweight and obesity based on BMI will therefore have to be ethnicity specific (Deurenberg, Yap, & Van Staveren, 1998). We can not exclude that ethnic differences in body composition influenced our results, therefore in the multivariate analyses we corrected for ethnicity.

Eating behaviour

Boys reported higher levels of external eating, while girls scored higher on emotional and restrained eating. Most eating behaviour scores increased with age. These gender and age differences have been found also in previous studies (Brugman et al., 1997; Lluch et al., 2000; Sanchez-Carracedo et al., 1996; Wardle et al., 1992). The finding that older adolescents scored higher on eating behaviour scales can have interesting implications. The results need replication in longitudinal studies to show whether eating behaviour indeed increases with age within persons. For boys educational level was negative associated with emotional and restrained eating. Similarly, in previous studies scores on desire for thinness and restraint were positively associated with socioeconomic status (Drewnowski et al., 1994), but the results were not consistent (Brugman et al., 1997).

Eating behaviour scores differed among ethnic groups; Dutch adolescents generally scored lower on restrained eating. This is in line with a previous Dutch study: nearly twice as many Turkish and Moroccan girls were dieting compared to Dutch girls (Brugman et al., 1997).

Emotional eating. In contrast to the psychosomatic theory (Bruch, 1973), no significant association between emotional eating and overweight was found for girls, whereas a negative association was found for boys. This finding is in line with previous adolescent studies, in which no significant correlations were found between emotional eating and overweight (Lluch et al., 2000) or BMI (Wardle et al., 1992). The
age of the respondents in our study could explain this result. In adult studies, positive relations between emotional eating and overweight have been systematically found (Slochower, 1983), even in a clinical sample of patients with an eating disorder (van Strien et al., in press). An explanation for differences in findings between adults and adolescents could be that problematic emotional eating probably develops later in life. Average scores on emotional eating in our sample were low, i.e. most adolescents scored on the lower end of the emotional eating scale. Another possible explanation is that the relation between food intake (eating behaviour) and BMI is not linear, due to other behavioural and genetic factors. In early adolescence factors like growth, biological age and menarcheal status (Fredriks, van Buuren, Wit, & Verloove-Vanhorick, 2000) especially influence BMI, therefore relations between BMI and eating behaviours are probably less pronounced in adolescents.

**Restrained eating.** Previous studies showed that dieting is common practice among Dutch adolescents (Brugman et al., 1997) and starts at a young age (Hill & Robinson, 1991). Restrained girls are motivated to diet, limit their daily intake of food, skip meals (particularly breakfast) and experience high levels of hunger and low control over their eating. Obese adolescents have been found to score higher on dieting and concern for diet (Sanchez-Carracedo et al., 1996), and to have higher degrees of restraint than normal weight adolescents (Lluch et al., 2000; Wardle et al., 1992). In our study, we found a positive relation between restrained eating and overweight, replicating those earlier results (Lluch et al., 2000; Wardle et al., 1992), and consistent with the restrained eating theory.

Previous publications showed that although restrained eating is associated with higher BMI it is also associated with lower intake of energy, carbohydrate and protein (only significant for boys) (Lluch et al., 2000; Wardle et al., 1992). It seems contradictory that restrained eating is associated with restriction of food intake as well as with being overweight. The restrained eating theory explains this by declaring that skipping meals lead to irregular eating patterns and to counter-regulation at moments of disinhibition, thus binging, and eventually higher weight. Therefore dieting is not always successful for long-term weight control of adolescents (Polivy & Herman, 1985). In our study restrained eating was negatively correlated to breakfasting; the higher adolescents scored on restrained eating the less often they breakfast ($r_{(4430)} = -.06$ for boys and $r_{(4581)} = -.17$ for girls ($p < .01$)). This suggests a very irregular and restrictive eating pattern in restrained adolescents. However, the association between overweight and restrained eating could also be the other way round: overweight adolescents are more likely to start dieting. Due to the cross-sectional nature of our and other studies among adolescents it is not possible to draw conclusions about the causal direction of the relation. Longitudinal data should reveal whether restrained eating and skipping meals, are a cause of or a response to overweight.

**External eating.** External eating was negatively associated with overweight. This is contrary to the theory of external eating and empirical findings in adult studies, but again in line with previous studies in adolescents (Lluch et al., 2000; Wardle et al., 1992). Interestingly, the findings of Wardle (1992) and Lluch (2000) showed that although external eating is negatively associated with weight, it is positively related to food intake. The influence of parents could explain this contradiction. In early
adolescence much of the food intake is controlled by parents. For example, parental presence at the evening meal was found to be positively associated with adolescents’ higher consumption of healthy food items (Videon & Manning, 2003). Heavier children are subject to more food control (Tiggemann & Lowes, 2002) and food restrictions (Fisher & Birch, 1999a). This could explain our findings that overweight adolescents scored lower on external eating than normal weight adolescents, and possibly also why overweight girls ate more fruits. Parents of overweight children are probably less likely to permit their children to give in to external cues, or to expose them to these cues.

On the other hand, parental food restrictions can also have unintended effects. A series of experiments by Birch and Fisher (Birch & Fisher, 2000; Fisher & Birch, 1999a, 1999b, 2000) showed that restriction of palatable food was associated with higher intake of these restricted foods and more negative self-evaluation afterwards. Parental restriction of palatable snack food was associated with higher desire to eat, and the actual intake of these foods in an unrestricted setting, even without hunger. The authors therefore suggested that imposed restriction of palatable food can sensitize children to external eating cues, and may interfere with their ability to self-regulate intake (Fisher & Birch, 1999a; Johnson & Birch, 1994). Adolescents’ self-restraint however appeared to counteract the tendencies towards excessive external eating in the study by Wardle (1992). The present study showed a negative correlation between restraint and external eating. It should be noted however that this correlation was low and that our study design does not allow conclusions about the mechanisms by which restraint, restriction, externality and food intake interact.

**Limitations**

A limitation of our study is that the data are cross-sectional. Longitudinal data on weight changes and weight outcomes at an older age are necessary to be able to make sound conclusions about the direction of our cross-sectional associations. As mentioned previously, restrained eating was positively associated with overweight, but whether restrained eating actually preceded overweight or whether overweight causes dieting and thus higher restrained eating scores can not be concluded from our data. The same can be discussed regarding our results on the negative association between external eating and overweight. Is external eating indeed a protective factor for overweight or do overweight adolescents adapt their eating behaviour?

In this study snacking was not measured with a validated questionnaire, although it was derived from a validated scale. Common food-intake measurements (e.g. food records, dietary histories, and repeated 24-hours recalls) are costly and time consuming and therefore not suitable for large scale studies. Moreover, measuring intake of nutrients was beyond the purpose of this study, in which we focussed on snacking behaviour irrespective of energy intake.

Also, physical activity was measured through self-reports, whereas other methods like double labelled water method or heart rate monitoring are more accurate. Questionnaires however, are more cost efficient and less burden for the subjects and therefore more suitable for large scale studies like ours.
Another limitation of our study is that questionnaires are vulnerable in respect to socially desirable answers. Being overweight is highly stigmatized in our society, therefore it could be socially desirable for overweight subjects to endorse questions about being on a diet and not to endorse those about emotional and external eating (van Strien & Ouwens, 2003a). It is, on the contrary, socially desirable to report high physical activity; this was not the case for obese subjects in our study. Therefore we think social desirability did not play a large role in this study.

Finally, this study used a community sample. Students from different regions, ethnicity and educational levels in the Netherlands were included. The results on eating behaviours, overweight and health-related behaviours can however not be generalized to specific high risk groups. For eating disorder patients for example different pathways could apply.

**Conclusions**

In this study, findings of previous small-scale studies have been replicated in a large nationwide sample. Three different measurements of eating behaviours (emotional, external and restrained eating) as well as other health-related behaviours (physical activity, fruit consumption, snacking and skipping breakfast) were studied in young adolescence. Results indicate that the theories developed in adult studies do not all seem to explains adolescents’ weight status. In adolescents, only restrained eating was positively associated with overweight. Emotional eating was not associated with overweight for girls and negatively associated for boys. External eating was negatively associated with overweight. Moreover, in this study we tried to get a better picture of the health-related behaviour of overweight adolescents. Social-cultural pressure to be thin (Stice, 1994), higher food restrictions and control by parents of overweight children could explain our results that being overweight is associated with a more healthy fruit and snack consumption and low external eating. With regard to fruit and snack consumption and external eating it seems that overweight adolescents practice a healthier lifestyle than non-overweight adolescents. However, our data revealed that their lifestyle was not healthier in all aspects as being overweight was also associated with low physical activity, skipping breakfast and high restrained eating.
Associations between eating behaviours and BMI trajectories in adolescence

Abstract

Individual differences in eating behaviours might partly explain the variations in development of weight gain and subsequent obesity. In the current study, we will test the predictive value of three psychological theories on trajectories of BMI in adolescence using growth mixture modelling, a method used to identify clusters of individuals within a population that follow distinct developmental trajectories. This study is the first to use this technique to describe the development of Body Mass Index (BMI) in adolescence, and additionally to test how eating behaviours are related to individual trajectories of BMI over time.

In total 328 Dutch adolescents (12-14 years old at baseline) self-reported their height and weight at five annual waves. Eating behaviour (ie. restrained, emotional, and external eating) was reported at baseline.

Development of BMI over this period was best fitted in five distinct trajectories that differed in magnitude but not in shape. All trajectories showed similar moderate increase of BMI over time; parallel but at a different level. No sex differences in trajectories were found. Restrained eating was significantly related to the trajectories: high restrained eaters had a higher chance of being in the higher BMI trajectories.

In conclusion, from early to mid-adolescence children follow very parallel patterns of moderate increases in BMI which suggests that factors that act on individual differences in weight status have had their influence mostly at a – perhaps much – younger age. Higher restrained eating was related to higher BMI trajectories which implies that restraint eating is related to BMI in early adolescence, but not to increases or decreases in BMI over the course of adolescence.
Introduction

The literature on obesity and eating pathology in adolescents has increasingly focused on individual differences in eating behaviours and physical exercise. Even in times where the prevalence of childhood obesity has increased profoundly in most Western countries (Wang & Lobstein, 2006), the question remains how we can explain that some youths keep their weight in balance for years, while others become overweight. Individual differences in eating behaviours might partly explain the variations in development of weight gain and subsequent obesity (van Strien, Frijters et al., 1986a). In the current study, we will test the predictive value of three psychological theories on trajectories of BMI in adolescence.

According to the theory of restrained eating, dieting can cause overweight through overeating. People who diet suppress their feeling of hunger cognitively and eat less. However, when cognitions of self control are undermined restrained eaters may abandon their diet altogether and are more likely to overeat than non-dieting individuals (Herman & Polivy, 1980, 2004; Polivy, 1996; Polivy & Herman, 1985; Ruderman, 1986). The psychosomatic theory focuses on “emotional eating” which is overeating in response to emotional arousal or (di)stress. This is considered an atypical reaction since the typical response to distress is considered loss of appetite due to physiologic effects (including inhibition of gastric contractions and elevation of blood sugar) (Bruch, 1973; Greeno & Wing, 1994; Kaplan & Kaplan, 1957; Schachter et al., 1968). Emotional eating may occur in people who are less responsive to internal signals of hunger and satiety perhaps as result of a conditioned association between negative mood and food reward. A third theory, focussing on external eating, states that certain people are more sensible to external food cues than others, and eat in response to a variety of external stimuli (Schacter & Rodin, 1974), such as time manipulations, taste, visibility and accessibility of food, regardless of internal states of feelings of hunger or satiety. The predictive value of these three theories in explaining weight status has been widely tested in adult samples, but in the past decade increasing attention has been paid to children and adolescents.

Concerning restrained eating, there is consistent empirical evidence that restraint is higher in overweight adolescents. Cross-sectional studies on small samples of UK and French adolescents (Hill et al., 1994; Lluch et al., 2000; Wardle et al., 1992) reveal a positive association between restraint and overweight status. Using a large sample of 2,474 Belgium 7-18 year olds, Braet et al. (2008) also found higher restrained eating in overweight children as well as in adolescents. In a homogenous age sample of 10,087 12-14 year olds, Snoek et al. (2007) found higher restrained eating scores in overweight children, even after controlling for emotional and external eating. Restrained eating also predicted increases in weight over time. In a study by Stice et al. (2001) on a US sample of 13-17 year olds, dieting predicted weight gain and the risk for obesity over a period of four years, and similar findings were obtained by Field et al. (2003) in US pre-adolescent and adolescents over three years time (see also (Neumark Sztainer, Wall, Haines et al., 2007)). However, some scholars have suggested that the association between restrained eating and weight status can also be explained in terms of dieting being a response to overweight (Hill, 2004; Stice et al.,
CH3 BMI trajectories in adolescence

1998). Testing the bi-directional associations between restrained eating and weight status by using longitudinal data over three waves in a sample of 804 adolescents, we found that BMI more consistently predicts restraint eating than the other way around (Snoek, van Strien, Janssens, & Engels, 2008).

Only few studies have been conducted on emotional eating in adolescents. Wardle et al. (1992), Lluch et al. (2000), Snoek et al. (2007), and Nguyen-Rodriguez, Rodriguez, Chou, Unger, & Spruijt-Metz (2008) found no associations between emotional eating and weight status (girls), whereas in Braet et al. (2008) overweight 13-18 year old girls – but not boys – had elevated levels of emotional eating and in Viana, Sinde and Saxton (2008) emotional eating was positively related to BMI-z-scores in children aged 3-13 years. In contrast, Hill et al. (1994) found highest mean ratings of emotional eating in underweight and lowest in overweight girls. Similarly Snoek et al. (2007) found that boys with high emotional eating scores had lower BMI, and Braet et al. (2008) found that in 8-12 year olds, both boys and girls had higher emotional eating scores if they were normal weight compared to children with overweight. Although these later findings seem to be in contrast with the theory, this might have to do with a) that emotional eating develops later in life and/or that it is not transversely related to weight status or BMI, but that it predicts increases in BMI over time or b) that only in association with negative emotional states or life stress emotional eating is associated with overweight or weight gain over time (van Strien, Rookus et al., 1986). There is however no prospective research on emotional eating and changes in BMI in the course of childhood and adolescence.

The few studies that did focus on external eating found that high external eating is related to lower BMI (Braet et al., 2008; Lluch et al., 2000; Snoek, van Strien, Janssens, & Engels, 2007; Wardle et al., 1992) or unrelated to weight status (Hill et al., 1994), which is in sharp contrast with experimental research showing that food cues are related to food intake in children (Anschutz et al., 2009) and to food intake and being overweight in adults (Herman & Polivy, 2008; Wansink et al., 2007; Wardle et al., 1992). The relation between external eating and weight status is thus unclear especially as survey studies on the associations between external eating and weight status in youth so far have been cross-sectional and prospective studies are lacking.

To test the impact of eating behaviours on body weight, it is essential to have longitudinal data in which people are followed over the course of adolescence. Although there is ample research testing age differences in weight status or body weight (e.g., Cole et al., 2000), there is a lack of studies that examine individual differences in the development of body weight in adolescence. In the area of developmental psychology, growth mixture modelling is a state-of-the-art technique to test whether clusters of individuals exist within a population who follow unique, qualitatively distinct developmental trajectories (i.e. latent trajectory groups; for a detailed description, see, e.g., Jones, Nagin, & Roeder, 2001; Muthen & Muthen, 1998-2004; Nagin, 1999). Even though adolescence is a period in which normative weight increase due to puberty occurs (Cole et al., 2000), different profiles can be identified with respect to developmental trajectories of body weight. For instance, it is possible that some adolescents are low on body weight in the onset of adolescence and their weight in-
creases relative to that of others, whereas others are high in the onset of adolescence and remain high over time. Using growth mixture modelling, we computed the individual body weight trajectories of 328 Dutch adolescents, using data across five annual waves. We computed BMI z-scores, which is the individual’s BMI corrected for age and sex specific BMI mean, variation and skewness values from a norm dataset. The use of BMI z-scores has the advantage that these are corrected for age and sex and therefore analyses can be done for the total sample instead of using subgroups.

As there are no studies calculating individual trajectories on BMI using longitudinal data of adolescents, it is impossible to postulate specific hypotheses regarding the number and types of trajectories in these data. So the first aim of the study is to examine the trajectories in adolescence. The second aim is to examine how eating behaviours at baseline measurement (when adolescents are approximately 12-14 year old) are related to individual trajectories of BMI over time. We controlled for parental BMI since associations between eating behaviour and BMI could be influenced by family similarities in BMI (Davison et al., 2000) and eating behaviour, especially for emotional (Snoek, Engels, Janssens, & van Strien, 2007) and restrained eating (Snoek, van Strien, Janssens, & Engels, 2009).

Method

Procedure

Participants of this study were children from 328 Dutch families who participated in the longitudinal ‘Family and Health’ study on family and individual predictors of various health-related behaviours of adolescents. For more detailed information on participant selection and characteristics see Harakeh, Scholte, de Vries, & Engels (2005) and Van der Vorst, Engels, Meeus, Dekovic, & van Leeuwe (2005).

Families with at least two children aged between 13 and 16 years were selected from the registers of 22 municipalities in the Netherlands and recruited through a letter. To be eligible families had to be intact and biologically related and we excluded twins and children with a mental or physical disability. Of the total of 885 families that indicated a willingness to participate, 765 fulfilled the study criteria, of whom we selected 428 to acquire an equal distribution in the children’s educational levels and all possible male/female sibling dyads in our sample. The data were collected by trained interviewers at the respondents’ homes between November 2002 and April 2003 for the first wave, with a one-year interval between each of the following waves. Care was taken that no interaction took place among the four participating family members during completion of the questionnaires. Each family received a €30-compensation per wave for their participation. In addition, families were randomly selected to win an additional €1000-travel check after completion of the three waves, and again after the following waves.

The overall response rate for the study duration was 77% with 328 of the 428 participating families completing the assessments at all five annual waves from 2003 to 2007 (416 (T2), 404 (T3), 347 (T4) and 328 (T5)). The study was originally designed
to comprise three waves, afterwards, families were asked to participate in the extension of the study which explained most of the drop-outs between the third (2005) and fourth (2006) wave. Families that left the study prematurely did not differ from families that completed all three waves in terms of eating behaviour, age, gender, or BMI. We, however, did find significant differences for education levels: participating fathers ($\chi^2(8) = 25.08, p < .01$), mothers ($\chi^2(8) = 26.94, p < .01$), and adolescents ($\chi^2(5) = 23.38, p < .001$) had higher education levels than family members who did not complete the study.

**Sample characteristics**

For the current paper, we only included the youngest sibling, as we were primarily interested in the development of BMI, and its correlates, from early to late adolescence. Participating adolescents were between 13 and 15 years old at wave 1, with an average age of 13.3 years. The representation of boys and girls was comparable: 48.5% were boys. Fathers were on average 46.2 and the mothers 43.9 years old at wave 1. The fast majority of the children (93%) were of Dutch ethnicity (as defined by the parents’ native country) and attended mainstream secondary schools for lower vocational to pre-university education at their age-related levels.

**Measurements**

*Restrained, emotional, and external eating* were assessed at baseline assessment using the Dutch Eating Behaviour Questionnaire (*DEBQ*) (van Strien, Frijters et al., 1986a). This questionnaire consists of 33 items, which measured restrained (10 items), emotional (13 items), and external eating (10 items). Example items are “Do you try to eat less at mealtimes than you would like to eat?” (restrained eating), “Do you have a desire to eat when you are irritated?” (emotional eating), and “If food smells and looks good, do you eat more than usual?” (external eating). All items had to be rated on a 5-point scale from 1 (never) to 5 (very often). The *DEBQ* scales have high internal consistency, high validity for food consumption, and high convergent and discriminative validity (van Strien, 2002). The *DEBQ* is easy to fill out by adolescents and has previously been used in other studies among adolescents (Lluch et al., 2000; van Strien, 1996). Cronbach’s alpha for restrained eating was .91, for emotional eating .93 and for external eating .85. The correlation between emotional and external eating was $r = .56, p < .001$, between emotional and restrained eating $r = .29, p < .001$, and between external and restrained eating $r = -.04, p > .05$.

*Adolescent’s BMI*s were calculated based on self-reported height and weight reporting both measures at each of the five waves. To evaluate the validity of self-reported values measured in this specific context (at home, with a trained interviewer and confidentially), we compared the self-reported measures with objectively measured data. This data was collected at wave 3 in a random subsample of 300 of the 404 families participating at that wave and yielded high correlations (all above .90) with self-reported measures. We found no evidence that underreporting of weight was stronger in certain weight groups (e.g., the overweight adolescents (Snoek et al., 2008), which suggests a random rather than a systematic bias for weight in our data, making it unlikely that the tested associations were affected as a participant’s relative
weight status in the groups remains the same. Although height-weight reports were fairly reliable at the third wave, we are not able to verify whether this was the case at the other waves (Snoek et al., 2008). For our analyses, BMI z-scores were calculated using the following formula: $Z = \frac{(\text{BMI}/\mu - 1)}{(\lambda \times \sigma)}$ (Cole et al., 2000), in which we imputed age and sex specific values for $\mu$ (mean), $\lambda$ (skewness) and $\sigma$ (coefficient of variance) from the 1997 National Growth Study in The Netherlands (Fredriks et al., 2000).

*Parental BMI.* At the first wave, father and mother reported their height and weight and BMI was computed based on these values.

**Strategy for analysis**

After presenting descriptive data on trends in BMI across the study age range, the analyses proceeded in two steps. In Step 1, models for the developmental trajectories were estimated for BMI. We used Growth Mixture Models (GMMs) to estimate the trajectories in Mplus Version 4.1 (Muthen & Muthen, 1998-2003). GMMs are designed to identify clusters of individuals who follow unique developmental trajectories, each of which may reflect distinct aetiologies and/or outcomes. These trajectories are described by both the shape and the proportion of individuals estimated to follow the trajectories. Missing data were handled through Full Information Maximum Likelihood (Enders & Bandalos, 2001). A series of models was fitted beginning with a one-trajectory model and moving to a six trajectory model. Evaluation of the best fitting models was accomplished using the Bayesian Information Criterion (BIC) and the entropy. The BIC is a commonly used fit index where lower values indicate a more parsimonious model. Entropy is a measure of classification accuracy with values closer to 1 indexing greater precision (range 0 to 1).

In step 2, we classified the adolescents based on their probabilities of belonging to the different trajectories and we used univariate analysis of variance to check for differences between the trajectory groups on restrained, emotional, and external eating using SPSS with weighted data. When data are weighted, each participant is represented in each cell as a function of his or her probability of being assigned to that joint trajectory group. This approach preserved the continuous nature of the classification variable and corrected for potential uncertainty in trajectory assignment. We controlled for sex, age, educational level and parental BMI. Bonferroni post hoc tests were used to identify which groups significantly differed from each other.

**Results**

**Step 1: Trajectory models of body mass index**

Table 1 shows BMI scores at each wave for the total group and for boys and girls separately. It appears that boys and girls do not differ on BMI level on any of the time points, accept for T1. At T1, girls have somewhat higher BMI scores than boys ($p < .05$).
Table 1: Mean levels of Body Mass Index

<table>
<thead>
<tr>
<th>Age</th>
<th>Boys</th>
<th>Girls</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>13a</td>
<td>18.54</td>
<td>2.43</td>
<td>19.10</td>
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<tr>
<td>14</td>
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<td>21.29</td>
</tr>
<tr>
<td>17</td>
<td>21.55</td>
<td>2.38</td>
<td>21.71</td>
</tr>
</tbody>
</table>

a Only at age 13, BMI for boys and girls were significantly different, \( p < .05 \)

The BIC indicated that a five-group solution (BIC = 3082.18) had a superior fit to the data compared to a four-group model (BIC = 3134.32), a three-group model (BIC = 3230.72) or a two-group model (BIC = 3554.94). Moreover, an entropy of .86 illustrated that classification was sufficiently accurate. The lowest trajectory of BMI consisted of 3.4% of the sample. Individuals in this trajectory had a mean initial BMI level of 15.27 increasing to 17.87 at time 5 (low-BMI trajectory) (See Figure 1). The second trajectory was composed of 19.5% of the sample with a mean initial BMI level

Figure 1: Estimated trajectories of relative BMI over the 5 annual waves

In fact, a six group solution had even better fit measures (BIC = 3040.06; entropy = .88). However, the extra trajectory was an additional low BMI trajectory group with only one individual and therefore limited in heuristic value.
of 17.07 increasing to 18.36 at time 5 (low-medium-BMI trajectory). The third trajectory comprised the largest group of individuals (41.3%) with an initial mean BMI level of 18.12 increasing to 20.27 at time 5 (medium-BMI trajectory). The fourth trajectory was composed of 26.6% of the sample with a mean initial BMI level of 20.32 increasing to 22.41 at the fifth time of measurement (medium-high-BMI trajectory), and the final trajectory was composed of 9.2% of the sample with an initial mean BMI level of 22.96 increasing to 24.96 at time 5 (High-BMI trajectory). We considered the necessity to calculate distinct trajectories for boys and girls. In our study, boys and girls were equally divided over the different trajectories (p = .96). Moreover, additional analyses showed that the shape of the trajectories for both groups was similar. Therefore, and because of a limited sample size, we decided to analyze the data on the total sample, controlling for sex.

### Table 2: Univariate analyses of emotional, externalizing and restrained eating after controlling for age, sex, and BMI of mother and father

<table>
<thead>
<tr>
<th>Measures</th>
<th>Characteristics</th>
<th>Univariate analyses</th>
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<tr>
<td></td>
<td>Low-BMI Mean SE</td>
<td>Medium-low Mean SE</td>
<td>Medium Mean SE</td>
</tr>
<tr>
<td>Restrained eating</td>
<td>1.66 .22</td>
<td>1.85 .09</td>
<td>1.96 .06</td>
</tr>
<tr>
<td>Emotional eating</td>
<td>2.28 .22</td>
<td>2.31 .09</td>
<td>2.26 .07</td>
</tr>
<tr>
<td>External eating</td>
<td>3.19 .20</td>
<td>3.04 .08</td>
<td>3.00 .06</td>
</tr>
</tbody>
</table>

* p < .05; ** p < .01
a,b,c,d similar letters indicate a significant difference between groups

### Step 2: Univariate analyses of variances

Subsequently, we tested three univariate models predicting each of the three eating behaviours (i.e. restrained eating, emotional eating, and external eating), while controlling for sex, age, BMI mother, and BMI father (see Table 2). The first row of Table 2 shows the results for restrained eating. Here we found a significant effect of sex and we found restrained eating significantly linked with membership in one of the five trajectories, F(1, 318) = 7.14, p < .001. Specifically, individuals with higher scores on restrained eating were more likely to follow higher trajectories. Post-hoc tests illustrated that individuals in the low-BMI trajectory significantly differed from those in the Medium-high trajectory group. Individuals in the medium-low group differed from individuals in the medium high and the high group. Finally, those in the medium group differed from those in the medium high group. The high trajectory only differed from the medium low group, possible due to a small cell size in this particular group. The second row of table 2 depicts the results regarding emotional eating and the third for external eating. Membership in one of the five trajectories was not significantly linked with emotional eating or externalizing eating.

1 Additional analyses showed that while concentrating on one of the three eating patterns, controlling for the other two did not change the results.
In all models we tested possible interaction effects of sex on the one hand, and BMI mother and BMI father on the other, on the relationships between the three eating behaviours and membership in the five trajectories. However, no interactions were found.

**Discussion**

Growth mixture modelling is a method to identify clusters of individuals within a population that follow distinct developmental trajectories. In this study the development of BMI from early to mid adolescence was best fitted in five parallel but distinct trajectories that differed in magnitude but not in shape: all trajectories showed moderate increase of BMI over time. No support was found for clusters of subjects that showed stable or decreasing BMI over the five waves which is probably due to the normative weight increases that occur due to puberty and maturation. More surprising is the finding that the trajectories did not differ in degree of BMI increase. It seems as if differentiation of individuals into weight categories occurs at a younger age and by the time children reach early adolescence, they are already condemned to a specific (relative) weight status. However, given the lack of growth mixture modelling studies on BMI development in adolescence, our results should be considered preliminary. More studies and replication of these findings are indispensable, preferably using measured height and weight data. The use of self-reported data in the present study is the most important limitation. Our measured values in the same sample (Snoek et al., 2008) have provide substantial validation for the self-reports in at-home contexts, most importantly they show that underreport of weight and overreport of height is not specific to a certain weight group. This makes it unlikely that for example a high increase trajectory was not found due to a tendency of overweight youngsters to give more social desirable answers. Still, we cannot rule out that for example those with highest increases of weight in the past year will underreport more, due to social desirability or ignorance about how tall or heavy one actually is. Advantage of this study are the long period (5 annual waves) reducing the effect of incidental misreport, and the high retention rates across waves.

A second aim of this study was to determine the association between eating behaviours and individual BMI development. Restrained eating was related to higher BMI trajectories, with is in line with previous cross-sectional (Hill et al., 1994; Lluch et al., 2000; Snoek, van Strien et al., 2007; Wardle et al., 1992) and prospective (Field et al., 2003; Stice, 1998) research showing that higher restrained eating is associated with a higher chance of being overweight. However, as the five trajectories showed very similar moderate increases of BMI, restrained eating was not related to the course of BMI development. In a previous analyses on the Family Study data, we examined the reciprocal nature of the association between BMI and restrained eating, and found that during adolescence BMI predicts restrained eating more consistently than the other way around (Snoek et al., 2008). So restrained eating is related to higher weight status both cross-sectionally and higher BMI trajectory over
Families on the balance

time but this association might be mainly due to the fact that heavy individuals are more likely to diet. The fact that this is already so in early adolescence is important to acknowledge as this has implications for treatment and prevention. An additional interpretation from our results is that the impact of restrained eating on weight status could have taken place at younger ages, therefore future research should also focus on younger children.

Emotional and external eating were unrelated to the probability of membership of a specific trajectory. For emotional eating previous cross-sectional studies have been inconsistent with some finding negative associations in certain age and sex groups (Hill, Braet), and some studies positive findings (Viana et al., 2008). However, most studies did not show significant associations between emotional eating and weight status which is consistent with our null findings (Braet et al., 2008; Lluch et al., 2000; Nguyen-Rodriguez et al., 2008; Snoek, van Strien et al., 2007; Wardle et al., 1992) (for boys). For external eating the null finding is consistent with Hill (1994) who found no associations between external eating and weight status but most previous studies found a negative association (Braet et al., 2008; Lluch et al., 2000; Snoek, van Strien et al., 2007; Wardle et al., 1992). It seems that “emotional eating may be a coping strategy used by people of all weights, however those who keep their weight within the normal range may possess certain protective qualities or engage in other compensatory behaviours” (Nguyen-Rodriguez et al., 2008). In addition, average scores on emotional eating are low in adolescents and even lower in young children indicating that for children emotional eating is rather rare (van Strien & Oosterveld, 2008). Braet et al. (2008) found that in the subgroups of overweight children, only 10.5 percent had a score of 3 or more (on the scale from 1 to 5) for emotional eating while 38.4 percent scored 3 or higher on external eating. External eating thus seems to be more common but it also does not differentiate between weight categories, rather cross-sectional findings provide some evidence for a negative association between weight and external eating. Perhaps a higher weight is a reason for parents (and children) to suppress their children’s intentions to give in to food cues.

On the other hand, emotional and external eating have been linked to disordered eating in adolescents (Braet et al., 2008), emotional eating was positively associated with binge-eating (Stice et al., 2002), and children reporting recent loss of control eating episodes score higher on the child version of the Emotional Eating Scale (Tanofsky-Kraff et al., 2007). As discussed by Braet et al. (2008), children who score high on external eating will need self-control to deal with food in the absence of hunger and a smaller group of adolescents might need coping skills to deal with emotional eating. Thus, regardless of the lack of association with weight status, identifying high risk groups of adolescents with elevated emotional and external eating tendencies and targeting research, treatment, and prevention of further disordered eating to this group seems important.

In conclusion, in light of the present overweight problem it is important to identify factors associated with weight status. For a general population of adolescents, emotional and external eating do not seem to have high predictive value for individual differences in the development of overweight, despite their relevance for theory and practice of eating disorders and binge eating. Restrained eating was related to
higher BMI trajectories but as the five trajectories showed very similar moderate increases of BMI also restrained eating did not predict individual differences in BMI increases. Differentiations of individuals into different weight statuses seems to occur at a younger age, and also eating style might have had their influence at a younger or perhaps older age. Therefore future studies should look at the associations between eating styles and weight development in young children or follow adolescents for a longer period into young adulthood.
CHAPTER 4
Restrained eating and BMI: A longitudinal study among adolescents

Abstract

Although restrained eating is believed to increase overeating and weight in the long term, the opposite has also been found: heavy individuals are more likely to diet. A longitudinal model was used to explore the bi-directional associations between restrained eating and BMI. At three annual waves, restrained eating and body mass index were obtained from both older (mean age 15.2) and younger (mean age 13.4) adolescent boys and girls who were sibling pairs in 404 Dutch families. Structural equation modelling showed that BMI predicted restrained eating more consistently than the other way round. The results remained the same when analyzed by sex, age, socio-economic status, and overeating tendency. Thus, in our general survey of adolescents restrained eating did not seem to be a successful weight-loss strategy, nor did it consistently predict weight increase. Positive associations between restrained eating and body mass index should mainly be interpreted in the sense that higher BMI predicted more restrained eating.
Introduction

Childhood and adolescent obesity is rapidly becoming a major health problem (Must & Strauss, 1999; Seidell, 1999). However, the cornerstone of weight management, i.e. the attempts to restrict food intake (dietary restraint), remains controversial since for both metabolic and psychological reasons it may produce overeating and weight gain (Herman & Polivy, 1980). Restrained eating may alter metabolic functioning in the direction of anabolism (Jeffery et al., 1984), which may increase the difficulty of losing weight or may even cause weight gain in the long run (Polivy & Herman, 1985). Further, a reliance on cognitive control over eating rather than on physiological cues may make dieters vulnerable to overeating when self-control is disturbed by, for example, distress, intoxicants, and the consumption of high caloric food (Herman, Polivy, & Leone, 2005). The hypothesised link between dietary restraint and overeating is based on the early laboratory work by Herman and Polivy (1980) in which participants high on dietary restraint overate when their self-control had been deliberately undermined.

The link between dietary restraint and weight gain was found in several longitudinal studies on adolescents (Field et al., 2003; Stice, 1998, 2001; Stice et al., 1999; Stice et al., 2005). In a 2-wave study among 369 female adolescents aged 16 to 19, dieting was positively related to weight gain over a 9-month period, but there was also a quadratic component to this effect wherein extreme dieting predicted weight loss (Stice, 1998). In a 4-wave study on 692 female adolescents aged 13 to 17, elevated dieting and radical weight loss efforts predicted greater subsequent increase in relative weight and an elevated hazard for onset of obesity over a 4-year period, but there was no support for quadratic relations between dietary efforts and weight gain (Stice, 2001; Stice et al., 1999; Stice et al., 2005). Similar results were found in a large 4-wave study over a 3-year period on pre-adolescents and adolescents in the US (Field et al., 2003).

There are, however, experimental and longitudinal studies showing that dietary restraint was not associated with high intake of food in students (Ouwens et al., 2003) or with weight gain in adolescents (de Lauzon-Guillain et al., 2006). Further, studies in which dietary restraint was not self-reported but formally imposed by assigning people to a professionally administered weight maintenance or weight loss diet suggested that although there were dieters with successful maintenance of lost body weight (Klem, Wing, McGuire, Seagle, & Hill, 1997), long-term success remained an issue of concern for both adults (Mann et al., 2007) and children (Epstein, Myers, Raynor, & Saelens, 1998). Also, such imposed diets did not seem to increase the risk of bulimic pathology in overweight children and adolescents (Butryn & Wadden, 2005).

The present study addressed the controversy of dieting by assessing the relationship between dietary restraint and weight change; however, the opposite relation was also tested, i.e. whether body mass index (BMI) predicted future dietary restraint. Overweight was often regarded as the result of restrained eating, but could just as well be a reason for dieting (Hill, 2004). There is some support for the latter relation (de Lauzon-Guillain et al., 2006; Shunk & Birch, 2004; Stice et al., 1998). In a
sample of 153 girls, Shunk and Birch (2004) found that while at age 5 no differences in restraint were found, girls with higher weight status at age 5 had higher restraint scores at age 9. Similarly, a higher value of initial adiposity predicted a larger increase in restraint over time in a more age-diffuse sample of 217 adolescents and young adults (de Lauzon-Guillain et al., 2006), and in a sample of 320 senior high school students (Stice et al., 1998). In sum, from the literature on children and young adults it is unclear whether restraint leads to weight gain or vice versa. Longitudinal analyses among adolescents testing cross-lagged links between restraint and weight gain are required to answer this question.

The discrepancy of findings in the previous studies on the effects of dietary restraint on weight status may also be explained by the fact that dietary restraint (an inhibition factor) is often empirically linked to emotional and external eating, and that these overeating tendencies may therefore contaminate relationships between dietary restraint, food intake and change in body weight (Field et al., 2003; Ouwens et al., 2003; van Strien, Cleven, & Schippers, 2000; Westenhoefer, Broeckmann, Munch, & Pudel, 1994). Results may, therefore, depend on the composition of dieters with high or low overeating tendencies in the sample (van Strien et al., 2006).

In the present study, relationships between restrained eating and BMI were tested over three annual waves, for both older and younger adolescent boys and girls who were sibling pairs in 404 Dutch families. It was tested whether restrained eating predicted BMI and whether BMI predicted restrained eating. Structural equation modelling was used to test both directions simultaneously and also take into account the stability of restrained eating and BMI. This way the hypotheses that high restrained eating predict a higher BMI, and that high BMI predicts higher restrained eating could both be tested. In subsequent analyses the same model was tested for possible sex and age differences, socio-economic status (SES), and for differences in those with high versus low levels of emotional and external eating. To our knowledge only the above-mentioned study by Field et al. (2003) studied associations between restrained eating and weight for boys next to girls and the results of this study suggested that both sexes showed a similar pattern of effects (Field et al., 2003). For SES, since higher status has been related to both more dieting and lower weight status (Jeffery et al., 1984), differences between SES groups could therefore be expected in the degree to which BMI predicts restrained eating.

**Methods**

**Procedure**

Participants of this study were 404 Dutch families who also participated in the longitudinal project ‘Family and Health’ that aimed at investigating family and individual predictors of various health related behaviours of adolescents (Harakeh, Scholte, de Vries, & Engels, 2005; van der Vorst, Engels, Meeus, & Dekovic, 2006). Families from different regions of the Netherlands with at least two children aged between 13 and 16 were recruited. Only intact families could participate. A total of
428 families were selected to acquire an equal distribution of the educational levels and sex of the adolescents.

A compliance rate of 94% was achieved, with 404 of the 428 participating families completing data at all three waves. In each family both parents and two adolescent children participated. Data collection took place at the respondents’ homes between November 2002 and April 2003 for the first wave, and one and two years later for wave 2 and wave 3, respectively. A trained interviewer visited the families, explained the procedure, clarified questions, and made sure the family members filled in the questionnaires at the same time, but individually and separately. Families were given a financial reward of €30 for their participation at each wave and 5 families were randomly selected to receive a €1000 travel check.

Sample characteristics
The participating adolescents were between 13 and 16 years old at wave 1; the average age was 15.2 (SD = 0.60) for the older adolescents and 13.4 (SD = 0.50) for the younger. Boys (50.3%) and girls were represented in almost equal numbers. Most adolescents (96%) were of Dutch ethnicity, and from various secondary educational levels in the Netherlands. Based on the highest finished education of the father SES was defined as either higher (defined for those fathers who had completed college or university (50.5%)) or lower.

Measurements
BMI was calculated based on self-reported height and weight, at each of the three waves. Next, at the third wave, a trained interviewer measured height and weight of the adolescents in a random sub-sample of 300 families. Weight and height were measured in light clothing without shoes, to the nearest of 0.1 kg and 0.5 cm. To determine whether an adolescent was overweight we used international age and sex-specific cut-off scores that corresponded with a BMI ≥ 25 for adults (Cole et al., 2000). In all analyses BMIs rather than BMI z-scores were used as the number of respondents in specific age and sex groups was limited, instead we tested for age and sex differences in model findings using multi-group analyses.

Restrained, emotional, and external eating were assessed at all three waves using the Dutch Eating Behaviour Questionnaire (DEBQ) (van Strien, Frijters et al., 1986a). This questionnaire consists of 33 items, which measured restrained (10 items), emotional (13 items), and external eating (10 items). An example item is “Do you try to eat less at mealtimes than you would like to eat?” (restrained eating), “Do you have a desire to eat when you are irritated?” (emotional eating), and “If food smells and looks good, do you eat more than usual?” (external eating). All items had to be rated on a 5-point scale from 1 (never) to 5 (very often). The DEBQ scales have high internal consistency, high validity for food consumption, and high convergent and discriminative validity (van Strien, 2002). The DEBQ is easy to fill out by adolescents and has been used in other studies among adolescents (Lluch et al., 2000; van Strien, 1996). Cronbach’s alphas for restrained eating were between 0.94 and 0.95 for older and between .92 and .94 for younger adolescents at the three waves. At baseline, Cronbach’s alphas for emotional eating were .93 for older and .93 for younger adolescents. For external
eating, alphas were .85 for older and .85 for younger adolescents. The correlation between emotional and external eating was .55 for older and .51 for younger adolescents (correlations significant at \( p < .001 \)). Correlations between emotional and restrained eating were 0.29 and 0.31 for older and younger adolescents (\( p < .001 \)), while correlations between external and restrained eating were -.14 (\( p < .05 \)) for older and -.06 (n.s.) for younger adolescents.

**Strategy for analyses**

To evaluate the validity of the self-reported height and weight of our adolescents, these were compared with measured data at wave 3 in the sub-sample of 300 families. Correlations showed high correspondence between measured and reported heights for older and younger boys and girls (\( r \)s between 0.91 and 0.95 for the different reporters, \( p \)-values < .001) and between measured and reported weights (\( r \)s between 0.96 and 0.97 for the different reporters, \( p \)-values < .001). Significant over-report of heights was found for older adolescents and younger girls, and significant under-report of weights was found for all reporters. In regression analyses with measured anthropometrics as dependent and reported data as explanatory variables, a significant linear but no significant quadratic term was found for reported measurements, indicating that, for example, the under-report of weight did not differ between subjects who differed in weight. Apparently, within the family context of our study height and weight reports were fairly reliable at the third wave. In all analyses self-reported anthropometrics were used.

Over the three measurements, potential differences in \( \text{BMI} \) and eating behaviour scores were compared with paired t-tests. Structural equation modelling (AMOS 5.0 (Arbuckle & Worthke, 1999)) with Maximum Likelihood (ML) estimation was used to determine longitudinal associations between restrained eating and \( \text{BMI} \) (Figure 1). The error terms of restrained eating and \( \text{BMI} \) at the same wave were allowed to correlate. The model fit was satisfactory for both older (\( \chi^2 (2) = 1.494, p = .474; \text{GFI} = 0.999; \text{AIC} = 39.494 \)) and younger adolescents (\( \chi^2 (2) = 2.890, p = .236; \text{GFI} = 0.998; \text{AIC} = 40.890 \)). As patterns may differ for normal-weight and overweight adolescents (de Lauzon-Guillain et al., 2006), analyses were repeated, leaving out the overweight adolescents (i.e. 20 older and 25 younger adolescents). In subsequent analyses the same models were tested for the different groups: i.e. for boys and for girls, for higher and lower SES, and for high and low emotional and external eating (divided by means of median split and by .20 percentile). Also, age differences were tested with 2 groups for younger adolescents (13 and 14 years old at wave 1) and 3 groups for older adolescents (14, 15 and 16 years old at wave 1). To test whether cross-lagged associations differed between the groups (for example between boys and girls) differences between groups were tested by fixing the betas and testing whether the model fit (\( \Delta \chi^2 \)) was significantly better for the model in which the paths were allowed to differ between groups, compared to the model in which the paths were constrained to be equal.
Table 1: Body mass index (BMI) and mean scores on emotional, external and restrained eating by sex, age, and socioeconomic status (SES) of Dutch adolescents (means and standard deviations (SD))

<table>
<thead>
<tr>
<th></th>
<th>BMI</th>
<th>Emotional eating</th>
<th>External eating</th>
<th>Restrained eating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td>***</td>
<td>*</td>
<td>***</td>
</tr>
<tr>
<td>Boys</td>
<td>405</td>
<td>19.35 (2.56)</td>
<td>2.09 (0.70)</td>
<td>3.04 (0.68)</td>
</tr>
<tr>
<td>Girls</td>
<td>403</td>
<td>19.53 (2.38)</td>
<td>2.40 (0.75)</td>
<td>2.94 (0.61)</td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td>***</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>13</td>
<td>266</td>
<td>18.58&lt;sup&gt;a&lt;/sup&gt;</td>
<td>19.03&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.06</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.88)</td>
<td>(2.41)</td>
<td>(0.65)</td>
</tr>
<tr>
<td>14</td>
<td>169</td>
<td>19.27&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>19.51&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.42)</td>
<td>(2.62)</td>
<td>(0.71)</td>
</tr>
<tr>
<td>15</td>
<td>247</td>
<td>19.90&lt;sup&gt;b&lt;/sup&gt;</td>
<td>19.61&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.32)</td>
<td>(1.90)</td>
<td>(0.72)</td>
</tr>
<tr>
<td>16</td>
<td>126</td>
<td>19.85&lt;sup&gt;b&lt;/sup&gt;</td>
<td>20.39&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.14)</td>
<td>(2.43)</td>
<td>(0.76)</td>
</tr>
<tr>
<td><strong>SES</strong></td>
<td></td>
<td>**</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Lower</td>
<td>398</td>
<td>19.37</td>
<td>19.85</td>
<td>2.09</td>
</tr>
<tr>
<td>SES</td>
<td></td>
<td>(2.57)</td>
<td>(2.22)</td>
<td>(0.69)</td>
</tr>
<tr>
<td>Higher</td>
<td>408</td>
<td>19.35</td>
<td>19.16</td>
<td>2.10</td>
</tr>
<tr>
<td>SES</td>
<td></td>
<td>(2.56)</td>
<td>(2.50)</td>
<td>(0.71)</td>
</tr>
</tbody>
</table>

1 Average scores on a 5-point scale from 1 (never) to 5 (very often)

Note: For main effects of sex, age, and SES in the ANOVAs, significant difference effects are marked: * p < .05; ** p < .01; *** p < .001 (n = 404 families). Differences between age and SES groups were tested with post-hoc tests (Scheffe) and significant differences (p < .05) are marked with a, b, c.
Results

Restrained eating and BMI

Average BMI and scores on eating behaviour at baseline are presented in Table 1. Girls scored higher on restrained and emotional eating, while boys scored higher on external eating. Eating behaviour scores did not differ between the age groups, except for lower restrained eating scores in 15-year-old boys compared to the other age groups. BMI was significantly higher in older age groups for both boys and girls. Concerning SES, significant higher restrained scores and higher BMI were found for girls in the lower SES group. Over the three measurements restrained eating remained relatively stable for older adolescents and younger girls, but decreased between the first and the second wave for younger boys. For both older and younger adolescents, BMI significantly increased over the three time moments (Table 2).

Cross-sectional, moderate, and positive associations were found between restrained eating and BMI at all three waves (Table 3). For the older adolescents, at waves 1, 2, and 3 the correlations were .37, .35, and .30 (p-values < .01) and for the younger adolescents they were .32, .36, and .39 (p-values < .01), respectively.

Table 2: Average scores (means and standard deviations; SD) on restrained eating and body mass index (BMI), for both older and younger adolescents at the three annual waves.

<table>
<thead>
<tr>
<th></th>
<th>Wave 1</th>
<th>Wave 2</th>
<th>Wave 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restrained eating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>Older adolescent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>1.68a (0.66)</td>
<td>1.72a (0.78)</td>
<td>1.75a (0.71)</td>
</tr>
<tr>
<td>Girls</td>
<td>2.39a (0.90)</td>
<td>2.44a (0.72)</td>
<td>2.49a (0.84)</td>
</tr>
<tr>
<td>Younger adolescent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>1.89a (0.72)</td>
<td>1.79b (0.69)</td>
<td>1.72b (0.69)</td>
</tr>
<tr>
<td>Girls</td>
<td>2.28a (0.83)</td>
<td>2.33a (0.90)</td>
<td>2.34a (0.87)</td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Older adolescent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>19.84a (2.28)</td>
<td>20.53b (2.46)</td>
<td>21.32c (2.51)</td>
</tr>
<tr>
<td>Girls</td>
<td>19.90a (2.26)</td>
<td>20.51b (2.16)</td>
<td>21.34c (2.42)</td>
</tr>
<tr>
<td>Younger adolescent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>18.66a (2.48)</td>
<td>19.46b (2.44)</td>
<td>20.24c (2.33)</td>
</tr>
<tr>
<td>Girls</td>
<td>19.22a (2.47)</td>
<td>19.90b (2.50)</td>
<td>20.67c (2.38)</td>
</tr>
</tbody>
</table>

Note: Differences over time within persons were tested with paired t-tests and are indicated with a,b,c; different letters indicate a significant difference (p < .05)

1 According to Cohen (1988, 1992): small = 0.1; medium = 0.3; large = 0.5 (Cohen, 1988, 1992).
Table 3: Correlations between body mass index (BMI) and restrained eating of the older (above diagonal) and the younger adolescent (below diagonal) of 404 Dutch families at three annual waves

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Restraint1</td>
<td>-</td>
<td>.73</td>
<td>.71</td>
<td>.37</td>
<td>.34</td>
<td>.36</td>
</tr>
<tr>
<td>2 Restraint2</td>
<td>.67</td>
<td>-</td>
<td>.79</td>
<td>.35</td>
<td>.35</td>
<td>.34</td>
</tr>
<tr>
<td>3 Restraint3</td>
<td>.52</td>
<td>.72</td>
<td>-</td>
<td>.29</td>
<td>.31</td>
<td>.30</td>
</tr>
<tr>
<td>4 BMI1</td>
<td>.32</td>
<td>.36</td>
<td>.39</td>
<td>-</td>
<td>.84</td>
<td>.79</td>
</tr>
<tr>
<td>5 BMI2</td>
<td>.33</td>
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<td>.40</td>
<td>.82</td>
<td>-</td>
<td>.85</td>
</tr>
<tr>
<td>6 BMI3</td>
<td>.30</td>
<td>.36</td>
<td>.39</td>
<td>.74</td>
<td>.85</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: All correlations significant at \( p < .01 \)

Prospective associations between restrained eating and BMI

Longitudinal associations between restrained eating and BMI are shown in Figure 1, for older and younger adolescents separately. The models showed strong stability paths for restrained eating between waves 1 and 2, and between waves 2 and 3 for both older and younger adolescents. An additional significant but weak path between wave 1 and 3 was found for older adolescents but not for younger. For BMI, strong stability paths were found between waves 1 and 2 and between waves 2 and 3, and weak, however significant, paths were found between waves 1 and 3 for both older and younger adolescents.

Figure 1: Longitudinal associations (standardized beta’s) between restrained eating and body mass index (BMI) for older/younger adolescents of 404 Dutch families

\* \( p < .05 \); \* \* \( p < .01 \); \* \* \* \( p < .001 \)
All significant cross-lagged paths between restrained eating and BMI had rather weak magnitudes. Over the three waves significant paths from restrained eating to BMI were found only between wave 1 and 2, and only for the younger adolescents (β = .08). Thus, younger adolescents’ restrained eating at wave 1 predicted BMI one year later. In contrast, paths from BMI to restrained eating were found between wave 1 and 2 for both older and younger adolescents (β = .09 and .17), and between wave 2 and 3 for younger adolescents (β = .15) (Figure 1). To conclude, older adolescents’ BMI at wave 1 and younger adolescents’ BMI at waves 1 and 2 predicted restrained eating one year later. The same model was tested leaving out the overweight adolescents, but this did not produce different results.

**Table 4:** standardized estimates of longitudinal associations between restrained eating (RS) and body mass index (BMI) for sex and socioeconomic status (SES) groups

<table>
<thead>
<tr>
<th>Sex</th>
<th>Older adolescents</th>
<th>Younger adolescents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>boys</td>
<td>girls</td>
</tr>
<tr>
<td>SES</td>
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**Stability paths**

<table>
<thead>
<tr>
<th>Path</th>
<th>Boys</th>
<th>Girls</th>
<th>Low</th>
<th>High</th>
<th>Boys</th>
<th>Girls</th>
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<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS1 → RS2</td>
<td>.56***</td>
<td>.68***</td>
<td>.67***</td>
<td>.73***</td>
<td>.62***</td>
<td>.50***</td>
<td>.70***</td>
<td>.55***</td>
</tr>
<tr>
<td>RS2 → RS3</td>
<td>.52***</td>
<td>.58***</td>
<td>.55***</td>
<td>.60***</td>
<td>.53***</td>
<td>.62***</td>
<td>.62***</td>
<td>.65***</td>
</tr>
<tr>
<td>RS1 → RS3</td>
<td>.22***</td>
<td>.20***</td>
<td>.29***</td>
<td>.28***</td>
<td>-.02</td>
<td>.07</td>
<td>.01</td>
<td>.07</td>
</tr>
<tr>
<td>BMI1 → BMI2</td>
<td>.81***</td>
<td>.83***</td>
<td>.83***</td>
<td>.82***</td>
<td>.75***</td>
<td>.82***</td>
<td>.74***</td>
<td>.84***</td>
</tr>
<tr>
<td>BMI2 → BMI3</td>
<td>.64***</td>
<td>.61***</td>
<td>.63***</td>
<td>.61***</td>
<td>.73***</td>
<td>.74***</td>
<td>.78***</td>
<td>.61***</td>
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<td>BMI1 → BMI3</td>
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<td>.22***</td>
<td>.16*</td>
<td>.11</td>
<td>.06</td>
<td>.28***</td>
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**Cross-lagged paths†**

<table>
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<th>Girls</th>
<th>Low</th>
<th>High</th>
<th>Boys</th>
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</tr>
</thead>
<tbody>
<tr>
<td>RS1 → BMI2</td>
<td>.07</td>
<td>.06</td>
<td>.01</td>
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<td>.13***</td>
<td>.04b</td>
<td>.10**d</td>
<td>.04d</td>
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<tr>
<td>RS2 → BMI3</td>
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<td>.06</td>
<td>.01</td>
<td>-.02</td>
<td>.08**c</td>
<td>.07</td>
<td>.00</td>
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<tr>
<td>BMI1 → RS2</td>
<td>.14*</td>
<td>.11*</td>
<td>.13*a</td>
<td>.04a</td>
<td>.15***</td>
<td>.16**</td>
<td>.11*</td>
<td>.22***</td>
</tr>
<tr>
<td>BMI2 → RS3</td>
<td>.05</td>
<td>.01</td>
<td>.03</td>
<td>-.01</td>
<td>.24***</td>
<td>.13*</td>
<td>.16**</td>
<td>.15*</td>
</tr>
</tbody>
</table>

* p < .05; ** p < .01; *** p < .001
† Multi-group analyses on unstandardized estimates: 1 (Δχ² (ddf) = 1.445 (p = .23), b (Δχ² (ddf) = 2.956 (p = .09), c (Δχ² (ddf) = 2.181 (p = .14), d (Δχ² (ddf) = 1.027 (p = .31).
Sex, SES, age, emotional and external eating

Multi-group analyses revealed no significant differences between boys and girls, or between adolescents of higher and lower SES (Table 4) in longitudinal associations between restrained eating and BMI. Also, age was not a significant factor. No multi-group differences in patterns were found for younger adolescents of 13 and 14 years old ($\Delta \chi^2 (4 \, df) = 6.7, p = .15$), neither for older adolescents of 14, 15, and 16 years old ($\Delta \chi^2 (8 \, df) = 12.6, p = .13$). Similarly, no differences in the cross-lagged paths were found between adolescents who scored low versus high (median split), very high (above .80 percentile), or very low (below .20 percentile) on emotional or external eating.

Discussion

Does dieting cause increase in body weight? Certainly, a positive (cross-sectional) association between restrained eating and weight status was repeatedly found, but this could also be interpreted in a sense that the heavier individuals are, the more prone they are to dieting (Hill, 2004). Adolescence is a period in which normative weight gain associated with puberty occurs (Cole et al., 2000), the wish to be thinner becomes stronger, and weight loss attempts increase (Halvarsson, Lunner, Westerberg, Anteson, & Sjöden, 2002). To test how restraint contributes to weight increase, the opposite (restraint as a consequence of higher weight status) should also be considered. This study was the first that addressed this bi-directionality between restrained eating and BMI in one model, by using structural equation modelling and therefore also controlling for stability over time and cross-sectional associations. Results showed that in this sample of adolescents over the three time moments BMI predicted restrained eating of both older and younger boys and girls more consistently than the other way round.

Although our data did not reveal the underlying mechanisms by which BMI predicts restrained eating, and the magnitude of the effects was not very strong, the finding that higher BMI predicted restrained eating while at the same time restrained eating did not predict weight loss, is particularly important when considering the current high obesity rates and the fact that dieting is common practice among Dutch adolescents (Brugman et al., 1997). In our sample, restrained eating did not lead to weight loss, or to less weight increase compared to non-dieting peers. It should be stressed that the same was found when we omitted the overweight adolescents, showing that our results were not attributable to this specific group. Possibly the adolescents did not diet as much as they should in order to achieve weight loss, or alternatively, restrained eaters were not strict enough in their actual reduction of food intake, thus, although they reported high restrained eating, their actual behaviour was not restrictive enough to have an effect on weight (Stice, 1998). Although the average restrained eating scores in the present study were comparable to those of one previous study on a sample of 1087 Dutch adolescents (Snoek, van Strien et al., 2007), the scores were quite low which might support this explanation. Also, adoles-
cents might feel that they were dieting because they ate less than they wanted, while in fact their food intake was not less than their physiological need (Lowe & Levine, 2005; Stice et al., 1999). In contrast, previous studies with adolescents found that, although restrained eating was associated with higher BMI, it was also associated with lower intakes of energy, carbohydrate and protein, suggesting that restraint adolescents actually had a healthier diet (Lluch et al., 2000; Wardle et al., 1992).

An alternative hypothesis would therefore be that daily food intake was indeed reduced but that dieting was often accompanied with overeating at other times. In the present study, differentiation between individuals with high overeating tendencies (for whom restraint may be unsuccessful) or low overeating tendencies (for whom restraint may be successful) did not lead to different associations between restraint and BMI. In both groups, restrained eating predicted neither weight gain nor weight loss. Caution is needed, however, in generalizing these results to other more high-risk populations with overweight and eating pathologies, i.e. older respondents or clinical samples. Also, the way in which the tendency toward overeating is related to restrained eating and overweight, might be complex and alternative mechanisms still need to be tested. For example, the tendency towards overeating could also precede restrained eating.

Alternative explanations for the lack of weight loss for higher restraint adolescents cannot be ruled out by the present study. One explanation could be that weight-control behaviours may lead to increased metabolic efficiency or other alterations in homeostatic processes (Klesges, Isbell, & Klesges, 1992), thus counteracting reduced food intake. It was also proposed that weight-control behaviours could simply be a proxy measure of risk for obesity (Stice et al., 2005). This means that adolescents at risk for obesity (e.g. because of a high tendency towards overeating, low physical activity, genetics, etc.) are more likely to start dieting. This is consistent with the pattern that appeared from this study; dieting was unsuccessful over time while weight increased, and higher BMI in turn predicted an increase in restrained eating. Such a pattern might lead to frustration, perhaps urging individuals to more heavy restraint practices, especially for those who are overweight. Future studies need to explore in what ways unsuccessful dieting during adolescence affect dieting and weight in the long term, also to pay attention to both restrained eating and specific dieting behaviours, and to discover whether overweight and normal-weight adolescents diet in the same way.

Our study consisted solely of intact families with both biological parents, who were also relatively high educated; this was not a nation-wide representative sample. Therefore the generalizability of the results is limited, especially when it comes to other family compositions such as single-parent families, and the relatively under-represented ethnic minorities. Secondly, this study made only use of self-reported data on height and weight of the adolescents. Several previous studies that found associations between restrained eating and BMI used self-reported heights and weights (Field et al., 2003; Stice, 1998, 2001; Stice et al., 1998) while others used measured data (de Lauzon-Guillain et al., 2006; Stice et al., 1999; Stice et al., 2005). In our study, high correlations were found between self-reported and measured anthropometrics at the third assessment, probably due to the fact that the adolescents
filled in their questionnaires at home and not in a classroom. Nevertheless, self-reported measurements are always subject to more bias than measured heights and weights. Also, in our sample we found under-reports of weight and over-reports of height in the third wave, and the reliability of our self-report measures at the other waves could not be determined. Future studies addressing restrained eating and BMI should therefore preferably use measured data. On the other hand, we found no support that under-report of weight was stronger in certain weight groups, for example in the overweight adolescents. This indicates a random rather than systematic bias for weight status in the measure of weight and therefore this error is not likely to affect the associations between BMI and restrained eating, as a person's relative weight status in the group remains the same.

This study also had several strengths, such as the large sample in two specific age groups (early and middle adolescents), the longitudinal design, and the use of structural equation modelling that allowed testing for bi-directionality. Since this was a longitudinal study we can conclude that BMI actually predicted dietary restraint over time; the results were not just attributable to that overweight adolescents are more likely to diet but, as dieting is often ineffective, they remain heavier than their leaner peers. Given the health problems associated with overweight and the fact that restrained eating is common behaviour it is disturbing that restrained eating seems unsuccessful in reducing or controlling adolescents' weights. The results of this study also raises some questions about the value of the restraint theory in predicting BMI in a general population of adolescent boys and girls, and showed that is more likely that restrained eating is the result, rather than the cause, of higher BMI. Although BMI was not a very strong predictor of restrained eating, it was more consistent than the other way round, suggesting that positive associations between restrained eating and BMI in adolescence should not simply be interpreted as the results of restraint and disinhibition. Instead, further studies should continue using bi-directional models, as these are necessary to disentangle the effects between restrained eating and BMI.
CHAPTER 5
Longitudinal relationships between fathers’, mothers’, and adolescents’ restrained eating

Abstract

Family members can exert important direct and indirect influence on the eating behaviours of children; these include modelling, and transmission of preferences, beliefs, and attitudes. Current studies on family similarities in dieting behaviours however show inconsistent results. The present study examines family similarities and reciprocal influences on restrained eating, using data of a longitudinal three-wave full-family study consisting of both parents and two adolescent sibling children (aged 13 – 16 at time 1) from 404 Dutch families. All family members reported their restrained eating behaviours at three annual waves. Cross-sectional associations were found between parents’ and adolescents’ restrained eating, but overall no transmission of restrained eating was found between family members over time. Similarities were higher between daughters and mothers compared to sons and mothers. Longitudinally, no differences in the results were found between boys and girls, or between adolescents with high or low quality relationships with their parents.
Introduction

The current high rate of overweight and its related health problems across the world emphasize the need for research on behaviours that influence the energy balance, such as dieting behaviours. Dieting is a generic term that refers to specific behaviours or, more generally, to the extent of restrained eating. Restrained eating, or dietary restraint, has been defined as the tendency to restrict food intake in order to achieve weight loss or to prevent weight gain (Herman & Polivy, 1980). Although dieting has become common behaviour among Dutch adolescents (Brugman et al., 1997), the benefits for weight regulation are very disputable. It has been suggested that especially rigid control over food intake (as opposed to flexible control) is associated with disinhibition and higher BMI (Westenhoefer, Stunkard, & Pudel, 1999). Some dieters successfully maintain lower body weight, but most diets and also restrained eating are not effective in the long term (Mann et al., 2007; Snoek et al., 2008). In addition, self-reported dieting has been found to be related to increases in eating pathology (Stice, 2002). Dieting is thus controversial, and therefore it is interesting to study its development in young people. Factors that add substantially to the prediction of dietary restraint in adolescents include body size as well as dissatisfaction with body weight and shape, but also sociocultural influences such as dietary habits within the family (Dunkley, Wertheim, & Paxton, 2001; Stice, 2001).

It is generally believed that parents can have an important influence on the eating behaviours of their children; there is some support for parental modelling, and transmission of preferences, beliefs, and attitudes towards eating as well as for the importance of parental feeding styles on child eating (Faith, Scanlon, Birch, Francis, & Sherry, 2004; Staflue, van Staveren, De Graaf, Burema, & Hautvast, 1995; Vauthier et al., 1996). Similiralties between parents and their young children in food preferences are attributable to both genetic and family environment components (Breen, Plomin, & Wardle, 2006); in addition parents determine what is consumed in a family by their food purchases. Twin studies showed great importance of genetic factors for restrained eating of young adult males, however in this older group shared environmental factors did not contribute to eating behaviour (Tholin et al., 2005). Children are thus likely to resemble their parents in eating behaviour and attitudes (such as dieting) and might also be influenced during periods in which their eating behaviours change. Due to normative weight increase associated with puberty, increasing social pressure to be thin, and the emphasis on physical appearance during adolescence (Striegel Moore & Cachelin, 1999) children are assumed to be vulnerable to parental influences and modelling of eating behaviour in this period. The present study investigates both similarity between adolescents and their parents and the development of restrained eating in the family context.

Family members have been found to resemble each other in weight status, food choices, and preferences (Davison et al., 2000; Faith, Keller et al., 2004; Lluch et al., 2000; Rankinen & Bouchard, 2006; Vauthier et al., 1996), and in the field of eating disorders the impact of family members’ behaviours is considered to be of great importance. Retrospectively, behaviours of parents and siblings are mentioned as factors that drive initiation of eating pathology, and additionally, disordered eating
is found to aggregate within families (Pike & Rodin, 1991). The general belief is that children resemble their parents in dieting behaviours; and although this has been addressed in numerous studies, the evidence for aggregation of dieting behaviours within families is not convincing. For weight-related behaviours (e.g. weight concerns, drive for thinness and body dissatisfaction), some found a significant positive association between parents and children’s behaviours (Keel et al., 1997; Smolak, Levine, & Schermer, 1999), while others found no similarities (Davison et al., 2000; Ogden & Elder, 1998). None found longitudinal associations; moreover, the studies differ greatly in design, and in methodological strengths and shortcomings. Another complication for the interpretation of studies on family similarities and influences is the lack of a consistent measurement of dieting behaviours. Restrained eating and dieting have been differentiated as separate constructs (Lowe, 1993), yet there is no consistent use of measurement of these behaviours. A number of studies used validated restrained eating scales, such as the Restrained subscale of the Dutch Eating Behaviour Questionnaire, the Restraint Scale or the diet subscale of the Eating Attitudes Test, while others used the whole EAT-26; resulting in a sum score including dimensions other than dieting. The majority of the studies included self-constructed scales or single items to assess dieting behaviour which makes it difficult to interpret the results.

**Similarities in dieting behaviour within families**

Studies that used either the Restrained subscale of the Dutch Eating Behaviour Questionnaire, the Restraint Scale or the diet subscale of the Eating Attitudes Test showed mixed results on family similarities. Null findings were reported by several studies (Benedikt et al., 1998; Hill & Franklin, 1998; Keel et al., 1997; Ogden & Elder, 1998; Ogden & Steward, 2000), while others found significant associations between mothers and daughters (Hill et al., 1990; Ruther & Richman, 1993; Steiger et al., 1995) but not between sons and parents (Ruther & Richman, 1993) or between fathers and children (Steiger et al., 1995). One study found that both daughters’ and sons’ scores on an adapted version of the DEBQ-R were associated with their perception of maternal dieting (which was assessed by only one item) (Hill & Franklin, 1998).

Studies that addressed the aggregation of other dieting behaviours within families found positive associations in dieting frequencies (Wertheim, Mee, & Paxton, 1999) and weight loss attempts (Smolak et al., 1999) between daughters (but not sons) and parents, as well as positive associations between two out of eleven dieting behaviours (skipping meals and crash dieting) of girls and their fathers’ dieting (Dixon, Adair, & O’Connor, 1996). One study found positive associations between both boys and girls’ dieting or healthy and unhealthy weight control, and mother’s weight loss attempts or dieting frequency (Keery, Eisenberg, Boutelle, Neumark Sztainer, & Story, 2006). Similarly, a large-scale study that included 5331 girls, 3881 boys, and their mothers found associations between dieting of children and weight loss attempts of mothers (Field et al., 2005). In contrast, others found no associations between children and mothers’ dieting behaviours (Fulkerson et al., 2002). For studies that used the (total) EAT, significant associations between mothers and daughters’ scores have been
reported (Attie & Brooks Gunn, 1989), while others found no significant associations between parents and both their children’s \textit{EAT} scores (Baker, Whisman, & Brownell, 2000; Mukai, Crago, & Shisslak, 1994; Thelen & Cormier, 1995).

**Transmission of dieting behaviour within the family**

Two studies reported longitudinal data: Byely, Archibald, Graber, and Brooks Gunn (2000) found no associations between mothers and daughters’ dieting (measured with the diet subscale of the \textit{EAT}) over a 1-year period. Similarly, Field et al. (2001) revealed no effects of mothers’ dieting on sons and daughters’ dieting (self-constructed scale), also over a 1-year period. Thus, so far no evidence has been found for transmission of restrained eating from parents to children over time.

**Weight status (BMI)**

Weight status might be an important confounding variable in the associations between restrained eating of family members. Overweight adolescents are more likely to diet (Snoek et al., 2008) and overweight tends to aggregate within families (Davison et al., 2000). In addition, children might, for example, be more likely to model their parents’ dieting if they think this behaviour is successful, i.e. if the parent is not overweight. The importance of weight status was underlined by Fulkerson et al. (2002) who found that the associations between mothers and children’s dieting disappeared after controlling for the child’s body mass index (\textit{BMI}). Similar results were found for the associations between mothers and daughters’ dieting (Field et al., 2005; Wertheim et al., 1999). Several other studies controlled for the child’s \textit{BMI}; some showed positive associations between child and parents’ dieting (Hill & Franklin, 1998; Paxton, Wertheim, Gibbons, Szmukler, & et al., 1991) while others found no family similarities and influences over time (Byely et al., 2000; Field et al., 2001). So far, only one study controlled for mothers’ \textit{BMI} (Field et al., 2005; Wertheim et al., 1999).

**Sex differences and quality of relationship**

A number of factors at the individual or relationship level might affect whether or not adolescents copy their parents’ behaviours, among other things these are sex of the adolescents or parents. Based on the social learning theory, people are more likely to imitate a person they like and whom they most resemble (Bandura, 1986). Adolescents might therefore copy the behaviour of their same-sex parent (i.e. mothers and daughters, sons and fathers) more often than that of their opposite-sex parent. Alternatively, adolescents might be more likely to copy their mothers’ dieting behaviour since mothers are often the primary caretakers, particularly when it comes to food. For example, in the Netherlands women spent on average 38 minutes per day on preparing food and drinks while men spent 14 minutes (Statistics Netherlands, 2003). Previous studies have often focused on girls and mothers rather than on sons and fathers. Studies that included both fathers and sons reported null findings (Smolak et al., 1999; Thelen & Cormier, 1995) with the exception of one study that found associations between perceptions of fathers’ behaviours and sons’ own weight
loss frequencies and scores on the Eating Attitudes and Behaviours Scale (Baker et al., 2000).

Adolescents might also be more susceptible for the behaviour of the parent with whom they have a good relationship (Bandura, 1986; de Leeuw, Snoek, van Leeuwe, van Strien, & Engels, 2007). Quality of relationship with parents is also a factor that has been related to weight concerns (Ogden & Steward, 2000), however, in the present study we tested whether it moderated the associations between the adolescents’ and their parents’ restrained eating. It was hypothesized that transmission of restrained eating would be influenced by the sex of the adolescents and parents, and that adolescents with a good relationship with their parents would be more strongly influenced by their restrained eating compared to those with a less optimal relationship.

The present study

In sum, two prospective studies showed no transmission of dieting behaviours by family members over time; cross-sectional and retrospective studies were mixed both in design and in results; so far, no studies on resemblance in, and prospective influences on, restrained eating had been conducted that used validated scales and multi-source data with a full-family longitudinal design. Therefore, in the present study similarities in and reciprocal influences on restrained eating in families were examined in a prospective three-wave full-family design in 404 Dutch families, consisting of both parents and two adolescent sibling children. A second model was tested in which BMI of each family member was corrected for. Additionally, the original model was run for adolescents with a low baseline restrained eating score, since possible increases in this group might be masked by the group of adolescents who already had high (and stable) scores on restrained eating at the start of the study. Finally, it was tested whether sex differences existed and whether adolescents with better or less optimal quality of relationship with their parents showed different patterns in the transmission of restrained eating.

Method

Participants

Participants of this study were 404 Dutch families; from each family both parents and two adolescent children participated. The participating adolescents were between 13 and 16 years old at wave 1. The average age was 15.2 (SD = 0.60) for older adolescents and 13.4 (SD = 0.50) for younger adolescents. Boys (50.3%) and girls were represented in almost equal numbers. The participating fathers were on average 46.2 years old (SD = 3.99) and the mothers were on average 43.8 years old (SD = 3.54). Most adolescents (96%) were of Dutch origin (defined by native country of the parents), and were from various secondary educational levels in the Netherlands: 30.9% of the older and 37.9% of the younger adolescents attended lower-level education (preparatory secondary school for technical and vocational training; in the Dutch
school system called LWOO, VMBO), 29.3 and 35.5% attended middle-level education (preparatory secondary school for college; in the Dutch school system called HAVO) and 39.6 and 26.5% attended higher-level education (preparatory secondary school for university; in the Dutch school system called VWO, atheneum, gymnasium). Concerning educational level of the parents: 33.5% of the mothers and 18.8% of the fathers completed primary or secondary school, 30.0% and 30.5%, respectively, completed vocational training and 35.7% and 49.6%, respectively, had a college or university degree.

**Materials**

*Restrained eating* was assessed at all three waves using the Dutch Eating Behaviour Questionnaire (DEBQ) (van Strien, Frijters et al., 1986a). This questionnaire consists of 33 items that measure emotional (13 items), external (10 items), and restrained eating (10 items). An example of a restrained eating item is “Do you try to eat less at mealtimes than you would like?” All items had to be rated on a 5-point scale from 1 (*never*) to 5 (*very often*). The DEBQ scales have high internal consistency, high validity for food consumption, and high convergent and discriminative validity (van Strien, 2002), and have been validated for dietary restraint (van Strien, 2008; van Strien et al., 2006; van Strien & Van de Laar, 2008). The DEBQ is easy to fill out by adolescents and has been used in other youth studies (Snoek, van Strien et al., 2007). At the three waves, Cronbach’s alphas were between .92 and .93 for fathers, between .93 and .94 for mothers, between .94 and .95 for older adolescents, and between .92 and .94 for younger adolescents.

*Height and weight* were reported by all family members at each of the three waves. BMI was calculated based on self-reported height and weight. At the first measurement, average BMI was 25.64 (SD = 3.04) for fathers, 24.39 (SD = 3.72) for mothers, 19.84 (SD = 2.28) and 19.90 (SD = 2.26) for older adolescent boys and girls, and 18.66 (SD = 2.48) and 19.22 (SD = 2.47) for younger adolescent boys and girls. To evaluate the validity of the self-reported height and weight of our adolescents, these were compared with objectively measured data at wave 3 in a sub-sample of 300 families. High correlations (all above .90) were found between measured and reported height and weight. Moreover, overweight status based on reported height and weight in this study showed that both sensitivity and specificity in predicting real (measured) height and weight were satisfactory. Apparently, within the family context of our study height and weight reports were fairly reliable (Snoek et al., 2008). For adolescents, z-scores were calculated using the following formula: \( Z = ((\text{BMI} / M)_L - 1) / (L \times S) \) (Cole et al., 2000), in which we imputed age and sex specific values for M (mean), L (skewness) and S (coefficient of variance) from the 1997 National Growth Study in The Netherlands (Fredriks et al., 2000).

At baseline, *parent – child relationship* was reported by the adolescents about both parents separately. A short version of the Inventory of Parent and Peer Attachment (IPPA) (Armsden & Greenberg, 1987) was used. This 12-item inventory measures the affect dimension of parenting and consists of the subscales ‘communication’, ‘trust’, and ‘alienation’. The IPPA is indicative of the relative degree of perceived parental security by adolescents (for more details see Engels, Finkenauer, Meeus, & Dekovic,
An example of an item is “I talk to my father/mother about my problems”. Items could be scored from 1 (never) to 6 (always). A high 3-week test–retest reliability has been reported for this scale (Armsden & Greenberg, 1987). In the present study, Cronbach’s alphas were between .81 and .87 for the different reporters.

**Procedure**

Families with at least two children aged between 13 and 16 were selected from the registers of 22 municipalities in the Netherlands, and recruited through an invitation letter to participate in the study on ‘families and health’ (Harakeh et al., 2005; van der Vorst, Engels, Meeus, Dekovic, & van Leeuwe, 2005). A total of 885 families were willing to participate and returned completed response forms. In order to participate in the study parents had to be married or living together, family members had to be biologically related, and the children could not be twins. Other exclusion criteria were mental or physical disability in children. From the 765 families fulfilling the study criteria, 428 families were selected to acquire an equal distribution of the educational levels of adolescents and of all the possible sibling dyads (i.e. boy-boy, girl-boy, boy-girl and girl-girls) of our sample. The response rate over the waves was 94%, with 404 of the 428 participating families completing data at all three annual waves (416 at wave 2). Data collection took place at the respondents’ homes between November 2002 and April 2003 for the first wave, with a one-year interval for waves 2 and 3. A trained interviewer visited the families, explained the procedure, and answered questions. To maintain anonymity and avoid that family members influenced each other’s responses, no interaction between family members was allowed when filling in the questionnaires. Each family received €30 per wave if all four family members had completed the questionnaires. At completion of the three waves of the study, five families were randomly selected to receive a €1000 travel cheque in addition.

**Strategy for analyses.** Over the three occasions, increases or decreases in restrained eating were tested with paired t-tests. Structural equation modelling (AMOS 5.0 (Arbuckle, 2003; Arbuckle & Worthke, 1999)) with Maximum Likelihood (ML) estimation was used to determine longitudinal associations in restrained eating between family members (see Figure 1). Restrained eating scores of the four family members at the three waves were employed in the model as observed variables. The stability paths for restrained eating within family members (the prediction of restrained eating at waves 2 and 3 by restrained eating at waves 1 and 2) and all cross-lagged paths between family members were estimated (Figure 1). In this model, errors of restrained eating within the same wave were allowed to correlate. For clarity, the covariances are not shown in the figure, however, all covariates, stability paths, and cross-lagged paths were tested simultaneously. For completeness of the model, influences between siblings were also included, this data has been presented earlier (de Leeuw et al., 2007), the focus of the present study is on influences between adolescents and their parents.

An alternative model was tested in which baseline (wave 1) BMI of the parents and BMI z-scores for adolescents were included. In this model, baseline restrained eating was corrected for BMI at that wave. Additionally, the model was run only for a sub-
sample of 104 older and 112 younger adolescents with low (< .25 percentile) baseline restrained eating scores, as possible increases in this group might be masked by a group of adolescents who already had high (and stable) scores on restrained eating at the start of the study. By looking at those adolescents with low baseline restrained eating scores, the prediction of onset rather than the maintenance of restrained eating can be studied. The fit of the models was assessed by the following global fit indexes: χ², CFI (Comparative Fit Index), GFI (Goodness of Fit Index), and RMSEA (Root Mean Square Error of Approximation). Since the chi-square goodness-of-fit test is sensitive to sample size, the fit indices CFI, GFI, and RMSEA were utilized. Except for the values of RMSEA (which is satisfactory with p < .08), goodness-of-fit values > .90 are considered an acceptable fit (Bentler & Bonett, 1980).

In multi-group analyses the initial model was tested for different groups: (1) by the sex of the adolescents (boy-boy, boy-girl, girl-boy and girl-girl dyads); and (2) by the quality of the relationships between parents and adolescents, which was di-
chotomized by means of a median split. To test whether certain estimates differed between the groups, for example between the sexes, all cross paths were constrained over groups and, if this proved a poorer fit than the unconstrained model, specific paths were tested by fixing the paths one by one and testing whether the model fit ($\Delta \chi^2 (1 \text{ df})$) was significantly better for the model in which the path was allowed to differ between groups compared to the model in which the paths were constrained to be equal. The level used to establish significance in all tests was $p < .05$.

Table 1: Average scores (SD) on restrained eating for all family members at the three measurement waves

<table>
<thead>
<tr>
<th></th>
<th>Wave 1</th>
<th>Wave 2</th>
<th>Wave 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restrained eating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fathers</td>
<td>2.32$^a$ (0.74)</td>
<td>2.42$^b$ (0.76)</td>
<td>2.47$^b$ (0.74)</td>
</tr>
<tr>
<td>Mothers</td>
<td>2.81$^{a,b}$ (0.78)</td>
<td>2.80$^a$ (0.78)</td>
<td>2.85$^b$ (0.77)</td>
</tr>
<tr>
<td>Older Boys</td>
<td>1.68$^a$ (0.66)</td>
<td>1.72$^a$ (0.78)</td>
<td>1.75$^a$ (0.71)</td>
</tr>
<tr>
<td>Girls</td>
<td>2.39$^a$ (0.90)</td>
<td>2.44$^a$ (0.72)</td>
<td>2.49$^a$ (0.84)</td>
</tr>
<tr>
<td>Younger Boys</td>
<td>1.89$^a$ (0.72)</td>
<td>1.79$^b$ (0.69)</td>
<td>1.72$^b$ (0.69)</td>
</tr>
<tr>
<td>Girls</td>
<td>2.28$^a$ (0.83)</td>
<td>2.33$^a$ (0.90)</td>
<td>2.34$^a$ (0.87)</td>
</tr>
</tbody>
</table>

Note: Differences over time within persons were tested with paired t-tests, and significant differences between waves are indicated by dissimilar superscripts ($p < .05$). Differences between fathers and mothers and between boys and girls were significant at $p < .001$.

Results

Restrained eating

Over the three waves, girls scored higher on restrained eating than boys, and mothers had higher scores than fathers (all significant at $p < .001$) (Table 1). Restrained eating increased for fathers between the first and the second wave and for mothers between the second and the third wave but remained stable for older adolescents and younger girls (Table 1). For the younger boys, restrained eating decreased between the first and the second wave but not between the second and third. For each family member moderate to high correlations in restrained eating were found for their three scores over the 2-year period ($r$s between .52 and .82 all significant at $p < .001$).
**Family similarities in restrained eating**

Modest but significant cross-sectional correlations were found at all three waves between spouses ($r_s$ between .12 and .13), between siblings ($r_s$ between .18 and .22 over the three waves) (see also de Leeuw, Snoek, van Leeuwe, van Strien, & Engels (2001)), between mothers and both adolescents ($r_s$ between .11 and .16), between fathers and older adolescents at wave 2 ($r = .14$), and between fathers and younger adolescents at wave 3 ($r = .13$). Compared to sons, stronger correlations with mothers’ restrained eating scores were found for younger daughters at waves 2 and 3 and for older daughters at wave 3 (Table 2).

**Table 2: Cross-sectional correlations at each wave between restrained eating scores of the parents and adolescents by sex of adolescents**

<table>
<thead>
<tr>
<th>Older adolescent</th>
<th>Younger adolescent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
</tr>
<tr>
<td>Father wave 1</td>
<td>.05</td>
</tr>
<tr>
<td>Father wave 2</td>
<td>.11</td>
</tr>
<tr>
<td>Father wave 3</td>
<td>.10</td>
</tr>
<tr>
<td>Mother wave 1</td>
<td>.19**</td>
</tr>
<tr>
<td>Mother wave 2</td>
<td>.16*</td>
</tr>
<tr>
<td>Mother wave 3</td>
<td>.06</td>
</tr>
</tbody>
</table>

* $p < .05$, ** $p < .01$, *** $p < .001$

**Reciprocal influences in restrained eating over time**

Results from structural equation modelling on the associations between restrained eating of family members over the three waves are presented in Figure 1. All stability paths, cross-lagged paths, and covariances were tested at once, but for reasons of clarity only significant paths are reported. Estimates of all cross-lagged paths are presented in Table 3. The model fitted the data well ($\chi^2 (12) = 12.78, p = .39$; $\text{CFI} = 1.00$; $\text{GFI} = .99$; $\text{RMSEA} = .01$). Strong stability paths for restrained eating between waves 1 and 2 and between waves 2 and 3 were found for all family members. An additional path between wave 1 and wave 3 was less strong but significant for parents and older adolescents, and not significant for the younger adolescents. All 24 possible cross-lagged paths were tested between family members over time, and only one path appeared significant: Restrained eating of younger adolescents at wave 2 predicted restrained eating of older adolescents one year later.
Table 3: Standardized estimates of longitudinal associations in restrained eating between family members for the original and BMI-adjusted model

<table>
<thead>
<tr>
<th>Cross-lagged paths</th>
<th>Total model estimates</th>
<th>Total model p-value</th>
<th>BMI-adjusted model estimates</th>
<th>BMI-adjusted model p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Older w1 → younger w2</td>
<td>.07</td>
<td>.07</td>
<td>.07</td>
<td>.07</td>
</tr>
<tr>
<td>Younger w1 → older w2</td>
<td>.03</td>
<td>.37</td>
<td>.03</td>
<td>.38</td>
</tr>
<tr>
<td>Mother w1 → older w2</td>
<td>-.01</td>
<td>.73</td>
<td>-.01</td>
<td>.70</td>
</tr>
<tr>
<td>Mother w1 → younger w2</td>
<td>.05</td>
<td>.23</td>
<td>.05</td>
<td>.22</td>
</tr>
<tr>
<td>Father w1 → older w2</td>
<td>.03</td>
<td>.38</td>
<td>.03</td>
<td>.35</td>
</tr>
<tr>
<td>Father w1 → younger w2</td>
<td>-.01</td>
<td>.72</td>
<td>-.01</td>
<td>.70</td>
</tr>
<tr>
<td>Older w1 → mother w2</td>
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<td>.10</td>
<td>.05</td>
<td>.10</td>
</tr>
<tr>
<td>Younger w1 → mother w2</td>
<td>.00</td>
<td>.91</td>
<td>.00</td>
<td>.91</td>
</tr>
<tr>
<td>Older w1 → father w2</td>
<td>.04</td>
<td>.20</td>
<td>.04</td>
<td>.24</td>
</tr>
<tr>
<td>Younger w1 → father w2</td>
<td>.03</td>
<td>.40</td>
<td>.03</td>
<td>.32</td>
</tr>
<tr>
<td>Mother w1 → father w2</td>
<td>.01</td>
<td>.68</td>
<td>.01</td>
<td>.73</td>
</tr>
<tr>
<td>Father w1 → mother w2</td>
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<td>.56</td>
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<td>.00</td>
<td>.99</td>
</tr>
<tr>
<td>Younger w2 → older w3</td>
<td>.08</td>
<td>&lt; 0.01</td>
<td>.08</td>
<td>.01</td>
</tr>
<tr>
<td>Mother w2 → older w3a</td>
<td>-.08</td>
<td>&lt; 0.01</td>
<td>-.08</td>
<td>.01</td>
</tr>
<tr>
<td>Mother w2 → younger w3</td>
<td>.04</td>
<td>.24</td>
<td>.04</td>
<td>.23</td>
</tr>
<tr>
<td>Father w2 → older w3</td>
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<td>.05</td>
<td>.13</td>
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<td>Father w2 → younger w3</td>
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<td>.72</td>
<td>.01</td>
<td>.80</td>
</tr>
<tr>
<td>Older w2 → mother w3</td>
<td>.05</td>
<td>.09</td>
<td>.05</td>
<td>.09</td>
</tr>
<tr>
<td>Younger w2 → mother w3</td>
<td>-.02</td>
<td>.48</td>
<td>-.02</td>
<td>.45</td>
</tr>
<tr>
<td>Older w2 → father w3</td>
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<td>Mother w2 → father w3</td>
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<td>.04</td>
<td>.06</td>
<td>.04</td>
</tr>
<tr>
<td>Father w2 → mother w3</td>
<td>-.03</td>
<td>.30</td>
<td>-.03</td>
<td>.32</td>
</tr>
</tbody>
</table>

1 The model was also run for the two subscales of the DEBQ-R that question intention and behaviour (Larsen, van Strien, Eisinga, Herman, & Engels, 2007): both models fit the data well. As in the original model, a significant path was found between younger adolescents’ restrained eating at wave 2 and older adolescents’ restrained eating at wave 3 for both the intention and the behaviour model. For the behaviour model additional paths were found: older adolescents’ restrained eating at baseline predicted both mothers’ (.08, p < .05) and younger adolescents’ (.08, p = .05) restrained eating one year later.

a This path was not interpreted as the negative association is not in accordance with the positive correlation between mothers’ restrained eating at wave 2 and older adolescents’ restrained eating at wave 3 (data not shown), and were therefore probably an artefact of the analyses.
**BMI adjusted model**

An alternative model was tested in which BMI at wave 1 was added for the four family members. Thus the restrained scores at wave 1 were corrected for baseline BMI (z-)scores. The (longitudinal) model fitted the data reasonably ($\chi^2 (56) = 132.85, p < .01; \text{CFI} = 0.98; \text{GFI} = 0.96; \text{RMSEA} = 0.06$) and significant associations between BMI and restrained eating were found ($\beta = 0.25$ for father, $\beta = 0.24$ for mother, $\beta = 0.28$ for older, and $\beta = 0.26$ for younger adolescents, $p$-values < 0.001) but the adjusted model revealed no differences in stability and cross-lagged paths compared to the original model.

**Sex and parent–child relationship**

In multi-group analyses, the associations between restrained eating of sons and their fathers and mothers did not differ from the associations between girls and their parents. Also, no differences in the associations were found for brothers, sisters, and mixed-sex sibling pairs. In the analyses on quality of relationship, similar patterns were found for adolescents with a high or a low level of quality of relationship with their fathers or mothers.

**Onset of restrained eating**

Additionally, we tested the associations in restrained eating in two sub-samples of families with either older or younger adolescents who scored low on restrained eating at baseline and for whom restrained eating might increase during adolescence, as opposed to those who already had high restrained eating scores at baseline. The model also showed a good fit ($\chi^2 (12) = 8.32, p = .76; \text{CFI} = 1.00; \text{GFI} = 0.99; \text{RMSEA} = 0.00$ for older and ($\chi^2 (12) = 13.05, p = .37; \text{CFI} = 0.99; \text{GFI} = 0.98; \text{RMSEA} = 0.03$) for younger adolescents. None of the cross-lagged paths (between family members over time) were significant for younger adolescents. For older adolescents with low baseline restrained eating, restrained eating at wave 2 was predicted by the younger adolescents’ restrained eating one year earlier (.20, $p < .05$). A few other paths appeared significant for the families in which the older adolescents had low baseline restrained eating scores, but none of these predicted the older adolescents’ restrained eating: Mothers’ restrained eating at wave 2 was predicted by the younger adolescents’ restrained eating at wave 1 (.10, $p < .05$) and it predicted younger adolescents’ restrained eating at wave 3 (.19, $p < .01$). Also, a path was found between the older adolescents’ restrained eating at wave 2 and fathers’ restrained eating at wave 3 (.11, $p < .05$), other cross-paths between the older adolescents and their parents were not significant, as in the original model.

**Discussion**

Significant cross-sectional associations were found between parents’ and adolescents’ restrained eating, but over time parents’ behaviour did not systematically predict adolescents’ restrained eating, or vice versa. Thus, although adolescent
children resemble their parents in restrained eating, during adolescence there seems to be no direct transmission of this behaviour. This result is surprising given the important role that has been ascribed to parents for the development of eating behaviour in general. It is, however, not in contrast with previous cross-sectional studies that showed mixed results on family similarities in dieting behaviours, and with two longitudinal studies that reported no transmissions between mothers and children (Byely et al., 2000; Field et al., 2001).

There are a number of possible explanations as to why adolescents did resemble their parents, but no transmission of restrained eating was found in the present study. An apparent explanation could be that familial influences occur at an earlier age. Especially girls have been found to start dieting at young ages (Hill & Robinson, 1991) and for girls as young as five, knowledge of dieting habits was influenced by mother’s behaviour (Abramovitz & Birch, 2000). Another explanation could be that familial similarities are due to factors other than transmission, e.g. to genetics. Twin studies found heritability for restraint ranging from 59% for young adult males (Tholin et al., 2005) to 0% in adult females (Neale, Mazzeo, & Bulik, 2003). For eating disorders, there is evidence that the roles of genetic factors and shared environment vary according to age with stronger genetic influences on pubertal girls’ disordered eating compared to younger girls (Klump, McGué, & Iacono, 2003). Further, parents may influence their children’s eating behaviours in ways other than modelling and irrespective of their own weight and dieting. For example, by helping the child to diet (Striegel Moore & Kearney Cooke, 1994) or by enforcing pressure to diet or to be thin (Stice et al., 1998) parents can promote their children’s dietary restraint even though they might not be taking their own advice. Finally, strong stability paths were found for restrained eating, and as these were relative stabilities it did not mean that the actual score did not change, only that restrained eating was highly predicted by earlier restrained eating scores. The lack of a significant increase in restrained eating in this period and the fact that restrained eating was to a large extent predicted by earlier behaviour might partly explain the lack of parental influences.

The present study contributes to previous studies by using a full-family design and by including not only mothers and daughters but also fathers and sons. Compared to boys, girls showed higher similarity in levels of restrained eating with mothers which is in line with previous research. However, the gender of neither the parents nor the adolescents influenced the longitudinal results. Thus, sons and daughters were not more strongly affected by their mothers’ restrained eating than by their fathers’ or vice versa. At relationship level, having a good quality of relationship with their parents did not increase transmission of restrained eating. In general, people are more likely to imitate a person they like and whom they most resemble (Bandura, 1986), but this was not confirmed by our longitudinal data.

As in the original model, no transmission of restrained eating was found in the BMI-adjusted model. Previous studies found that associations between mothers and children’s dieting disappeared after controlling for BMI (Fulkerson et al., 2002; Ogden & Steward, 2000; Wertheim et al., 1999). Our hypothesis that transmission between parents’ and adolescents’ restrained eating is attributable to similarities in
weight status could neither be confirmed nor be rejected due to the lack of significant transmission paths in the original model.

Studies that used several measures of dieting behaviour found different results on family similarities for the different measures. For example, Benedikt et al. (1998) found no similarities in moderate weight loss behaviours (importance of and struggle with weight and appearance, dietary restraint, exercising, and counting calories), but positive correlations in extreme weight loss behaviours (skipping meals, fasting, and crash diets) between mothers and daughters. Apparently, some dieting behaviours are more likely to be copied than others, perhaps because they are more visible and therefore more likely to be noticed by the child. A limitation of our study is that we cannot be sure whether family members noticed each other’s restrained eating, since we have not asked the adolescents to reports on parents restrained eating or parents’ perception of adolescents’ restrained eating. In the case of empirical studies that included both parents and children’s reports on parental behaviour, the child’s perceptions tended to be more strongly associated with children’s behaviour than parents’ self-reported behaviour (Baker et al., 2000; Keery et al., 2006). But then the question remains whether one actually measures transmission of dieting behaviours since children’s reports are possibly biased by their own behaviour (Baker et al., 2000).

Another limitation is that our study consisted solely of intact families with both biological parents, who were relatively highly educated; this was not a nation-wide representative sample. Therefore, the generalizability of the results is limited, especially when it comes to other family compositions such as single-parent families, and the relatively underrepresented ethnic minorities. Finally, this study was a three year longitudinal study and included younger and older adolescents from each of the participating families, covering an age span between 13 and 19, however the annual measures might not be sensitive for fluctuations in restrained eating within years.

An important strength of the present study is that structural equation modelling was used, making it possible to test several cross-sectional associations and prospective cross-lagged associations simultaneously. This implies that associations between family members are adjusted for associations between other family members and for stability in behaviours. Therefore, these are truly rigorous analytic methods.

**Implications and conclusions**

Restrained eating is a risk factor for body dissatisfaction and eating pathology (Stice, 2001); moreover, it is generally not effective in reducing weight in adolescents (Snoek et al., 2008). Therefore, it is rather important to know which (social) factors contribute to the development of this behaviour in adolescence. It is an important finding for both theory and practice, that we found such moderate cross-sectional associations and no systematic longitudinal associations. During adolescence, children’s weight, weight-related attitudes, and behaviours change and we expected adolescents to be vulnerable to parental levels of dietary restraint during this period. However, this was not confirmed by our data. The conclusion that parents do not matter would be too far-reaching as parenting practices were not included in the present study. Further, since this study consists of a community sample, no conclu-
sions can be drawn about family influences in high-risk populations, or about the importance of parents' behaviours for the development of more disordered eating behaviours. However, the reviewed literature and our results over a 3-year period clearly showed that assuming a direct transmission effect of parents on adolescents' restrained eating in the general population seems too simple.
CHAPTER 6
Abstract

The present study investigated similarities and reciprocal influences in emotional, external and restrained eating in adolescent siblings, and the moderating role of sex and quality of relationship. A total of 415 sibling pairs (aged 13-16 years) participated in this two-wave one-year longitudinal study. Analyses were conducted by means of Structural Equation Modeling. Cross-sectional findings demonstrated that siblings are moderately similar in their eating behavior. Longitudinal findings showed that the younger siblings exert a small influence on the emotional and external eating behavior of the older siblings. No support was found for older siblings affecting the younger siblings in their eating behavior. Furthermore, no sex differences were found in the associations between sibling eating behaviors within and over time. However, we did find a moderating effect for the quality of the relationship concerning similarities in emotional eating. Future research focusing on various sociocultural influences on adolescents’ eating behaviors should also include younger siblings.
Introduction

The prevalence of overweight and obesity among children and adolescents worldwide is still increasing (World-Health-Organisation). Insight into the etiology of eating behaviours is needed to prevent adolescents from developing unhealthy eating habits. Previous research focuses primarily on media, parents and peers as sociocultural factors which appear to be associated with adolescents’ eating behaviour (e.g., (Levine et al., 1994; Pike & Rodin, 1991; Shroff & Thompson, 2006)). However, siblings seem to be relatively neglected, which is remarkable given the importance of the role of siblings on several behavioural outcomes (Brody, 1998; Bullock & Dishion, 2002; Feinberg & Hetherington, 2000; Garcia, Shaw, Winslow, & Yaggi, 2000).

Previous findings among adolescent boys indicate that siblings are perceived to have at least some influence over boys’ body change methods, which includes exercise practices as well as eating habits (Ricciardelli, McCabe, & Banfield, 2000). In girls, siblings played a small role within restrained cognitions about eating (Vincent & McCabe, 2000). In addition, siblings’ weight concerns seem to be related to those of older and younger girls and boys (McHale, Corneal, Crouter, & Birch, 2001). Unfortunately, research on sibling influences on actual eating behaviours is – to our knowledge – not existing. Because of the total lack of studies on siblings we think it is important to address some of the research on peer relationships, as mechanisms in these types of relationships might be comparable with mechanisms operating in sibling relationships. Many adolescent girls discuss body weight and dieting with their friends (Desmond et al., 1986; Wertheim et al., 1997), and exposure to peer dieting techniques significantly accounted for variance in dieting in adolescent girls (Levine et al., 1994). In addition, dieting or weight-watching together with friends seem to provide social support for adolescent girls in losing weight, just for social comparison (Wertheim et al., 1997). These findings suggest that peer concerns with weight and shape might serve as cues for adolescent girls’ eating behaviour. It seems plausible that sibling girls also affect each other through comparable mechanisms. However, the question arises whether adolescent boys seem to affect each others eating behaviour through such processes as social comparison.

In general, girls seem to be more preoccupied with their weight (Phares, Steinberg, & Thompson, 2004) as they prefer to be thinner and were more dissatisfied with their body than boys (Furnham, Badmin, & Sneade, 2002). Ricciardelli et al. (2000) found that the majority of adolescent boys in their study were satisfied with their body, notwithstanding their attempts to increase the size of their muscles, to change their body shape or to change their body size. Due to the higher prevalence of eating-related problems among girls and women, many empirical studies have focused exclusively on female samples. In the present study, we examine similarities and reciprocal influences in eating behaviours for female and male siblings separately, as these associations may differ by sex.

Another factor which might affect influence processes between siblings is the quality of the sibling relationship. According to Brody (1998), siblings with a positive relationship will experience more opportunities to observe and to learn from each other. Through interactions and imitation, siblings might become similar
in their cognitions and their subsequent behaviours. Feinberg and Hetherington (2000) reported higher homogeneity in behavioural outcomes in siblings with a high qualitative relationship than in siblings with a low qualitative relationship, implying that siblings who are warm towards each other and show empathy and companionship, tend to be more alike. Based on these research findings an effect of the sibling relationship on eating behaviour outcomes might be expected. Siblings with a high qualitative relationship might be more likely to affect each other in their eating behaviour than siblings with a low to moderate qualitative relationship.

In the present study we focused on three frequently examined eating behaviours, namely: emotional, external and restrained eating (e.g., Lluch et al., 2000; Wardle et al., 1992). In several studies these eating behaviours were found to be associated with overeating (Herman & Polivy, 1980; Kaplan & Kaplan, 1957; Schachter & Rodin, 1974), which is a risk factor for obesity. *Emotional* eating refers to eating in response to emotional arousal, like anger, fear or anxiety, while the usual response to a state of arousal is loss of appetite (Bruch, 1973; Greeno & Wing, 1994; Kaplan & Kaplan, 1957; Schachter et al., 1968). *External* eating is eating in response to external and food-related stimuli, like the sight and the smell of food, but also its availability (Rodin, 1981). Finally, *restrained* eating refers to eating behaviour that is affected by a self-imposed resistance to physiological pressures. Sociocultural factors, especially trendy ideals of slimness and disapproval of overweight, motivate restrained food intake (Herman & Polivy, 1980).

In the current longitudinal study we investigated whether adolescent siblings influence each other in their eating behaviours by means of Structural Equation Modeling, which allowed us to disentangle reciprocal influences from similarities in eating behaviour. This distinction is essential, as similarities obviously do not directly implicate that siblings influence each other. The present study is the first to investigate similarities and reciprocal influences in adolescent siblings’ emotional, external and restrained eating behaviour.

**Methods**

**Procedure**

Participants of this study were Dutch families with at least two siblings aged between 13 and 16 years old (Harakeh et al., 2005; van der Vorst et al., 2005). Families were derived from the records of 22 municipalities in the Netherlands, and recruited by means of a letter. They were told that the study was about families and health. A total of 885 families were willing to participate. In order to participate in this study parents had to be married or living together, family members had to be biologically related, and the children could not be twins. Other exclusion criteria were physical or mental disability in the children. A total of 765 families fulfilled these criteria. Finally, 428 families were selected to acquire an equal distribution of educational levels of adolescents and of sex. Both parents and two adolescent children of each family participated. Data collection took place between November 2002 and April 2003 for
the first wave (T1) and one year later for the second wave (T2). The families were visited by a trained interviewer. All family members filled out a complete questionnaire individually, no interaction between family members was allowed when filling out the questionnaires. Each family received €30 per wave when all four family members had completed the questionnaires. The moment the study was completed, 5 families were selected at random to receive a €1000 travel cheque. In the present study, data of siblings who participated both at the first and second wave are utilized. A total of 416 families participated at T2, resulting in a response rate of 97%.

**Sample characteristics**

The majority of the participating adolescents were of Dutch origin (> 95%). At the first wave the age of the older siblings ranged from 14 to 17 years, with a mean age of 15.22 (SD = 0.60) years. The age of the younger siblings ranged from 13 to 15 years, with a mean age of 13.36 (SD = 0.50) years. Sex of both siblings was almost equally divided: 47.2% of the older siblings and 52.3% of the younger siblings were girls at the first wave. At the first wave approximately one-third of all siblings followed special or low education, one-third followed an intermediate general education, and the remaining adolescents followed the highest level of secondary school, namely preparatory college and university education.

**Measures**

**Quality of the sibling relationship.** The quality of the sibling relationship was assessed with the Sibling Relationship Questionnaire (SRQ; Furman & Buhrmester, 1985). Both the older and the younger sibling of each family were asked to fill in a questionnaire individually. All 33 questions of the SRQ had to be scored on a 5-point scale from 1 (hardly at all) to 5 (very much). Questions on the SRQ are, for example: “How much fun do you and your brother/sister have?” and “How much do you and your brother/sister share things with each other?” A higher score on the SRQ implies a high qualitative relationship. Cronbach’s alpha coefficients were .88 for the older sibling, and .87 for the younger sibling. The mean score was 3.15 (SD = 0.38) for the older sibling and 3.19 (SD = 0.39) for the younger sibling. The Pearson correlation between the score of the older and younger siblings was .56 (p < .01).

**Eating behaviour.** Eating behaviour was measured with the Dutch Eating Behaviour Questionnaire (DEBQ; van Strien, Frijters, Bergers & Defares, 1986). The DEBQ has 33 items, forming three separate scales: emotional eating, external eating and restrained eating behaviour. The scale for emotional eating consists of 13 items and contains questions like: “Do you have a desire to eat when you are irritated?” The scale for external eating consists of 10 items, an example of a question is: “If foods smells and looks good, do you eat more than usual?” The scale for restrained eating consists of 10 items, an example of these items is: “Do you try to eat less at meal-times than you would like to eat?” All these questions have to be scored on a 5-point scale from 1 (never) to 5 (very often). The DEBQ scales have satisfactory internal consistency, validity for food consumption, convergent and discriminative validity (van Strien, 2002). The DEBQ scales are suitable to be filled in by adolescents and have been used in other studies (e.g., (Lluch et al., 2000; Wardle et al., 1992)).
alpha coefficients in the present study for the older and younger sibling were: .85 and .85 for external eating, .94 and .92 for restrained eating, and .93 and .92 for emotional eating, respectively. Table 1 presents means and standard deviations for the eating behaviours at both waves.

**Strategy of analyses**

First, descriptive analyses were conducted on the eating behaviours to examine differences between boys and girls, and to test differences between the older and younger siblings (Table 1). Furthermore, a two-wave model was tested with Structural Equation Modeling using **AMOS 5.0** (Arbuckle, 2003; Arbuckle & Worthke, 1999). The model in Figure 1 represents the hypotheses concerning eating behaviour in general, but this model was tested for each of the eating behaviours separately. In the model the eating behaviour variables are considered as latent constructs. However, using all the individual items as indicators for each latent variable, the number of parameters to be estimated is too large with regard to the sample size. Therefore parcels are used as indicators for the latent variables (Bandalos & Finney, 2001), which means that each latent variable in the model was assessed by two parcels where each parcel represented half of the scale items. The fit of the models was assessed by the following global fit indexes: $\chi^2$, GFI (Goodness of Fit Index), NFI (Bentler-Bonett Index), AGFI (Adjusted Goodness of Fit Index) and RMSEA (Root Mean Square Error of Approximation). Because the chi-square goodness-of-fit test is sensitive to sample size, the fit indices GFI, NFI, AGFI and RMSEA were utilized additionally. These fit indexes are more robust and provide additional information about the fit of the model. Except for the values of the RMSEA (which is satisfactory with $p < .08$), goodness-of-fit values greater than .90 are considered an acceptable fit (Arbuckle & Worthke, 1999; Bentler & Bonett, 1980; Hu & Bentler, 1999).

To test whether certain associations in the model differed between boys and girls, multi-group analyses were performed. In multi-group analyses, differences between groups can be examined by fixing the betas and testing whether the model fit was significantly better for the model in which the paths were allowed to differ between the groups compared to the model in which the paths were constrained to be equal. Thus, to measure the moderating effect of sex, siblings were divided in the following groups: one group with exclusively girls (girl-girl dyads) and one with exclusively boys (boy-boy dyads). Subsequently, we executed multi-group analyses to investigate whether differences exist between girl-girl dyads and boy-boy dyads in cross-sectional correlations at the first wave, differences in stability paths and differences in cross-lagged paths across both groups. In the first step of this analysis a baseline $\chi^2$ of the model was computed per eating behaviour variable with no equality constraints between the two sex groups (unconstrained model). In the next step, all betas were constrained to be equal. Than the $\chi^2$ of this constrained model was calculated. If $\chi^2$ increases significantly from step 1 to step 2 these betas would be significantly different across the sibling groups.

To measure the moderating effect of the quality of the sibling relationship, siblings were also divided in a high quality group and a low to moderate quality group. Therefore, the median split method was used (see also van der Vorst et al., 2006).
Subsequently, we applied also multi-group analyses to investigate whether the associations in the model differed between the group of siblings with a high qualitative relationship versus the group of siblings with a low to moderate qualitative relationship.

### Results

#### Descriptive analyses

T-tests were conducted to examine sex differences, and differences between the older and younger siblings in eating behaviours. We found higher scores on emotional eating for girls than for boys at both waves. For external eating, a significant difference was found only between the older sibling boy and the younger sibling girl at the first wave. At the second wave, the scores on external eating did not differ significantly between the sex and birth order groups. For restrained eating sex differ-

<table>
<thead>
<tr>
<th></th>
<th>Emotional eating¹</th>
<th>External eating¹</th>
<th>Restrained eating¹</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td><strong>Wave 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Older sibling boy</td>
<td>226</td>
<td>2.07</td>
<td>.71</td>
</tr>
<tr>
<td>Younger sibling boy</td>
<td>204</td>
<td>2.08</td>
<td>.68</td>
</tr>
<tr>
<td>Older sibling girl</td>
<td>202</td>
<td>2.41</td>
<td>.74</td>
</tr>
<tr>
<td>Younger sibling girl</td>
<td>224</td>
<td>2.37</td>
<td>.76</td>
</tr>
<tr>
<td><strong>Wave 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Older sibling boy</td>
<td>221</td>
<td>2.12</td>
<td>.74</td>
</tr>
<tr>
<td>Younger sibling boy</td>
<td>197</td>
<td>2.05</td>
<td>.73</td>
</tr>
<tr>
<td>Older sibling girl</td>
<td>195</td>
<td>2.50</td>
<td>.74</td>
</tr>
<tr>
<td>Younger sibling girl</td>
<td>219</td>
<td>2.52</td>
<td>.80</td>
</tr>
</tbody>
</table>

¹ Average scores on 5 point-scale from 1 = never, to 5 = very much (DEBQ, van Strien et al., 1986).

Note: Differences between sibling groups per wave were tested with ANOVA by post hoc tests (LSD). Means in the same column with different subscripts differ significantly at *p* < .05.
ences were found, with girls scoring higher on the restrained scale than boys at both waves. The older and the younger sibling boys differed on restrained eating at the first wave, but not at the second wave (Table 1).

To investigate associations between the eating behaviour of the older and the younger sibling, correlations were calculated for all three eating behaviours at both waves. Small to moderate correlations were found between the older sibling and the younger sibling. At T1 the correlation between the siblings for emotional eating was \( r (N = 415) = .19 \) \((p < .01)\). At T2 this correlation was \( r = .20 \) \((p < .01)\). For external eating these correlations were also positive \((T1: r = .25, p < .01; T2 r = .18, p < .01)\). For restrained eating, correlations were \( r = .20, p < .01 \) \((T1)\) and \( r = .20, p < .01 \) \((T2)\) (Table 2).

### Model findings total group

To investigate whether the older and the younger siblings are similar in their eating behaviour and whether they influence each other over time, we tested a
two-wave model (as depicted in Figure 1) with structural equation modeling. The fit indices for the emotional eating model were $\chi^2 (df = 12, n = 415) = 23.118$, $GFI = .986$, $NFI = .992$, AGFI = .959 and RMSEA = .047. For external eating the fit indices were $\chi^2 (df = 13, n = 415) = 32.860$, $GFI = .982$, $NFI = .980$, AGFI = .949 and RMSEA = .061 and for restrained eating $\chi^2 (df = 13, n = 415) = 11.004$, $GFI = .993$, $NFI = .996$, AGFI = .982 and RMSEA = .000. These results indicated that the a priori measurement models permit adequate tests of the hypothesized multi-group models.

**Figure 1:** Theoretical model on similarities and reciprocal influences concerning sibling eating behaviours

The cross-sectional correlations between the older and the younger sibling for the total sample showed a positive correlation between emotional eating of the older and the younger sibling at the first wave ($r = .20, p < .001$) and at the second wave ($r = .22, p < .001$). These correlations were also found significant for external eating ($r = .27, p < .001$ at the first wave and $r = .17, p < .001$ at the second wave) and restrained eating ($r = .22, p < .001$ at the first wave and $r = .19, p < .001$ at the second wave).

Over a one-year period all three eating behaviours appeared to be relatively stable, for the older siblings as well as for the younger siblings. Standardized estimates for the cross-lagged paths showed an association of emotional eating of the younger sibling at the first wave and emotional eating of the older sibling at the second wave ($\beta = .13, p < .01$). This path is also found in external eating ($\beta = .12, p < .01$) but not in restrained eating (Tables 3-5).

**Multi-group comparisons: Boys versus girls**

To investigate whether similarities and reciprocal influences between siblings differ by sex, the models for male sibling pairs ($n = 106$) were compared with the models for female sibling pairs ($n = 102$). The $\chi^2 (df = 24)$ of the unconstrained emotional eating model for the two sex groups was 27.230. A chi-square test demonstrated that the constrained model did not significantly differ from the unconstrained model [$\chi^2$-change ($df = 5$) = 3.279, $p = .657$], implying that the model parameters did not differ between boys and girls. The $\chi^2 (df = 25, n = 208)$ of the unconstrained exter-
Multi-group differences: Quality of sibling relationship

To investigate whether similarities and reciprocal influences between siblings were moderated by the quality of the sibling relationship, the sample was divided into two groups. The models of siblings with a high qualitative sibling relationship \( (n = 192) \) were compared with those with a low to moderate qualitative relationship \( (n = 206) \). These tests showed the following findings. The \( \chi^2 \) \( (df = 24, n = 398) \) of the unconstrained emotional eating model for siblings relation groups was 29.831. Multi-group analyses also showed no significant differences between girls and boys in the restrained eating model \( [\chi^2\text{-change} \ (df = 5) = 5.440, p = .365] \) (Tables 3-5).

### Table 3: Standardized estimates for sex groups and for sibling relation groups in the model for emotional eating

<table>
<thead>
<tr>
<th>Path</th>
<th>Cross-sectional correlations between latent variables</th>
<th>Stability paths (betas)</th>
<th>Cross-lagged paths (betas)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Older T1 - younger T1</td>
<td>.20 *** .27 * .10 .40 *** .05 (^1)</td>
<td>.65 *** .53 *** .61 *** .61 *** .69 ***</td>
<td></td>
</tr>
<tr>
<td>Older T2 - younger T2</td>
<td>.22 *** .34 *** .18 * .34 *** .09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Older T1 - older T2</td>
<td>.66 *** .68 *** .51 *** .64 *** .66 ***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Younger T1 - younger T2</td>
<td>.06 .04 .11 .13 .02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Younger T1 - older T2</td>
<td>.13 ** .19 * .10 .12 * .10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^0\) \( p < .05, ^*\) \( p < .01, ^***\) \( p < .001\)

\(^1\) A chi-square test demonstrated a significant difference between the high SRQ group and the low SRQ group \( [\chi^2\text{-change} \ (df = 1) = 12.504, p < .01] \).

Note: High SRQ refers to the groups of siblings who consider the quality of the sibling relationship as high, and Low SRQ to the groups of siblings who consider this quality as low to moderate.

The internal eating model was 36.356. Multi-group analyses demonstrated no significant differences between girls and boys in external eating \( [\chi^2\text{-change} \ (df = 5) = 3.129 \ p = .680] \). The \( \chi^2 \) \( (df = 25, n = 208) \) of the unconstrained restrained eating model was 22.761. Multi-group analyses also showed no significant differences between girls and boys in the restrained eating model \( [\chi^2\text{-change} \ (df = 5) = 5.440, p = .365] \) (Tables 3-5).
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pathways significantly differ from each other we utilized chi-square tests in which specific betas were constrained to be equal. These chi-square tests per pathway represented a significant higher cross-sectional correlation between emotional eating of the older sibling and emotional eating of the younger sibling in the group of siblings with a high qualitative relationship $\chi^2$ change ($df = 1$) = 12.504, $p < .001$. Further, no significant differences between both sibling groups were found in the emotional eating model (see parameters in Table 3). The $\chi^2$ ($df = 25$, $n = 398$) of the unconstrained external eating model was 35.812. Multi-group analyses showed no significant differences between both sibling groups in the external eating model $\chi^2$ change ($df = 5$) = 4.327, $p = .503$ (Table 4). The $\chi^2$ ($df = 25$, $n = 398$) of the unconstrained restrained eating model was 24.490. Multi-group analyses showed no significant differences between both sibling groups in the restrained eating model $\chi^2$ change ($df = 5$) = 7.338, $p = .197$ (Table 5).

**Multi-group comparisons: Same-sex versus different-sex**

Multi-groups analyses in which the model findings of the boys were compared with the model findings of the girls revealed no differences between the same-sex

### Table 4: Standardized estimates for both sex groups and for both sibling relation groups in the model for external eating

<table>
<thead>
<tr>
<th>External eating</th>
<th>Total</th>
<th>Girl dyads</th>
<th>Boy dyads</th>
<th>High SRQ</th>
<th>Low SRQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>N = 415</td>
<td>N = 102</td>
<td>N = 106</td>
<td>N = 192</td>
<td>N = 206</td>
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<tr>
<td>Path</td>
<td>Cross-sectional correlations between latent variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Older T1 - younger T1</td>
<td>.27 ***</td>
<td>.40 **</td>
<td>.23</td>
<td>.38 ***</td>
<td>.23 **</td>
</tr>
<tr>
<td>Older T2 - younger T2</td>
<td>.17 ***</td>
<td>.29 **</td>
<td>.07</td>
<td>.25 ***</td>
<td>.16 **</td>
</tr>
<tr>
<td>Stability paths (betas)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Older T1 - older T2</td>
<td>.72 ***</td>
<td>.70 ***</td>
<td>.71 ***</td>
<td>.69 ***</td>
<td>.76 ***</td>
</tr>
<tr>
<td>Younger T1 - younger T2</td>
<td>.61 ***</td>
<td>.73 ***</td>
<td>.62 ***</td>
<td>.60 ***</td>
<td>.70 ***</td>
</tr>
<tr>
<td>Cross- lagged paths (betas)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Older T1 - younger T2</td>
<td>-.01</td>
<td>-.03</td>
<td>-.09</td>
<td>.03</td>
<td>.01</td>
</tr>
<tr>
<td>Younger T1 - older T2</td>
<td>.12 **</td>
<td>.18</td>
<td>.10</td>
<td>.13</td>
<td>.10</td>
</tr>
</tbody>
</table>

$^a p < .05, ^{**} p < .01, ^{***} p < .001$

Note: High SRQ refers to the groups of siblings who consider the quality of the sibling relationship as high, and Low SRQ to the groups of siblings who consider this quality as low to moderate.
To examine whether similarities and reciprocal influences between sibling might differ for same-sex versus opposite-sex, we compared the following four groups with each other: a group with boy-boy dyads ($n = 106$), a group with girl-girl dyads ($n = 102$), a group with girl-boy dyads ($n = 92$), and a group of boy-girl dyads ($n = 115$). The $\chi^2 (df = 48, n = 415)$ of the unconstrained emotional eating model for the four sex groups was 71.381. A chi-square test demonstrated that the constrained model did not significantly differ from the unconstrained model [$\chi^2$-change ($df = 15$) = 8.542, $p = .900$], implying that the model parameters did not differ between the several sex-dyads. The $\chi^2 (df = 49)$ of the unconstrained external eating model was 58.287. Multi-group analyses demonstrated no significant differences between the four sex groups in external eating [$\chi^2$-change ($df = 15$) = 9.925, $p = .824$]. The $\chi^2 (df = 49)$ of the unconstrained restrained eating model was 51.396. Multi-group analyses also showed no significant differences between the four sex groups in the restrained eating model [$\chi^2$-change ($df = 15$) = 16.822, $p = .330$].

### Table 5: Standardized estimates for both sex groups and for both sibling relation groups in the model for restrained eating

<table>
<thead>
<tr>
<th>Restrained eating</th>
<th>Total</th>
<th>Girl</th>
<th>Boy</th>
<th>High</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>sample</td>
<td>dyads</td>
<td>dyads</td>
<td>SRQ</td>
<td>SRQ</td>
</tr>
<tr>
<td></td>
<td>N = 415</td>
<td>N = 102</td>
<td>N = 106</td>
<td>N = 192</td>
<td>N = 206</td>
</tr>
<tr>
<td>Path</td>
<td>Cross-sectional correlations between latent variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Older T1 - younger T1</td>
<td>.22 ***</td>
<td>.20</td>
<td>.28 *</td>
<td>.33 ***</td>
<td>.11</td>
</tr>
<tr>
<td>Older T2 - younger T2</td>
<td>.19 ***</td>
<td>.22 *</td>
<td>.36 ***</td>
<td>.30 ***</td>
<td>.09</td>
</tr>
<tr>
<td></td>
<td>Stability paths (betas)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Older T1 - older T2</td>
<td>.76 ***</td>
<td>.69 ***</td>
<td>.57 ***</td>
<td>.78 ***</td>
<td>.72 ***</td>
</tr>
<tr>
<td>Younger T1 - younger T2</td>
<td>.69 ***</td>
<td>.76 ***</td>
<td>.66 ***</td>
<td>.66 ***</td>
<td>.74 ***</td>
</tr>
<tr>
<td></td>
<td>Cross-lagged paths (betas)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Older T1 - younger T2</td>
<td>.06</td>
<td>.08</td>
<td>.17 *</td>
<td>.06</td>
<td>.04</td>
</tr>
<tr>
<td>Younger T1 - older T2</td>
<td>.03</td>
<td>.03</td>
<td>.21 *</td>
<td>.07</td>
<td>.01</td>
</tr>
</tbody>
</table>

* $p < .05$, ** $p < .01$, *** $p < .001$

Note: High SRQ refers to the groups of siblings who consider the quality of the sibling relationship as high, and low SRQ to the groups of siblings who consider this quality as low to moderate.
Discussion

The aim of the present study was to investigate similarities and reciprocal influences in adolescent siblings’ eating behaviour. Sex differences, and differences between siblings with a high qualitative relationship versus those with a low to moderate qualitative relationship, in models were tested. First of all, female adolescents reported higher levels of emotional eating and restrained eating than male adolescents, which is in line with the findings of Lluch et al. (2000) and Wardle et al. (1992). Besides the difference between the older sibling boy and the younger sibling girl at the first wave, no sex differences between average scores on external eating were found at both waves. These results confirm the findings of Lluch et al. (2000) and Wardle et al. (1992), in which no sex difference were found in children’s external eating.

Similarities in emotional, external and restrained eating were found between siblings. Moreover, an influence of the younger sibling on the older sibling was found for emotional and external eating. These findings indicate that siblings are modestly similar in their eating behaviour and that younger siblings influence older siblings in emotional and external eating. It is, however, surprising that the younger siblings influence the older ones, because older siblings are generally viewed as an influential source of guidance, advice, support and knowledge for younger siblings (e.g. C. J. Tucker, Barber, & Eccles, 1997). A possible explanation, especially for adolescent girls, might be that the older siblings, due to puberty, are not as thin as their younger siblings, which might leads to processes of social comparison whereby the older sibling prefers to look like the younger sibling. After all, in the current Western society, being thin is highly valued among women (Thompson & Stice, 2001). This thin ideal might lead the older sibling to imitate the eating behaviour of the younger sibling. Future research should investigate whether and why older siblings imitate the younger siblings.

Findings concerning similarities in emotional, external and restrained eating between siblings, indicate no differences between sibling boys and sibling girls. To our knowledge, the present study is the first which explicitly examines sex differences in eating behaviour among adolescent siblings. Based on these results one might conclude that, although boys and girls differ in their eating behaviour, the degree of similarity and reciprocal influences do not differ by sex. In short, having a same-sex sibling is of the same importance for adolescent girls as for adolescent boys with respect to eating behaviour. Moreover, additional analyses did not point out significant differences between all possible sex-dyads, which indicates that having a same-sex sibling is of the same importance for adolescents as having a opposite-sex sibling. In sum, that the younger sibling affects the older sibling in emotional and external eating seems not to differ for the different dyads. Future studies should examine exactly how younger siblings influence the older siblings in their eating behaviour.

Finally, the tests concerning the quality of the sibling relationship produces an interesting finding. We expected that siblings with a high qualitative relationship would be more similar in eating behaviour than siblings with a low to moderate qualitative relationship. This hypothesis was confirmed for emotional eating, imply-
ing that siblings who are warm towards each other, show affection and empathy, and who are involved with each other and communicate, tend to be more alike in their eating behaviour. These findings conform with results from Feinberg and Hetherington (2000), who reported significantly higher associations in other behavioural outcomes between siblings with a high qualitative relationship than in siblings with a low qualitative relationship. The findings of the present study suggest a potential moderating effect of the quality of the sibling relationship that contributes considerably to similarities in emotional eating behaviour in siblings. Unexpectedly, this effect was not found for external and restrained eating. An explanation is that external and restrained eating are more directly observable behaviours, which might result in imitation processes, whether the adolescent likes the model (i.e. the sibling) or not. This might explain why similarities in external and restrained eating within siblings exist irrespective of the quality of their relationship.

Longitudinal analyses over a one-year period showed that siblings hardly influence each other over time, and that the quality of the sibling relationship and sex does not affect these associations. A possible explanation is that eating behaviour is relatively stable over a one-year period. Siblings may have already developed a specific eating behaviour pattern before they enter the teenage years. Collins (1990) suggests that the onset of disparate figure perceptions and expectations regarding thinness is already evident among six- and seven-year-old girls. Moreover, these dieting concerns were found to be related to restrained eating behaviour among nine-year-old girls (Hill & Robinson, 1991). Perhaps influence processes have already taken place and resulted in similarities in eating behaviour. Another explanation might be that similarities within siblings are due to factors other than reciprocal influences. Genetic and shared environmental factors may cause some siblings to have similar characteristics, interests and behaviours. Because of these characteristics, interests and behaviours, these siblings presumably spend more time with each other and therefore develop a higher qualitative relationship than siblings who have no or less comparable characteristics, interests and behaviours. In short, a high qualitative relationship might be the consequence of similarities within siblings, rather than the reason. Nevertheless, although adolescent siblings are similar in their eating behaviour, this does not necessarily imply that they influence each other in their eating behaviour. In recent studies, genetic factors are found of great importance in several forms of eating behaviour (e.g., deCastro & Lilienfeld, 2005; Tholin et al., 2005). Families share genes and environment, and it should be noted that our full family design cannot distinguish between the effects of these two factors. Future research should therefore employ a genetic informative design, such as a twin or adoption design, to disentangle modeling from heritability effects.

Although our longitudinal design with reports on eating behaviours of both siblings has some strong features, a few limitations should be discussed. First, the study relied solely on self-reported data, including data from diaries, data from parents and observational research would improve the reliability. Second, to test the hypotheses concerning sex and quality of the sibling relationship relatively small groups were constructed which reduced the statistical power to detect significant differences between groups. Third, the interval between the first and second wave was one year;
this interval may be too small to make assumptions concerning the influence of siblings on eating behaviour over a period of time. Research is needed with a prolonged time interval to test assumptions about the influence of siblings on eating behaviour. Sibling influences on eating behaviour within a younger sample could also be examined, because siblings may have a stronger influence on each other in childhood when eating patterns have not yet stabilized. Fourth, the current sample was relatively homogenous regarding age and ethnicity, and consisted of intact families and biologically-related siblings. Finally, in the present study, differences by sex and the quality of the sibling relationship were investigated. Although these findings shed some light on eating behaviour developments within adolescent siblings, other important shared (e.g., family climate, marital relationship) and non-shared environmental factors (e.g., differential parental treatment, specific life events, differential peer-group characteristics, and factors such as personality) were not included in our analyses. Future prospective investigations of environmental factors and genetic resemblance might provide insight into the several influences on eating behaviour and eating pathology in siblings.

Notwithstanding these limitations, the present study has focused on a relatively neglected factor within research concerning adolescents’ eating behaviour. Findings of this study imply that younger siblings seem to be a small but important socializing agent within the adolescents’ sociocultural environment with respect to eating behaviour. Therefore, in future studies investigating multifactor models relating to adolescents’ eating behaviour, especially younger siblings should not be disregarded.
Parental behaviour and adolescents’ emotional eating

Abstract

Parents can influence their children’s emotional eating behaviour through modelling processes and parenting. In this study, data on parenting (support, behavioural control and psychological control), emotional eating, and demographic variables were gathered among both parents and two adolescent children of 428 Dutch families. Structural equation modelling showed positive associations between parents’ emotional eating and adolescents’ emotional eating. Adolescents’ reports of low maternal support and of high psychological control for younger adolescents and high behavioural control for older adolescents were associated with higher emotional eating. Parents’ reports of parenting were not significantly associated with adolescents’ emotional eating. Multi-group analyses revealed no significant differences in associations between modelling and parenting factors on the one hand, and adolescents’ emotional eating on the other, by sex of the older or younger adolescents.
Introduction

It is widely accepted that emotional arousal and distress affects eating behaviour (Ganley, 1989). In humans, evidence points to an individual difference model of food intake in response to negative effect (Greeno & Wing, 1994); in this model, the physiologically normal reaction to emotional arousal and distress is loss of appetite. In contrast, some individuals respond by excessive eating, or at least not eating less; a phenomenon that has been named emotional eating (Bruch, 1973; Greeno & Wing, 1994; Kaplan & Kaplan, 1957; Oliver & Wardle, 1999; Schachter et al., 1968). Eating more versus less in response to stress is dependent on the context and type of stress, but has been considered an individual characteristic because it was found to be highly consistent over time and varied more between than within individuals (Stone & Brownell, 1994). Why some people develop this kind of eating behaviour and others do not remains unclear. Early observational studies have led to the suggestion that parental behaviour might play an important role in the development of emotional eating in childhood (Bruch, 1973). It was proposed that especially an emotional feeding style (i.e. feeding in response to emotional distress) might enhance emotional eating. In a more recent study, mothers who scored high on emotional eating themselves were found to have a more emotional feeding style, although this feeding style was not associated with either mothers’ or children’s body mass index (BMI) (Wardle et al., 2002). In Brown and Ogden (2004) ‘parental control over children’s diet’ and ‘parental levels of control over their child’s behaviour using food’ were unrelated to children’s scores on a short version of the emotional eating scale. Further, young girls’ perceptions of parental pressure to eat more were positively associated with emotional eating (Carper et al., 2000). Other studies on modelling or parenting effects on emotional eating in children or adolescents are lacking, although different aspects of parental behaviour are reported to be related to children’s food intake, eating behaviour, disordered eating, and weight status. The objective of the present study is to determine how modelling and general parenting (support and control) factors are related to adolescent’s emotional eating.

Parental modelling

High similarities in emotional eating between parents and children could indicate that, besides possible genetic effects, parents and children influence each other’s eating behaviour, for example through modelling. Children might model not only their parents’ food intake and preferences (Birch & Fisher, 1998), but also their attitudes towards food and reasons behind eating behaviours (Brown & Ogden, 2004). Surprisingly, studies on the role of familial modelling of body image dissatisfaction and disordered eating behaviour have been ambiguous, with some reporting no similarities between parents and children (Littleton & Ollendick, 2003) whereas others found that modelling occurs (especially of maternal eating behaviours) even at a very young age (Ricciardelli & McCabe, 2001).
Parenting

Many studies have suggested that parenting influences different aspects of children's behavioural and cognitive development, including disordered eating (Birch & Fisher, 1998; Minuchin et al., 1975; Tata et al., 2001). Parenting can refer to food-specific parenting or feeding practices but also covers general parenting (Hughes et al., 2005). This is the context in which parenting practices occur and is often operationalized by the dimensions control and support (Baumrind, 1971). The control dimension varies from supervision and monitoring to more manipulatively suppressive control while the support dimension refers to the affective and supportive behaviour of the parents (Finkenauer et al., 2005; Lamborn et al., 1991). Those two dimensions have been related to children's behaviours, including health risk behaviours and internalizing problem behaviour (Maccoby & Martin, 1983).

Studies on parental control and food intake tend to focus on young children. A series of experiments by Birch and Fisher in young children (Birch & Fisher, 2000; Fisher & Birch, 1999a, 1999b) showed that food restrictions were associated with unintended outcomes, such as higher preference for and intake of the restricted foods and lower ability to self-regulate intake (Birch, 1998; Fisher & Birch, 1999a; S. L. Johnson & Birch, 1994). Similar results on snacking were found by Brown and Ogden (2004) although others found opposite results (de Boudeaudhuij, 1997), and the association between parental control and overweight in children has not consistently been found (Faith, Keller et al., 2004; Robinson et al., 2001). In a cross-sectional survey, parental supervision and monitoring were associated with higher levels of extreme dieting in boys, but not girls (Fonseca, Ireland, & Resnick, 2002).

These inconsistent findings might be explained by the way parents enforce control, thus the type of control. Parental control can consist of active supervision of and acquiring knowledge about what children are doing; this is called behavioural control. But control can also be harsh, suppressive and manipulating, including behaviours, such as guilt induction, love withdrawal and excessive pressure for change; this is called psychological control. Generally, behavioural control was found to be a protective factor for problem behaviour while psychological control was a risk factor (Finkenauer et al., 2005). Furthermore, psychological control is suppressive and authoritarian and therefore more likely to undermine the child's autonomy and ability to self-regulate intake (Birch & Fisher, 1998).

Parental support has been associated with less problem behaviour and emotional problems in children (Finkenauer et al., 2005). Studies on eating problems and obesity are generally in line with these findings. Lack of parental support and parental caring has been related to disordered eating and body dissatisfaction (Littleton & Ol lendick, 2003; McVey et al., 2002). Another study found that parental overprotection, not care, was related to body dissatisfaction and, for females, disordered eating (Tata et al., 2001). In addition, one study reported a negative association between parental support and obesity (Lissau & Sorensen, 1994).

In the present study we examined the associations between parental emotional eating, behavioural control, psychological control and support, and the level of adolescents' emotional eating in 428 families consisting of both parents and two adolescent children. It was hypothesized that adolescents model their parents and
that high behavioural control, low psychological control and high support were associated with higher emotional eating in adolescents. Both adolescents of each family were included to cover a broader age range. Our design with multiple reporters per family provided reliable information about both parents and adolescent’s scores on eating behaviour and allowed to compare influences of parenting reported by the adolescent and by the parents themselves. Moreover, we tested whether paternal and maternal behaviours were differentially related to adolescent behaviours, and whether the adolescent’s sex moderated these associations. Most research in this area has focussed on maternal feeding practices, despite the fact that fathers seem to be important in child eating disturbances (Blissett, Meyer, & Haycraft, 2006). Given that the role of children’s weight status is relevant to studies of parental influence on children’s eating (Birch, Fisher, & Davison, 2003; Francis & Birch, 2005) an additional model was tested that included adolescents’ weight status.

Methods

Procedure
Participants of this study were 428 Dutch families (Harakeh et al., 2005; van der Vorst et al., 2005). Families with at least two children aged between 13 and 16 years were selected from the registers of 22 municipalities in the Netherlands, and recruited through a letter. Of these approximately 5400 families, a total of 885 families were willing to participate and returned the completed response forms. These families were contacted by telephone to establish whether they met the study criteria. In order to participate in the study parents had to be married or living together, family members had to be biologically related, and the children could not be twins. Other exclusion criteria were mental or physical disability in adolescents. From the 765 families fulfilling the study criteria, 428 families were selected to acquire an equal distribution of the educational levels of adolescents and of all the possible sibling dyads (i.e. boy-boy, girl-boy, boy-girl and girl-girls) in our sample. In each family both parents and two adolescent children participated. Data collection took place at the respondents’ homes between November 2002 and April 2003. A trained interviewer visited the families, explained the procedure, and clarified questions. To maintain confidentiality and avoid mutual influences no interaction between family members was allowed when filling in the questionnaires. Each family received €30 when all four family members had completed the questionnaires.

Sample characteristics
The participating adolescents were between 13 and 16 years old, and boys (50.3%) and girls (49.7%) were represented in almost equal numbers. Most adolescents (96%) were of Dutch ethnicity (defined by native country of the parents), and they were from various secondary educational levels in the Netherlands. On the whole, 34.1% of the adolescents attended lower-level education (preparatory secondary school for technical and vocational training; in the Dutch school system LWOO,
32.7% attended middle-level education (preparatory secondary school for college; in the Dutch school system called HAVO) and 33.3% attended higher-level education (preparatory secondary school for university; in the Dutch school system called VWO, atheneum, gymnasium).

**Measurements**

*Emotional eating* of adolescents and parents was measured with a subscale of 13 items of the Dutch Eating Behaviour Questionnaire (van Strien, Frijters et al., 1986a) (originally published in Dutch (van Strien, Frijters et al., 1986b)). Examples of items are “Do you have a desire to eat when you are irritated?” and “Do you have a desire to eat when you feel alone?” All items had to be rated on a 5-point scale from 1 (never) to 5 (very often). The emotional eating scale has a high internal consistency, high validity for food consumption, high convergent and discriminative validity (van Strien, 2002). The instrument is also easy to fill in by adolescents; it has been used in other studies with children (Wardle et al., 1992). Cronbach’s alphas in this study were high (Table 1).

Parenting was reported by adolescents about both parents separately, and also by the parents about both adolescents separately. The *support* dimension of parenting was measured with a subscale of the Relational Support Inventory (Scholte, van Lieshout, & van Aken, 2001). This 12-item questionnaire (e.g., “My mother supports me in the things I do” / “I support my child in the things he/she does”) is rated on a response scale ranging from 1 (completely untrue) to 5 (completely true). The *control* dimension of parenting was measured by behavioural control (control on whereabouts and activities) and psychological control (coercive, non-democratic discipline and psychological manipulative strategies in order to control the child’s behaviour). *Behavioural control* was assessed with a 5-item scale (e.g., “Before you leave on a Saturday evening, does your father (mother) want to know with whom and/or where you are?”) rated on a response scale from 1 (never) to 5 (always) (Kerr & Stattin, 2000). A Dutch translation (Beyers & Goossens, 1999) of the Steinberg Parenting Instrument (Steinberg, Lamborn, Darling, Mounts, & et al., 1994) was used to assess *psychological control*. The 8-item questionnaire (e.g. “My father (mother) makes me feel guilty when I fail at school”) had to be rated on a response scale ranging from 1 (completely not true) to 5 (completely true). The original scale showed high internal consistency, external validity, and test-retest reliability (Glasgow, Dornbusch, Troyer, Steinberg, & et al., 1997; Gray Little, Williams, & Hancock, 1997; Lamborn et al., 1991). The Cronbach’s alphas in our study were satisfactory for all parenting measurements and reporters (Table 1). Analyses of inter-correlations of the parenting practices showed significant but moderate correlations between the scales (Table 1).

*BMI* was calculated based on self-reported height and weight. To determine whether a child was overweight or obese we used international cut-off scores (Cole et al., 2000).

**Strategy for analyses**

Adolescents’ average scores on emotional eating were calculated for sex, age, and educational level group. Differences between groups were analysed by t-tests.
(sex) or one-way ANOVA (age and education level) with Scheffe post-hoc tests. Next, Pearson correlations between parental behaviours and adolescents’ emotional eating were computed.

Structural equation modelling with Ml estimation in AMOS 5.0 (Arbuckle, 2003; Arbuckle & Worthke, 1999) was used to determine associations between parenting (support and control) and parental emotional eating on the one hand, and adolescent emotional eating on the other simultaneously (Figure 1). Additionally, error terms of emotional eating were allowed to correlate between spouses and between siblings to correct for inter-correlation between family members. Similarly, error terms between parenting measurements were allowed to correlate between and within siblings (not presented in the figure).

As parenting was reported by multiple reporters, separate models were run for the different reporters. An alternative model was tested in which the report of the adolescent on both parents and both parental reports were loaded on one latent construct (per variable, for instance parental support). However, correlations between the parents’ and the adolescents’ reports on parenting as well as the correlations between the mothers’ and fathers’ reports showed low correspondence between the reports (Table 1). The model with these latent constructs was therefore not supported by the data resulting in the necessity to test models for the different reports. This also allows comparing model findings between father and mother and between effects of parenting reported by parents versus effects perceived by adolescents.

To test whether certain effects differed between boys and girls, multi-group analyses were performed. In multi-group analyses, differences between the sexes were tested by fixing the betas and testing whether the model fit (Δχ²) was significantly better for the model in which the paths were allowed to differ between the sexes compared to the model in which the paths were constrained to be equal (van der Vorst et al., 2005). Finally, a model was tested in which BMI of both adolescents was added as a confounder; in this model BMI of each adolescent was linked to their emotional eating score. This way the association between BMI and emotional eating was tested and emotional eating score was controlled for BMI.

The fit of the models were assessed by the following global fit indexes: χ², GFI (Goodness of Fit Index), NFI (Bentler-Bonett Normed Fit Index), AGFI (Adjusted Goodness of Fit Index) and RMSEA (Root Mean Square Error of Approximation). Because the chi-square goodness-of-fit test is sensitive to sample size, the fit indices GFI, NFI, AGFI and RMSEA were utilized. Except for the values of RMSEA (which is satisfactory with p < .08), goodness-of-fit values greater than 0.90 are considered an acceptable fit (Bentler & Bonett, 1980).

Results

Demographic differences

Girls scored higher on emotional eating than boys (Table 2). No significant differences in emotional eating were found between different age groups, between older and younger adolescents, or between educational levels.
Table 1: Mean scores (SD), Cronbach alpha’s, and correlations (x100) between emotional eating and parenting. The correlations between emotional eating of adolescents (A), fathers (F) and mothers (M) and parenting scores reported by adolescent about the parents (A-F/A-M) and by the parents themselves (F/M) are reported for older (upper right-hand half) and younger (lower left half) adolescents separately.

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Table 1: Mean scores (SD), Cronbach alpha’s, and correlations (x100) between emotional eating and parenting. The correlations between emotional eating of adolescents (A), fathers (F) and mothers (M) and parenting scores reported by adolescent about the parents (A-F/A-M) and by the parents themselves (F/M) are reported for older (upper right-hand half) and younger (lower left half) adolescents separately.
modelling and parenting factors on the one hand, and adolescent emotional eating (Table 1). A significant association was found between emotional eating of parents and adolescents. Additionally, correlations computed by sex of the child showed that emotional eating in mothers was positively related to both boys’ (r = .13, p < .01) and girls’ (r = .13, p < .01) emotional eating. Fathers’ emotional eating was solely significantly positively related to boys’ emotional eating (r = .11, p < 0.05) (for girls: $r = .08$, ns).

**Family factors in emotional eating**

Structural equation modelling showed significant positive associations between mothers’ and adolescents’ emotional eating for both older and younger adolescents (Figure 1). Fathers’ emotional eating was significantly associated with emotional eating of their younger, but not their older adolescents.

Significant associations between parenting and emotional eating of adolescents were only found when parenting was reported by the adolescent about the mother. For younger adolescents, lower perceived maternal support and higher perceived maternal psychological control were associated with higher levels of emotional eating. For older adolescents, higher perceived maternal behavioural control was related to higher levels of emotional eating, and a trend was found for higher emotional eating at higher levels of perceived maternal psychological control. Perceived paternal support and psychological control (for younger adolescent only) were borderline significantly associated with higher emotional eating of adolescents. The model fitted the data well for all reporters.

Multi-group analyses revealed no significant differences in associations between modelling and parenting factors on the one hand, and adolescent emotional eat-
ing on the other, by sex of the older or younger adolescent (Figure 1). Also, the BMI adjusted model revealed no significant associations between BMI and adolescents’ emotional eating, and no different associations between modelling and parenting variables on adolescents’ emotional eating (results available from the first author).

**Rater differences**

Although there were significant associations between parent and adolescent reports of parenting, these associations were generally low (Table 1). Average scores differed between parents and adolescents. Both older and younger adolescents had lower scores on support and behavioural control than their parents and higher scores on psychological control than their mothers (all *p*s < 0.001).

**Table 2**: Average scores (range 1-5) on emotional eating scale for different groups of participants

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>mean</th>
<th>SD</th>
<th>statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>boys</td>
<td>430</td>
<td>2.08</td>
<td>0.70</td>
<td><em>t</em> = 6.31 (<em>p</em> &lt; 0.001)</td>
</tr>
<tr>
<td>girls</td>
<td>426</td>
<td>2.39</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>280</td>
<td>2.20</td>
<td>0.73</td>
<td><em>F</em> = 0.54 (<em>p</em> = 0.66)</td>
</tr>
<tr>
<td>14</td>
<td>182</td>
<td>2.25</td>
<td>0.74</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>263</td>
<td>2.27</td>
<td>0.73</td>
<td></td>
</tr>
<tr>
<td>16 and 17</td>
<td>131</td>
<td>2.21</td>
<td>0.78</td>
<td></td>
</tr>
<tr>
<td><strong>Birth order</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>oldest</td>
<td>428</td>
<td>2.23</td>
<td>0.74</td>
<td><em>t</em> = 0.05 (<em>p</em> = 0.96)</td>
</tr>
<tr>
<td>youngest</td>
<td>428</td>
<td>2.23</td>
<td>0.73</td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lower(^a)</td>
<td>287</td>
<td>2.17</td>
<td>0.72</td>
<td><em>F</em> = 2.38 (<em>p</em> = 0.09)</td>
</tr>
<tr>
<td>middle</td>
<td>275</td>
<td>2.22</td>
<td>0.74</td>
<td></td>
</tr>
<tr>
<td>higher(^a)</td>
<td>280</td>
<td>2.30</td>
<td>0.76</td>
<td></td>
</tr>
<tr>
<td>other</td>
<td>14</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) different at *p* < .05
Figure 1: Associations between parenting scores and emotional eating of older (O) and younger (Y) adolescents and their fathers (F) and mothers (M) (standardized estimates)

† ≤ 0.10; *p < .05; **p < .01 (n = 428 families).

Note: The model was run 4 times and estimates are reported for the different reports: adolescents about mother / adolescents about father / mother report / father report. Model fit:
1 Model fit: χ² (df = 18, n = 428) = 33.588, GFI = 0.985, NFI = 0.904, AGFI = 0.954 and RMSEA = 0.045
2 Model fit: χ² (df = 18, n = 428) = 29.748, GFI = 0.986, NFI = 0.933, AGFI = 0.959 and RMSEA = 0.039
3 Model fit: χ² (df = 18, n = 428) = 20.685, GFI = 0.991, NFI = 0.983, AGFI = 0.971 and RMSEA = 0.019
4 Model fit: χ² (df = 18, n = 428) = 50.903, GFI = 0.978, NFI = 0.965, AGFI = 0.932 and RMSEA = 0.065
Discussion

The current study is one of the first to focus on the role of parental emotional eating and parenting practices in adolescent’s emotional eating behaviours using data of fathers and mothers as well as two adolescents from each family. The findings showed that higher levels of emotional eating by parents were related to higher levels in adolescents’ emotional eating. Interestingly, these associations did not differ according to sex of the adolescents. Adolescents’ reports of low maternal support and of high psychological control for younger adolescents and high behavioural control for older adolescents were associated with higher levels of emotional eating.

We found moderate correlations between adolescents’ and parents’ emotional eating; these results suggest a modelling effect, thus a direct effect of parents’ emotional eating on their adolescents’ emotional eating which is in line with a previous study that reported moderate correlations in emotional eating between parents (mainly mothers) and adolescents (mainly girls) (Greenberg et al., 2003). Interestingly, in the present study the associations in emotional eating did not differ between fathers and mothers, or by sex of the child. This is in contrast to Blissett et al. (2006) who suggested that parental extrapolation of weight concerns may be more likely to occur within the mother-daughter and father-son relationships. Alternatively, one could argue that mothers are usually the most important caregivers and their eating behaviours would affect adolescents more than their fathers’ eating behaviours. However, the present study indicates the role of fathers’ eating behaviours and the importance of including them in family studies on eating behaviours. Recently, a genetic component has been found for emotional eating (Tholin et al., 2005). Families share genes and environment, and it should be noted that our full-family design cannot distinguish between the effects of these two factors. Future research should employ a genetic informative design (such as a twin or adoption design) to disentangle modelling from heritability effects.

Regarding the role of parenting practices in adolescent emotional eating, we did not find a consistent pattern for all reporters. Higher maternal support was associated with lower emotional eating in younger adolescents, while higher psychological control was associated with higher emotional eating in younger and older (trend) adolescents. Unexpectedly, perceived maternal behavioural control was associated with higher emotional eating in older adolescents. Our study is not the first to examine different types of parental control and to criticise measurements of such control in previous research. Ogden, Reynolds, and Smith (2006) stated that research on parental control is confusing and uses a narrow conceptualisation of the ways in which parents control what and when their children eat. Parental control may be more complex than previously assumed and different forms of control may influence different areas of eating behaviour (Ogden, Reynolds, & Smith, 2006). In a review, Faith et al. (2004) concluded that, compared to measurement in which maternal feeding restrictions were explicitly assessed, measures of global parental feeding styles (including controlling efforts) did not seem to be sensitive enough to detect associations between parental behaviours and children’s weight (Faith, Scanlon et al., 2004). Questionnaires used in studies on food-specific control and children’s weight.
or food intake address many different constructs of control that include both monitoring and more psychological control items (Brown & Ogden, 2004; de Boudeaudhuij, 1997; Saelens et al., 2000). Our findings suggest it is essential to establish not only whether parents control at all but also how they enforce control. Future studies on parenting and (disordered) eating behaviours would benefit from using scales that discriminate between the different dimensions of control.

Import to mention also is that in multi-group analyses we found no differences between boys and girls in the way their emotional eating was associated with the emotional eating and parenting of their father and mother. Also, no parenting effects were found for fathers, although there were trends in the expected directions for their support and psychological control.

### Multisource data

The discrepancy in results based on parent or adolescent reports can either be the result of biased answers by the children or by the parents (Engels et al., 2001). Parents might be more susceptible for social desirability, which is underlined by higher average scores on support and behavioural control and lower average scores on psychological control for parents than for adolescents. On the other hand, the shortcoming of using exclusively adolescent reports is that correlations between concepts with adolescents' reports exclusively are subject to shared rater bias (i.e. associations are significant because an individual reports on both dependent and independent variables). Furthermore, parents and adolescents might interpret questions differently, or can have different perceptions of the parenting practices. For example, some adolescents may not perceive all behaviours of parents which are meant to be supportive, as support. This is an important point to consider when translating research outcomes into practical implications for parents.

### Strengths and limitations

Our study consisted only of intact families with both biological parents living together. Additionally, although the sample was nationwide it is not representative for the general Dutch population. The results cannot be generalized for other family compositions such as, for example, single-parent families. Further, the relative under-representation of ethnic minorities does not allow generalizing to these groups.

Another limitation of our study is that the data are cross-sectional, while longitudinal data are necessary to generate conclusions about the direction of the associations. In young adolescents scores on emotional eating are generally low and problematic patterns of emotional eating might develop later in life. Also, the relationship between emotional eating and weight status, unlike in adults, has not been found in adolescents, although emotional eating was positively related to energy intake (Wardle et al., 1992). However, dietary habits acquired in childhood are known to persist through adulthood. A longitudinal design that also includes weight status and food intake can provide insight into the impact of parental influences on emotional eating and future health and wellbeing. In such a design also bi-directional influences between parents and adolescents could be tested; i.e. whether the whether parents’ level of support and control is a reaction to the child’s behaviour (i.e.
emotional eating) or whether the child's eating behaviour is influenced by certain parental behaviours.

This study also has a few strengths, in particular the large sample and full-family design with multi-informant data. Many studies focus exclusively on adolescent girls. Further, besides the lack of research on adolescent boys, the role of fathers is largely neglected in research on family factors in food intake and eating behaviours. In conclusion, similarities in emotional eating between adolescents and their parents have clearly been shown in this study, and these were irrespective of the adolescents' sex. Moreover, a maternal parenting style perceived as highly controlling, and especially psychological control, was related to higher levels of emotional eating, whereas the results partly supported the assumption that lower levels of maternal support are related to emotional eating.
Longitudinal associations between parents’ satisfaction with their adolescent children’s body figures and children’s own body satisfaction

Abstract

Cultural norms and social influences such as socio-cultural pressure to be thin or more muscular are known to predict body dissatisfaction in adolescents. The current study tested associations between parental satisfaction with their adolescent children’s figures and children’s own body satisfaction using longitudinal family data collected in three annual waves between 2004 and 2006. Respondents were both parents and two differently-aged adolescent siblings of 416 families (age range: 14-17 years) residing in the Netherlands. Results showed that, relative to parents’ satisfaction with their children’s figures, children themselves were more often dissatisfied with their figures. In a cross-sectional model, we found that parents’ satisfaction with their children’s bodies was associated with children’s satisfaction, although the associations with parental measures were small. Parents’ satisfaction with their children’s figures at wave 1 was not directly related to children’s own satisfaction at waves 2 or 3. However, parents’ satisfaction was indirectly related to their children’s body satisfaction at waves 2 and 3 via children’s body satisfaction at wave 1. Hence, parents’ feelings about their adolescent offspring’s figures seem to influence adolescents’ own feelings about their body.
Introduction

Body dissatisfaction is common among adolescents (Littleton & Ollendick, 2003). This is not simply an uncomfortable feeling about one's physical image but can motivate unhealthy weight-loss practices, binge eating, or spark eating pathologies (Neumark Sztainer et al., 2006; Stice, 2001, 2002). Perhaps most distressing, body dissatisfaction also has been found to relate to suicidal behaviour (Crow et al., 2008).

A substantial amount of research has examined sociocultural influences on body dissatisfaction in young girls (Stice & Whitenton, 2002) and boys (McCabe & Ricciardelli, 2001). Although body dissatisfaction can refer to discontent with any aspect of one's appearance, for girls this mostly amounts to a wish to be thinner, whereas for boys it can refer to either the wish to be thinner as well as a wish to be larger. The present study focuses on these specific aspects of body satisfaction (wish to be thinner or larger) and investigates the role of parents specifically — rather than sociocultural influences at large — to test whether adolescent children's own body perceptions are a function of their parents' perceptions of their (i.e., the child's) body.

The role of parents

Previous studies have shown that parents have substantial impact on the weight-related attitudes and behaviours of their adolescent children, with the majority of the research being focused on girls' desire for thinness. In a model of risk and protective factors for adolescent girls' eating disorders, family context (e.g., socioeconomic status (snes), parental psychopathology, parenting style, attachment, and abuse) and family characteristics such as parents' weight and weight concerns have all been marked as risk factors for girls' low self-esteem and poor body image (Striegel Moore & Cachelin, 1999). At a more proximal level, parents may influence their children's body satisfaction through explicit communications such as criticism, teasing, and pressure to be thin (Stice, 1994; Stice & Whitenton, 2002). Socio-cultural pressures as exerted by parents, peers, and the media include an emphasis on weight loss, a focus on physical attractiveness, and pressure to restrict food intake. In adolescent girls, these behaviours are thought to result in internalization of the thin ideal (that is the active endorsement of the ideal body as a thin body) which in turn leads to body dissatisfaction (Stice, 1994, 2002). In a review by Cafri, Yamamiya, Brannick, and Thompson (2005) internalization of the thin ideal and perceived pressure to be thin had medium-to-large associations with body-image dissatisfaction.

With the exception of one study that found no effects of perceived family pressure on adolescents' body dissatisfaction (Blowers, Loxton, Grady Flesser, Occhipinti, & Dawe, 2003), cross-sectional studies generally have reported associations between perceived parental encouragement to diet, parental weight-related criticism or teasing and weight-change behaviours and body dissatisfaction in their adolescent children (Keel et al., 1997; Keery et al., 2005; Levine et al., 1994; Schreiber et al., 1996; Wertheim et al., 2002). Limited research has examined the role of sociocultural influences on body image of boys; these data suggest that boys are similarly influenced.
by parental messages, although to a lesser degree, as are girls (McCabe & Ricciardelli, 2004).

Prospective findings on familial influences and adolescents’ body dissatisfaction have been less conclusive than cross-sectional studies. Field et al. (2001) found that the importance that parents attached to thinness predicted weight concerns and dieting among 9- to 14-year-old boys and girls over a one year period. McCabe and Ricciardelli showed that over an 8- and a 16-month period perceived pressures from parents predicted weight-loss as well as weight-gain and muscle-building strategies in adolescent girls and boys (McCabe & Ricciardelli, 2003, 2005). Byely, Archibald, Graber, and Brooks Gunn (2000), in contrast, concluded that adolescent body image was only predicted by earlier self-reported body image and not by maternal encouragement to diet, maternal modelling, or mothers’ perception of their daughters’ weight (relative to other girls of the same age). Similarly, (Paxton, Eisenberg, & Neumark Sztainer, 2006) found no effects of parental encouragement to diet on body dissatisfaction among adolescent boys and girls over a five year period. In summary, then, cross-sectional studies have reported associations between parental behaviours and their children’s own body dissatisfaction, but longitudinal studies provided inconclusive support for the impact of these behaviours over time.

Despite scholars’ interest in parental effects on their children’s body dissatisfaction, few studies have directly measured parents’ perception of their children — most ask children whether they perceive pressure from one or more of their parents to have a different figure (e.g., be thinner). This method is fraught with assumptions, such as that children have knowledge of whether parents are dissatisfied with their (child’s) body, parents communicate this dissatisfaction to their children, and children detect their parents’ dissatisfaction. In addition to avoiding the assumptions inherent in the indirect method there is also the potential issue that children themselves may be systematically biased: Children who are dissatisfied with their bodies may perceive others as being dissatisfied with them as well, reflecting an effect of the child more than of the person on whom they are reporting. Hence, asking parents to directly report their satisfaction with their children’s figures has multiple advantages over the indirect and assumption-laden measure of the children’s perceptions of their parents’ dissatisfaction.

One study of family influences on eating disorders did measure one parent’s (mothers’) assessments directly. Pike and Rodin (1991) asked mothers of daughters with disordered eating patterns to provide estimates of their daughters’ ideal and current weight. These mothers reported greater differences between the ideal and the current weight scores of their daughters than did ideal and current weight scores given by mothers of girls who were not eating disordered (even after controlling for body mass index; BMI). Mothers of eating disordered girls also rated their daughters as significantly less attractive than the daughters rated themselves (Pike & Rodin, 1991).

Similar to Pike and Rodin, the present study investigated the influence of parental dissatisfaction with their children’s figures on children’s perceptions of their own bodies. Note, though, that we used silhouette figures and created a difference scores of current and ideal figure ratings to measure both adolescents’ and parents’ satisfac-
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tion with the child’s body whereas in Pike and Rodin’s study mothers reported on their daughter’s current and ideal shape by estimating her height in inches, current weight in pounds, and ideal weight in pounds. The use of silhouette figures, while having some limitations (Gardner, Friedman, & Jackson, 1998), offers several advantages to measuring body satisfaction. The current study advanced Pike and Rodin’s study in several other ways. One, we tested both mothers’ and fathers’ perceptions. Two, as mentioned, we assessed parents’ feelings about their children’s bodies directly. Three, we used longitudinal data so as to test for relationships over time. Four, we included both boys and girls to test for gender-specific pathways. Five, we obtained two adolescent children per family to cover a broader age range.

The current study

To determine associations between parental satisfaction with their adolescent children’s bodies and the adolescents’ own body satisfaction we first tested a cross-sectional model that included baseline parental satisfaction and body mass index (BMI) as predictors and children’s body satisfaction at wave 1 as the outcome variable (Figure 1). We subsequently tested prospective associations over a 2-year period in a longitudinal model (Figure 1). We expected parental satisfaction relates to boys’ and girls’ body-satisfaction scores both cross-sectionally and prospectively. Gender differences were examined for parents’ and adolescents’ dissatisfaction as well as for the cross-sectional and longitudinal associations between adolescents and parental dissatisfaction and BMI.

Method

Procedure

We tested 416 families involved in an ongoing longitudinal family study on parental influences and health behaviours. For detailed information on participant selection and characteristics see Harakeh, Scholte, de Vries, & Engels (2005) and Van der Vorst, Engels, Meeus, Dekovic, & van Leeuwe (2005). The three waves that are reported in this study are termed waves 1, 2 and 3.

Families with at least two children ages 13 to 16 years were selected from the registers of 22 municipalities in the Netherlands (a total of 5602 families) and recruited through a letter. To be eligible, families had to be intact and biologically related and we excluded twins and children with a mental or physical disability. Of the total of 885 families that indicated a willingness to participate, 765 fulfilled the study criteria, of whom we selected 428. This sample was selected so as to have equivalent distribution of children’s educational levels and combinations of male/female sibling dyads. Initial background information was obtained between November 2002 and April 2003 and remaining data were collected by trained interviewers at the respondents’ homes at one-year intervals from the initial screening. Hence data were collected during a span of three years for the three waves in the current analyses. Care was taken so that no interaction took place among the four participating family members.
during completion of the questionnaires. The interviewers received training and a protocol on how to explain the purposes of the study as well as how to answer to a number of most common questions raised by the family members. Each family received a €30-compensation per wave for their participation. In addition, five families were randomly selected to win an additional €1000-travel check after completion of the three waves.

The response rates were: Wave 1 had 416 families (97.2% of the full selected sample of 428 families), wave 2 had 404 families (94.4%), and wave 3 had 347 families (81.1%). Families that left the study prematurely did not differ from families that completed all three waves in terms of children's self-reported body satisfaction, age, gender, BMI, ethnicity, or parental satisfaction. We, however, did find significant differences for education levels: participating fathers ($\chi^2(8) = 24.88, p < .01$), mothers ($\chi^2(8) = 27.39, p < .01$), older ($\chi^2(5) = 22.66, p < .001$), and younger siblings ($\chi^2(5) = 12.58, p < .01$) had higher education levels than family members who did not complete the study.

**Sample characteristics**

All siblings were between 14 and 17 years old at wave 1 with 16.2 years (range 15-17) as the average age for the older and 14.4 years (range 14-16) for the younger sibling. The representation of boys and girls was comparable: 47.3% of the older and 53.3% of the younger siblings were boys with an equal distribution of sex across sibling dyads: 25.9% boy-boy, 27.4% boy-girl, 21.3% girl-boy and 25.4% girl-girl. Fathers were on average 47.2 years old and the mothers 44.8 years old at wave 1. The majority of the children (94%) were of Dutch ethnicity (as defined by parents’ native country) and attended mainstream secondary schools (In the Netherlands these vary from lower vocational to pre-university education at age-related levels).

**Measurements**

At all waves, body satisfaction of adolescents was measured with the Figure Rating Scale from the Eating Disorder Inventory Symptom Checklist (EDI-SC) (van Strien, 2002). Participants indicated which of the six body silhouettes they felt most resembled their current body figure, resulting in a score from 1 (most slim figure) to 6 (most overweight figure). Next, they were asked whether they were satisfied with their current figure and, when not, to indicate which figure they would be most satisfied with (i.e., ideal figure). The six silhouette drawings were inspired by the five body silhouettes from Storz and Greene (1983) and were designed such that they represented people who were 30% underweight, 20% underweight, 10% underweight, average weight, 10% overweight and 20% overweight (van Strien, 2002). Because the silhouettes were neutral for age and gender, we were able to use the same set of drawings for boys and girls. Hence this method has the advantage that differences between gender could not be attributed to differences in the drawings.

A discrepancy score was calculated by subtracting the ideal figure from the perceived figure (again acknowledging that there are concerns about difference scores and silhouette figures; see Keeton, Cash, & Brown, 1990; Roberts, Cash, Feingold, & Johnson, 2006; Thompson & Garner, 2002). A discrepancy score of zero describes
participants who are at their desired body size. A positive discrepancy score describes
participants who want to be thinner than their current body size whereas a nega-
tive discrepancy score those who want to be bigger. In the present study we used
the whole range of scores. Theoretically discrepancy scores range from -5 (strongest
desire to be bigger than one is currently) through zero (satisfied with current figure)
to +5 (strongest desire to be thinner than one is currently).

Figure rating scales have been widely used (Fallon & Rozin, 1985; Ricciardelli &
McCabe, 2001) and have been found to have good test-retest reliability and adequate
validity for body image disturbance for both men and women (Thompson, Fabian,
Moulton, Dunn, & Altabe, 1991). The current Figure Rating Scale was earlier used by
Van Strien (1989) and Anschutz, Engels, and Van Strien (2008). In the present study
this Figure Rating Scale had high test-retest-reliabilities, and discrepancy scores had
good convergent validity for drive for thinness and good discriminating validity for
general self-esteem.

High test-retest reliabilities across a period of one year were obtained for current
figure (ranging from $r = .69$ (n = 195), $p < .001$ for younger boys to $r = .74$ (n = 194), $p
< .001$ for older girls). Discrepancy scores also had high one-year test-retest reliabili-
ties, ranging from $r = .55$ (n = 195), $p < .001$, (for younger boys) to $r = .62$ (n = 194), $p <$ .001 (for older girls). Further, the discrepancy score had a good convergent validity
with wave 2 measures of drive for thinness as measured with three items of the Eat-
ing Disorder Inventory-11 (Garner, 1991; van Strien & Ouwens, 2003b). In the present
study, drive for thinness ($\alpha > .88$ across subgroups) correlated with the discrepancy
score from $r = .48$ (n = 163), $p < .001$ (for younger boys) to $r = .63$ (n = 162), $p < .001$ (for
older girls). Discrepancy scores also had good discriminating validity, as they showed
much lower correlations with general self-esteem as measured with the Rosenberg
(1965) self-esteem scale at wave 1 ($\alpha > .88$ in the various subgroups). Correlations
ranged from $r = .05$ (n = 193), $p > .10$ (for younger boys) to $r = -.28$ (n = 194), $p < .001$
(for older girls). In sum, the Figure Ratings Scale and associated discrepancy scores
showed adequate psychometric properties.

Comparison of our validity data with those obtained for Stunkard’s Figure Rating
Scale (Thompson et al., 1991) suggests that our measure performs at least equally
well for both the males and the females. As seen in Table 2, Thompson and Altabe
(1991) reported correlations between Stunkard’s Figure Rating discrepancy score and
drive for thinness as measured with the EDI of $r = .33$ (n = 91), $p < .001$ for boys and $r
= .54$ (n = 146), $p < .001$, for girls. Correlations with the Rosenberg (1965) self-esteem
scale were $r = .09$ (n = 91), $p > .10$ for boys and $r = -.30$ (n = 146) for girls. In sum, our
validity data match up well with previous uses of other figure rating scales.

Parental dissatisfaction with their adolescent children’s figures was measured at wave
1 (2004) using the same method and the same questions we posed their children.
They reported about the two participating children separately. More specifically, the
parents were asked to indicate which silhouette resembled the figure of their child
most, whether they were satisfied with that figure and, if not, to indicate the figure
they would be most satisfied with. A difference score between the ideal and the cur-
rent figure was used as the dissatisfaction score.
BMIS for the children were calculated based on self-reported height and weight with both siblings reporting both measures at each of the three waves. To evaluate the validity of self-reported values, we compared self-reported height and weight with height and weight measurements taken by the interviewers (i.e., when participants were standing on a scale with shoes off, for weight; height was measured with a stadiometer) at wave 2 in a random subsample of 300 families. Comparisons of the two types of reports yielded high correlations (all rs > .90). We found no evidence that misreporting of weight was more prevalent in certain weight groups (e.g., overweight adolescents, (Snoek et al., 2008). Hence, we have good data height-weight self-reports were quite valid at the second wave, but acknowledge that we are unable to verify whether this was the case for the other two waves.

The ratings of children’s current figures showed high correlations with children’s BMIS. The correlations with BMI were .69 for children’s self-perception, .63 for fathers’ perception of their children, and .65 for mothers’ perception of their children (all significant at p < .001). Adolescents’ body dissatisfaction ratings were substantially associated with their BMIS with rs across the three waves ranging from .38 to .45 (all ps < .001). For both parents, dissatisfaction ratings were significantly correlated with adolescents’ BMIS, r = .36 for fathers and r = .38 for mothers (ps < .001). All correlations between the model variables are reported in the Appendix.

**Strategy for analysis**

For descriptive statistics we calculated the percentages of adolescents who wished to be thinner and those who wished to be larger at each wave and also did the for parents’ wishes for their children’s bodies. Differences between boys and girls were analyzed by chi-square tests. Further, paired t-tests were used to compare fathers’ and mothers’ measures.

To test cross-sectional and longitudinal relationships among parental satisfaction, BMI, and adolescents’ body satisfaction we constructed path models and used Mplus of Muthén & Muthén (1998-2004) to test our models. Correlations between two siblings’ body-satisfaction scores were significant but weak at waves 1 (r = .13, p < .05) and 2 (r = .19, p < .01) and not significant at wave 3 (r = .10). Mean satisfaction scores for older and younger siblings did not differ significantly and birth order differences are not an issue in this study. Therefore we combined data of the older and younger adolescents in one sample of 832 adolescents. As a consequence we included age of the adolescent as a covariate in both models. In this way, the data have a multilevel structure. To account for dependency in the data due to nesting, the procedure complex was used in Mplus in combination with the robust maximum likelihood estimator. This estimator gives parameter estimates with standard errors and a chi-square test statistic that are robust to non-independence and non-normality. Missing data were treated with a robust full information maximum likelihood (FIML) approach such that parameters were estimated using all available information in the data (Muthen & Muthen, 1998-2004).

The cross-sectional model at wave 1 was tested first. BMI was included as predictor of parental and adolescents’ body dissatisfaction. By including BMI in the model and by linking it with variables of interest (that is including the paths between
BMI and these variables in the model), we controlled for the effect of BMI so that we could test whether parental dissatisfaction predicts adolescent dissatisfaction above and beyond adolescent BMI. Parents' satisfaction with their child's bodies was included as a predictor of adolescents' body satisfaction. The disturbance terms of father and mother satisfaction scores were correlated (Figure 1).

Second, to test for influences over time we tested a longitudinal model: the cross-sectional model of wave 1 was extended by including adolescents' body dissatisfaction at wave 2 and wave 3 (Figure 1). The fit of the models was evaluated by the fit indexes CFI (Comparative Fit Index) and RMSEA (Root-Mean-Square Error of Approximation). Models with CFI values > 0.95 are considered to have good fit and CFI-values > .90 indicate an acceptable fit. Models with RMSEA-values < .05 have a good fit but values < .08 are also acceptable (Bentler & Bonett, 1980; Byrne, 2001; Kline, 2005).

To test moderating effects of sex we applied multi-group analyses. The unconstrained model was compared with the constrained model where all parameter estimates are constrained to be equal for male and female adolescents. If this test shows a significant decrease in fit (i.e., a significant increase in chi-square), then the decrease in fit is investigated by fixing parameters individually. Using the robust FIML-estimator, the standard chi-square is replaced by a robust chi-square. Differences between robust chi-squares do not have a standard chi-square distribution and consequently the robust chi-square values are first rescaled to standard chi-square values according to procedures described in Satorra and Bentler (1994) and Muthén & Muthén (1998-2004). Mediating effects of parental dissatisfaction in the relation between BMI and adolescents’ body dissatisfaction at wave 1 and indirect effects of parental dissatisfaction to adolescents’ dissatisfaction at wave 2 and wave 3 were examined using Sobel tests.

**Results**

**Adolescent body dissatisfaction and parental dissatisfaction**

A significantly higher percentage of girls (41.5 – 43.3%) than boys (26.2 – 26.6%) were dissatisfied with their bodies. The vast majority of girls wished to be thinner whereas boys’ desires were either to be thinner or larger (Table 1). Parents, less than the children themselves indicated dissatisfaction with their children’s figures. Dissatisfaction rates over the three waves were between 10.7 and 18.8% for fathers and between 11.9 and 13.6% for mothers. The fathers’ and mothers’ dissatisfaction scores substantially correlated ($r$’s between 0.40 and 0.53 over the waves, $p$’s < .001). For both fathers and mothers, most dissatisfied parents wished for their daughters to be thinner rather than larger while sons’ parents wished for them to be either thinner or larger. Average satisfaction scores did not differ between fathers and mothers (Table 1).
Cross-sectional and Longitudinal Path Models

The cross-sectional model was a saturated model, which necessarily leads to a perfect fit. The model explained 25.2% of the variance of adolescents’ body satisfaction scores. The parameter estimates of this model are identical with those of the first part of the longitudinal model. For this reason the cross-sectional model is not displayed as a distinct figure; see the first part of the longitudinal model, Figure 1. Parental satisfaction was positively related to children’s body satisfaction scores. Children’s BMI was positively associated with parental dissatisfaction and adolescents’ own body dissatisfaction. Using the Sobel test we found that fathers’ \( z = 2.96, p < .01 \) and mothers’ dissatisfaction \( z = 3.19, p < .001 \) proved to be significant mediators of the relationship between BMI of the adolescent and adolescents’ own body dissatisfaction at wave 1. So, the positive association between BMI and adolescents’ body dissatisfaction is partly mediated by parents’ dissatisfaction.

### Table 1: Adolescents’ self-reported body dissatisfaction and parental self-reported dissatisfaction with their children’s bodies: percentages (%) of negative (wish to be bigger), neutral (satisfied), and positive (wish to be thinner) for all three waves.

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th>Girls</th>
<th>( \chi^2 ) (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(-)</td>
<td>0</td>
<td>(+)</td>
</tr>
<tr>
<td><strong>Wave 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adolescent</td>
<td>10.1</td>
<td>75.8</td>
<td>14.1</td>
</tr>
<tr>
<td>N=416</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Father</td>
<td>6.2</td>
<td>88.8</td>
<td>5.0</td>
</tr>
<tr>
<td>Mother</td>
<td>7.0</td>
<td>88.0</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>Wave 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adolescent</td>
<td>10.9</td>
<td>75.5</td>
<td>13.6</td>
</tr>
<tr>
<td>N=404</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Father</td>
<td>7.0</td>
<td>88.7</td>
<td>4.3</td>
</tr>
<tr>
<td>Mother</td>
<td>7.7</td>
<td>87.6</td>
<td>4.7</td>
</tr>
<tr>
<td><strong>Wave 3</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adolescent</td>
<td>10.5</td>
<td>75.4</td>
<td>14.1</td>
</tr>
<tr>
<td>N=347</td>
<td></td>
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<tr>
<td>Father</td>
<td>6.2</td>
<td>86.5</td>
<td>7.4</td>
</tr>
<tr>
<td>Mother</td>
<td>5.5</td>
<td>89.6</td>
<td>4.9</td>
</tr>
</tbody>
</table>

Note: Significant differences between boys and girls in percentages who (were) wished bigger, not different, or thinner are tested with \( \chi^2 \) and indicated with: \( \text{p}<.05, \text{**p}<.01, \text{***p}<.001 \). Differences between fathers and mothers were tested with paired t-test and were all not significant (ps > .05).
Figure 1: Standardized estimations of associations between BMI, age, parental dissatisfaction and children's self-reported body dissatisfaction measured at three annual waves (n = 832).

Note: The correlation between father and mother dissatisfaction is between disturbance terms.
The longitudinal model (Figure 1) showed a good fit: $\chi^2 (df = 2, n = 832) = .53, p = .768; CFI = 1.000, RMSEA = .000$. The model explained 43.4 and 42.6 % of the variance of adolescents’ body satisfaction scores at waves 2 and 3, respectively. Over the two-year period nonsignificant longitudinal associations were found between parental rates at wave 1 and adolescents’ satisfaction rates at wave 2 and wave 3. Baseline BMI predicted children’s own body dissatisfaction one and two years later. Finally, children’s body satisfaction at waves 2 and 3 was significantly predicted by their earlier body satisfaction.

Satisfaction of father and mother were not directly significantly related to adolescents’ body satisfaction at waves 2 and 3. Yet we did find, using the Sobel test, that adolescents’ body satisfaction at wave 2 was indirectly related to fathers’ ($z = 3.08, p < .01$) and mothers’ satisfaction ($z = 3.14, p < .01$) via adolescent body satisfaction at wave 1. The same results were found for adolescents’ body satisfaction at wave 3 ($z = 2.84, p < .01$ for fathers and $z = 2.78, p < .01$ for mothers). In other words, parents’ satisfaction with their children’s bodies at wave 1 was related to adolescents’ body satisfaction at wave 1, which in turn predicted adolescents’ body satisfaction at waves 2 and 3.

**Gender differences**

Adolescents boys and girls differed in their level of wish to be thinner or larger (Table 1) but neither the cross-sectional nor the longitudinal model revealed differences between boys and girls in the associations among BMI, parental, and adolescents’ body satisfaction, with $\Delta \chi^2 (10) = 7.61, ns$, for the cross-sectional model and $\Delta \chi^2 (19) = 15.94, ns$ for the longitudinal model. Hence the relationships reported above held in equivalent fashion for adolescent boys and girls.

**Discussion**

Adolescents who have high body dissatisfaction are more likely than others to engage in unhealthy dieting practices, develop eating pathologies (Neumark Sztainer et al., 2006; Stice, 2002), and possibly develop psychosocial disturbances (e.g., stress, anxiety, low self-esteem, depression, and suicidal behaviour) (Crow et al., 2008; F. Johnson & Wardle, 2005; Kostanski & Gullone, 1998; van den Berg et al., 2002). Parents are a major source of influence on their children and may well affect the onset, maintenance, or aggravation of body dissatisfaction in this age group. In the present study we tested whether the parents’ feelings of satisfaction with the body shapes of their adolescent children related to adolescents’ perceptions of their own bodies. The results showed that roughly 10 to 20 percent of the fathers and mothers indicated a wish for their children to be thinner or, to a lesser degree, larger. In line with our hypotheses, cross-sectional results showed a weak but significant relation between parental and adolescent dissatisfaction but this relationship was not replicated in the longitudinal data. Yet, initial levels of parental dissatisfaction did influ-
ence adolescents dissatisfaction over time in an indirect fashion in that it was related to adolescents’ body dissatisfaction at wave 1 which in turn predicted adolescents’ body dissatisfaction at waves 2 and 3.

One explanation for the findings is that transmission of parental satisfaction to adolescents occurs at a relatively early age and therefore cross-sectional associations may be found and may persist, concurrently, over time without having lagged effects on children. This may help explain the lack of direct longitudinal associations in our data. Also, stability paths for children’s dissatisfaction were high and strong, which means that although scores may change over time but also be highly predicted by earlier dissatisfaction scores. This kind of effect would leave little variance to be explained by other factors. Heavier, as compared to normal or under-weight, adolescents are more likely to have parents who are dissatisfied with their appearance and are more likely to be dissatisfied themselves. BMI however cannot explain the associations between parental and child satisfaction found in this study as in all models, we controlled for children’s BMI. Instead we found that parental dissatisfaction partly mediated the relation between BMI and adolescents’ dissatisfaction.

To establish which adolescents were most affected by their parents’ dissatisfaction, we looked for gender-related differences. In line with a large number of prior studies (e.g., (Kostanski & Gullone, 1998; Ricciardelli & McCabe, 2001) we found girls to be consistently more dissatisfied with their bodies than were boys. Parents more often wished for their daughters to be thinner whereas for sons they wished for them to be both thinner and larger. Although we do not have data on parental behaviour, it seems likely that differences in the way parents judge their sons’ and daughters’ bodies may be associated with differences in degree and type of parental behaviours (e.g., pressuring to diet) for boys and girls but earlier studies have been inconclusive. One prior study reported that girls, relative to boys, perceived more weight-related feedback from their mothers (McCabe & Ricciardelli, 2001), Wertheim et al. (2002) on the other hand obtained null findings in the same age group on differences in parental encouragement to diet between boys and girls.

Looking at each parent separately, we found similar patterns for fathers and mothers. Earlier studies in this field tended to focus on mothers and daughters; one study that did include boys and girls and compared mothers with fathers found that maternal comments had more impact than did fathers’ comments and girls seemed to be more affected than boys (Smolak et al., 1999). Other studies reported effects for fathers in particular (Keel et al., 1997; Keery et al., 2005) or, as in our study, similar results for fathers and mothers (Field et al., 2001). It is therefore evident that fathers should not be neglected, especially since parents might strengthen or buffer each other’s as well as their other family members’ behaviours. Paternal weight teasing, for instance, has been found to provoke more teasing by siblings (Keery et al., 2005). Apparently, our boys and girls were not differently affected by their parents’ dissatisfaction as we found neither cross-sectional nor longitudinal sex differences in the associations between parental and adolescents’ body satisfaction.
Limitations and strengths

First, as ours was not a nationwide, representative sample, generalizability of our results may be limited as we did not include a broad range of family compositions such as single-parent families or stepparents. It is also important to note that ethnic minorities and less educated parents were relatively underrepresented in our sample relative to the general population in the Netherlands. Second, the height and weight data for the adolescents we used were based on self-reported measures. Some validation of these measures can be drawn from the high correlations we found between the self-reported and objective data obtained at the second assessment. Nevertheless, self-reported measurements are subject to more bias than factually measured height and weight (Larsen, Ouwens et al., 2007). Third, limitations that generally apply to the use of silhouette ratings to measure body dissatisfaction (Gardner et al., 1998) also apply to our study. There may have been some loss of information and insensitivity to small differences due to the use of the Likert-type ratings rather than a continuous variable and due to restriction of range which might account for the low associations found in this study. Perhaps with another measure stronger associations between parents’ and adolescents’ satisfaction scores would have been found. Further, silhouette ratings only assess one aspect of body dissatisfaction, specifically dissatisfaction with body shape/size. Finally, we used figure silhouettes that are neutral for age and gender, which had the advantage that possible differences between the sexes could not be attributed to differences in the drawings. A limitation of this measure however is that the silhouette figures may be more or less appropriate to certain age groups. We are not, for example, able to correct for changes that occur with puberty. Also, by not including a musculature aspect an important factor in boy’s body dissatisfaction may have been neglected. Similar to Davison, Markey, and Birch (2000), positive scores on our measure indicated the extend to which one wanted to be thinner with, conversely, wanting to be larger resulting in negative scores; both ends of the scale thus indicate dissatisfaction but reasons and motivations behind the wish to be thinner can differ from the wish to be larger. For this same reason we cannot combine those in absolute dissatisfaction scores with both wish to be thinner and larger resulting in dissatisfaction scores. Clearly, more studies are needed that use direct measures of parental dissatisfaction and also address the distinction between the desire to be thinner or larger as well as include muscularity. From our results we can only conclude that parents and adolescents measures of dissatisfaction cross-sectionally point in the same direction without clearly being able to differentiate differences between wish to be thinner and larger.

Strengths of the current study were the large samples in two specific age groups (early and middle adolescents), the longitudinal design, and the use of structural modelling that allowed for testing of parental influences while controlling for individual factors such as BMI and gender. Another strength of our study was that parental dissatisfaction with their children’s figures was based on reports from the parents themselves rather than reports from the children and therefore were biased by adolescents’ own attitudes. The fact that associations between the within-family parental body dissatisfaction reports for older and younger sibling were nonsignifi-
significant for fathers and weak for mothers indicates that parents actually reported their dissatisfaction with their children's figures rather than their reports being a reflection of an overall preoccupation with weight and shape or a general tendency to be critical towards their children. This method does, however, have the disadvantage that it remains unknown how much of the parental dissatisfaction was actually perceived by the adolescents. We only measured general parental dissatisfaction with their children's figures and hence have no information about parental communication of this dissatisfaction in terms of their exerting pressure to be thin, weight teasing, and encouragement to diet, or parental behaviours related to weight control, such as actual dieting together with their children, enforcing physical activity, and creating a healthy food environment. Finally, the magnitude of the associations between parents' and adolescents' body dissatisfaction was low. Although they were statistically significant in path analyses, effect sizes should be taken into account when interpreting those results.

Although the magnitudes of the associations were relatively low, parental dissatisfaction with their adolescent children's figures was related to adolescents' own dissatisfaction. Further studies are needed to test whether, how, and at what age transmission to offspring takes place. Several studies have shown that explicit communication of dissatisfaction by parents (e.g., weight criticism, encouragement to diet, parental pressure to be thin) is related to feelings of body dissatisfaction among their children (Cafri, Yamamiya, Brannick, & Thompson, 2005; Stice, 1994; Stice & Whitenton, 2002) and thin internalization also has been strongly associated with body dissatisfaction (Stice, 1994, 2002). However, longitudinal evidence with respect to parental influences is mixed (Field et al., 2001; Paxton et al., 2006; Stice, 2001) and the use of different measures of parental behaviour makes it difficult to compare findings across studies.

Finally, the vast majority of studies thus far has been on negative parental behaviours. Neumark-Sztainer (2005) concluded that families have an important role to play in reinforcing the positive influences and in filtering out the negative influences. For example by helping their children engage in healthy eating and physical activity behaviour and feel good about themselves by providing a supportive environment. One recent study that looked at encouragements to eat healthy or be physically active found no differences in parents who did or did not recognize that their child is overweight (Neumark Sztainer, Wall, Story, & van den Berg, 2007). We feel it would be relevant for future studies to include, in addition to parental satisfaction with their children's bodies, several dissatisfaction-related as well as positive parental communications, such as giving compliments, conveying acceptance of their child's figure and weight, or supporting healthy behaviours. This way, effects of differential parental behaviours and communication patterns could be identified as well as whether the levels of parental dissatisfaction are related to specific parental behaviours and certain outcomes for the adolescents.

Parental dissatisfaction differed between adolescents within the same family so this construct appears to be child-specific. Moreover, parental dissatisfaction was strongly related to the child's characteristics, especially body mass, indicating that parents are reacting to their children's figures and looks. If children are at risk of
become overweight, it may be important for their parents to notice; however it is possible that awareness of their children becoming overweight may have no beneficial effects but only serve to heighten children’s dissatisfaction with their bodies. This issue is especially important since adolescent are growing up in an environment that fosters overeating, a lack of exercise, and consequently becoming overweight (International-Obesity-TaskForce, 2002) but paradoxically also emphasizes thinness, which, in turn, promotes body dissatisfaction and eating pathology (Stice, 2002). In this light it is particularly interesting to examine parents’ satisfaction with their adolescent children’s behaviours and long-term well-being among adolescents in populations at high risk of developing eating pathologies or becoming overweight. Based on the current findings, we conclude that parental satisfaction with their adolescent offsprings’ figures is weakly associated with the adolescents’ self-reported body satisfaction and has an indirect influence on adolescents’ body satisfaction over a 2 year period via earlier body satisfaction.
## Appendix A: Correlations Between Variables

<table>
<thead>
<tr>
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<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2. BMI</td>
<td></td>
<td>.19***</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3. Dissatisfaction father</td>
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<td>.36***</td>
<td></td>
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<tr>
<td>4. Dissatisfaction mother</td>
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<td>.38***</td>
<td>.43***</td>
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<td>5. Body dissatisfaction wave1</td>
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<td>.45***</td>
<td>.31***</td>
<td>.34***</td>
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<td>6. Body dissatisfaction wave2</td>
<td>.05</td>
<td>.44***</td>
<td>.29***</td>
<td>.32***</td>
<td>.63***</td>
<td></td>
</tr>
<tr>
<td>7. Body dissatisfaction wave3</td>
<td>.02</td>
<td>.38***</td>
<td>.23***</td>
<td>.23***</td>
<td>.54***</td>
<td>.61***</td>
</tr>
</tbody>
</table>

* p < .05, ** p < .01, *** p < .001
Appendix B: Modelling of body dissatisfaction

Aim: To test similarities body dissatisfaction between adolescents and their parents and between siblings. Large-scale prospective studies that included modelling of body dissatisfaction in addition to other parenting factors, and found mixed results. Over a one-year period, importance of thinness to parents predicted weight concerns and dieting in a study with 9-14 year old boys and girls (Field 2001). Others found that parental body image and eating pathology did not predict increases in body dissatisfaction or dieting of adolescents, suggesting that these behaviours are not modelled (See Stice (2002) for a review) Paxton, Eisenberg, and Neumark-Sztainer (2006) explained their null findings by the long follow up (5 years) in their study and concluded that parent dieting environment factors may be more proximal influences and less relevant over a longer period.

Design: Body dissatisfaction was assessed at four annual waves for the adolescents. Parents' own body dissatisfaction was considered to be stable over the period of the study, therefore parents' behaviour was only measured once at wave 1 for the mothers and at wave 3 and 4 for the fathers. Cross-sectional correlations between siblings' and between parents' and adolescent' body dissatisfaction were calculated at the times data of both were available.

Results: Significant correlations were found between siblings' body dissatisfaction scores at all waves except the fourth: Wave 1 ($r = .18, p < .001$) wave 2 ($r = .15, p < .01$), wave 3 ($r = .17, p < .01$), and wave 4 ($r = .11, p > .05$). Mothers' body dissatisfaction score (measured at wave 1 only) was correlated to younger sons ($r = .14, p < .05$) and daughters ($r = .17, p < .05$) but not older adolescents' body dissatisfaction score. Cross-sectional correlations between fathers' (measured at waves 3 and 4) and older and younger adolescents sons and daughters body dissatisfaction scores were not significant with exception of one significant correlation between fathers' and sons' scores at wave 3 ($r = .19, p < .01$).

Conclusion: These data provide no consistent evidence for strong similarities in body dissatisfaction between parents and adolescents, whereas for siblings significant but weak associations were found.
CHAPTER 9
Food choices of 4- to 6-year-old overweight and non-overweight children while role-playing as adults

Abstract

This study compared the food choices overweight and non-overweight preschoolers make while role-playing adults and examines the influence of maternal restriction. Children role-played a mother who bought food for the family. After screening 619 children for height and weight 56 overweight children (equal sex distribution, aged 4-6) and 56 non-overweight children (matched on age, sex, demographics) were selected to participate. Children’s purchases of low and high caloric snacks, drinks, and dinner products in a miniature supermarket were recorded. Mother and child-reported maternal restriction were assessed using the Child Feeding Questionnaire (CFQ) and the Kid’s CFQ. Overweight children tended to buy more high-caloric products, and more products in total. Mothers’ reported need to inhibit child food intake moderated the relations between children’s weight status and food purchases. In conclusion, the findings suggest that overweight children tend to find higher caloric food parcels more acceptable for everyday life compared to non-overweight children.
Introduction

The prevalence of overweight among children has alarmingly increased in the Netherlands (Hirasing et al., 2001), a tendency that can be observed worldwide (Seidell, 1997; World-Health-Organization, 2002). Currently, about 11% of the Dutch youth (2 – 20 years) is overweight, and 2.5% is obese (Statistics-Netherlands, 2007). Since genetic factors alone cannot account for the rapid increase of obesity, environmental factors seem to play an important role in its development (Faith, Berkowitz et al., 2004). These factors include the environment in which children grow up, but also sociocultural influences, that is, messages and values transmitted by for example family members, peers, and media. When studying overweight in young children, an environment of particular interest is the family in which a child grows up. Considerable attention has been paid to the role of parents and parental behaviours in children’s eating behaviour and overweight (Baughcum, Chamberlin, Deeks, Powers, & Whitaker, 2000; Birch & Fisher, 1998; Faith, Scanlon et al., 2004; Kremers et al., 2003; Vereecken, Keukelier, & Maes, 2004).

The food environment provided by caregivers largely shapes the child’s food preferences, as children like and eat what is familiar (Birch & Fisher, 1998). Young children who are repeatedly exposed to a certain food parcel are likely to form corresponding habits, as eating is a daily activity and habits are formed through repetition of behaviour (Verplanken & Faes, 1999). Differences between families in typical food purchases may therefore lead to different food cognitions in children but perhaps also to differences in weight status (Ransley et al., 2003). This is an important issue to study, since children who are used to high caloric food parcels might be at double risk of developing overweight: Their current food supply promotes weight increase and at the same time these children acquire obesogenic dietary habits that could persist throughout life (Kelder et al., 1994; Nicklas, 1995). Krahnstoever, Davison, Francis, and Birch (Krahnstoever Davison, Francis, & Birch, 2005) found that within obesogenic families (i.e. families in which parents’ have higher total energy intakes as well as higher percentages fat intakes and lower activity-related behaviours) daughters also had a greater energy from fat intake and showed a greater increase in BMI over time, suggesting long-term effects of obesogenic dietary patterns on their weight status. Apparently, besides other factors (such as genetics), children’s weight status seems to also mirror the dietary habits within their family. Less is known, however, about whether these dietary habits influence young children’s own food choices.

When assessing food attitudes in children, who are too young to fill out a questionnaire and are rather sensitive to the way in which questions are phrased, an unobtrusive measurement is needed. In a structured observational study conducted by Dalton et al. (2005) preschoolers’ cognitions and behaviours toward alcohol and cigarettes were examined using an innovative paradigm. In this study, 120 2- to 6-year-olds were asked to role-play as adults and go shopping in a doll supermarket. Significant relations between parents’ alcohol and cigarette use and children’s purchases of these products were found, suggesting that children whose parents smoke and drink find alcohol and cigarettes rather appropriate to buy. In a second study us-
ing the same setting Sutherland et al. (2008) found that children’s number of healthy and unhealthy food purchases were positively associated with their parents’ food choices on a questionnaire. The findings of these studies suggest that role-playing is a suitable way to study young children’s beliefs and that even very young children have well-established ideas about the purchases of cigarettes, alcohol, and food.

Possibly, parents not only serve as role models but children’s ideas about what appropriate food choices comprise are also formed through food-related parenting behaviours. An extensive amount of research focused on food-specific parenting and children’s food preferences, intake, and weight status (Birch & Fisher, 2000; Birch et al., 2001; Faith, Scanlon et al., 2004; Klesges et al., 1991; Spruijt-Metz, Lindquist, Birch, Fisher, & Goran, 2002). Mothers may be of particular significance in this process, as literature suggest that mothers play a central role in children’s eating behaviours (Hannon, Bowen, Moinpour, & McLerran, 2003; Vereecken et al., 2004). Clark and colleagues reviewed 26 studies, published between 1996 and 2006, in which the relations between parental child-feeding behaviours including monitoring, pressure to eat, restriction on the one hand, and child eating and weight on the other were examined. They concluded that restriction of children’s eating has most frequently and consistently been associated with child weight gain (Clark et al., 2007). Remarkably, in a number of studies parental restriction was found to be related to increased food intake and child weight (Faith, Scanlon et al., 2004; Fisher & Birch, 1999a, 1999b; Lee, Mitchell, Smiciklas-Wright, & Birch, 2001). Parental restriction thus seems to yield the opposite effects on child behaviour, perhaps because it is evoked by undesired child eating behaviours, but ineffective to alter them. However, in a role-play setting where children are asked to be a parent, their choices might be closer to parental behaviour than in an ad lib food intake setting. Therefore, it is expected that restriction would be related to children’s food purchases in the intended direction (e.g. children will buy less if their mothers are highly restrictive). Further, overweight children have been found to be subject to more control and they might also be affected differently by these behaviours, therefore the interactions between weight status and maternal restriction on children’s food purchases will also be studied.

The present study examined preschoolers’ food choices while role-playing a mother who buys food for her family, and whether overweight children choose more high caloric foods than non-overweight children. Further, it was hypothesized that the interactions between maternal restriction and child overweight would be related to food choice, as parenting messages may affect children’s ideas about what is appropriate to consume daily.

**Method**

**Participants**

The scientific committee of the Behavioral Science Institute (BSI) of the Radboud University Nijmegen granted permission to carry out the present study. Fifty-
nine public primary schools in the eastern part of the Netherlands were approached, and 13 schools (22%) gave permission to conduct the study. Lack of time and space were by far the most common reasons for the other schools to refuse participation. The parents of the children in all preschool classes received a letter to inform them about the study and to give them the opportunity to decline participation. Only one parent declined, and from her child no data were collected. In total, 619 preschoolers’ weights and heights were measured by the second author using a portable stadiometer and a weighing scale according to standard procedures (translated from the Nhanes 2002 Anthropometry procedures manual) in light clothing, without shoes, to the nearest of 0.1 kg and 0.5 cm.

All mothers were asked to fill out a questionnaire containing general questions about the mother and her partner, own height and weight, and the Restriction subscale of the Child Feeding Questionnaire (Birch et al., 2001). The 470 children (76%) whose mothers returned a completed questionnaire formed the group from which the children for the role-play were selected. This group consisted of 234 boys and 236 girls, with a mean age of 5 years and 2 months (SD = 8 months, range = 3 years and 10 months to 6 years and 11 months). Body Mass Index (BMI) was computed by applying the formula weight/height^2. To determine whether children were overweight or not, internationally accepted age and sex specific BMI cut-off points for overweight were used (Cole et al., 2000). These cut-off points are based on modeled curves that correspond with a BMI of 25 (for overweight) or 30 (for obesity) at age 18. The main advantage of these cut-off points over the use of percentile scores is that it does not require a norm group and therefore does not differ by background (e.g. country) or percentage of overweight subjects in the reference group. In the present sample children’s mean BMI was 16.2 (SD = 1.5) and 89 children (18.9%) were overweight. 56 of the 89 children (62.9%) participated in the role-play, they were selected based on 1. age (children under 4 were excluded), 2. family composition; only intact families (two parents) were included as family size might be related to children’s purchases, and 3. school; 5 of the 13 schools participated in the screening but not in the role-play.

Overweight children were matched within their schools to non-overweight children based on age, sex, ethnicity, number of children in the family, educational level, and hours of paid employment per week of both parents. Again, only children of intact families were selected. The final selection included 56 pairs of children with 28 pairs of boys and 28 pairs of girls. At the day of the role-play, the participating children were between 4 years and 2 months and 6 years and 8 months old with a mean age of 5.5 (SD = 0.62). The groups did not differ in any of the variables they were matched for, except for the hours of paid employment per week of the fathers. The fathers of children of the overweight group (M = 43.3, SD = 10.1) worked more on average than the fathers of the non-overweight children (M = 38.8, SD = 8.9; t = 2.45, p = .02). Mean BMI of the overweight group was 18.5 (SD = 1.0) and mean BMI of the non-overweight group was 15.3 (SD = 0.8; t (112) = 18.76, p < .001).

**Materials**

Mother questionnaire. Mothers’ questionnaires consisted of a general part including socio-demographic information, height and weight questions, and a Dutch
translation of a subscale of the Child Feeding Questionnaire (Birch et al., 2001). The CFQ assesses parents’ general ideas and behaviours with regard to child feeding, and consists of seven subscales. The Restriction subscale was used for this study.

Restriction. Mothers’ tendencies to restrict their children’s food intake were assessed through eight restriction items, e.g. ‘I have to be sure that my child does not eat too many high-fat foods’, or ‘If I did not guide or regulate my child’s eating, he/she would eat too many junk foods’. Response categories ranged from 1 ‘disagree’ to 5 ‘agree’. Cronbach’s alpha appeared to be low (α = 0.59 in the role-play sample, and .38 in the total sample), and therefore factor analysis (Principal Component Analysis, Varimax rotation) was done on the total sample (n = 470). We chose for a three factor solution because the first three factors had Eigenvalues above 1. The three subscales consisted of ‘importance of preventing consumption of unhealthy foods’ (two items; factor loadings of .89 and .88; r (112) = 0.56, p < .01), ‘using food as reward’ (two items; factor loadings of .85 and .82; r (112) = 0.65, p < .01), and ‘perceived need to inhibit child’s intake of unhealthy foods’ (two items; factor loadings of .88 and .87; r (112) = 0.69, p < .01). Two of the original eight restriction items (‘I have to be sure that my child does not eat too much of his/her favorite food’, and ‘I intentionally keep some foods out of my child’s reach’) did not fit adequately (factor loadings < .50) to any of the factors and were excluded from further analyses. Several studies examined the psychometric properties of the original English version of the CFQ, such as the predictive validity, content validity, and internal consistency (Birch et al., 2001; Kaur et al., 2006). A remarkable difference between previous studies and our findings is that the original Restriction scale was divided into three meaningful subscales in the present study.

Child questionnaire. Children’s experienced restriction from the mother was assessed through a Dutch translation (van Strien & Bazelier, 2007) of the Restriction subscale of the Kids’ Child Feeding Questionnaire (Carper et al., 2000). The items were read aloud by the researcher, and children could respond to these items by choosing between response categories 0 ‘no’, 1 ‘sometimes’, and 2 ‘yes’. Cronbach’s alpha was 0.63. An example of a Restriction item is ‘If you ask for a snack, does your mommy let you have it?’ A factor analysis confirmed the unidimensional structure of the Child version Restriction scale.

Children’s food choices. To assess children’s food choices, a miniature supermarket at Barbie size was used (see Figure 1). The whole miniature setup contained two cupboards, a freezer, a counter, 86 different food products, a mother doll, a pushcart, and a girl doll representing the salesclerk. For most of the products, the original wrappings were scanned and scaled down in order to obtain realistic and recognizable miniatures. Bottled drinks were made by putting scaled labels on miniature bottles. Fresh products (i.e. fruit, vegetables, and meat) were custom-made out of suitable clay. For all children the products were placed in the same exact position.

The choice of the food products in the miniature market was based on the Dutch food composition table (NeVO-Foundation, 2001) in which detailed nutritional information is provided for foods organized in main categories, such as meat, oils & sauces, fruits & vegetables, et cetera. From every category, foods were chosen that fitted in one of the three food groups used in this study (dinner, snacks, and drinks).
and were common in Dutch households. Attention was paid to avoid disproportionate representations of one of the food groups in the miniature grocery shop. The final selection contained 30 dinner products, 32 snacks, and 24 drinks. It is important to stress that by no means we aimed to have a completely realistic selection of food products sold in typical Dutch supermarkets as this would result in a high number of products and would make the role-play too complicated for young children.

**Procedure**

A protocol (piloted with five preschoolers (two boys and three girls, all aged 5) was made to ensure that the instructions were identical for each child. The children performed the role-play at their schools, one by one, in a separate room, and during regular school hours. First, it was explained to the children that they will start with playing a game in the miniature supermarket, and that the researcher then will ask some questions. Secondly, the researcher described in general terms what kind of products could be found in the supermarket (e.g. “here you see fruit”, “on the next shelf are vegetables”, “here are drinks”, et cetera), for the pilot study had revealed that children sometimes overlooked parts of the supermarket and children were asked if there was anything they did not recognize. Next, the researcher brought out the mother doll and started reading out loud the story from the protocol. This described how the mother discovered after breakfast that she had totally run out of food for the family (father, mother and children), and that she had to go to the grocery shop to buy dinner products, drinks, and maybe some snacks, since she had run out of them as well. The researcher underlined that it was a normal school day and explained that they only needed to buy food for one day. Then, the children were asked to play the mother, and the researcher would play the salesclerk. They were given the mother doll together with the pushcart and the researcher shortly repeated the assignment. When the children had finished shopping they were asked to put the products on the counter one by one and identify the products they bought to ensure...

**Figure 1. Miniature supermarket for the role-play**
the validity of their purchases. If a product was identified incorrectly, it was counted as the product the child referred to. After the role-play, four (irrelevant) practicing items and the KCFQ were administered. Finally, the children received a small token of appreciation. The entire procedure took about 27 minutes on average (SD = 8 minutes, range = 15 – 50 minutes). Overall, the children were enthusiastic about the role-play and very motivated to cooperate.

**Statistical analyses**

Based on their caloric value (NEVO-Foundation, 2001) the foods were divided within their categories in high or low caloric snacks, drinks, and dinner products. Sum scores in these six categories and a total sum score were computed from the children’s purchases. Additionally, energy density (kCal/100g) of the purchased foods was calculated to confirm that some were bigger threats to a healthy weight than others. The average energy density of all the purchased foods, as well as average energy density in the six categories were computed. The average caloric value (Kcal) per 100 gram of each product was 101.8 for low caloric dinner products, 333.5 for high caloric dinner products, 143.7 for low caloric snacks, 445.4 for high caloric snacks, 8.7 for low caloric drinks, and 68.0 for high caloric drinks.

The analyses of the data occurred in three phases. First, t-tests were performed to see whether overweight and non-overweight children differed in their purchases. Both differences in amounts of food purchases as well as differences in caloric values of purchases were analyzed for the total and for each of the six categories (high and low caloric snacks, drinks and dinner products). Second, t-tests were conducted to examine whether mothers of overweight and non-overweight children differed in the scores of both self-reported and child-reported restriction, and correlations between maternal restriction and food purchases in overweight and non-overweight children were determined. Third, mothers’ mean scores on the CFQ Restriction subscales and children’s mean score on the KCFQ Restriction subscale were standardized; that is, centered for their means (Whisman & McClelland, 2005) and subsequently the interaction variables with weight status were computed. Finally, by means of linear regression analyses it was tested in separate analyses whether mother and child-reported maternal restriction moderated the relations between child’s weight status and the children’s purchases. Child weight status and the restriction variables were entered in the first step, and the interaction term was added in the second step.

**Results**

**Characteristics of the families**

In the selected sample of 112 children, the majority of the mothers were born in the Netherlands (94.6%), the others were born in Turkey (5.4%). Of the fathers, 90% was born in the Netherlands, 5.4% in Turkey, 1.8% in Germany, 1.8% in a European country, and 0.9% in an African country. With regard to religion, 44.6% of
<table>
<thead>
<tr>
<th>Products</th>
<th>Kcal/100g</th>
<th>Non-overweight</th>
<th>Overweight</th>
<th>Non-overweight</th>
<th>Overweight</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dinner</td>
<td>Low cal</td>
<td>2.56 2.43</td>
<td>3.14 2.73</td>
<td>1.18 .24</td>
<td>234 234</td>
<td>1.49 .14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High cal</td>
<td>1.32 1.10</td>
<td>1.91 1.53</td>
<td>2.34 .02</td>
<td>460 418</td>
<td>2.25 .03</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.89 2.76</td>
<td>5.05 3.75</td>
<td>1.86 .07</td>
<td>694 512</td>
<td>2.35 .02</td>
<td></td>
</tr>
<tr>
<td>Snacks</td>
<td>Low cal</td>
<td>1.27 1.52</td>
<td>1.27 1.50</td>
<td>0.02 .97</td>
<td>92 109</td>
<td>0.46 .64</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High cal</td>
<td>3.05 3.34</td>
<td>4.50 3.75</td>
<td>2.16 .03</td>
<td>1349 1462</td>
<td>1.99 .05</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.93 3.72</td>
<td>5.25 4.00</td>
<td>1.81 .07</td>
<td>1442 1505</td>
<td>1.97 .05</td>
<td></td>
</tr>
<tr>
<td>Drinks</td>
<td>Low cal</td>
<td>.95 0.88</td>
<td>1.39 1.41</td>
<td>2.01 .05</td>
<td>19 24</td>
<td>0.41 .68</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High cal</td>
<td>2.78 2.13</td>
<td>4.05 3.47</td>
<td>2.33 .02</td>
<td>185 183</td>
<td>2.25 .03</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.75 2.60</td>
<td>5.45 4.37</td>
<td>2.50 .01</td>
<td>204 187</td>
<td>2.27 .03</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>12.07 7.69</td>
<td>16.35 10.32</td>
<td>2.45 .02</td>
<td>2354 1867</td>
<td>2.46 .02</td>
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</tr>
</tbody>
</table>

Table 1: Children’s purchases: means, standard deviations, and results for the t-test analyses for independent samples (n = 112).
the mothers was Catholic, 12.5% was Protestant, 4.5% had other Christian beliefs, 5.4% was Islamic, and 33% indicated not being religious. Seventy-five percent of the mothers and 11% of the fathers had a low education level (elementary school or low (vocational) education), and 25% and 73% of the mothers and fathers respectively had average educational levels (secondary education or intermediate vocational education), and 17% of the fathers had high educational levels (college or university). On average, the mothers worked 16 hours per week and the fathers worked 41 hours per week. Self-reported height and weight of the mothers yielded a mean BMI of 24.3 (SD = 3.85), with one-third of the mothers being overweight (33%). In the group of overweight children a higher percentage of mothers (46.2%) were overweight compared to the non-overweight children’s mothers (23.2%) ($X^2(1) = 6.30, p < .05$).

**Table 2:** Child feeding questionnaire: means, standard deviations, and results for the t-test analyses for independent samples ($n = 112$).

<table>
<thead>
<tr>
<th></th>
<th>Non-overweight</th>
<th>Overweight</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
<th>t</th>
<th>p</th>
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<tr>
<td>Mother-reported</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Restriction: Preventing</td>
<td>4.52</td>
<td>0.63</td>
<td>4.62</td>
<td>0.63</td>
<td>0.82</td>
<td>.42</td>
<td></td>
<td></td>
</tr>
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<td>Restriction:</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Food as Reward</td>
<td></td>
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<tr>
<td>Need to Inhibit</td>
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<td></td>
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<tr>
<td>Child-reported</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Restriction</td>
<td>1.00</td>
<td>0.36</td>
<td>0.99</td>
<td>0.42</td>
<td>-0.21</td>
<td>.83</td>
<td></td>
<td></td>
</tr>
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</table>

**Children’s purchases**

*Number of products.* Overweight children bought more products in total than non-overweight children (Table 1), which was merely the result of an inclination to buy more high caloric products. Overweight children bought significantly more high caloric dinner products and snacks, and not more low caloric dinner products and snacks. Also overweight children tended to buy both more high and low caloric drinks. Summarizing, these results demonstrated that overweight children bought more products in total, and more high caloric foods. No sex differences in food purchases were found in the total group, and neither in the overweight and non-overweight groups. Therefore, child sex was not included in further analyses.
<table>
<thead>
<tr>
<th></th>
<th>Non-overweight</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>15</th>
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<tr>
<td><strong>Overweight</strong></td>
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<td></td>
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<tr>
<td>Purchases</td>
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<td></td>
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</tr>
<tr>
<td>1 Dinner low cal</td>
<td>-.10</td>
<td>.40**</td>
<td>.32*</td>
<td>.44**</td>
<td>.36**</td>
<td>.70**</td>
<td>- .01</td>
<td>.06</td>
<td>-.01</td>
<td>-.16</td>
<td></td>
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<td>2 Dinner high cal</td>
<td>-.12</td>
<td>.07</td>
<td>.23</td>
<td>.44**</td>
<td>.36**</td>
<td>.70**</td>
<td>- .01</td>
<td>.06</td>
<td>-.01</td>
<td>-.16</td>
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<td>3 Snack low cal</td>
<td>-.13</td>
<td>.13</td>
<td>.36**</td>
<td>.07</td>
<td>.23</td>
<td>.44**</td>
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<td>.08</td>
<td>.38**</td>
<td>.03</td>
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<td>4 Snack high cal</td>
<td>-.14</td>
<td>.32*</td>
<td>.57**</td>
<td>.24</td>
<td>.61**</td>
<td>.30*</td>
<td>-.37**</td>
<td>-.13</td>
<td>.03</td>
<td></td>
<td></td>
<td></td>
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<td>5 Drink low cal</td>
<td>-.15</td>
<td>.32*</td>
<td>.57**</td>
<td>.24</td>
<td>.61**</td>
<td>.30*</td>
<td>-.37**</td>
<td>-.13</td>
<td>.03</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>6 Drink high cal</td>
<td>-.16</td>
<td>.32*</td>
<td>.57**</td>
<td>.24</td>
<td>.61**</td>
<td>.30*</td>
<td>-.37**</td>
<td>-.13</td>
<td>.03</td>
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<td>7 Total</td>
<td>-.17</td>
<td>.32*</td>
<td>.57**</td>
<td>.24</td>
<td>.61**</td>
<td>.30*</td>
<td>-.37**</td>
<td>-.13</td>
<td>.03</td>
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<tr>
<td>CFQ mother</td>
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<td>.32*</td>
<td>.57**</td>
<td>.24</td>
<td>.61**</td>
<td>.30*</td>
<td>-.37**</td>
<td>-.13</td>
<td>.03</td>
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<tr>
<td>10 Restriction:</td>
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<td>.32*</td>
<td>.57**</td>
<td>.24</td>
<td>.61**</td>
<td>.30*</td>
<td>-.37**</td>
<td>-.13</td>
<td>.03</td>
<td></td>
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<tr>
<td>11 Restriction:</td>
<td>-.21</td>
<td>.32*</td>
<td>.57**</td>
<td>.24</td>
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<td>.30*</td>
<td>-.37**</td>
<td>-.13</td>
<td>.03</td>
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<td>12 Restriction:</td>
<td>-.22</td>
<td>.32*</td>
<td>.57**</td>
<td>.24</td>
<td>.61**</td>
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<td>CFQ child</td>
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<td>.32*</td>
<td>.57**</td>
<td>.24</td>
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<td>-.37**</td>
<td>-.13</td>
<td>.03</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05  ** p < .01
Caloric value. The caloric values of the total amount of purchases, as well as the caloric values of purchased high caloric dinner products, snacks, and drinks were significantly higher for the overweight children (Table 1). No significant differences between the two groups were found for the caloric values of purchased low caloric dinner products, snacks, and drinks.

**Maternal restriction**

Comparison of overweight and non-overweight children. For all three restriction factors, no significant differences were found between mothers of overweight and non-overweight children (Table 2). Similarly, no differences were found between overweight and non-overweight children’s reports of experienced restrictions from their mothers. Correlations between maternal restriction and children’s food purchases are reported in Table 3. Child reports of maternal restriction were unrelated to food purchases and, similarly, maternal reports were unrelated to overweight children’s food purchases. For the non-overweight children, however, higher ‘preventing consumption’ restriction and lower ‘use of food as a reward’ were associated with

---

**Table 4:** Beta’s for moderating effects of maternal child-feeding behaviour and concern.

<table>
<thead>
<tr>
<th>CFQ Mother¹</th>
<th>Dinner</th>
<th>Snacks</th>
<th>Drinks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low cal</td>
<td>High cal</td>
<td>Low cal</td>
</tr>
<tr>
<td>Step 1 Weight status</td>
<td>.12</td>
<td>.22*</td>
<td>-.02</td>
</tr>
<tr>
<td>Restriction: preventing</td>
<td>-.01</td>
<td>-.03</td>
<td>.11</td>
</tr>
<tr>
<td>Step 2 Interaction</td>
<td>-.05</td>
<td>.05</td>
<td>-.26</td>
</tr>
<tr>
<td>Step 1 Weight status</td>
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<td>.21*</td>
<td>-.05</td>
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<tr>
<td>Restriction: food as reward</td>
<td>-.07</td>
<td>-.03</td>
<td>-.25**</td>
</tr>
<tr>
<td>Step 2 Interaction</td>
<td>-.17</td>
<td>-.14</td>
<td>.18</td>
</tr>
<tr>
<td>Step 1 Weight status</td>
<td>.12</td>
<td>.20*</td>
<td>-.03</td>
</tr>
<tr>
<td>Restriction: need to inhibit</td>
<td>.05</td>
<td>.08</td>
<td>-.05</td>
</tr>
<tr>
<td>Step 2 Interaction</td>
<td>.07</td>
<td>-.33*</td>
<td>.15</td>
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<table>
<thead>
<tr>
<th>CFQ Child</th>
<th>Dinner</th>
<th>Snacks</th>
<th>Drinks</th>
</tr>
</thead>
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<tr>
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<td>.12</td>
<td>.23*</td>
<td>-.01</td>
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<tr>
<td>Restriction</td>
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<td>.00</td>
<td>.04</td>
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<tr>
<td>Step 2 Interaction</td>
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<td>-.04</td>
<td>.02</td>
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</tbody>
</table>

† p < .05 † p < .01  
¹ Analyses with the original restriction scale of the CFQ did not reveal significant interactions between weight status and maternal restriction on any of the food choice outcome variables.
more low caloric snacks, whereas high ‘need to inhibit’ was associated with more high caloric dinner products.

**Moderating roles of maternal restriction.** Linear regression analyses were used to examine whether mothers’ restriction affected the relations between children’s weight status and their food purchases. No significant main or moderating effects were found for the degree of importance mothers attached to their children’s eating less unhealthy foods (preventing consumption; Table 4). A main effect of using food as a reward on the number of children’s purchased low caloric snacks was found, i.e., children bought significantly less low caloric snacks if their mothers often used food as a reward. However, mothers’ self-reported tendency to reward good behaviour with food did not moderate the relations between children’s weight status and their food purchases. Furthermore, analyses revealed main effects of mother’s perceived need to inhibit their children’s unhealthy food consumption, in that children tended to buy more high caloric snacks if their mothers scored high on reported need to prevent their children from eating too much unhealthy food. Mothers’ tendency to inhibit their children’s consumption of unhealthy food moderated the relations between child weight status and the amount of purchased high caloric dinner products, in that the positive relation between child’s BMI and number of purchased high caloric dinner products was weaker for children whose mothers reported a high perceived need to inhibit their children’s intake of unhealthy foods. If examining the moderating effects of child-reported maternal restriction, analyses revealed that there were no significant main or interaction effects of restriction.

**Discussion**

In this study it was found that overweight children tend to buy more products in general and more high caloric foods, implying a positive association between children’s body weight and the caloric value of what they find normal to consume. No differences on both self-reported and child-reported restriction were found between mothers of overweight and non-overweight children. Also, the findings provided little evidence for main or moderating effects of maternal restriction. These findings suggest that mothers’ restriction efforts are not consistently related to children’s ideas about normal food parcels. The positive relations between children’s weight status and the caloric values of their food choices, found in this study, correspond to the positive associations between weight status and the caloric values of what families tend to buy and eat (Fisher & Birch, 2002; Krahnstoever Davison et al., 2005; Ransley et al., 2003; L. A. Tucker, Seljaas, & Hager, 1997). From these results it seems that a higher body weight is associated with habitual consumption of a higher caloric food parcel, and in line with this our findings suggest that already young children seem to relate weight status with ideas about what is normal to consume daily.

The present study was the first in using a role-play to examine young children’s ideas about normal, everyday foods. Based on the study of Dalton et al. (2005), it was assumed that by asking preschoolers to play a mother who buys food for the family
it would be possible to elucidate children's implicit ideas about the appropriateness of foods for everyday life. The findings revealed a clear pattern of children's food purchases, in that overweight children's purchases tended to be higher in caloric value, which is in line with research on relations between child food intake and weight status (Dubois, Farmer, Girard, Peterson, & Tatone-Tokuda, 2007; Fiorito, Ventura, Mitchell, Smiciklas-Wright, & Birch, 2006; Lee et al., 2001; Tucker et al., 1997). This suggests that children's food choices indeed reflected what they normally eat, thus providing support for the validity of a role-play in a miniature supermarket as a tool to examine children's ideas about normal foods. However, overweight children might have bought more since they like to eat more, for overweight in children relates to overeating (Dubois et al., 2007). On the other hand, one would expect them to buy more low caloric products as well, but little evidence was found for this. When looking at single products instead of food groups, French fries were popular in both groups, implying that children's own preferences to some degree affected their choices. However, the children also bought beer, wine, and cigarettes, products that the children themselves obviously will not consume or like.

This provides strong support for a modeling effect: Children seem to be affected in their purchases by what they see their parents buy and consume. Overweight was found to aggregate within families (Davison et al., 2000) and at very young ages children already seem to copy their parents' unhealthy food choices (Sutherland et al., 2008). More research on young children's food choices could further examine the factors that might relate to modelling of parental behaviours, such as parental weight, gender, and quality of relationship. Overall, it seems that a role-play in a miniature supermarket is a suitable tool to study preschoolers' ideas of what foods are normal.

Few main effects of mothers' restriction on children's purchases were found. Perhaps food-related messages affect ideas about eating more than about foods, therefore parental child feeding behaviours might be more strongly related to children's ideas about eating behaviour. Another possibility could be that preschoolers are too young to understand the underlying concept of the parenting strategy, and as a result will not be affected in their ideas about the appropriateness of foods. Possibly, a stronger relation between restriction and children's ideas can be found in older children.

Little variance in mothers' reported restriction was found, subsequently leaving fewer opportunities for interaction effects to occur. However, one moderating effect of maternal restriction was found, in that mothers' perceived need to inhibit child food intake negatively affected the relations between child BMI and number of high caloric dinner products. As hypothesized, the effect was in the intended direction, in that the relations between BMI and number of products bought were weaker if mothers reported a high perceived need to inhibit child food intake. It seemed as if mothers who were aware of the need to inhibit their child's food intake were successful in influencing their children's eating habits. Alternatively, during mealtimes overweight children might evoke this parenting behaviour, and this might affect the parents' ideas about dinner products.
No direct or moderating effects of child-reported maternal restriction were found. This might be due to the limited answering options (leaving little opportunity for differentiation between children), and to the possibility that children often answered ‘sometimes’ to avoid loyalty breach resulting in little variance in children’s mean scores, and also to concentration problems of some children. All these reasons might have caused children’s reports of maternal restriction to be somewhat less reliable, and it could explain why no direct or moderating relations were found.

Some limitations of the present study should be mentioned. First, no conclusions about causality could be drawn because of the cross-sectional design of the study. Possibly, an experimental design in which it is tested whether maternal feeding behaviours prior to the role-play affect children’s food purchases could clarify how parenting affects ideas about food. Second, generalizability of the results is restricted to intact families. Also, fathers were not included, which is a limitation since including both parents would give a more complete picture of the role of families. Third, the findings suggest that overweight and non-overweight children indeed have different ideas about what normal food parcels comprise, but it remains unknown to what extent confounding child characteristics partially accounted for this difference. For instance, impulsivity and appetite might partly explain children’s purchases, and might be related to children’s weight status as well. Taking these variables into account in future studies would provide important additional information about what would guide children’s food purchases. Fourth, the questionnaire used to measure restriction was translated from English into Dutch (van Strien & Bazelier, 2007). The items were developed in a U.S. sample and additional analyses are needed to show whether these have the same meaning for Dutch mothers and children (item equivalence) and whether the constructs being tapped relate to other related constructs in the same manner (functional equivalence) (Hui & Triandis, 1985). Finally, assumptions were made about the caloric values of the products in the miniature shop. However, it is difficult to infer caloric values from the caloric density of the food parcels the children purchased as they did not have the opportunity to choose from different types or amounts of products, and we did not know what portion sizes they intended to consume. This setting is not an exact reflection of reality, by taking the children’s age in consideration we deliberately offered a relatively small range of products compared to real life and we did not provide different portion sizes. Therefore, the differences in the caloric values of the children’s purchases should be taken as a not exact reflection of reality.

Shopping in a real supermarket would avoid some of the aforementioned difficulties. For preschoolers it may become too complicated, whereas for older children a real supermarket might be more appealing than a role-play situation with dolls. This would give researchers additional opportunity to offer children more food options and to study differences in amounts and caloric values as well as nutritional value (e.g. fat, sugar, and micronutrient content). Furthermore, influences of marketing, advertisements, and product placement can then be taken into account. Exposure to brand advertisement on television was found to influence children’s food consumption patterns; also, additional associations depending on family environment (Buijzen, Schuurman, & Bomhof, 2008) and the influences of these processes on
children’s food choices should be taken into account. Alternative research methods such as observational studies might clarify the relationships between parental behaviour and children’s ideas about food. Fathers’ child-feeding behaviours and attitudes should be included also, to attain a more complete picture of children’s food-related parenting environment. Moreover, a qualitative approach (for example semi-structured interviews with parents) could be very informative to study what exactly happens within families when it comes to food, and whether different processes occur in overweight and non-overweight children’s families.

In conclusion, overweight and non-overweight preschoolers’ food purchases differ in caloric value, suggesting a positive relation between children’s weight status and the caloric value of what they find normal to consume. It appears that young children have already developed ideas about what is normal for everyday consumption, and overweight children have become used to weight-threatening diets. Little evidence was found for direct or moderating effects of maternal restriction.
CHAPTER 10
Maternal controlling behaviours and young overweight children’s food choices: An observational role play study

Abstract

Previous studies on the relation between parental restriction, monitoring, pressure to eat, and other food-specific parenting practices have shown conflicting results on their relation to children’s weight and food intake. In addition, results are difficult to interpret due to the use of different measures. Observational research might be an adequate additional method to study parent-child interactions over food choices, especially in young children. In this study, 40 overweight children (aged 5-7) participated in a structured role-play in which they were assigned to do grocery shopping in a miniature market. Next, they participated in the same role-play but with their mothers present, who were instructed to help or interfere when necessary. Mother-child interactions were video-taped, each event was coded (resulting in two factors: authoritarian and monitoring control) and general ratings were scored for the whole interaction (resulting in three factors: “both conflict”, “child dominant”, and “negativity both”).

Generally, mothers seemed successful in influencing their children’s food choices as these were healthier compared to when the child shopped alone. Higher scores on “authoritarian control” were associated with higher low-caloric snacks purchases while “monitoring control” was unrelated to food choices. For general ratings, the “child dominant” factor was strongly associated with higher purchase of high caloric snacks, drinks and dinner products and more products in total while it was not related to the purchase of low caloric food. This factor is characterised by high withdrawal and permissiveness of the mother and low dominance while the child is highly dominant. Thus, this suggests that not specific child or maternal behaviours but particularly interaction patterns between mother and child are related to the food choices of overweight children.
Introduction

Parents play an important role in children’s food related ideas and behaviours. Weight status, food choices and food preferences “aggregate” within families (Davidson et al., 2000; Faith, Keller et al., 2004; Rankinen & Bouchard, 2006), which suggests modelling and transmission of these features. Parents also have a more direct influence on their off-spring through food-specific parenting practices. In research on food-specific parenting, most attention has been focussed on parental control and restriction over food intake; that is their attempts to control their children’s eating by restricting access to foods. Other food-specific parenting practices include pressure to eat (ie. prompting, pressure or encouragement to eat more healthy foods or more food in general, particularly at mealtimes), monitoring food intake (ie. extent to which parents report watching their children’s consumption of (energy-dense) foods), instrumental and emotional feeding (i.e. use of ‘food treats’ as rewards or comfort), and showing concern about child weight (i.e. extent to which parents are concerned that their children will be overweight or will have to diet) (Birch et al., 2001; Wardle & Carnell, 2007).

Research on food-specific parenting practices and their relation to weight and food intake is needed to be able to focus future interventions not only on what foods parents provided to their children but also how these foods should be provided (Baughcum et al., 2000; Clark et al., 2007). In a recent review, Clark et al. (2007) concluded that parental restriction was most consistently related to child’s weight gain and sometimes produced unintended effects on food intake in the sense that restricted children eat more. Monitoring of child food intake by parents, on the other hand, was related to lower fat intake and food consumption. A series of studies by Birch and Fisher in samples of young children (Birch & Fisher, 2000; Fisher & Birch, 1999a, 1999b, 2000) indeed showed that maternal food restrictions were associated with unintended outcomes, such as higher preference for, and intake of, the restricted foods and lower ability to self-regulate intake (Birch, 1998; Fisher & Birch, 1999a; S. L. Johnson & Birch, 1994). For maternal monitoring, Faith et al. (2004) found that in the low-risk group monitoring was related to lesser child weight gain. In contrast Spruijt-Metz et al. (2006) found no association between monitoring and restriction on the one hand, and weight changes on the other. Not all studies support the conclusion by Clark et al. (2007) that restricted children eat more. An overview by Wardle and Carnell (2007) that focussed more on high-risk group and longitudinal studies concluded that results of the studies they reviewed on the relation between food-specific parenting and weight have been conflicting and concluded that “there is some way to go before it will be possible to give evidence-based guidance to parents” (p96). They argue that greater parental control either leads to lower adiposity in the long-term or has minimal impact on weight for the majority of children.

For pressure to eat, results were mixed and also seem to depend on the weight status of the child (Clark et al., 2007). For example, Faith et al. (2004) found that pressure to eat was associated with reduced BMI z-scores among high-risk children only. Lee, Mitchell, Smiciklas-Wright, and Birch (2001) found that mothers of daughters who had higher fat intakes reported using more pressure to eat than those who
reported fat intakes in accordance with recommendations whereas Spruijt-Metz et al. (1998) found no association between pressure to eat and weight.

Some of the contradictions in earlier studies might be due to conceptualisation and measurement of parental behaviours. Ogden, Reynolds, and Smith (1998) stated that research on parental control is confusing and interpretation of the results difficult due to the use of different measures. Also, the way parents enforce control might be an important factor, as parental control can be harsh, suppressive and manipulative, or alternatively, more in terms of supportive monitoring (Snoek, Engels et al., 2007). Measures of global parenting styles that address this distinction between monitoring and authoritative control are probably not sensitive enough to detect associations between parental practices and children’s weight. Therefore, measurements that explicitly assess feeding restrictions are needed (Faith, Scanlon et al., 2004).

One of the most commonly used questionnaires on food specific parental restricting of children is the Child Feeding Questionnaire (CFQ) (Birch et al., 2001). Although the CFQ showed good psychometric characteristics in a number of studies (Birch et al., 2001), it is still an unresolved issue how scores on the CFQ are related to parents’ actual behaviours. In our own work, overweight children showed greater preference for unhealthy foods than normal weight children but, somewhat surprisingly, maternal behaviours, such as restriction of food intake measured by the CFQ were unrelated to these differences (Snoek, Sessink, & Engels, resubmitted). Also, we found no clear correspondence between child and mothers reports on the CFQ scales indicating discrepancies between parents’ reports and children perceptions of their parents’ behaviour. Similarly, Carper, Fisher, and Birch (2000) found that while only 26% of the parents indicated that they pressured their daughters to eat, 61% of the daughters reported to perceive some degree of parental pressure. This raises some questions on and to what extent mothers generally give a fair and realistic report of their behaviour when it comes to complex behaviours like how they handle food intake of their children.

Observational designs might be a good alternative way to study mother-child interactions over food, especially when addressing young children, who also can not verbally report on their perceptions of their parents’ behaviours. Observations of children's attempts to influence their parents’ food purchases have been used to study the effect of TV advertisement (Brody, 1981) and also more recent studies looked at interactions between parents and children while grocery shopping. One study has shown that a substantial number of children is actively involved in purchase decisions, and that parent-child interactions during shopping reveal which parenting practices are commonly used by the parents (Pettersson, Olsson, & Fjellstrom, 2004). Similarly, O’Dougherty, Story, and Stang (2006) found that children were actively engaged in food shopping. Children’s requests were in half of the cases for sweets or snacks. Parents refused just over half of the requests most often by ignoring the request, by explaining why not, or by a simple verbal no. Usually, children accepted their parent’s refusal at once, suggesting that parents were in charge during the shopping (O’Dougherty et al., 2006). Parent-child interactions over food choices have also been observed in other situations such as family meals. Moens, Braet, and
Soetens (2007) found that during family dinners, families with an overweight child showed twice as much maladaptive control strategies, and less parental support.

In the present study we expanded on previous observational studies by recording mother-child interactions in a structured role-play paradigm where children are asked to role play a mother doing food shopping for her family by using a doll and a mini-market. We have previously shown that this mini-market paradigm is suitable to assess children’s ideas about normal every day food (Snoek et al., resubmitted) and a similar setting has been used to show that young children (2-6 years) already resemble their parents in food choices (Sutherland et al., 2008). The mini-market has an important advantage that even children as young as four years old have a clear overview of the available products, and are able to do the shopping themselves. Moreover, by providing an assignment in which children had access to both healthy and unhealthy foods we expected to provoke maternal controlling behaviours within the short time period of the observation.

Parental attempts to control and restrict children’s food intakes have been found to be higher for children with overweight or perceived at risk for overweight by their mothers while pressure to eat was higher for those who were thinner or considered underweight by their mothers (Birch & Fisher, 2000; Faith, Scanlon et al., 2004; Fisher & Birch, 1999a; Francis, Hofer, & Birch, 2001). Also, overweight children have been observed to be subject to more maladaptive control (Moens et al., 2007). In the present study, we concentrated on overweight children as these might be a high risk group for maternal control over food intake. Next, within the overweight group we examined whether differences in Body Mass Index (BMI) and other child characteristics, such as age, sex and perceived weight status are related to maternal controlling behaviours.

Finally, we hypothesized that maternal controlling behaviours might also be related to maternal characteristics, such as maternal BMI, restrained eating and body dissatisfaction. Mothers do not always recognise their child’s overweight, alternately or additionally their behaviour might be driven by the way they deal with food themselves. It has for example been found that although girls who were encouraged to diet were on average heavier than girls not encouraged by their parents; 50% of them was actually not overweight while mothers’ reports of restricting their daughters’ intake was related to the mothers’ own dietary restraint (Dixon et al., 1996; Francis et al., 2001). Birch and Fisher (2000) found that a mother’s efforts to control her own weight, as measured by dietary restraint, in combination with her perceptions of her daughter’s risk of overweight, predicted the mother’s use of greater restrictive control in child feeding. Wardle, Sanderson, Guthrie, Rapoport, and Plomin (2002), on the other hand found no significant differences in feeding style for high restrained mothers. Similarly, others found no association between maternal weight status and restriction (Francis & Birch, 2005) or degree of overt control (Ogden et al., 2006). Overall there is some support for an association between maternal characteristics and parenting behaviours.

In summary, for the present study a structured role-play in which children were assigned to grocery shop in a miniature market and their mothers were instructed to help or interfere when necessary was used to observe how maternal food controlling
behaviours would be related to overweight children’s food choices. Additionally, the relation were examined between both child characteristics (BMI, perceived weight, age, and sex) and mother characteristics (maternal BMI, restrained eating, and body dissatisfaction) on one hand, and maternal behaviours on the other hand.

Method

Participants

For the present study, 13 schools in the eastern part of the Netherlands participated. The parents of the children in all preschool classes (5-7 years old) received a letter to inform them about the study and to give them the opportunity to refuse participation. Also, mothers were asked to fill in a questionnaire. Only one parent refused participation, so her child was excluded from data collection. For 619 children weight and height were measured according to standard procedures in light clothing, without shoes, to the nearest of 0.1 kg and 0.5 cm. In the total sample, children’s mean BMI was 16.2 (SD = 1.5) and 89 children (18.9%) were overweight (Cole 2000). From this overweight group, 58 overweight children whose mothers filled in the questionnaire (the total response was 76%, n = 470) were selected and matched within their school to 58 normal weight children based on age, sex, ethnicity, parental education level, hours of paid employment per week of mothers, and family size. Only children living with both their parents were selected. These children participated in the first role play which took place between February and April 2007 (Snoek et al., resubmitted). Two children were later excluded resulting in a total sample of 112 children (equal distribution of sex, aged 4-6). All children received a small gift for their participation and ten mothers were randomly selected to win a 20 euro gift coupon.

For the second role play, mothers of the overweight children from the first role play were contacted through the schools and asked to participate with their child. As mothers could only participate once, 2 siblings were excluded. Therefore, 56 mothers were contacted and 40 agreed to participate (71%). The second role play took place between October and December 2007. After the role play children’s height and weight were measured and mothers filled out a questionnaire. All mothers were given 20 euro for their participation, and children received a small gift. The ethical committee of the Faculty of Social Sciences of the Radboud University Nijmegen granted permission to carry out the study. Informed consent forms of all participating mothers were obtained. After the first and after the second role-play, newsletters with a summary of the main results were sent to school for all the parents.

Characteristics of the final sample

Children were between 4 and 6 years (mean = 4.9, SD = 0.76) at the first and between 4 and 7 at the second (mean = 5.7, SD = 0.70) observation. Most children were of Dutch origin (defined by native country of their parents): Only one child had parents born outside the European Union (Turkey). With regard to educational level
of the parents, 10% of the mothers and 5.1% of the fathers had a low (elementary school or low vocational education), 57.5% of the mothers 69.2% of the fathers a middle (intermediate vocational education), and 32.5% of the mother and 25.7% of the fathers a high (college or university) educational level. On average, mothers worked 16.9 hours ($\text{SD} = 7.7$) per week and fathers worked 42.5 hours per week ($\text{SD} = 10.3$). All mothers were either married or lived together with their partner and had on average 2.2 children ($\text{SD} = 0.64$; range between 1 and 4). The average age of mothers was 36.2 years ($\text{SD} = 4.58$) and for fathers 39.0 years ($\text{SD} = 4.96$). Average BMI of the parents was 25.7 ($\text{SD} = 3.94$) for mothers and 26.1 ($\text{SD} = 2.34$) for fathers, with half of the mothers and a majority of the fathers being overweight (50.0 and 69.2%).

**Role play**

Both role-plays took place at the children’s schools during or just after school hours, depending on what was suitable for the mother and school-boards. The role play consisted of a shopping task in a Barbie size miniature-market (Figure 1). First, the (female) research assistant described in general terms what kind of products could be found in the supermarket and asked whether there was anything the child did not know. Next, she brought out the mother doll and started reading out loud the story from the protocol which described how the mother discovered after breakfast that she had totally run out of foods for the family, and that she had to go to the grocery shop. In the shop she had to buy dinner products, drinks, and maybe some snacks. Children were given the mother doll and pushcart and were asked to play the mother and do food shopping for the family. It was explained that they needed foods for father, mother, and children, just for the afternoon and evening, and just for one day. The researcher stressed that it was a normal school-day, not a (birthday) party. When the children were done shopping they were asked to put the products on the counter, one by one and to identify the products they bought to ensure the validity of their purchases. If a product was identified incorrectly, for example if the child took an orange and stated is was a mandarin, it was counted as the product the child referred to. The researcher played with the girl-doll presenting the sales clerk and was present during the whole first role-play. In the second role-play, she left the room after instruction and came back when the child and mother indicated to be ready to “pay” for their purchases. The maximum time of the shopping task was not fixed.

For the second role play, children were reminded about their previous role-play experience and asked whether they wanted to play again. They received the same instructions as during the first role play and were explained that their mother was there to help them. Mothers were given similar instruction as their children and were told to let their children do the shopping but to help or coach them when they thought that was necessary. The second role play was videotaped so that interactions could be coded afterwards. For both role plays, a protocol was made to ensure that the instructions were identical for every child and these protocols were piloted for 5 children and 3 mother-children pairs for the first and second role play respectively.
**Food purchases**

The miniature-market contained of two cupboards, a freezer, a counter, and 86 different food products. For the manufacture of most of the products, the original wrappings were scanned and scaled down in order to obtain realistic and recognizable miniatures. Bottled drinks, fresh products (i.e. fruit, vegetables and meat), and uncommon wrappings (i.e. chips) were custom-made. Products were selected from every main category in the Dutch food composition table (NeVO-Foundation, 2001) choosing foods that were either high or low in caloric value and that are most commonly eaten by Dutch families. Attention was paid to avoid disproportionate representation of one of the food groups in the miniature grocery shop, and at the same time keep the proportion of food groups comparable to a real supermarket. The final selection contained 30 dinner products, 32 snacks, and 24 drinks. Children’s purchases of the foods were noted and dived into categories based on the energy content. This resulted in the following outcome variables: high energy snacks, low energy snack, high and low energy drinks, high and low energy dinner products, and total amount of products bought.

**Observation coding**

Observations were coded according to two coding systems: Coding of specific events and general ratings (Table 1). Each event, defined as an uninterrupted (either by the child or by a > 2 second pause) series of verbal comments made by the mother, was coded as either 0 “neutral” (unrelated to the assignment), 1 “monitoring” (maternal coaching and help with the assignment), 2 “directive control” (supportive maternal control) – either restricting (2a) or pressuring (2b), 3 “enforcing control” (harsh and suppressive maternal control) – restricting (3a) or pressuring (3b), or 4 “support” (maternal agreement or support). See also Table 1.

General ratings were adapted from the Specific Affect Coding System Manual (SPAFF) (Gottman, 1994, Granic, 2003). For the whole observation one rating was given for mother and for child on positivity, negativity, conflict, dominance, withdrawal and permissiveness (mother)/ obedience (child). Ratings ranged from 1 (extremely uncharacteristic) to 5 (extremely characteristic).

All videos were coded by either the third or the fifth author. First 10 out of 40 were coded by both coders and Cohen’s Kappa was calculated which showed an average consensus of .81. To see whether factors mentioned in the literature (such as pressure to eat, support, authoritarian control and monitoring) could be confirmed as well as to be able to see whether certain mother and child scores (for the general ratings) would cluster, general and event coding of maternal and child behaviour were used in Principal Component Analysis with Varimax rotation structure. This resulted in a two-factor solution for the event coding (see Table 2) and a three-factor solution for the general coding (see Table 3). For the event coding, the factors “Monitoring control” (with high loadings of monitoring, support and directive control), and “Authoritarian control” (high loadings of the two enforcing control behaviours) explained 69.57% of the variance. For the general coding, we came up with three factors, “Both negative” (high loadings of negativity, positivity (negatively loaded), and child withdrawal, “Dominant child” (high loadings of dominance child and domi-
Families on the balance

These three factors explained 70.93% of the variance. Factor scores were saved (regression method) and used in subsequent analyses.

Table 1: Event and general coding during the role play

<table>
<thead>
<tr>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Event ratings</strong></td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td>Not related to the assignment.</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Coaching without pushing towards certain products or food groups. Child is given the freedom to choose. “What are we going to eat tonight?” “What else do we need?”</td>
</tr>
<tr>
<td>Directive control</td>
<td>Mother has a clear idea about which product or food-group to buy (pressure) or not to buy (restriction) and pushes child in that direction. Child is still able to make choices within certain boundaries. “Do we eat French fries on a normal day?” “What do we always eat with our potatoes?” (pressure)</td>
</tr>
<tr>
<td>Enforcing</td>
<td>Mother gives an order, is commanding, points at one specific product, or takes the product herself to make the child buy (pressure) or put back (restriction) something. “Put the pizza back.” “And now some carrots.”</td>
</tr>
<tr>
<td>Support</td>
<td>Mother agrees with something the child does or encourages child. “Well done.” “Yes, you can take that one.”</td>
</tr>
<tr>
<td><strong>General ratings</strong></td>
<td></td>
</tr>
<tr>
<td>Positivity</td>
<td>Positivity in facial expressions, body positioning, voice. Expression of affection/caring, compliments, statements of support, empathy, enjoyment, and humor.</td>
</tr>
<tr>
<td>Negativity</td>
<td>Negativity in facial expressions, body positioning, voice. Criticism, whining and complaining, tension, anger, contempt, hostile humor, expression of disgust, and insults.</td>
</tr>
<tr>
<td>Conflict</td>
<td>Expressed struggle between mother and child. Imposing will on the other, disagrees more often than agrees, minimizes the value of the other’s contribution, makes negative interpretations.</td>
</tr>
<tr>
<td>Dominance</td>
<td>The degree of initiative and taking charge during the task. Directing the course of the conversation, giving directives, using “forceful persuasion”, commanding, taking more than the other, interrupting.</td>
</tr>
<tr>
<td>Withdrawal</td>
<td>Lack of involvement in the task. Withdrawal from or avoid interacting with the other, allows other to dominate, resigned/passive, low level of communication assertiveness and self-disclosure, clam’s-up, is unresponsive to partner.</td>
</tr>
<tr>
<td>Permissiveness</td>
<td>For mothers: permissiveness towards child.</td>
</tr>
<tr>
<td>Obedience</td>
<td>For children: Obedience to mother.</td>
</tr>
</tbody>
</table>

Other measures and questionnaires

Children’s height and weight were measured during screening before the first role play and again after the second role play according to standard procedures in light clothing without shoes, to the nearest of 0.1 kg and 0.5 cm. Children’s mean BMI was 18.63 (SD = 1.10) at the first and 18.78 (SD = 1.45) at the second observation. At the start of the study all selected children were classified as overweight according to international cut-off points (Cole et al., 2000) and 33 children (83%) were still overweight during the second observation.
Table 2: Factor loadings in principal component analysis with varimax rotation on event coding and mean frequency of each coding

<table>
<thead>
<tr>
<th></th>
<th>Monitoring control</th>
<th>Authoritarian control</th>
<th>Mean (sd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring</td>
<td>.92</td>
<td></td>
<td>13.65 (7.66)</td>
</tr>
<tr>
<td>Support</td>
<td>.87</td>
<td></td>
<td>13.50 (8.56)</td>
</tr>
<tr>
<td>Directive control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>restriction</td>
<td>.70</td>
<td></td>
<td>8.58 (5.17)</td>
</tr>
<tr>
<td>pressure</td>
<td>.60</td>
<td></td>
<td>7.55 (5.07)</td>
</tr>
<tr>
<td>Enforcing control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>restriction</td>
<td>.87</td>
<td></td>
<td>4.45 (3.91)</td>
</tr>
<tr>
<td>pressure</td>
<td>.83</td>
<td></td>
<td>2.23 (3.48)</td>
</tr>
<tr>
<td>Neutral</td>
<td></td>
<td></td>
<td>10.35 (8.75)</td>
</tr>
</tbody>
</table>

Table 3: Factor loadings in principal component analysis with varimax rotation on general coding and mean score of each coding

<table>
<thead>
<tr>
<th></th>
<th>Both negative</th>
<th>Dominant child</th>
<th>Both conflict</th>
<th>Mean (sd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negativity</td>
<td>Mother</td>
<td>.75</td>
<td></td>
<td>1.93 (0.92)</td>
</tr>
<tr>
<td></td>
<td>Child</td>
<td>.74</td>
<td></td>
<td>1.48 (0.72)</td>
</tr>
<tr>
<td>Positivity</td>
<td>Mother</td>
<td>-.74</td>
<td></td>
<td>3.40 (0.90)</td>
</tr>
<tr>
<td></td>
<td>Child</td>
<td>-.84</td>
<td></td>
<td>3.68 (0.80)</td>
</tr>
<tr>
<td>Withdrawal</td>
<td>Child</td>
<td>.65</td>
<td></td>
<td>1.68 (0.94)</td>
</tr>
<tr>
<td>Dominance</td>
<td>Child</td>
<td>.74</td>
<td></td>
<td>2.93 (1.05)</td>
</tr>
<tr>
<td></td>
<td>Mother</td>
<td>-.84</td>
<td></td>
<td>3.25 (0.98)</td>
</tr>
<tr>
<td>Permissiveness</td>
<td>Mother</td>
<td>.62</td>
<td></td>
<td>2.93 (0.92)</td>
</tr>
<tr>
<td>Withdrawal</td>
<td>Mother</td>
<td>.77</td>
<td></td>
<td>1.73 (1.11)</td>
</tr>
<tr>
<td>Conflict</td>
<td>Child</td>
<td>.94</td>
<td></td>
<td>2.13 (0.97)</td>
</tr>
<tr>
<td></td>
<td>Mother</td>
<td>.81</td>
<td></td>
<td>2.03 (0.97)</td>
</tr>
<tr>
<td>Obedience</td>
<td>Child</td>
<td>-.85</td>
<td></td>
<td>3.20 (0.82)</td>
</tr>
</tbody>
</table>
The mother’s questionnaire consisted of questions on demographic variables, weights and heights of the mother and the child’s fathers, restrained eating, body dissatisfaction, and perceived child weight-status. Parental BMI was computed by the height and weight reported by mother (weight/(height)^2) and a parent with BMI higher that 25 was considered to be overweight. Restrained eating was assessed with a subscale (10 items) of the Dutch Eating Behavior Questionnaire (DEBQ) (van Strien, Frijters et al., 1986a) [originally published in Dutch (van Strien, Frijters et al., 1986b)]. An example of a restrained eating item is “Do you try to eat less at mealtimes than you would like to eat?” Items had to be rated on a 5-points scale from 1 (never) to 5 (very often). The DEBQ scales have high internal consistency, high validity for food consumption, and high convergent and discriminative validity (van Strien, 2002). Cronbach’s alpha in our study was .91.

Body dissatisfaction was assessed using silhouette ratings of the Body Image Assessment (BIa) (Williamson et al., 1989). Mothers were asked to indicate which of the nine presented figures (ranging from slim to overweight) they felt most resembled their own figure, resulting in a score from 1 (most slim figure) to 9 (most overweight figure). Next, they were asked to indicate which figure they would be most satisfied with. Body dissatisfaction was computed by a difference score between actual and desired figure rating. Eleven mothers indicated to be satisfied with their current figure, for the others difference scores were all in the same direction (mothers wanted to be thinner). For further analyses, body dissatisfaction was dichotomized into either satisfied or not-satisfied.

Perceived Child Weight Status was reported at the time of the first role-play (Snoek et al., resubmitted), a question was adapted from the CFQ (Fisher & Birch, 1999b). In the original scale parents are asked to report perceived child weight from infancy through 8th grade by means of 6 questions. Due to sample age, this distinction was irrelevant and therefore, the subscale was reduced to one question: “how is your child’s weight at the moment?” with a response category ranging from 1 (markedly underweight) to 5 (markedly overweight).

Strategy of analyses
First, paired t-tests were used to determine whether differences existed between the food purchases at the first (child alone) and the second (with the mother) role-play. Next, ratings of maternal behaviours and mother-child interactions during the role-play were described as well as their relations to both child characteristics (BMI, sex, age, perceived weight) and maternal characteristics (BMI, restrained eating, body dissatisfaction). This was done by means of t-tests and Pearson correlations.

Finally, to determine the association between maternal and child behaviours and the children’s food purchases we conducted multiple regression analyses with food purchases (six categories and total) as outcome variables and the two event rating factors or the three general rating factors (in the second step) as predictors. In the first step we controlled for child sex, age and BMI, and parental BMI as these are important factors that might be related to family food habits. To correct for children’s general tendency to buy a large or small amount, additional analyses were conducted.
in which we controlled for the number of children’s food purchases at the first role play in step two and predictors (event and general rating clusters) in step three.

Results

Children's food purchases in presence and absence of their mother

In presence of their mother children made significantly healthier food choices than when they performed the role-play alone. Children bought fewer products in total in the role play with their mother present compared to the first role play (Table 4). Specifically, they bought less high caloric snacks and drinks while no differences were found for low caloric snacks and drinks and for dinner products.

Table 4: Child mean (SD) purchases of high and low caloric snacks, drinks and dinner products at observation 1 (alone) and observation 2 (in presence of the mother)

<table>
<thead>
<tr>
<th></th>
<th>Observation 1</th>
<th>Observation 2</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snack</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High cal.</td>
<td>4.35 (3.66)</td>
<td>1.93 (1.29)</td>
<td>4.19**</td>
</tr>
<tr>
<td>Low cal.</td>
<td>2.48 (3.36)</td>
<td>3.18 (2.44)</td>
<td>-1.23</td>
</tr>
<tr>
<td>Drinks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High cal.</td>
<td>4.00 (3.62)</td>
<td>2.18 (1.58)</td>
<td>3.18**</td>
</tr>
<tr>
<td>Low cal.</td>
<td>1.90 (2.04)</td>
<td>1.65 (1.00)</td>
<td>0.71</td>
</tr>
<tr>
<td>Dinner</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High cal.</td>
<td>2.42 (2.32)</td>
<td>1.83 (1.30)</td>
<td>1.51</td>
</tr>
<tr>
<td>Low cal.</td>
<td>4.83 (4.15)</td>
<td>4.20 (2.44)</td>
<td>0.94</td>
</tr>
<tr>
<td>Total</td>
<td>19.98 (13.59)</td>
<td>14.95 (4.97)</td>
<td>2.44*</td>
</tr>
</tbody>
</table>

* p < .05, ** p < .01

Mother-child interactions: event ratings

During the second role-play, interactions between mothers and children were recorded and coded. The shopping section of the role-play lasted on average 6.8 minutes (SD = 3.5; range 1.9-19.5 minutes) during which on average 50.0 events (SD = 23.4; range 12-104) were coded. Mean event frequencies and standard deviations on each behaviour code are presented in Table 2. Monitoring behaviours were coded in 16.2% of the occasions, in 33.0% of the occasions mother used directive controlling
and 14.3% used enforcing behaviours, 26.6% of the events were coded as support/encouragement. Mothers did not impose more monitoring behaviours, directive control or enforcing control on boys compared to girls, nor were these behaviours correlated with age of the children or perceived weight status of the child by mother. Also, child BMI, mother BMI and father BMI were not significantly correlated to any of the maternal behaviours. Similarly, other maternal characteristics, like restrained eating and body dissatisfaction were unrelated to the monitoring, directive control or enforcing control behaviours.

**Mother-child interactions: general ratings**

In Table 3 means and standard deviations on the general ratings are presented. Mother-sons dyads showed higher scores on maternal conflict (2.42 versus 1.67, t (40) = 2.59, p < .05), lower scores on positivity (3.37 versus 3.95, t (40) = -2.50, p < .05), and higher scores on child withdrawal (2.05 versus 1.33, t (40) = 2.51, p < .05) compared to mother-girls dyads. Higher age of the child was correlated to lower maternal conflict (r = -.44, p < .01), lower child conflict (r = -.47, p < .01), and higher child obedience (r = .39, p < .05). Other child characteristics (BMI and perceived weight status by the mother) were unrelated to general ratings of positivity, negativity, dominance, withdrawal, conflict, and permissiveness/obedience. Similarly, most parental characteristics (i.e. maternal body dissatisfaction and BMI, father BMI) were unrelated to the general ratings. Higher maternal restrained eating was associated with higher maternal conflict (r = .35, p < .05) and lower maternal permissiveness (r = -.34, p < .05).

**Mother-child interactions and children’s food purchases**

Several regression analyses were performed to determine how the two event rating factors (Factor A monitoring control, Factor B authoritarian control) and the three general rating factors (Factor 1 both negative, Factor 2 child dominant, mother permissive, Factor 3 both conflict) were associated with purchases of high and low caloric snacks, drinks and dinner products. For event coding no consistent pattern was found. The “monitoring control” factor was unrelated to any of the purchases whereas higher scores on the “authoritarian control” factor were associated with higher low-caloric snacks purchases but unrelated to any of the other purchases (Table 5). Similar results were found when correcting for child food purchases in the first observational session in an additional step.

For the three factors derived from the general rating scores, higher scores on the “child dominant” factor were strongly associated with higher purchase of high caloric snacks, drinks and dinner products and more products in total while these scores were not related to the purchases of low caloric food. The “negativity both” and “conflict both” factors were unrelated to any of the child’s food purchases (Table 5).
Discussion

Generally, mothers seemed successful in influencing their children’s food choices since these were healthier compared to when the child shopped alone. This is in accordance with previous studies that found positive effects of maternal presence or expected presence on children’s food choice (Klesges et al., 1991).

Results further showed that mothers used a range of controlling and encouraging behaviours to influence their overweight child’s food purchases. Observation of these behaviours in our study revealed two underlying factors: Monitoring control” that included support, monitoring, and directive control (pressure and restriction) and “Authoritarian control” that existed from the enforcing control (pressure and restriction). Pressure to eat (either directive or enforcing) was not a separate factor, in contrast to the distinction made in the Child Feeding Questionnaire.

Although authoritarian control, which is more harsh, manipulative, enforcing and compelling, is a distinct factor from other maternal behaviours it was generally not related to the food choices by children. Previous studies related (questionnaire) scores on psychological control (that is harsh, suppressive and manipulating general parental control, including behaviours, such as guilt induction, love withdrawal and excessive pressure for change) to negative behavioural outcomes while an authoritative feedings style was associated with healthier eating patterns (Patrick, Nicklas, Hughes, & Morales, 2005). In line of these results it seems reasonable to expect an association between authoritarian control and unhealthier food choices (Finkenauer et al., 2005; Steinberg et al., 1994). In contrast, higher scores on the “authoritarian

Table 5: Purchases of high and low caloric snacks, drinks and dinner products and factors of maternal behaviours (standardized Beta’s)

<table>
<thead>
<tr>
<th>factor</th>
<th>High caloric</th>
<th>Low caloric</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Snack Dinner Drinks Snack Dinner Drinks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>.01 -.04 -.02 -.28 .02 .05 -.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>.70*** .53** .42* -.07 -.15 .09 .36*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>-.04 .04 .31 .15 .06 .29 .26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>-.14 .24 -.30 .20 .32 .22 .23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>-.13 -.22 .21 .44* .23 .07 .32</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05, **p < .01, ***p < .001

Note: Factor 1 both negative, Factor 2 child dominant, mother permissive, Factor 3 both conflict. Factor A monitoring control, Factor B authoritarian control.

Analyses in first step controlled for mother BMI, father BMI, Child BMI, age, sex, and total number of events.
control” factor were only associated with higher low-caloric snacks purchases and unrelated to all other purchases.

Based on the results of the event coding it does not seem to matter how the mother imposes control over her child as long as she is present. A similar conclusion can be derived from the results of the general ratings: Whereas the factors “both conflict” and “negativity both” were unrelated to any of the food choices, the “child dominant” factor was associated with higher purchase of high caloric snacks, drinks and dinner products and more products in total and it was unrelated to the purchase of low caloric food. This factor is characterised by a low dominance, high withdrawal and high permissiveness of the mother while the child is highly dominant. Thus, as long as the mother is present and actively involved she will influence her child in the way that children make healthier choices; some degree of parental control seems to be needed. This was also concluded by Moens, Braet, and Soetens (2007) who observed that a more permissive feeding style (that is lack of parental control) was most prevalent in families with overweight children. Interestingly in that study, parents of overweight children reported more restriction and monitoring on the Child Feeding Questionnaire than parents of normal weight children. Thus observations and questionnaires provided opposite results in the same study which might be due to social desirability or inability of mothers to judge their own behaviour. Observation studies therefore provide valuable information and are in addition more suitable to study interactions between persons and dynamics in behaviour. Our results show that especially the combination of dominant children and permissive, not highly involved mothers, leads to the most unhealthy food choices.

The type of mother-child interactions differed by sex and age of the child. Mother-son dyads showed lower positivity, more maternal conflict, and more child withdrawal than mother-girl dyads. Some interesting earlier findings showed that mothers were more likely to classify their daughters as overweight compared to sons (He & Evans, 2007; A. N. Jeffery, Voss, Metcalf, Alba, & Wilkin, 2005), and that mothers were more concerned with their daughters’ weight. Therefore, it seems reasonable to also expect more maternal control for girls but this is not supported by our findings. Future studies are needed to address this controversy.

Older children have more conflicts, even though we had a small age-range in our sample. All children were quite young and probably more used to have their parents being in control over their food intake and not discussing these with them. For example, it is remarkable that only one out of 40 mothers motivated her controlling behaviour by explaining the healthy and unhealthy aspects of foods. This is in line with findings by O’Dougherty et al. (2006) who noted not a single explicit health-related explanation in 129 grocery shopping observations. Buijzen and Valkenburg (2008) give a detailed description of how children’s attempts to influence their parents’ choices differ by age of the child. In line with their own expectations they found that children’s purchase influence attempts increased until early elementary school and started to decline in late elementary school. Whereas preschoolers use the highest levels of coercive behaviours – that is forceful or persistent attempts to influence their parents – and are highly dependent on their parents to satisfy their needs, older children employ more sophisticated influence strategies and are more
skilled to delay gratification (Buijzen & Valkenburg, 2008). In future studies it would be interesting to see how maternal behaviours are related to food choices of older children especially as the children obtain more possibilities to make their own food choices outside their parents’ supervision. Research by Fisher and Birch suggests that children who are highly restricted by their mother will make more unhealthy food choices when their mothers are away and they could choose what they want in a free access situation (Fisher & Birch, 1999b). So although our results show positive short-term results of maternal control, long-term consequences still need to be determined.

Other child characteristics, such as child BMI and perceived child weight by the mother were not related to other maternal behaviour patterns. This is not in line with previous studies in which heavier children are subject to more control in general (Birch & Fisher, 2000; Faith, Berkowitz et al., 2004; Fisher & Birch, 1999a; Francis et al., 2001) and to more maladaptive control (Moens et al., 2007) but the discrepancy between these and our results could be due to the high homogeneity of our sample: all children were overweight at baseline of the study.

Further, we expected that parent characteristics, such as maternal weight and weight-related behaviours would also be related to maternal behaviours as it has previously been found that mothers who are highly dissatisfied and pre-occupied with their own weight are more controlling to their children. The support for this hypothesis however was small but in the expected direction. Restrained eating in mothers was related to higher maternal conflict and lower maternal permissiveness, so it seems that mothers who more involved in weight-related behaviours are more harsh for their children which is in line with some previous results (Birch & Fisher, 2000). For body dissatisfaction this result was not replicated, perhaps because this measure explicitly refers to the mothers’ figure and only indirectly to her feelings about eating and health.

A limitation of this study is the 6 to 10 months time lap between the two observations. If for example older children make healthier food choices, we cannot rule out that results are partly attributable to increased age of the children rather than the presence of the mother. Another limitation that is inherent to the use of these designs is the ecological validity and generalizability of the results to other situations. This was not an every-day situation and mothers might have been more strongly motivated to do well and make healthy food choices as they knew their choices were recorded and even more as their children were overweight. This could for example partly explain the relation between enforcing control and the purchase of low-caloric snacks. Fruit presented a large share of the low-caloric snacks and as fruits are obviously healthy, mothers might be highly focussed on making sure their children would choose fruits. Strength of the study in regard to generalisability is that this group of overweight children was derived from a large community sample, and not for example overweight children seeking therapy.

Despite these limitations we believe observation studies might make a good contribution to the far more common survey studies in this field of research. Especially as there is no consistent use of one single questionnaire for food-specific parenting and existing questionnaires have not yet been validated for tapping actual interac-
tion patterns of complex behaviours like how families deal with food preferences and intake. Also, questionnaires are less appropriate when studying the behaviour of young children who are not able to read and write and who have difficulties understanding questions, framing answers and keep their attention to one topic for a longer period. Food choices at this age however affect both immediate nutrition status and eat habits and patterns later in life, so this is certainly an interesting and important group to study. A final advantage of observational studies is that although social desirable behaviour to some extent will occur it is less profound than when answering a questionnaire. Especially for mother of overweight children social desirability could be confounding the questionnaire measurements.

In the present study we used both general and event ratings. Event rating give a detailed measure of the behaviours but the disadvantage of our events measure – like most questionnaires as well – is that it only measures one direction of behaviour (i.e. maternal behaviours) rather than tapping interactions and reciprocal influences between child and mother (see Granic & Patterson, 2006), for a discussion on dynamic interactional methods). Results of the general ratings show that it is especially the combination of dominant children and permissive, not highly involved mothers that lead to most unhealthy food choices. This study can not conclude on any of the long-term results of food restriction but on the short term some degree of maternal control seems necessary in order for young children to make healthy food choices.
CHAPTER II
The effect of television viewing on adolescents’ snacking: Individual differences explained by external, restrained and emotional eating

Abstract

In a nationwide sample of 10,087 Dutch adolescents aged 11-16 (M = 13.0, SD = 0.8) on average 25% of the respondents watched more than 3 hours TV per day. Lowest levels of television viewing (TVV) were found in Dutch adolescents as compared to other ethnic groups, and in groups with higher compared to lower educational levels. Snacking was negatively associated with physical activity and positively associated with TVV. For both boys and girls, the positive association between TVV and snacking was stronger in adolescents who scored high on external and (only for boys) emotional eating, while restrained eating attenuated this association.
Introduction

Ample research examined the association between children’s television viewing (TVV) and weight. Cross-sectional studies, a few intervention studies, and recent longitudinal studies (Hancox et al., 2004) have shown a positive relationship between hours of TVV and weight (increase) during childhood and adolescence (Coon & Tucker, 2002). Two primary mechanisms by which TVV contributes to obesity have been suggested: Reduced physical activity and increased energy intake (Epstein et al., 2002).

Inverse associations between TVV and physical activity have been found (Crespo et al., 2001), albeit in some studies this association was weak or non-significant (Coon & Tucker, 2002). There is also evidence that at least part of the relationship between TVV and overweight is due to food intake. TVV is associated with higher intake of energy and fat, and is assumed to promote snacking (Halford et al., 2004) and consumption of nutritionally poorer diets.

Two major hypotheses about the mechanism by which TVV exactly promotes food intake are often mentioned. First, TV is believed to provide food cues (e.g., food advertisements) that may alter the viewer’s food preferences and intake. Second, weight-related messages on TV like thin idealizations and stigmatization of overweight people as well as showing incorrect, contradictory messages of slim actors who eat unhealthily without gaining any weight could cause negative emotions and overeating in persons who are preoccupied with weight. Such theories however assume that people react similarly to food cues and to negative emotions, and do not explain for individual differences in eating behaviour. The objective of the present study is to provide a framework for explaining individual differences in the magnitude of the association between TVV and food intake. We discuss three major psychological theories on the relationship between eating behaviour and overweight: External, restrained, and emotional eating, and subsequently test their moderating effects on the association between TVV and snacking.

The first theory, focussing on external eating, states that certain people are more sensible to external food cues than others, and that they eat in response to those stimuli, regardless of their internal state of hunger and satiety (Schachter & Rodin, 1974). TVV can provide food cues in the form of food advertisements. The association between advertisement and food intake has been studied extensively. Watching TV commercials was found to be associated with children’s preferences for the advertised foods (Borzekowski & Robinson, 2001), and persuading parents to buy those foods (Brody et al., 1981). It seems, however, unreasonable to assume that everyone is affected by this exposure to advertisements in the same way. External eaters are more sensitive to external cues and more likely to respond to those food advertisements by eating. Inter-personal differences in sensitivity for TV food cues have been studied by Halford et al. (2004). In their study, obese subjects recognized more food advertisements than lean subjects, and this was associated with higher food intake following exposure to these food advertisements. No significant interaction of advertisement recognition with external eating was found, but this might be due to the small sample (Halford et al., 2004). In our study, the positive association between
Eating behaviour, TVV, and snacking in adolescents

TVV and food intake was hypothesized to be stronger in subjects who scored higher on external eating.

According to the restraint theory, dieting can lead to overeating. People who diet, suppress their feelings of hunger cognitively and eat less. However, when cognitions are undermined (disinhibition) restrained eaters are more likely to overeat than non-dieting individuals; this is called counter-regulation (Herman & Polivy, 1980). Several disinhibitors have been studied, such as food preloads, alcohol, and also weight related media messages. Weight related media messages are linked with negative feelings like body dissatisfaction and low self-esteem (Groesz et al., 2002). Restrained participants ate more than unrestrained subjects in response to a video-tape or magazine advertisements containing stereotypical images of thin attractive females (Mills, 2002; Seddon & Berry, 1996) or after viewing diet-oriented TV advertisements. Moreover, Schotte and colleagues showed that watching a frightening movie was associated with negative affect, which triggered overeating among restrained participants (Cools et al., 1992; Schotte et al., 1990). TVV may be a disinhibitor for restrained eating and thus the combination of high-restrained eating and high TVV was hypothesized to be associated with higher snack intake.

According to the psychosomatic theory “emotional eaters” do not eat in response to internal signals, feelings of hunger and satiety, but in response to their emotions. In case of emotional arousal or stress, emotional eaters respond with excessive eating instead of the normal reaction, loss of appetite (Bruch, 1973). In adult studies, TVV has also been associated with negative emotions, like loneliness, feelings of failure and guilt, and depression (Dittmar, 1994). These negative emotions have been related to overeating in highly emotional eaters (Ganley, 1989; Slochower, 1983). To the best of our knowledge there are no studies linking emotional eating to TVV. Assuming that TVV is associated with negative emotions (Dittmar, 1994), high TVV might especially be associated with overeating in subjects that eat in response to those negative emotions (i.e., high emotional eaters).

This study describes the association of physical activity and snacking with TVV in a large (n = 10,087) nationwide sample of Dutch adolescents. Individual differences in the association between TVV and snacking are studied by introducing external, restrained, and emotional eating behaviours as moderator variables for this association. Additionally demographic and ethnic differences in TVV are reported.

Methods

A nationwide sample of 10,087 Dutch undergraduates aged 11-16 (M = 13.0, SD = 0.8) were recruited through their schools, the total response of participating schools was 91.9%. Details of the selection procedure are described elsewhere (Otten, Engels, & van den Eijnden, 2005).

The number of sweet and/or savoury snacks respondents usually ate per day measured Snacking. This item was derived from a larger food intake questionnaire and had been used in an adolescent sample before. Television viewing on a regular
school day (including video and DVD) was rated on an 8-points scale from 0 (almost never) to 7 (more than 4 hours per day). Self-reported TVV has been used in most non-experimental studies on TVV, and weekday TVV has been found to be a valid indicator of total TVV time in adolescents (Hancox et al., 2004). Eating behaviour was measured with the DEBQ (Dutch Eating Behaviour Questionnaire) and includes external, restrained, and emotional eating which have a high internal consistency, high validity for food consumption, and high convergent and discriminative validity (van Strien, 2002). Cronbach’s alphas in this study were .84 and higher. The Godin-Shephard questionnaire was used to assess Physical activity. Respondents were asked to report the durance of habitual physical activity at three levels of intensity: Light (e.g., walking), moderate (e.g., badminton) and strenuous (e.g., basketball). Total physical activity was calculated by a combination of these sub scores, using the following formula: (9 x strenuous) + (6 x moderate) + (3 x light). The scale has been validated for adolescents (Godin & Shephard, 1985).

For analyses, scores on eating behaviour were divided in high and low by means of a median split, TVV was divided in low and high (≤ or >3 hours TVV/ day), high TVV roughly corresponded with the upper quartile for both boys and girls. This classification was done because intense TV viewers were expected to be particularly at risk of overweight and problematic eating behaviours. Heavy TVV has been found to be associated with a statistically higher risk of obesity (Crespo et al., 2001), low physical activity, smoking, and depression in young adults (Sidney et al., 1996).

**Results**

Table 1 shows TVV per group of subjects, differences were found between age, educational level and ethnic groups but not for gender (Table 1). TVV was negatively associated with physical activity ($r = -.06$ for boys, and $r = -.10$ for girls, $p's < .001$) and positively associated with snacking ($r = .25$ for boys, and $r = .21$ for girls, $p's < .001$).

Adolescents who scored high on external eating ate more snacks than those who scored low on external eating ($t(4810) = -15.95$ for boys, and $t(5042) = -19.54$ for girls, $p's < .001$). Adolescents who scored high on restrained eating ate fewer snacks than those who scored low on restraint eating ($t(4799) = 9.94$ for boys, and $t(5039) = 9.58$ for girls, $p's < .001$). Adolescents who scored high on emotional eating ate more snacks than those who scored low on emotional eating ($t(4798) = -7.16$ for boys, and $t(5035) = -11.59$ for girls, $p's < .001$) (see Table 2).

Significant main effects on snacking were found for the three eating behaviours, as well as significant TVV × eating behaviour interactions on snacking for TVV × external eating ($p < .01$ for boys and $p = .01$ for girls), TVV × restrained eating ($p = .03$ for boys and $.02$ for girls), and TVV × emotional eating ($p = .01$ for boys).
Table 1: Television viewing per group of subjects

<table>
<thead>
<tr>
<th>Gender</th>
<th>%</th>
<th>n</th>
<th>Television viewing (%)</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>&lt;1hour 1-3 3 &gt;3</td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>49</td>
<td>4712</td>
<td>22 54 24</td>
<td>$\chi^2 (2, n=9658) =$</td>
</tr>
<tr>
<td>Girls</td>
<td>51</td>
<td>4946</td>
<td>22 53 25</td>
<td>1.16, $p = .56$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age</th>
<th>%</th>
<th>n</th>
<th>Television viewing (%)</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>&lt;1hour 1-3 3 &gt;3</td>
<td></td>
</tr>
<tr>
<td>11-12</td>
<td>29</td>
<td>2760</td>
<td>26 55 19</td>
<td>$\chi^2 (6, n=9652) =$</td>
</tr>
<tr>
<td>13</td>
<td>47</td>
<td>4506</td>
<td>21 55 24</td>
<td>131.82, $p &lt; .001$</td>
</tr>
<tr>
<td>14</td>
<td>22</td>
<td>2092</td>
<td>18 51 31</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>3</td>
<td>294</td>
<td>19 43 38</td>
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</table>

<table>
<thead>
<tr>
<th>Educational level$^1$</th>
<th>%</th>
<th>n</th>
<th>Television viewing (%)</th>
<th>Statistics</th>
</tr>
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<tbody>
<tr>
<td>Lower level education</td>
<td>54</td>
<td>5224</td>
<td>20 48 32</td>
<td>$\chi^2 (2, n=9600) =$</td>
</tr>
<tr>
<td>Higher level education</td>
<td>46</td>
<td>4376</td>
<td>24 60 16</td>
<td>347.81, $p &lt; .001$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ethnicity$^2$</th>
<th>%</th>
<th>n</th>
<th>Television viewing (%)</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dutch</td>
<td>81</td>
<td>7710</td>
<td>23 55 22</td>
<td>$\chi^2 (8, n=9493) =$</td>
</tr>
<tr>
<td>Surinam/Antillean</td>
<td>4</td>
<td>372</td>
<td>12 46 42</td>
<td>123.89, $p &lt; .001$</td>
</tr>
<tr>
<td>Moroccan</td>
<td>1</td>
<td>107</td>
<td>17 48 35</td>
<td></td>
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<td>Turkish</td>
<td>3</td>
<td>326</td>
<td>15 49 36</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>10</td>
<td>978</td>
<td>20 51 29</td>
<td></td>
</tr>
</tbody>
</table>

---

1 lower-level education (LWOO, VMBO; preparatory college for vocational training) and higher level education (HAVO, VWO; preparatory school for college or university).

2 Ethnicity was determined by the native country of the parents.
Table 2: Average number of snacks per day per group of subjects sorted by score on eating behaviour and hours TV watched per day (mean (SD))

<table>
<thead>
<tr>
<th>Score on eating behaviour</th>
<th>Television viewing</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;= 3 hours</td>
<td>&gt;3 hours</td>
<td>&lt;= 3 hours</td>
</tr>
<tr>
<td></td>
<td>n = 3516</td>
<td>n = 1116</td>
<td>n = 3675</td>
</tr>
<tr>
<td><strong>External Eating</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below median</td>
<td>1.98 (1.10)</td>
<td>2.42 (1.35)</td>
<td>1.75 (0.93)</td>
</tr>
<tr>
<td>Above median</td>
<td>2.47 (1.30)</td>
<td>3.16 (1.47)</td>
<td>2.29 (1.16)</td>
</tr>
<tr>
<td><strong>Restraint Eating</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below median</td>
<td>2.36 (1.27)</td>
<td>3.06 (1.50)</td>
<td>2.12 (1.13)</td>
</tr>
<tr>
<td>Above median</td>
<td>2.03 (1.14)</td>
<td>2.55 (1.37)</td>
<td>1.83 (0.98)</td>
</tr>
<tr>
<td><strong>Emotional Eating</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below median</td>
<td>2.09 (1.18)</td>
<td>2.58 (1.44)</td>
<td>1.83 (0.98)</td>
</tr>
<tr>
<td>Above median</td>
<td>2.31 (1.25)</td>
<td>3.03 (1.46)</td>
<td>2.16 (1.13)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2.20 (1.22)</td>
<td>2.83 (1.47)</td>
<td>1.99 (1.08)</td>
</tr>
</tbody>
</table>

* Groups differ significantly in snack consumption ($p < .001$) (One-way Anova)

Discussion

This study provides tentative evidence that external, restrained and emotional eating might play a role in the association between TVV and snacking. Conform our hypothesis high external and emotional eaters had stronger associations between TVV and snacking. Interestingly, the interaction between TVV, emotional eating and snacking was only significant for boys, these gender differences need further investigation. Possibly, in certain people both heavy TVV and emotional eating might be the consequences of inadequacy of to deal with negative emotions (Dittmar, 1994), mechanism that might differ between men and women. Opposite to our prediction, restrained eating attenuated the association between TVV and snacking. Perhaps,
TVV and accompanied thin idealizing messages do not always lead to negative emotions and disinhibition but have also shown inspiring effects in restrained eaters (Mills et al., 2002). Such mechanisms should preferably be studied in real life settings and over longer time periods.

Snacking was measured with a questionnaire instead of dietary food intake measurements, and does therefore not allow for conclusions about nutrient intake. We can also not rule out the possible effect of socially desirable answers on dieting and snacking. A strength of this study is that it covers a large sample and substantial proportions of ethnic minorities and lower education level groups. Although the data are cross-sectional and no causal inferences from the results can be drawn, they indicate that studying eating behaviour in other designs, where snacking during TVV is measured can provide more insight in the mechanisms that underlie the association between TVV and food intake in adolescents.
References


Families on the balance

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Lee, Y., Mitchell, D. C., Smiciklas-Wright, H., & Birch, L. L. (2001). Diet quality, nutrient intake, weight status, and feeding environments of girls meeting or exceeding


References


References


Snoek, H. M., Sessink, N. Y., & Engels, R. C. M. E. (resubmitted). Food choices of 4-6 year old children with and without overweight while role-playing as adults.


References


Appendices

Appendix A.

Study and sample characteristics

To answer the questions proposed in this dissertation three datasets were used (Table 1). First, cross-sectional data from a large scale study at secondary schools in the Netherlands was obtained from 10,087 adolescents aged 11-16 years (M = 13.0, SD = 0.8). We randomly selected 55 secondary schools from four regions in the Netherlands (North, South, East and West) to have a national sample (response rate of 91%).

Second, health related behaviour and questions on parenting were obtained from a sample of 428 Dutch families from which both parents and two adolescent siblings (boys and girls; mean age 15.2 for older and 13.4 for younger sibling). Families with at least two children aged between 13 and 16 were selected from the registers of 22 municipalities in the Netherlands (5602 families), and recruited through a letter. A total of 885 families were willing to participate, of whom 765 fulfilled the study criteria and 428 were selected to acquire an equal distribution of the educational levels of the adolescents and of all possible sibling dyads (i.e. boy-boy, girl-boy, boy-girl and girl-girl) in our sample. During the study, the response rate was 77% with 328 of the 428 participating families completing data at all five annual waves from 2003 to 2007 (416 at the 2004 wave, 404 at the 2005 wave, and 347 at the 2006 wave). The study was originally designed to comprehend three waves but was later prolonged, which explained most of the drop out between the 2005 (third) and 2006 (fourth) waves.

Finally, we used a structured role-play in which preschoolers were asked to do a shopping task in a Barbie size mini-market. They were asked to play a mother who is doing grocery shopping for her family for one day. For this study, height and weight of 619 children was measured and 89 children (18.9%) were overweight (Cole 2000). From this overweight group, 56 overweight children whose mothers filled in the questionnaire were selected and matched within their school to 56 normal weight children. These children participated in the first role play, resulting in a total sample of 112 children (equal distribution of sex, aged 4-6). For the second role play, mothers of the overweight children from the first role play were contacted through the schools and asked to participate with their child, 40 agreed (71%) and participated in the second role.
Table 1: Design of the studies and characteristics of the samples used in this dissertation

<table>
<thead>
<tr>
<th>Study Type</th>
<th>N</th>
<th>Participants</th>
<th>Design</th>
<th>Chapters</th>
</tr>
</thead>
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<tr>
<td>“scholierenstudie”</td>
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<td>adolescent boys and girls (11-16 years)</td>
<td>cross-sectional</td>
<td>2, 11</td>
</tr>
<tr>
<td>family and health</td>
<td>428</td>
<td>adolescent siblings (13-16) and both their parents</td>
<td>longitudinal, 5 waves</td>
<td>3, 4, 5, 6, 7, 8</td>
</tr>
<tr>
<td>role play study</td>
<td>112</td>
<td>preschoolers (4-6 yrs)</td>
<td>structured role-play / observation</td>
<td>9, 10</td>
</tr>
<tr>
<td>follow up</td>
<td>40 pairs</td>
<td>preschoolers and their mothers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eating Behaviour</td>
<td>Wave 1</td>
<td>Wave 2</td>
<td>Wave 3</td>
<td>Wave 4</td>
</tr>
<tr>
<td>------------------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>Emotional eating</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oldest child</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>2.07 (0.72)</td>
<td>2.09 (0.74)</td>
<td>2.08 (0.75)</td>
<td>2.06 (0.74)</td>
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<tr>
<td>Girls</td>
<td>2.42 (0.74)</td>
<td>2.52 (0.77)</td>
<td>2.48 (0.69)</td>
<td>2.44 (0.80)</td>
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<td>Boys</td>
<td>2.09 (0.68)</td>
<td>2.08 (0.72)</td>
<td>2.10 (0.77)</td>
<td>2.03 (0.78)</td>
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<td>Girls</td>
<td>2.41 (0.77)</td>
<td>2.57 (0.82)</td>
<td>2.54 (0.74)</td>
<td>2.62 (0.74)</td>
</tr>
<tr>
<td>External eating</td>
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<td></td>
</tr>
<tr>
<td>Oldest child</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>3.11 (0.65)</td>
<td>3.05 (0.68)</td>
<td>3.05 (0.61)</td>
<td>2.97 (0.60)</td>
</tr>
<tr>
<td>Girls</td>
<td>2.99 (0.63)</td>
<td>3.02 (0.64)</td>
<td>3.02 (0.59)</td>
<td>2.97 (0.61)</td>
</tr>
<tr>
<td>Youngest child</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>2.97 (0.71)</td>
<td>2.99 (0.67)</td>
<td>3.00 (0.67)</td>
<td>3.05 (0.63)</td>
</tr>
<tr>
<td>Girls</td>
<td>2.93 (0.62)</td>
<td>3.05 (0.59)</td>
<td>3.07 (0.68)</td>
<td>3.08 (0.66)</td>
</tr>
<tr>
<td>Restrained eating</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Oldest child</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>1.65 (0.67)</td>
<td>1.64 (0.67)</td>
<td>1.69 (0.67)</td>
<td>1.78 (0.75)</td>
</tr>
<tr>
<td>Girls</td>
<td>2.40 (0.91)</td>
<td>2.44 (0.90)</td>
<td>2.50 (0.86)</td>
<td>2.54 (0.90)</td>
</tr>
<tr>
<td>Youngest child</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>1.86 (0.68)</td>
<td>1.73 (0.64)</td>
<td>1.68 (0.67)</td>
<td>1.67 (0.75)</td>
</tr>
<tr>
<td>Girls</td>
<td>2.27 (0.83)</td>
<td>2.33 (0.89)</td>
<td>2.35 (0.86)</td>
<td>2.41 (0.86)</td>
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Appendix C

Similarities in dieting behaviour between family members

<table>
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<tr>
<th>Reference</th>
<th>Age in years</th>
<th>n</th>
<th>Reporter</th>
<th>Sibling</th>
<th>Follow up</th>
<th>Measurements</th>
<th>BMI adjustment</th>
<th>Significant positive associations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Attie &amp; Brooks 1989)</td>
<td>16-18</td>
<td>193 girls</td>
<td>Parental behavior</td>
<td>-</td>
<td>-</td>
<td>EAT-26</td>
<td>-</td>
<td>Mothers and daughters (p &lt; 0.10)</td>
</tr>
<tr>
<td>2 (Hill et al., 1990)</td>
<td>9-11</td>
<td>20 girls</td>
<td>Mother</td>
<td>-</td>
<td>-</td>
<td>RS</td>
<td>-</td>
<td>Mothers and daughters</td>
</tr>
<tr>
<td>3 (Paxton et al., 1991)</td>
<td>11-18</td>
<td>341 girls</td>
<td>Child</td>
<td>-</td>
<td>Dieting frequency and parental dieting</td>
<td>Child</td>
<td>-</td>
<td>Parents and daughters (not sons)</td>
</tr>
<tr>
<td>4 (Ruther &amp; Richman, 1993)</td>
<td>9-10</td>
<td>26 girls, 18 boys</td>
<td>Mother</td>
<td>-</td>
<td>-</td>
<td>RS</td>
<td>-</td>
<td>Daughters and mothers, n.s. for sons and mothers</td>
</tr>
<tr>
<td>5 (Mukai et al., 1994)</td>
<td>M = 16.8</td>
<td>197 girls</td>
<td>Child</td>
<td>-</td>
<td>Dieting frequency and parental dieting</td>
<td>Child</td>
<td>-</td>
<td>None</td>
</tr>
<tr>
<td>6 (Thelen &amp; Cormier, 1995)</td>
<td>9-10.5</td>
<td>51 girls, 49 boys</td>
<td>Mother</td>
<td>-</td>
<td>-</td>
<td>Child: ChEAT, dieting frequency (1 item), Parent: EAT-26</td>
<td>-</td>
<td>None</td>
</tr>
<tr>
<td>7 (Steiger et al., 1995)</td>
<td>M = 23.9/24.8</td>
<td>57 girls, 52 mothers, 36 sisters, 19 fathers, 25 brothers</td>
<td>Child</td>
<td>-</td>
<td>Dieting behavior (11 items), parental dieting (1 item)</td>
<td>Child</td>
<td>-</td>
<td>Higher restraint scores for mothers (but not fathers and siblings) of dieters compared to nondieters</td>
</tr>
<tr>
<td>8 (Dixon et al., 1996)</td>
<td>13-16</td>
<td>232 girls</td>
<td>Child</td>
<td>-</td>
<td>Dieting behavior (11 items), parental dieting (1 item)</td>
<td>Child</td>
<td>-</td>
<td>For 2 of the 11 dieting behaviors (skipping meals and crash dieting) were significantly associated with father’s dieting.</td>
</tr>
<tr>
<td>9 (Keel et al., 1997)</td>
<td>12-18</td>
<td>51 girls</td>
<td>Both parents</td>
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<td>-</td>
<td>RS</td>
<td>-</td>
<td>None</td>
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<td>10 (Benedikt et al., 1998)</td>
<td>Grade 10-11</td>
<td>89 girls</td>
<td>Mother</td>
<td>-</td>
<td>Frequency of moderate (4 items + DEBQ-R) and extreme (4 items) weight loss strategies</td>
<td>Child</td>
<td>-</td>
<td>Only for extreme weight loss strategies</td>
</tr>
<tr>
<td>11 (Hill &amp; Franklin, 1998)</td>
<td>11</td>
<td>40 girls</td>
<td>Mother</td>
<td>-</td>
<td>DEBQ, History of dieting</td>
<td>-</td>
<td>-</td>
<td>None</td>
</tr>
<tr>
<td>12 (Hill &amp; Pallin, 1998)</td>
<td>8</td>
<td>176 girls</td>
<td>Child</td>
<td>-</td>
<td>Adapted version of DEBQ-R, parental dieting (1 item)</td>
<td>Child</td>
<td>-</td>
<td>Dieting of daughters and sons and perception of mothers’ dieting</td>
</tr>
<tr>
<td>13 (Ogden &amp; Elder, 1998)</td>
<td>18-26</td>
<td>50 girls</td>
<td>Mother</td>
<td>-</td>
<td>DEBQ-R</td>
<td>-</td>
<td>-</td>
<td>None</td>
</tr>
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</table>
### Continuing Appendix C

<table>
<thead>
<tr>
<th>Reference</th>
<th>Age in years</th>
<th>n</th>
<th>Reporter</th>
<th>Sibling</th>
<th>Foil</th>
<th>Measurements</th>
<th>BMI adjust</th>
<th>Significant positive associations</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Attie &amp; Brooks Gunn, 1989)</td>
<td>16-18</td>
<td>193</td>
<td>girls</td>
<td>Mother</td>
<td>-</td>
<td>EAT-26²</td>
<td>-</td>
<td>Mothers and daughters</td>
</tr>
<tr>
<td>(Hill et al., 1990)</td>
<td>9-11</td>
<td>20</td>
<td>girls</td>
<td>Mother</td>
<td>-</td>
<td>RS³</td>
<td>-</td>
<td>Mothers and daughters</td>
</tr>
<tr>
<td>(Paxton et al., 1991)</td>
<td>11-18</td>
<td>341</td>
<td>girls</td>
<td>Child</td>
<td>-</td>
<td>Dieting frequency</td>
<td>Parents and daughters (not sons)</td>
<td></td>
</tr>
<tr>
<td>(Ruther &amp; Richman, 1993)</td>
<td>9-10</td>
<td>26</td>
<td>girls</td>
<td>Mother</td>
<td>-</td>
<td>RS - daughters and mothers, n.s. for sons and mothers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Mukai et al., 1994)</td>
<td>16.8</td>
<td>197</td>
<td>girls</td>
<td>Child</td>
<td>-</td>
<td>EAT, self-constructed scale dieting of mother/father/sibling</td>
<td>None</td>
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</tr>
<tr>
<td>(Thelen &amp; Cormier, 1995)</td>
<td>9-10.5</td>
<td>51</td>
<td>girls</td>
<td>Child</td>
<td>-</td>
<td>ChEAT, dieting frequency (1 item)</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>(Steiger et al., 1995)</td>
<td>23.9 / 24.8</td>
<td>57</td>
<td>girls</td>
<td>Child</td>
<td>-</td>
<td>DEBQ-R</td>
<td>Higher restraint scores for mothers (but not fathers and siblings) compared to nondieters</td>
<td></td>
</tr>
<tr>
<td>(Dixon et al., 1996)</td>
<td>13-16</td>
<td>232</td>
<td>girls</td>
<td>Child</td>
<td>-</td>
<td>DEBQ-R</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>(Keel et al., 1997)</td>
<td>12-18</td>
<td>51</td>
<td>Both</td>
<td>Both</td>
<td>-</td>
<td>RS - None</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>(Benedikt et al., 1998)</td>
<td>Grade 10-11</td>
<td>89</td>
<td>girls</td>
<td>Mother</td>
<td>-</td>
<td>Frequency of moderate (4 items + DEBQ-R) and extreme (4 items) weight loss strategies</td>
<td>Only for extreme weight loss strategies</td>
<td></td>
</tr>
<tr>
<td>(Hill &amp; Franklin, 1998)</td>
<td>11</td>
<td>40</td>
<td>girls</td>
<td>Mother</td>
<td>-</td>
<td>DEBQ, History of dieting</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>(Hill &amp; Pallin, 1998)</td>
<td>8</td>
<td>176</td>
<td>Child</td>
<td>Both</td>
<td>-</td>
<td>Adapted version of DEBQ-R, parental dieting (1 item)</td>
<td>Child Dieting of daughters and sons and perception of mothers' dieting</td>
<td></td>
</tr>
<tr>
<td>(Ogden &amp; Elder, 1998)</td>
<td>18-26</td>
<td>50</td>
<td>girls</td>
<td>Mother</td>
<td>-</td>
<td>DEBQ-R</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

Note: BMI adjusted associations indicate that the associations were controlled for BMI in the analysis.
1 Longitudinal study but mother’s eating behaviour was measured only at time 2.
2 **EAT**: Eating Attitudes Test (Garner, Olmsted, Bohr, & Garfinkel, 1982), **CheAT**: child version *EAT*. Consists of three subscales: diet, bulimia and food preoccupations, oral control
3 **RS**: Restraint Scale (Herman & Polivy, 1980)
4 Only the data on comparison between “normal dieters” and “nondieters” was used, Eating Disorder patients not included
5 **DEBQ-R**: Restrained eating subscale of the Dutch Eating Behavior Questionnaire (van Strien, Frijters et al., 1986a).
6 Both studies used the GUTS/NHS data
7 Both studies used the EAT data
Summary

Three eating styles

This dissertation focusses on three eating styles: Emotional eating which is the tendency to eat in response to emotional (dis)stress, external eating which is the tendency to eat in response to food cues, and restrained eating which is the tendency to restrict food intake in order to loose weight or prevent weight gain.

Eating styles and weight status in adolescence

Theoretically all three eating styles are assumed to be related to overeating. The first part of this dissertation aims to test the relation between eating styles and weight status for adolescents. The most convincing evidence for a positive association with weight status in survey studies was found for restrained eating, as several cross-sectional and prospective studies found a positive and only few studies found no association with BMI or weight status. However, there is also evidence to support that overweight people more often engage in dieting. This reciprocity in the associations between restraint and weight status was not accounted for in most previous studies. There are only very few studies addressing associations between external and emotional eating and weight. For external eating consistent results are found with lower external eating in the higher weight categories. For emotional eating, the results are more diffuse; emotional eating was found to be both positively and negatively related to weight in subgroups of one study and unrelated to weight in other studies. Both large-scale cross-sectional and longitudinal studies are needed to describe associations between emotional and external eating and weight status. Finally, little is known about how emotional, external, and restrained eating develop during adolescence, and about the differences between age, sex, SES, and ethnic groups.

In the first part of this dissertation we aimed to fill these gaps. The associations between the eating styles and weight status are studied in a large young adolescent high school sample (n= 10,087) and a prospective family study (n = 428). In chapter 2 cross-sectional associations between eating behaviours and weight status were determined, chapter 3 links eating styles to trajectories (development) of BMI over time and in chapter 4 tests on reciprocal influences between BMI and restrained eating are presented.

Results and conclusions on eating styles and weight status in adolescents

Descriptive results show that girls score higher on emotional and restrained eating, and lower on external eating, compared to boys. Most eating behaviour
scores are higher in older age groups. Similar gender and age differences have been found in previous studies. Our results also provide evidence for higher levels of restrained and emotional eating in ethnic minorities and youngsters with a lower educational level which is in line with previous Dutch research on dieting. More studies that specifically address these groups are needed to reveal underlying processes.

Cross-sectional associations between eating behaviours and overweight status show that higher restrained eating is associated with a higher chance of being overweight, while higher external eating is associated with a lower chance of being overweight and emotional eating is unrelated to weight status. Higher restrained eating is related to a greater chance of being in the highest BMI trajectory over a four-year period. However, restrained eating did not affect the course of BMI development. Emotional and external eating were unrelated to the probability of membership of a specific BMI trajectory. When examining the reciprocal nature of the associations between restrained eating and BMI over time, it appears that BMI predicts restrained eating more consistently than the other way around. So, restrained eating is related, to both a higher weight status and a higher BMI trajectory over time, but this association is mainly due to the fact that heavier individuals are more likely to diet.

Emotional and external eating may, in young children or adolescents, not (yet) be associated with overweight or weight gain. However, both types of overeating have been shown to be related to disordered eating in adolescents, whilst emotional eating was also positively associated with binge-eating, and loss-of-control eating episodes. Thus, targeting research as well as prevention to treating and preventing (increases in) disordered eating in these groups is probably more useful than studying the relations between these behaviours and weight in a general population. Our results are not supportive for the restraint theory: Restained eating was related to higher weight, but this relation seemed to be predominantly the result of overweight adolescents’ having higher restrained eating scores. If overweight youngsters already display specific minimal efforts to control their weight, treatment and prevention programmes should recognize this and anticipate on the tendency of overweight youngsters to restrain their food intake. Especially since diets are generally unsuccessful in reducing weight gain.

Social influences: Family

Childhood and adolescence are periods in which food-related behaviours and attitudes are shaped. This has long-term effects on health and well-being, especially in late-adolescence when health behaviours begin to solidify and may track into adulthood. It is therefore important to study the factors that influence and shape these behaviours. Family members influence each other’s behaviours in several ways, including modelling and direct transmission, general parenting (i.e. parental support and control), and food-related parenting; the parenting behaviours that specifically relate to eating and food choice. In the second part of this dissertation, the role of
the family in adolescents' eating behaviours and body dissatisfaction is addressed, as well as parental influences on young children's food choices.

**Similarities between family members**

Modelling and transmission of eating behaviours result in similarities between family members. The general belief is that children resemble their parents in dieting behaviours. However, the numerous studies that have addressed this issue are subject to several methodological constraints, are mostly cross-sectional, and did not provide convincing evidence for associations between parents’ (mostly mothers) and children's (mostly daughters) restrained eating and dieting. Little studies have looked at family similarities in emotional eating and the results are not conclusive in whether children do or do not model their parents' emotional eating. For siblings, even less is known about modelling of eating behaviours. From the findings of studies on peers we hypothesized that siblings' eating behaviours might be related, especially for girls and especially for restrained eating. We looked at parent-adolescent (chapter 5 and 7) and sibling similarities (chapter 6) in eating behaviours as well as at prospective influences on restrained eating (chapter 5) in the family study; a full family design, containing two siblings and both biological parents.

Our results show support for family similarities in restrained, emotional, and (for siblings) external eating, but there seems to be no transmission during the adolescent period. In addition we expected higher similarities between family members of the same sex such as mothers and daughters or sisters and between family members who have a good quality relationship. The social learning theory suggests that people are more likely to imitate someone whom they resemble, look up to, or have a good relationship with. Our data is not supportive for these expectations, neither for the social learning theory.

The conclusion that parents are not important for the development of eating behaviours during adolescence would be too far-fetched, since this can not be concluded from similarities and transmission only without taking also genetics, parenting factors, and their interactions into account. Our results however, suggest that adolescence is not a key time-period in transmission of eating styles, therefore, it might be more interesting for future studies to investigate transmission of eating behaviours between family members at a younger age, since transmission may have occurred at an earlier age.

**General parental control and support**

General parental support and control have been related to various behaviours in children and adolescents, including health risk behaviours and internalizing problem behaviours. Parental behaviour might also play an important role in the development of emotional eating (Bruch, 1973). It has been proposed that especially an emotional feeding style (i.e., feeding in response to emotional distress) might enhance emotional eating. More recent studies found some evidence for associations between parenting controlling behaviours and emotional eating. We looked at the associations between general parental support and control and emotional eating, results are presented in chapter 7.
A higher level of maternal support is associated with lower emotional eating in younger adolescents, while higher psychological control is associated with higher emotional eating in younger and older (trend) adolescents. This is in line with previous studies that found positive influences of support and negative influences of psychological control on children’s (eating) behaviours. Unexpectedly, perceived maternal behavioural control is associated with higher emotional eating in older adolescents, perhaps this is related to feelings of being over-controlled in the older adolescents. Future studies on parental influences on emotional eating might include both general and more specific parenting behaviours, and should additionally look at the interactions between those.

Parental influences on body dissatisfaction
The ideal of being thin in our society puts high pressure on youngsters, and many of them are dissatisfied with their body. The sociocultural model postulates that social pressure to be thin fosters internalization of the thin ideal and in turn body dissatisfaction. Sociocultural pressures are exerted by parents, peers, and the media, and include (direct or indirect) pressures to lose weight, a focus on dieting and physical attractiveness, weight-related teasing, parental control over children’s weight, and pressure to restrict food intake. Despite ample research on the thin ideal and sociocultural pressures to be thin, no study so far looked at how parents perceive their adolescent children’s figures and how this in turn prospectively relates to adolescents’ own perceptions. This question is addressed in chapter 8 of this dissertation.

The results show that roughly 10 to 20 % of the fathers and mothers indicate their wish for their children to be thinner or, to a lesser degree, larger. In line with our hypotheses, cross-sectional results showed a weak but significant relation between parental and adolescent dissatisfaction. Over time parental dissatisfaction influenced adolescents dissatisfaction in an indirect manner in that it was related to the adolescents’ body dissatisfaction at measurement 1, which in turn predicted adolescents’ body dissatisfaction one and two year later. Future studies are needed to address the distinction between the desire to be thinner or larger, and include muscularity in the direct measures of parental dissatisfaction. It is a challenge for parents to help their children keep a healthy weight and at the same time promote a positive body image, therefore positive, encouraging behaviours of parents should be included.

Parental restriction and food choice of young children
The majority of research on food-specific parenting focuses on pre-school and primary-age children and on three types of parental control: Restriction (restricting access to foods), pressure to eat (prompting, pressure or encouragement to eat more healthy foods or more food in general), and monitoring (watching their children’s consumption of (energy-dense) foods). Monitoring is generally related to a healthier eating pattern whereas for pressure to eat the results vary and seem to depend on weight status. Parental restriction over food intake of young children is strongly debated, because of their possibly unintended (negative) effects on children’s food choices. Commonly used questionnaires however, are not validated for behaviour,
show discrepancies between parent and child reports, and are not suitable for young children. In our studies we used an innovative design: a structured role-play combined with observations of maternal controlling behaviour.

In the first observation study (described in chapter 9) we found that overweight children tend to buy more products in general and more high-caloric foods than their normal-weight peers. Mother-reported and child-reported restriction do not differ between mothers of overweight and non-overweight children and have little main or moderating effects on the children’s food choices. The second role-play (described in chapter 10) showed that, mothers are successful in influencing their children’s food choices, since the food choices are healthier compared to when the child shops alone. Observation of mothers’ support, monitoring, directive control (pressure and restriction), and enforcing control (pressure and restriction) were unrelated to food choices. Interactions characterized by low involvement, low dominance and high permissiveness of mothers and high dominance of children were related to unhealthier food choices compared to “generally positive” or “high-conflict” interactions.

Our results thus suggest that not specific maternal behaviours but rather the interaction between mothers and children determines whether children make healthy choices. The presence, active involvement and some degree of control by mothers seems indispensable. Future research should especially focus on a combination of general and food-specific parenting and their interactions. In addition, observation studies proved to be very useful in thoroughly studying maternal control over young children’s food choices.

**Media influences: TV**

Television and television viewing (TVV) are linked to overweight and higher (snack) food intake. In the third part of this dissertation (chapter 11) we looked at whether the three eating styles can provide a framework for explaining individual differences in the magnitude of the association between TVV and food intake, and tested their moderating effects on the association between TVV and snacking.

For different reasons both external, restrained, and emotional eaters can be more vulnerable for overeating induced by TVV. First, TV provides food cues. External eaters are sensitive to external cues and therefore more likely to respond to cues (such as food advertisements) by eating. Second, there is evidence that weight-related media messages can act as disinhibitors (that is, cues for restrained eating to give up their diet and overeat) similar to the effects of other disinhibitors such as food preloads and alcohol. Also negative affect (for example after watching a frightening movie) could trigger overeating among restrained participants. Third, TVV has been associated with negative emotions, such as loneliness, feelings of failure and guilt, and depression. Such negative emotions have been related to overeating in high emotional eaters.
We found that the positive associations between TVV and snacking are stronger in adolescents who score high on external and (only for boys) emotional eating, whereas restrained eating weakens these associations. The three types of eating behaviours thus seem to be related to susceptibility to influences of TVV on food intake, and should therefore be considered when studying the associations between TVV and food intake. The theories of eating behaviour can provide insight into the complex mechanisms by which TVV increases food intake. For restrained eating the results are opposite to our expectations but in line with the reinhibition theory: diet and weight-related messages on TV might remind restrained eaters of their diets and make them eat less.
Samenvatting

Drie eetstijlen

Drie eetstijlen staan centraal in dit proefschrift. Ten eerste emotioneel eten: bij emoties en stress is de natuurlijke reactie een verminderde eetlust. Sommige mensen zijn echter geneigd om bij emoties juist meer te gaan eten, deze neiging noemen we emotioneel eten. Een voorbeeld hiervan zijn de zogenaamde comfort foods oftewel troost-eten: de reep chocola om je verdriet weg te eten. De tweede theorie is die van extern eten: dit is de neiging van mensen om in meer of mindere mate toe te geven aan de verleidingen van externe eetsignalen zoals het lekker ruiken van eten of gebak in een etalage. De derde theorie gaat over lijngericht eten. Dat is de neiging van mensen om minder te eten dan ze zouden willen of lusten om te voorkomen dat ze aankomen. Lijnen staat ter discussie, want het onderdrukken van hongergevoelens kan juist overeten tot gevolg hebben op momenten dat de lijngerichte eeter “doorslaat”. Dit kan gebeuren als de dag gevoelsmatig al verpest is door bijvoorbeeld een traktatie, als het een keer “mag”, of als een lijngerichte eeter de controle verliest.

De eetgedragingen en overgewicht

Alle drie de theorieën verklaren overeten en zouden een verklaring kunnen zijn waarom sommige mensen overgewicht hebben en anderen niet. Het eerste doel van dit proefschrift is om te zien hoe scores op vragenlijsten, die emotioneel, extern en lijngericht eten meten, samenhangen met (over)gewicht bij jongeren. Voor emotioneel en extern eten is dit nog niet vaak onderzocht en geen enkele studie heeft de samenhang met gewicht over een langere periode bekeken. Ook hielden eerdere studies niet altijd rekening met het feit dat lijnen niet alleen gevolgen voor gewicht kan hebben maar dat tegelijkertijd een hoger gewicht vaak samenhangt met meer lijnen. Wij hebben de samenhang tussen gewicht en emotioneel, extern en lijngericht eten onderzocht en ook onderzocht of lijnen nu vooral leidt tot overgewicht of overgewicht tot lijnen. Daarnaast hebben we gekeken naar verschillen tussen jongens en meisjes, leeftijd, sociaal-economische status en etniciteit. In totaal 10087 scholieren hebben een vragenlijst over hun eetgedrag ingevuld en daarnaast hebben we 428 gezinnen op 5 opeenvolgende jaren vragenlijsten in laten vullen. De jongeren tussen de 12 en de 18 jaar.

De resultaten laten zien dat meisjes gemiddeld hoger scoren op emotioneel- en lijngericht eten en jongens hoger op extern eten. De oudere kinderen scoren op alle drie de eetgedragingen gemiddeld hoger dan jongere kinderen. Etnische minderheden en jongeren uit lagere sociaal-economische statusgroepen scoren hoger op emotioneel en lijngericht eten dan autochtone jongeren en jongeren van wie de ouders een hoger opleidingsniveau hebben. Emotioneel eten hangt niet samen met gewicht bij jongeren, voor extern eten zien we zelfs dat jongeren die hoger scoren op extern eten minder vaak overgewicht hebben. Echter voor zowel extern and emotioneel
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eten vonden we geen relatie met BMI (gewicht gedeeld door lengte in het kwadraat) over een langere periode. Hogere scores op lijngericht eten hangen wel samen met een hoger BMI en ook over een langere periode. We vonden echter dat dit vooral komt doordat zwaardere jongeren vaker aan de lijn doen.

Het lijkt er op dat voor jongeren in de leeftijd van 13 tot 18 de eetgedragingen weinig verklaren met betrekking tot gewichtsverschillen. Echter, bij het opstellen van interventies om overgewicht te voorkomen en bij de behandeling van overgewicht is het belangrijk om er rekening mee te houden dat jongeren lijngericht eten en dat dit lijngericht eten niet het gewenste effect (namelijk gewichtsverlies) heeft. Ook is het belangrijk rekening te houden met de mogelijke aanwezigheid van emotioneel en extern eten. Er mogen dan geen directe gevolgen zijn voor overgewicht, eerder onderzoek heeft aangetoond dat emotioneel eten samenhangt met eetstoornissen en verstoord eetgedrag.

Eetgedrag en de rol van de familie

Kinderen en jongeren ontwikkelen een eetpatroon en eetgedragingen die gedurende het hele leven een invloed hebben op eetgedrag en dus gezondheid. Het is daarom belangrijk te kijken naar factoren die het ontstaan en ontwikkelen van eetgedrag in deze periode beïnvloeden. Een van deze factoren is de familie. Ouders en familieleden hebben op verschillende manieren invloed op het eetgedrag van kinderen en jongeren. Ten eerste nemen kinderen ideeën en gedrag over van hun ouders, ze lijken op hen. Ten tweede hebben ouders via de opvoeding een invloed op het eetgedrag. Hierbij maken we onderscheid tussen algemeen opvoedingsklimaat en opvoeding die gericht is op voeding, dit laatste noemen we voedingspecifieke opvoeding.

In het tweede deel van dit proefschrift hebben we gekeken naar gelijkenissen tussen familieleden in emotioneel, extern en lijngericht eten en de rol van de algemene opvoeding hierin. Ook hebben we gekeken naar twee vormen van voedingspecifieke opvoeding. De achtergronden van dit onderzoek en de resultaten worden hieronder besproken.

Gelijkgenissen in eetgedrag tussen jongeren en hun familie

Er wordt algemeen aangenomen dat het lijngedrag van jongeren op dat van hun familieleden lijkt, voornamelijk dat meisjes het lijngedrag van hun moeders en zussen kopiëren. Een overzicht van de studies die tot nu toe zijn verricht laat zien dat jongeren weliswaar op hun ouders lijken, maar dat over een langere periode vaak geen beïnvloeding wordt gevonden. Eerdere studies richtten zich vaak op moeders en dochters en vaders werden buiten beschouwing gelaten. Door de opzet van onze gezinstudie waar beide ouders en twee jongeren uit elk gezin meerdere jaren achtereen een vragenlijst invulden over hun eigen eetgedrag konden wij onderzoeken in hoeverre jongeren hun ouders kopiëren. We keken ook naar gelijkenissen tussen broers en zussen, dit is nog niet eerder onderzocht. We vonden gelijkenissen tussen ouders en jongeren en tussen broers en zussen op alle drie de eetgedragingen. Het
lijngerichte gedrag van ouders en jongeren hebben we ook over een langere periode gekeken. Hierbij concludeerden we dat jongeren weliswaar op hun ouders lijken, maar dat er over de jaren heen geen overdracht plaatsvindt. Wellicht heeft deze overdracht al op eerdere leeftijd plaats gevonden. Ook zou het kunnen dat de ouders het eetgedrag van hun kinderen hebben beïnvloed op een andere manier, zoals door opvoeding.

**Algemene opvoeding en emotioneel eten**
Het algemene opvoedingsklimaat is de manier waarop ouders in het algemeen met hun kinderen omgaan. Gedragingen van ouders worden beschreven als steun, gedragscontrole en psychologische controle. Gedragscontrole is het in de gaten houden van kinderen en regels stellen terwijl psychologische controle meer manipulatief en dwingend is. Gedragscontrole is bijvoorbeeld weten waar en met wie het kind is en psychologische controle is kinderen schuldgevoelens aanpraten of geen liefde geven als ze ongehoorzaam zijn. Een hoge mate van psychologische controle en een lage mate van steun en van gedragscontrole hangen samen met probleemgedrag. In dit proefschrift hebben we gekeken hoe deze opvoedingsgedragingen samenhangen met emotioneel eten. Omdat emotioneel eten gezien wordt als een onnatuurlijke en aangeleerde reactie op emoties en stress is het voor dit type eetgedrag aannemelijk dat ouders een belangrijke rol in de ontwikkeling ervan spelen. Met name door eten te gebruiken als troost, kunnen ouders kinderen wellicht aanleren om troost in eten te vinden. De invloed van algemene opvoeding op emotioneel eten is echter nog niet eerder onderzocht. Onze resultaten laten zien dat, zoals verwacht, een hogere mate van ouderlijke steun samenhangt met minder emotioneel eten. Zoals verwacht hangt een hoge mate van psychologische controle samen met meer emotioneel eten, maar ook voor gedragscontrole hangt een hoge mate van controle samen met meer emotioneel eten. Dit laatste was tegen de verwachtingen in: een mogelijke verklaring is dat jongeren zich over-gecontroleerd voelen. Het zou interessant zijn dit verder te onderzoeken en ook te kijken naar de samenhang tussen algemene opvoeding en voedinggerelateerde opvoeding (zoals het troosten met eten).

**Lichaamstevredenheid van jongeren en invloed hierop van ouders**
In onze cultuur is slank zijn het schoonheidsideaal, we spreken daarom ook wel van het slankheidsideaal. Niet elke jongere voldoet volgens zichzelf en/of volgens anderen aan dit ideaal en het is dan ook niet verwonderlijk dat veel jongeren ontevreden zijn met hun figuur en lichaam. Vooral als jongeren sterk hechten aan het slankheidsideaal en tegelijkertijd druk ervaren van de media, andere jongeren of hun ouders om slanker te worden, aan de lijn te doen, of af te vallen. Er is uit eerdere onderzoek gebleken dat deze druk van ouders en ook gewichtsgerelateerde pesterrijen samenhangen met meer ontevredenheid bij de jongeren. In één eerdere studie werd ouders gevraagd of ze tevreden waren met het figuur van hun kind. Dit hebben we in onze studie ook gedaan en daarnaast hebben we dit aan de jongeren zelf gevraagd. Het bleek dat ongeveer 10-20 procent van de ouders ontevreden zijn over het figuur
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van hun kind, deze ontevredenheid hangt samen met een hogere ontevredenheid bij het kind zelf en dit voorspelde weer latere ontevredenheid. Jongeren lijken zich dus de ontevredenheid van hun ouders aan te trekken en dit over te nemen. Deze verbanden staat los van gewicht. Een hoger gewicht hangt samen met een hogere ontevredenheid bij zowel ouders als jongeren dus in onze berekeningen controleerden we voor de invloeden van gewicht. We vonden nog steeds een verband tussen ontevredenheid van ouders en jongeren. Omdat een hoge mate van lichaamsontevredenheid ook samenhangt met verstoord eetgedrag en eetstoornissen is het niet wenselijk dat jongeren in hoge mate ontevreden zijn over hun lichaam. Voor ouders is het de grote uitdaging om hun kinderen te stimuleren een gezond gewicht te bereiken zonder hierbij de lichaamsontevredenheid van hun kinderen te vergroten.

Voedingspecifieke opvoeding en voedselkeuzen van kinderen

Het meeste onderzoek naar voedingspecifieke opvoeding richt zich op jonge kinderen en op de volgende drie gedragingen: controleren/toezicht houden, druk uitoefenen om te eten en restrictie. In eerdere onderzoeken zijn positieve effecten van controle gevonden. Restrictie, zoals het verbieden van bepaalde producten staat echter ter discussie; dit zou de verboden producten extra aantrekkelijk maken en jongeren zouden er juist meer van eten. Deze gedragingen worden meestal gemeten met een vragenlijst, maar de betrouwbaarheid van deze lijst staat ter discussie. Ten eerste is de vragenlijst niet gevalideerd voor gedrag maar is er ook weinig overeenstemming tussen hetgeen ouders en wat kinderen invullen. Jonge kinderen zijn bovendien niet in staat vragenlijsten in te vullen. We hebben daarom een nieuwe onderzoeksmethode gebruikt om voedingspecifieke opvoeding te meten: we lieten kinderen een rollenspel spelen in een winkel op barbieformaat. De kinderen kregen de opdracht dat zij vandaag de moeder waren en boodschappen moesten doen voor het gezin voor een middag en avond op een gewone schooldag. In de winkel waren zowel gezonde als ongezonde (calorierijke) dranken, snacks en producten voor het avondeten. Eerst hebben we 56 kinderen met en 56 kinderen zonder overgewicht laten winkelen om te kijken of hun inkopen verschilden. Daarna hebben we 40 van de kinderen met overgewicht opnieuw laten winkelen en dit maal met hun moeders. We hebben hiervan opnames gemaakt en een code gegeven aan elke zin of serie zinnen die de moeders zeiden. Daarnaast gaven we scores aan hoe moeders en kinderen zich in het rollenspel gedroegen.

In de eerste studie vonden we dat kinderen met en zonder overgewicht niet verschilden in hun aankopen van gezonde voedingsmiddelen. De kinderen met overgewicht kochten echter meer ongezonde voedingsmiddelen, snacks en dranken en dus ook meer in totaal. In de tweede studie, met de moeders erbij, hadden de kinderen een gezonder inkopenpatroon dan toen ze alleen winkelden. Het aantal keren dat moeders steun/aanmoediging, toezicht houden, sturende controle en dwingende controle gebruikten, hing echter niet samen met de aankopen van de kinderen. Voor de interacties tussen moeders en kinderen vonden we drie patronen: een groep waarin zowel de moeders als kinderen erg positief waren en weinig negatief gedrag lieten zien, een groep waarin veel conflict was en het kind weinig gehoorzaam was en een laatste groep waarin het kind erg dominant was en de moeder passief en
toegeeflijk. In deze laatste groep hadden kinderen ongezondere aankopen dan in de andere groepen. Het lijkt er dus op dat niet bepaalde gedragingen van de moeder, maar juist de interactie tussen moeder en kind bepaald hoe gezond de uiteindelijke keuzes zijn. Hierbij is het van belang dat de moeder zich actief bemoeid met wat het kind koopt en dus controle en restrictie uitoefent.

**Eetgedrag en de invloed van televisie**

Eerdere onderzoeken hebben aangetoond dat televisie kijken bij kinderen sterk samenhangt met overgewicht. Dit komt doordat kinderen minder bewegen, maar ook omdat ze meer eten. In het derde deel van dit proefschrift hebben we bekeken hoe televisiekijken er voor zorgt dat jongeren meer eten en wat de rol van de drie eetgedragingen hierin is. Om heel verschillende redenen zouden emotioneel, extern en lijngerichte eters wel eens extra gevoelig kunnen zijn voor de invloeden van TV kijken.

Ten eerste is TV een bron van eetsignalen, bijvoorbeeld door reclames waarin koek, snoep en ijs op een aantrekkelijke manier worden gepresenteerd. Externe eters zouden wel eens extra gevoeliger kunnen zijn voor deze signalen. En inderdaad, onze resultaten laten zien dat de samenhang tussen TV kijken en snacken hoger is bij hoog externe eters vergeleken met de groep mensen die laag scoort op extern eten. Ten tweede is uit eerder onderzoek gebleken dat veel TV kijken samenhangt met negatieve gevoelens zoals depressie, eenzaamheid en gevoelens van mislukking en schuldgevoelens. Voor emotionele eters kunnen deze negatieve emoties een aanleiding zijn tot overeten. En inderdaad, voor jongens vonden we dat de relatie tussen TV kijken en snacken sterker is voor hoog emotionele eters. Ten slotte bleek uit eerder onderzoek dat o.a. via de media het slankheidsideaal in sterke mate verkondigd wordt. Ook is gebleken dat dit soort berichten voor lijngerichte eters een aanleiding kunnen zijn om hun dieet opzij te zetten en te overeten, het doorslaan dus. We hadden daarom verwacht dat de relatie tussen TV kijken en snacken ook sterker zou zijn voor lijngerichte eters. Echter, we vonden het tegengestelde, TV kijken hing in deze groep juist minder sterk samen met snacken. Het lijkt erop dat lijngerichte eters juist tijdens het TV kijken zich hun dieet herinneren en zich eraan houden. Concluderend laten onze resultaten dus zien dat jongeren die hoog scoren op extern eten en jongens die hoog scoren op emotioneel eten gevoeliger lijken te zijn voor de negatieve invloed van TV kijken terwijl lijners juist beschermd lijken te zijn.
Publications

(this dissertation)


Curriculum vitae

Harriëtte Snoek was born on September 15th, 1979 in Zaanstad, the Netherlands. She grew up in Cameroon where she lived for 11 years, attended French elementary school and was additionally home schooled. After moving back to The Netherlands, she completed Atheneum in 1997 at the St.-Michaël College in Zaan- dam. That same year she moved to Wageningen and studied at the Wageningen University and Research Centre where in March 2002 she obtained her MSc. in Nutrition and Health. Part of her studies was a 4 months stay at Kabete campus in Nairobi (Kenya) where she conducted a field study on the street food intake of children in a slum area. During her studies she also conducted a lab-study in collaboration with TNO-Nutrition in Zeist on sensory-specific satiety of obese and normal-weight women.

From August 2003 till March 2009 she worked on a PhD position at the developmental psychopathology group of the Behavioural Science Institute of the Radboud University Nijmegen. She studied the relation between eating behaviours and weight as well as the influences of family and media on eating behaviours, which resulted in this doctorate thesis. Also, she presented her work on several international conferences and workshops, and national research meetings, including the ISED research day, meetings of the Workgroup Eating Habits and the Expert Group Eating Behaviours. Parallel to her research, she supervised MA and MSc students with their theses.

Currently, she works at the Research Group Consumer and Behaviour of the Agricultural Economics Research Institute, Wageningen University and Research Center.

Harriëtte is married to Paul van Genuchten and they have two children; Christian (2006) and Elise (2008).