Parent-child feeding interactions:

The Influence of Child Cognitions and Parental Feeding
Behaviors on Child Healthy Eating

by

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Summary

With the increasing prevalence of child and adolescent overweight and obesity in mind, the main objective of this thesis is to contribute to the understanding of preadolescent children's eating behavior in the context of parent-child food-related interactions. A more long-term objective is to obtain knowledge that might have the potential to inform future family-oriented nutrition interventions. This thesis consists of three empirical studies and an overview presenting the theoretical foundation, aims, major findings, and an overall discussion of the research performed.

The specific aims of the studies included in the thesis are: (1) to test the validity of a n ot yet established parental feeding measure (the Comprehensive Feeding Practices Questionnaire; CFPQ) to see if it is suitable tool for measuring feeding behaviors with parents of preadolescent children (10-12-year-olds); (2) to explore the roles of child cognitions and parental feeding behaviors in explaining child intentions and behavior regarding fruit and vegetable consumption; and (3) to investigate the pathways of the associations between parental feeding behaviors and child vegetable consumption, addressing potential mediating effects of child cognitions.

The results of the studies suggest that the CFPQ is a promising tool for measuring feeding practices with parents of preadolescent children (study 1); child-reported cognitions plays a greater role than parent-reported feeding practices in explaining the variance in child intentions and behavior regarding fruit and vegetable consumption (study 2); some parent-reported feeding practices are *indirectly* associated with child vegetable consumption (i.e. parent-reported child control, parental encouragement of a balanced and varied diet, and parental restriction for health purposes) indicating mediation through child cognitions, while others are *directly* associated with child vegetable consumption

(i.e. parent-reported home environment) (study 3). A lthough our analyses show statistically significant associations between some parental feeding practices and child intentions and behavior regarding fruit and vegetable consumption, these associations are weak. Possible reasons for the weak associations are thoroughly discussed, and directions for future research are suggested.

This thesis extends the current literature on parent-child feeding interactions. It also makes a contribution to the more general health behavior and food consumption literature, by expanding an established cognitive model often applied within these research fields. Both the validation study (study 1) and the studies on the influence of child cognitions and parental feeding behaviors on c hild (healthy) eating (studies 2 a nd 3) address clear shortcomings within the literature. However, more research is needed to inform future family-oriented nutrition interventions in this group of the population.

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Part I

1 Introduction

Child and adolescent obesity has become a significant public health issue, as it h as significant adverse effects on physical, social and psychological health both in childhood and later in life (Baker, Olsen, & Sorensen, 2007; Freedman, Khan, Dietz, Srinivasan, & Berenson, 2001; Lee, 2009; Lee, Okumura, Freed, Menon, & Davis, 2007; Reilly et al., 2003). It is well known that food choice, energy intake and weight status are related (Ledikwe et al., 2006; Nicklas, Yang, Baranowski, Zakeri, & Berenson, 2003); that child eating behavior often track to adulthood (Kelder, Shepherd, Perry, Klepp, & Lytle, 1994; Mikkilä, Rasanen, Raitakari, Pietinen, & Viikari, 2004); and that obese children tend to become obese adults (Freedman et al., 2005; Semmler, Ashcroft, van Jaarsveld, Carnell, & Wardle, 2009; Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). Thus, effective promotion of healthy eating among children and adolescents is critical to address the world wide obesity epidemic.

The increasing prevalence of overweight and obesity has created a strong interest in determinants of food choice and the most effective ways to provide food guidance to individuals and populations to improve their diet and well-being. Eating behavior is highly complex, resulting from the interaction of multiple factors across different contexts and conditions (Larson & Story, 2009). However, research on determinants of eating behaviors has predominantly focused on individual-level determinants such as attitudes, preferences, behavioral intentions and self-efficacy (Sallis & Owen, 2002). Although there has been a recent shift in attention to environmental determinants, the empirical evidence on the influence of environmental factors is scarce, and little research has been done on how environmental factors interact with individual factors to influence eating behaviors in various populations (Brug & van Lenthe, 2005; Kremers et al., 2006; Van der

Horst, Oenema, et al., 2007). Different environmental factors operate across multiple domains: (1) the *social environment* includes interactions with family, friends, peers and others, and can impact food choices through mechanisms such as role modeling, social support and social norms; (2) the *physical environment* includes the multiple settings where people eat and procure food such as schools, child care, work sites, retail food stores and restaurants, and influence what foods are available and accessible; and (3) the *macro-level environment* include cultural norms, food-, health- and agricultural policies, and plays a more distal and indirect role, but has a substantial effect on what people eat (Larson & Story, 2009).

The family is increasingly being recognized as an important environmental influence on child eating (Pearson, Biddle, & Gorely, 2009). Thus, this thesis aims to extend the literature on child (healthy) eating behavior by investigating the associations between parental feeding behaviors (family-environmental factors), child cognitions (individual factors), and child fruit and vegetable consumption (child healthy eating behavior). The following sections of this introductory part include a short review of the child nutrition and eating literature. First, general challenges within child and adolescent health and eating, such as the increasing prevalence of overweight and obesity and the suboptimal consumption of fruit and vegetables, are outlined. Next, a brief presentation of parental influence on child eating behavior is given (parental influence on child eating is further elaborated in the Theoretical framework section). Finally, the transitional stage of adolescence is described, as the populations of interest in the current thesis are children on the onset of adolescence and their parents.

1.1 Child weight and the importance of fruit and vegetable consumption

According to the Public Health Institute, 15-20% of Norwegian children aged 8-12 years, and 8-14% of Norwegian adolescents aged 15-16 years, are overweight or obese (www.fhi.no, 2008). The prevalence of overweight in the pediatric population seems to be at the same level in Norway as in the other Nordic countries and the rest of Western Europe (Juliusson et al., 2007; Lobstein & Frelut, 2003). Many factors have been attributed to the overall rise in obesity, including lack of physical activity, changes in dietary habits, and the ready availability of high-calorie low-nutrient foods (Rhee, 2008).

Fruit and vegetable intake has been linked to reduced risk for the development of obesity (Guenther, Dodd, Reedy, & Krebs-Smith, 2006; Rolls, Ello-Martin, & Tohill, 2004) and certain types of cancer (Paolini, Sapone, Canistro, Antonelli, & Chieco, 2003). Furthermore, there is increasing evidence that a diet rich in fruit and vegetables (F&V) is associated with reduced risk of cardiovascular diseases (CVD) (Egert & Rimbach, 2011; Marmot, 2011). Importantly, CVD risk is dose dependent, and lowers with increasing F&V intake (Crowe et al., 2011; Dauchet, Amouyel, Hercberg, & Dalongeville, 2006; He, Nowson, & MacGregor, 2006). Thus, there seem to be strong epidemiological support for the recommendation to consume at least 5 servings per day of F&V. However, national dietary surveys from 2000 showed that the average intake of F&V among Norwegian children and adolescents was less than half the recommended amount (Øverby & Andersen, 2002). Subsequent cross-national surveys among children and adolescents also found that the F&V intake was far from reaching population goals and food-based dietary guidelines in all the surveyed countries (Yngve et al., 2005). The promotion of healthy eating (including daily F&V consumption) in preadolescent children is important, since food habits established in childhood may to a certain

extent track into adolescence and adulthood (Lien, Lytle, & Klepp, 2001; Mikkilä, et al., 2004). Furthermore, food habits in preadolescent children may be more flexible to change than food habits in adolescents and adults (Birch, 1990).

1.2 Parental influence on child eating behavior

Studies have shown that eating behaviors are modeled after important caregivers of the child, primarily the parents (Nicklas et al., 2001). Parents shape children's early experiences with food and eating (Savage, Fisher, & Birch, 2007), and can affect children's diet and eating behaviors in numerous ways. For instance: By encouraging them to eat certain foods, by restricting certain foods, or by passively allowing certain foods in the regular diet. Other important parent-related determinants of children's eating behaviors are the physical and emotional environment in which eating behaviors are developed (Golan & Crow, 2004). A qualitative study by Zeinstra (2007) suggests that children's cognitive development influences the strategies that parents use to shape the eating behavior of their children, and that further research should focus on the role of parental strategies in shaping children's food preferences and consumption. Also according to Hart, Bishop and Truby (2002), there is a need for increased knowledge about parental influence on children's eating behavior. So far, most studies of parental influence on child eating behavior have focused on young children. Thus, in the present thesis, we choose to focus on feeding practices in parents of preadolescent children, also referred to as "tweens".

1.3 Tweens and the transitional stage of adolescence

Adolescence is the period from about the age of eleven to the late teen years, and represents a transitional stage from childhood to adulthood.

It is characterized by the elaboration of identity, and it is a time of growing independence when individuals want to make their own decisions including what and when to eat (Boutelle, Lytle, Murray, Birnbaum, & Story, 2001; Koivisto & Sjøden, 1996). This stage is typically a time of gradual shift from parental to peer influence (Erikson, 1963). Thus, during adolescence parental influence over food choice may be displaced by the effects of advertising and peer pressure (Shepherd & Dennison, 1996) and the age at which these influence shifts occur appears to be diminishing (Robinson, 2000). Food choice is (as many other types of behavior) deeply linked to the construction and expression of identity both at a personal and a social level (Bisogni, Connors, Devine, & Sobal, 2002; Vartanian, Herman, & Polivy, 2007), and particularly in this phase of life it fulfills a function of self-expression (Guidetti & Cavazza, 2008). However, the eagerness of adolescents to take over responsibility for food choice is not necessarily matched with their ability to make healthy food decisions. Although adolescents often hold the nutritional knowledge needed to achieve a balanced diet, this group of the population has a reputation for unhealthy food choices (Cavadini et al., 1999; Story, Neumark-Sztainer, & French, 2002; Walsh & Nelson, 2010). Furthermore, research has found that adolescents understand at an abstract level the (un)healthiness of foods, but have limited concern about future health (Bissonette & Contento, 2001). Because schools provide convenient access to children and adolescents, the majority of interventions implemented to change their eating behaviors (and physical activity patterns) have been school-based. However, school-based interventions have had limited success (Jeffery & Linde, 2005; Knai, Pomerleau, Lock, & McKee, 2006). Given this limited success, an expansion of prevention approaches to other contexts is warranted (Ventura & Birch, 2008). Even though adolescence is a life stage associated with new-found independence and a desire to exert greater control over one's life, a recent study by Walsh & Nelson (2010) indicated that parents still continue to have significant influence on adolescents' eating behavior.

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Therefore, the influence of parents should be assessed at all stages of this "hand-over-of-control" period to assist in the development of concurrent child and parental intervention programs.

This thesis has its focus on children on the onset of adolescence, so-called preadolescents or "tweens". The tween concept originates from marketing, and is a widely used term in marketing and media research. Tweens is a consumer segment defined by age, and the concept is based on being "in-be-tween" childhood and teens (Siegel, Coffey, & Livingston, 2004). Most commonly, tweens or preadolescents are defined as 8-12-year-olds, but both wider (8-14-year-olds) and narrower (11-12-year-olds) definitions exist (Siegel, et al., 2004). The high prevalence of overweight among Norwegian tweens (15-20% of children aged 8-12 are overweight or obese; (www.fhi.no, 2008), is part of the motivation for exploring determinants of (healthy) eating in this group. Increased knowledge about potential determinants of eating behavior among children within this age range is necessary to develop tailored interventions for this particular group of the population.

2 Theoretical framework

Eating behaviors include the choice and intake of foods and beverages, considering what, how, when, where, and with whom people eat. These behaviors are important because they determine which nutrients and other substances that enter the body and subsequently influence health, morbidity and mortality (Sobal, et al., 2006). Several models of the influences upon f ood choice have been proposed, and these models generally split the influences into those related to the *food* itself, to the *individual* and to the *environment*. External factors linked to the food (e.g. food characteristics) and the environment (e.g. social and economic factors), are assumed to influence sensory, psychological and physiological factors within the individual, and together these factors influence food-related behaviors (Conner & Armitage, 2002). The wide range of factors potentially involved in eating behaviors has created an interest for this topic within different disciplines such as biology (including medicine and nutrition), psychology, sociology, economy and anthropology. Because of the multidisciplinary interest in this topic, different approaches have been used to study the determinants of food choice and eating behavior. The research presented here has a social-psychological approach, and the theoretical framework of this thesis includes models and instruments which have their origin within social and developmental psychology.

2.1 Cognitive models of eating behavior

The Attitude-Social Influences-Self-Efficacy (ASE) model (De Vries, Dijkstra, & Kuhlman, 1988), the Theory of Planned Behavior (TPB) (Ajzen, 1991), and similar cognitive theories derived from social psychology are seen as comprehensive models for explaining and predicting health behavior, including eating behavior (Baranowski, Cullen, Nicklas, Thompson, & Baranowski, 2003; Conner & Armitage,

2006). These models were originally developed to explain other types of behavior (e.g. consumer behavior) and aim to explain personal, cognitive decision-making processes. More distal variables, such as the social and physical environment, are theorized to influence behavior through the variables of these models (Ajzen, 1991; De Bourdeaudhuij et al., 2005). Questionnaires based on such models enable researchers to investigate the attitudes and beliefs underlying human behaviors in a systematic way. The ASE model and the almost identical TPB both postulate that the immediate antecedent of any behavior is the intention or motivation to perform the behavior in question (e.g. the consumption of a particular food or food group), and that three additional determinants predict intention: attitudes, perceived social influences (TPB: subjective norm), and perceived self-efficacy (TPB: perceived behavioral control).

In both models the first determinant, *attitudes*, is determined by the individual's beliefs about the positive or negative consequences of performing the behavior. Regarding the second determinant, perceived *social influences*, there seem to be a small difference in definition between the models: According to the TPB *subjective norm* represents the perceived social influences, and is defined as the perceived opinion of other people regarding the behavior. The ASE model, however, incorporate a broader spectrum of perceived social influences, including perceived direct social support of the behavior and perceived example behavior by important others (i.e. modeling or descriptive norms). According to the ASE model the third determinant, perceived *self-efficacy* reflects the individual's confidence about being able to perform the behavior (De Vries, et al., 1988; Kok, et al., 1996). The TPB applies the term *perceived behavioral control* (PBC) (Ajzen, 1991), which is the perception as to what extent the behavior is under personal volitional control. Although these constructs are often measured differently, and some studies have shown unique contributions of self-efficacy and PBC in explaining health behavior,

they are generally regarded to be similar or even identical (Ajzen, 1991; Armitage & Conner, 2000; Conner & Armitage, 2002). The ASE model is presented in Figure 1.
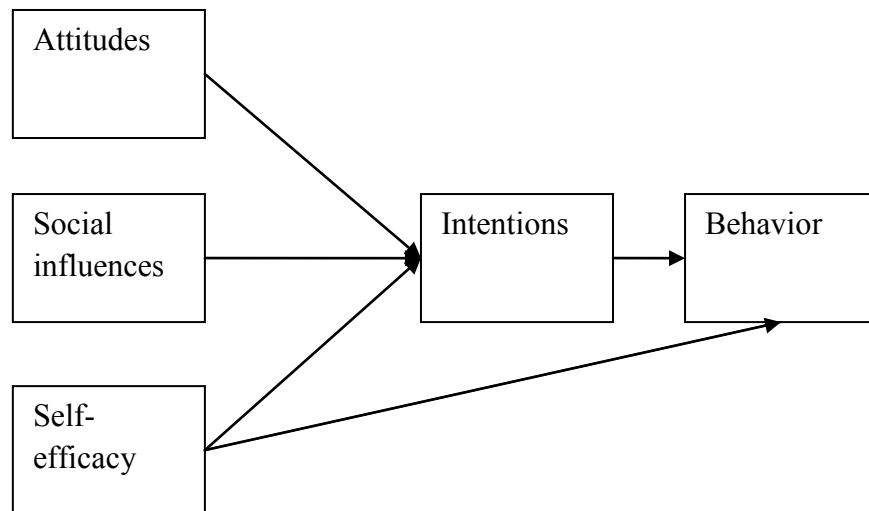
Figure 1. The ASE model (De Vries, et al., 1988)

Cognitive models like the ASE model and the TPB are based on the implicit idea that people are "reasonable" and make rational choices (Köster, 2003). These models constitute the dominant paradigm within the food consumption research field, and assume that people are well-informed, conscious decision-makers (Hamlin, 2010). However, human decision-making also involves an unconscious part often referred to as *intuitive reasoning*, represented by for instance past behavior, habit and hedonic appreciation (Köster, 2009). Nevertheless, the current thesis has its focus on rational (cognitive) and environmental factors influencing child eating behavior, thus features of "the unconscious mind" will not be further elaborated here.

Several studies have shown that cognitive models can predict food choice intentions and behavior among adolescents and young adults (E. S. Anderson, Winett, & Wojcik, 2007; Backman, Haddad, Lee, Johnston, & Hodgkin, 2002; DeJong, van Lenthe, van der Horst, & Oenema, 2009; Åstrøm & Rise, 2001) but rather few studies have applied such models to food choice intentions and behavior among children (Hewitt & Stephens, 2007). Whilst cognitive development is an important internal effector of health awareness in children, the most important external influence may be their parents (Hart, et al., 2002). It is well known that parents play a major role in the shaping of their children's health and eating behaviors (Birch & Fisher, 1998; Perry et al., 1988; Savage, et al., 2007). Thus, parents' food-related practices work together with the children's own cognitions and decisions about food choice and eating behaviors. Several studies have explored child eating behavior in the context of parental feeding practices but, until recently, never in conjunction with cognitive/behavioral models such as the TPB or the ASE model. Hewitt and Stephens (2007) are the first and (to our knowledge) so far the only authors using a combination of a cognitive model and a pure feeding practices measure to explore child eating behavior. They found support for the application of the TPB to predict child eating intentions and behavior. However, inclusion of parental feeding practices, measured by the CFQ (Birch et al., 2001), did not increase the explanatory power of the model, and they concluded that the role of parental influence requires further examination.

2.2 Parental feeding practices and developmental models of eating behavior

2.2.1 Feeding practices; an important part of the parent-child interaction domain

A parent's feeding practices and the way the child respond to them, is an important and complex part of the daily parent-child interaction (Satter, 1999). Feeding practices represent the caregivers' approach to maintain or modify children's eating behaviors (Patrick & Nicklas, 2005), and can be categorized into three different feeding "styles" that correspond with Baumrind's (1991) taxonomy of parenting styles: authoritarian, permissive/neglectful and authoritative. Authoritarian feeding is characterized by attempts to control the child's eating behaviors with little regard for the child's preferences and choices. This strictly controlling style includes behaviors such as restricting certain foods (e.g. sweets and desserts) and forcing the child to eat other foods (e.g. fruit and vegetables). Permissive feeding, also termed "nutritional neglect", is characterized by allowing the child to eat whatever he or she wants in whatever quantities he or she wants. Permissive feeding provides little or no structure and control, and the child's food choices are limited only by what is available. Authoritative feeding represents a balance between the authoritarian/strictly controlling style and the permissive/unstructured style. Thus, authoritative parents encourage their children to eat healthy foods, but they are also given some choices about eating options. With authoritative feeding, parents determine which foods are offered and children determine which foods are eaten (Patrick & Nicklas, 2005). Feeding styles are considered underlying, stable patterns of behavior, as opposed to feeding practices which are actual behaviors or directives depending on specific situations (Savage, et al., 2007).

When it comes to child outcomes authoritarian feeding practices has been associated with lower intake of fruit, juice and vegetables (Cullen et al., 2000; Patrick, Nicklas, Hughes, & Morales, 2004; Vereecken, Legiest, De Bourdeaudhuij, & Maes, 2009). Moreover, previous research has shown that children who were told to "clean their plate" were less sensitive to physiological cues of satiety (Birch, McPhee, Shoba, Steinberg, & Krehbiel, 1987), and that restriction of foods high in fat and sugar lead to fixation on a nd over-consumption of these "forbidden foods" (Fisher & Birch, 2000). Authoritative feeding practices, on the other hand, has been associated with higher intake of fruit and vegetables (Gable & Lutz, 2000; Patrick, et al., 2004; Zeinstra, Koelen, Kok, van der Laan, & de Graaf, 2009), while permissive feeding practices has been associated with greater intake of foods high in fat and sugar and fewer healthy food choices (De Bourdeaudhuij, 1997 a, 1997 b; De Bourdeaudhuij & Van Oost, 1996; Hennessy, Hughes, Goldberg, Hyatt, & Economos, In press; Hoerr et al., 2009). Concerning the association between feeding practices and weight status, studies have shown that authoritarian feeding including restricting and monitoring the child's intake, have been associated with higher child BMI (Fisher & Birch, 2000; Lee & Birch, 2002; Webber, Hill, Cooke, Carnell, & Wardle, 2010) and total body fat mass (Spruijt-Metz, Lindquist, Birch, Fisher, & Goran, 2002). Also permissive feeding is associated with increased child weight status (Hennessy, Hughes, Goldberg, Hyatt, & Economos, 2010).

So far, most previous research on parental feeding practices and styles has focused on a spects of *control* over child food intake, such as restrictive feeding and pressure to eat (i.e. authoritarian feeding). These aspects are typically measured with the Child Feeding Questionnaire (CFP) (Birch, et al., 2001) and the Preschooler Feeding Questionnaire (PFQ) (Baughcum et al., 2001). However, the emphasis on parental control in the previous feeding measures may have prevented other practices (e.g. permissive and authoritative) from being sufficiently

explored. This is especially true for feeding practices that are associated with desirable outcomes in children (Musher-Eizenman & Holub, 2007). Parental modeling of healthy eating and exposure to foods are examples of feeding practices that may be effective (Hendy & Raudenbush, 2000; Lee & Birch, 2002; Wardle et al., 2003), yet these practices have not been incorporated into previous self-report measures of parental feeding practices. The extent to which parents try to teach their children about nutrition is another aspect not examined in the previous measures of parental feeding practices (Musher-Eizenman & Holub, 2007). However, more recent research has suggested that additional feeding practices such as these can also be measured in parents and might impact child outcomes (Musher-Eizenman, de Lauzon-Guillain, Holub, Leporc, & Charles, 2009).

The Comprehensive Feeding Practices Questionnaire (CFPQ) (Musher-Eizenman & Holub, 2007) is a new instrument designed to assess parents' perceptions and concerns about child health, in addition to child feeding attitudes and different child feeding practices (both authoritarian, permissive and authoritative feeding). This instrument is an extension of previous measures, and represents a more complete range of feeding practices that may be relevant to child outcomes. That is; it includes feeding practices reflecting the different feeding styles referred to above, not only controlling/authoritarian feeding which has been the focal point of previous measures. Initial examination of the validity of the CFPQ has given positive results: Factor analyses shows that the items form coherent scales, and relationships between feeding practices and parents' concerns of their child's weight, and their perceived responsibility for feeding their child, has provided further support for the instrument. Concerning reliability, the internal consistency (Cronbach's alpha) of most of the scales was moderate to high (Musher-Eizenman & Holub, 2007). According to the developers of the CFPQ, further work needs to be done to assure that the

psychometric properties of the CFPQ are appropriate for more diverse samples than the ones studied in the initial validation study.

2.2.2 Developmental models of eating behavior

The development and application of the CFPQ and previous feeding measures is, like other research on parenting strategies and child outcomes, based on theories within developmental psychology (Ventura & Birch, 2008). A developmental approach to eating behavior emphasizes the importance of learning and experience, and focuses on the development of food preferences in childhood (Ogden, 2007). Children's food preferences are important determinants of intake (Birch & Fisher, 1998), hence understanding the factors that shape food preferences is critical when scrutinizing child eating behavior. According to Birch (1999) the development of food preferences can be understood in terms of exposure, social learning and associative learning. Parents are essential for the development of children's eating behaviors, as they shape children's preferences through their feeding practices: Parents provide repeated exposure to certain foods (children come to like and eat what is familiar), they act as models in social learning processes, and they reinforce certain types of behavior as part of associative learning processes (e.g. "If you eat your vegetables I will be pleased with you") (Birch & Fisher, 1998; Ogden, 2007). Developmental models of eating behavior will not be further elaborated here, as it is beyond the scope of this thesis.

3   Aims and problem areas

The overall aim of this thesis is twofold: The number one aim is to further develop the current state-of-the-art literature on child eating behavior, with a particular focus on the influence of child cognitions and parental food-related behaviors. The second, and more long-term aim, is to obtain knowledge that might have the potential to inform future family-oriented nutrition interventions.

Three problem areas address some of the shortcomings within existing literature. These problem areas were explored in three empirical studies (studies 1-3) and highlight the intended contributions of the thesis.

Problem area/study 1: There is a lack of valid instruments measuring a broad spectrum of parental food-related behaviors as most measures include just a few feeding practices, such as food-restrictions and pressure to eat, which are aspects of control over child eating behavior. Moreover, existing feeding measures are primarily developed for and tested on parents of young children.
The first problem area is attacked by adaptation and testing of the validity of the CFPQ among Norwegian parents of pre-adolescent children. The original CFPQ is developed for parents of children aged 2 to 8 years, and has previously only been tested in American and French samples (Musher-Eizenman, et al., 2009; Musher-Eizenman & Holub, 2007). The version tested in the current study is modified to be applicable to parents of older children (10-to-12-year-olds).

Problem area/study 2: There is a need for increased knowledge about the extent to which personal, cognitive factors and environmental factors are related to child eating behavior. Parental food-related behaviors are important environmental influences that need to be further explored, especially among older children and adolescents. To

our knowledge, only one previous study has concurrently explored the roles of child cognitions and parental feeding behaviors (using a pure feeding measure) in explaining child healthy eating (Hewitt & Stephens, 2007). However, this study included only controlling feeding practices.

Thus, the second study aims to expand the work of Hewitt & Stephens (2007) by including a broader spectrum of feeding practices in the concurrent examination of the roles of child cognitions (measured by variables based on the ASE model) and parental feeding behaviors (measured by the CFPQ) in explaining the variance in child intention and behavior regarding healthy eating.

Problem area/study 3: Environmental factors such as parental food-related behaviors might influence child eating both directly and indirectly through child cognitions. However, little is known about the pathways in the relationship between parental feeding behaviors and child eating.

Consequently, the aim of the third study was to investigate the pathways of this relationship, addressing potential mediating effects of child cognitions regarding healthy eating.

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4 Methods

Several designs and methodological approaches can be applied to study personal and environmental determinants of child eating behavior. Due to time, personnel, and financial restraints, a cross sectional design and a survey approach was chosen to explore associations between personal factors, environmental factors and child healthy eating. For the same reasons participants were recruited through local schools, and the instruments used were based on existing measures. In the following sections study design, participants, measures and instruments are further described.

4.1 Design, procedure and participants

A cross sectional survey directed towards 10-12 year old children and their parents were used to address the aims of the thesis. Both children and parents received written information about the study. The child information letter was designed to fit the cognitive level of 10-12-year-olds, and the teachers were asked to read the information out loud to secure the children's awareness of the study. The parent information letter included a consent form as children under the age of 18 need written parental consent to participate in research projects. Parents' information letters and questionnaires were distributed to the children at school with instructions to take them home to be completed by one of their parents. Strategies to enhance the response rate among parents included information about the aim and importance of the study, information about who was responsible for the study, and reassurance that respondent anonymity would be protected (using the same identification number on child and parent questionnaires made linking the data possible without compromising privacy). Written consent was sought from parents prior to distribution of child questionnaires. The children completed their survey questionnaire in the classroom during a school lesson and with the presence of a teacher. A lottery with the

possibility of winning free movie tickets and a gourmet restaurant meal were used as incentives for children and parents respectively.

Participants were recruited from primary schools in two neighboring municipalities (Gjesdal and Sandnes) in the South-Western part of Norway. All primary schools in these municipalities were invited to participate in the study, and 18 out of 25 schools (72%) agreed to participation. All grade 5 and 6 students in the participating schools and one of their parents (the parent most involved in home food issues) were invited to take part in the study, thus forming a convenience sample. Of the 1466 students invited to participate, 865 returned signed consent forms from their parents and 796 students (92%) completed the questionnaire. Of the 796 child respondents, 51% were girls and 49 % were boys. Average age was 10.8 years (SD=0.6 years). Of the 1466 parents invited to participate, 963 (66%) returned completed questionnaires. Of the 963 pa rent respondents, 820 (85%) were mothers, 118 (12%) were fathers and 11 (1%) were other caregivers (e.g. stepmother/stepfather). Fourteen participants (2%) did not report their relationship with the child. The average age of the participants were 39,8 years, and 91% of the sample was of Norwegian or other Nordic origin (8% had their origin outside the Nordic countries, 1% did not report country of origin).

4.2 Instruments

Existing measures for the variables of interest were sourced from the literature and adapted for the present study. A pretest of both child and parent questionnaires was performed to test face validity in our group of children and parents.

4.2.1 Parents' questionnaire

The parents' questionnaire included a Norwegian version of the Comprehensive Feeding Practices Questionnaire (CFPQ), items from three related attitude scales, and demographic questions.

The Comprehensive Feeding Practices Questionnaire (CFPQ)

As mentioned in the Theoretical framework section, the CFPQ is a new self-report measure of parental feeding practices, using previous measures of parental feeding as an initial framework. The developers of the CFPQ used both a thorough literature review and qualitative research to develop new subscales related to parental feeding practices, as well as to more fully capture constructs addressed by established measures. The development and validation of the CFPQ was conducted among American parents and consisted of three steps: First, a literature-based, closed-format questionnaire was developed and tested on mothers (n=269) and fathers (n=248) of 3-6 year old children. Then, additional items to define subscales not sufficiently described by the literature-based questionnaire was generated by asking mother-father pairs (n=33) of 4-6-year-olds to fill in an open-ended questionnaire on parental feeding practices. Finally, a validation of the more complete questionnaire was undertaken among mothers (n=152) of children from 18 months to 8 years of age. This initial validation of the CFPQ gave positive results: Factor analysis suggested that the items form coherent scales, and relationships between feeding practices and related attitude scales (parents' attitudes about their child's weight and their responsibility for feeding their child) provided additional support for the validity of the instrument. For further details of the initial validation process; see Musher-Eizenmann & Holub (2007). The validity of the CFPQ has later been assessed in a French sample prior to cross-cultural examination of feeding practices among American and French parents (Musher-Eizenmann et al 2009). The convergent and discriminant validity of the CFPQ items was tested in the French sample by performing a multi-trait/multi-item scaling analysis. The analysis

demonstrated reasonable validity for this sample as well. For further details of the validation in the French sample; see Musher-Eizenmann et al (2009).

Translation of the CFPQ
The CFPQ items were translated from English into Norwegian by one person and a random sample of 10 items were back translated into English by another person. Both translators are experienced nutritionists, Norwegian native speakers, and fluent speakers of the English language. A linguist assessed the quality of the translation by evaluating the semantic equivalence between the two English versions. The quality was considered good, as the meaning of the items were retained after translation/back translation.

Pretesting and adaptation of the Norwegian version of the CFPQ
The CFPQ was originally developed to measure multiple feeding practices among parents of children in the age span from about 2 to 8 years. In the present study the CFPQ was slightly adapted to fit parents of 10-12 year old children. The adaptation was guided by assessment/pretesting of the instrument among Norwegian parents of 10-12-year-olds (4 mothers, 2 fathers). Four items were considered irrelevant to parents of 10-12 year old children, and were therefore removed from the Norwegian version. These items were: 1) "If this child gets fussy, is giving him/her something to eat or drink the first thing you do?" (from the Emotion regulation subscale), 2) "Do you give this child something to eat or drink if s/he is bored even if you think s/he is not hungry?" (also from the Emotion regulation subscale), 3) "I withhold sweets/desserts from my child in response to bad behavior" (from the Food as reward subscale), and 4) "When he/she says he/she is finished eating, I try to get my child to eat one more (two more, etc.) bites of food" (from the Pressure subscale). This study did not involve development of new items to replace the ones that were

removed. Thus, the adapted Norwegian version of the CFPQ consisted of 45 items assumed to tap 12 dimensions of parental feeding practices.

Related attitude scales

Like Musher-Eizenman & Holub (Musher-Eizenman & Holub, 2007), we also asked the parents to respond to items on three related attitude scales adapted from the CFQ (Birch, et al., 2001): The concern about child overweight scale (3 items), the concern about child underweight scale (3 items) and the responsibility for child eating scale (3 items). These items were included for validation purposes, and they were translated/back translated and pretested on pa rents of 10-to-12-year-olds like the CFPQ items.

4.2.2 Children's questionnaire

The child questionnaire consisted of two parts; one part assessing child cognitions related to F&V intake (psychosocial part), and another part assessing child consumption of F&V (food frequency part). The items constituting the child questionnaire has previously been validated and widely used among Norwegian 6'th graders   (Andersen, Bere, Kolbjørnsen, & Klepp, 2004; Bere & Klepp, 2004; Bere, Veierød, & Klepp, 2005; De Bourdeaudhuij, et al., 2005; De Bourdeaudhuij et al., 2008; Sandvik, Gjerstad, Samdal, Brug, & Klepp, 2010; Sandvik et al., 2007).

Psychosocial part

As already mentioned (in the Introduction section) food-related decision making processes are often studied using theories and models from social psychology. Among these are the previously described ASE model and the very similar TPB. Beliefs are the cognitive and affective foundation for the ASE/TPB variables, and are therefore considered predecessors of these variables. However, belief-based (indirect) measures of the ASE/TPB variables require more items than direct measures. Thus, to avoid response fatigue, we reduced the

number of items by focusing on overall, thoroughly tested psychosocial measures used in previous studies of child eating behavior. Our source of psychosocial measures was the child questionnaire developed for the Pro Children study (De Bourdeaudhuij, et al., 2005). This cross-national study aimed to assess personal, social and environmental factors regarding fruit and vegetable intake among 10-to12-year old European children, using the same questionnaire in nine European countries (Sandvik et al., 2005). The development of the Pro Children questionnaire was conducted in several steps including a major theory- and determinant-oriented literature review, qualitative research (focus group interviews with children, personal interviews with parents and school staff) and pilot-testing of the draft questionnaire in six European countries. The validity and reliability of the final questionnaire was then assessed in five European countries, including Norway, and it was concluded that this questionnaire provides a reliable and valid tool for assessing personal, social and environmental correlates of fruit and vegetable intake in 10-12-year-olds (De Bourdeaudhuij, et al., 2005). Thus; we see the items of this tool as reliable and valid for studying determinants of fruit and vegetable intake in the present study sample.

The items included in this instrument reflect variables based on the ASE model: Attitudes, social influence, self-efficacy and intention. In the present study, attitudes were measured with two items for fruit and vegetables respectively (To eat fruit/vegetables every day gives me more energy, and to eat fruit/vegetables every day makes me feel good). Social influence, which in the present study was limited to parental influence, was measured by four items. Two of these items reflected parental descriptive norms or modelling (My mother/father eats fruit/vegetables every day), and two items reflected active parental encouragement (My mother/father encourages me to eat fruit/vegetables every day). General self-efficacy was measured with two items (It's easy for me to eat fruit/vegetables every day, and if I decide to eat fruit/vegetables every day, I can do it), and intention with

one item (I want to eat fruit/vegetables every day). Response categories ranged from 1 (fully disagree) to 5 (fully agree).

Food frequency part

Child consumption of F&V was assessed using food frequency questions adapted from the work of Andersen et al (2004). The present study included four questions about the consumption of F&V: "How often do you eat vegetables for dinner", "…other vegetables", "…apple, orange, pear and banana", and "…other fruit and berries". All questions had 10 response categories (never=1, less than once a week=2, once a week=3, twice a week=4,…., six times a week=8, every day=9, several times every day=10). Participants were asked to have their usual habits in mind when answering the food frequency questions. As suggested by Bere et al (2005), the 10 response categories were re-coded to reflect F&V intake in times per week prior to data analyses (never=0, less than once a week=0.5, once a week= 1, twice a week = 2, …, six times a week=6, every day=7, several times every day=10). Thus, all response categories had a common denominator (per week), which improved the readability of the results, and increased comparability with studies using a similar F&V consumption measure (e.g. Andersen et al, 2004; Bere et al, 2005).

Pretesting of the children's questionnaire

The draft questionnaire, which was largely based on items and scales from previous studies as described above, was pretested on 5th graders (10-11-years-olds) recruited from a local school. The students who took part in the pretest were not included in the main survey. The testing was conducted in two steps.

Step one: The draft questionnaire was tested through interviews with pairs of students to check if any questions, wordings or scales were perceived as difficult to understand, easy to misunderstand, vague or ambiguous, strange or stupid, irrelevant or provoking. Alternative

wordings, scales or ways of asking questions were discussed with the students to enhance the understanding and relevance of the questionnaire for the target group (Norwegian 10-12-year-olds). Feedback from the students was registered in a form developed for this purpose, and we continued to recruit students for interviews until no new feedback was given. Eight students (six females and two males) took part in the first step of the pretesting of the questionnaire. This first step of pretesting led to some small adjustments of the original items formulated by De Bourdeaudhuij et al (2005): The wording of one of the self-efficacy items was changed from negative ("It's difficult for me to eat fruit/vegetables every day") to positive ("It's easy for me to eat fruit/vegetables every day"), as the children perceived positive wording as more natural. Furthermore, we reversed the response categories from descending numbers (5=I fully disagree to 1=I fully agree) to ascending numbers (1=I fully disagree to 5=I fully agree), as it seems more logical that increasing agreement with statements and increasing numbers accompany each other.

Step two: The revised version of the questionnaire was then tested among 5th graders in a classroom setting. Twenty five students (12 females and 13 males) took part in the second step of the pretest. The questionnaire was distributed in the classroom and the students were asked to fill in the questionnaire individually. After completing the questionnaire, they were encouraged to give comments on it. Some cue questions were asked to initiate a discussion, and many of the questions used in the first step of pretesting were repeated. The pretest cue questions are presented in the frame below.

> Are any of the questions/scales difficult to understand?
> Can any of the questions/scales be easily misunderstood?
> Are any of questions/scales vague or ambiguous?
> Do any of the questions/scales seem strange or stupid?
> Do any of the questions/scales seem irrelevant?
> Are you able to keep focused when filling in the questionnaire?
> What do you think about the length of the questionnaire (is it ok, or is it too long and tiring)?
> What do you think about the layout of the questionnaire (is it ok, is it clear and well organized, or is it difficult to follow)?

Most students thought the questions were relevant and easy to understand and no new issues were brought up. Only 2 out of 25 students had problems completing the questionnaire within one school lesson (45 minutes).

4.3 Data analyses

All data were coded and processed using the Statistical Package for the Social Sciences (SPSS) versions 15 (study 1) and 18 (studies 2 and 3). The three studies of the thesis applied different types of analyses of the data, as the analytical approach was determined by the research aim of each particular study. All studies included preliminary analyses such as distribution of scores (studies 1-3) and tests of multicollinearity (studies 2 and 3).

4.3.1 Study 1

The aim of study 1 was to test the validity of the CFPQ with parents of preadolescent children. Psychometric scale analysis was performed as suggested by Churchill (1979). First, factor analysis (Principal Component Analysis; PCA) was performed on the individual subscales as an initial test of the dimensionality and convergent validity of the

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scales in our sample. Next, internal consistency for each subscale was assessed by Cronbach's alpha. After that, scale composites were made by averaging the item scores on each subscale, and bivariate correlations between CFPQ scales were run as an initial test of discriminant validity. According to Churchill (1979) and Andersen et al (2005), analyses at a subscale level is not always sufficient to reveal all poorly performing items. For that reason, the factor structure and discriminant validity was further tested by running factor analysis (PCA) on the unified version of the instrument. Finally, like Musher-Eizenman and Holub (2007), we ran bivariate correlations between CFPQ subscales and related attitude scales to examine if the scales related to each other in theoretically expected ways (i.e. nomological validity).

For factor analysis, at least three variables per factor is recommended (Kim & Mueller, 1978). Consequently, the Emotion regulation and Food as reward subscales were not included in the analyses because they had too few items (one and two items respectively). Thus, the analytical steps described in the previous paragraph were performed on a 10 subscale, 42 item version of the CFPQ. The suitability of data for factor analysis was assessed by inspection of the correlation matrix, by computing the Kaiser-Meyer-Olkin value (KMO) (Kaiser, 1974), and by running Bartlett's Test of Sphericity (Bartlett, 1954) for each subscale as well as for the unified 42 item version of the instrument. Tabachnick and Fidell (2007) recommend the presence of coefficients greater than 0.3 in the correlation matrices, KMO values of 0.6 or greater, and significant Bartlett's tests ($p < 0.05$) for factor analysis to be considered appropriate.

A combination of the Kaiser criterion (Kaiser, 1960), the Monte Carlo PCA for parallel analysis (Horn, 1965; Watkins, 2000), and substantive evaluation based on previous research, was used for deciding the number of factors to retain. Since there is evidence that some feeding

practices are significantly correlated (Musher-Eizenman & Holub, 2007), oblique rotation was chosen to clarify the data structure (Costello & Osborne, 2005; Pett, Lackey, & Sullivan, 2003). Communalities of 0.5 or higher and/or factor loadings of 0.4 or higher on assigned scale was used as a criterion for convergent validity, while cross loadings of less than 0.4 on any other scale was used as a criterion for discriminant validity (Hair, Black, Babin, & Anderson, 2010).

4.3.2 Study 2

The aim of study 2 was to investigate the roles of child cognitions (measured by variables based on the ASE model) and multiple parental feeding behaviors (measured by the CFPQ) in explaining the variance in child intention and behavior regarding healthy eating (F&V consumption). To examine the contribution of child cognitions and parental feeding practices in explaining the variance in child intentions and behaviors regarding F&V consumption, stepwise regression analyses were conducted with child intentions to eat F&V, and child self-reported F&V consumption, as dependent variables. Thus, child cognitions (ASE-based variables) were entered in the first step and parental feeding practices (CFPQ-based variables) were entered in the second step for fruit and vegetable intentions and consumption respectively. Since fruit and vegetable consumption can be seen as different behaviors, influenced by different factors (Reinaerts, De Nooijer, Candel, & De Vries, 2007), analyses were run separately for fruit and vegetables.

4.3.3 Study 3

The aim of study 3 was to investigate the pathways of the associations between parental feeding practices and child healthy eating (vegetable consumption), addressing potential mediating effects of child cognitions regarding healthy eating (vegetable consumption). First, to reveal which feeding practices were significantly related to child

vegetable consumption (without adjusting for child cognitions), a series of simple, bivariate regression analyses were conducted. Stepwise regression analyses were then performed to identify potential mediating effects of child cognitions on t he associations between feeding practices and child vegetable consumption: Feeding practices were entered in the first step, and child cognitions were entered, one at a time, in the subsequent steps. We focused on t he standardized regression coefficients (β), and any marked change in β-values indicated mediation through child cognitions. P-values were reported, indicating whether the change was marked (significant) or not. The identified, potential mediators were further tested according to Baron and Kenny's (1986) criteria for mediation (i.e. significant relations between predictor and mediator, and between mediator and outcome variable).

4.3.4 Listwise deletion and t-tests

In studies 2 and 3, a rather puritan approach to the data was chosen, and listwise deletion was applied for the model analyses. Thus, only dyads which had completed data sets for the models tested were included in these analyses. Listwise deletion reduces the sample size, and therefore has the potential to reduce the statistical power of the tests conducted. However, since the present sample of parent-child dyads was quite large, and since there was no reason to believe that missing data were not random, this method was chosen as it (unlike pairwise deletion) keeps the sample size definite throughout all model analyses. Before applying listwise deletion, independent-samples t-tests were conducted to test for potential differences between dyads included in model analyses and those not included due to incomplete data.

4.4 Ethics

The research project resulting in this thesis was approved by the Norwegian Social Sciences Data Services (NSD), which is the Privacy

Ombudsman for all the Norwegian universities, university colleges and several hospitals and research institutes (Appendix A). The project protocol was also submitted for consideration and approval by the Regional Committee for Medical and Health Research Ethics (REK, Vest). However, the ethics committee decided that the Norwegian Act on Medical and Health Research (The Health Research Act) ("Lov om medisinsk og helsefaglig forskning (Helseforskningsloven)," 2008) did not apply to the present project, as the individual health information included was considered marginal. Thus, the project could be conducted without their approval (Appendix B).

5 Results

The results presented in this section summarize the results found in the three studies of the thesis. A more detailed presentation of the results can be found in the respective papers written for each study.

5.1 Study 1

The aim of study 1 was to test the validity of a slightly adapted version of the CFPQ with Norwegian parents of 10-12 year old children. Analyses of both the individual subscales and a unified 42 item version of the instrument suggested reasonable validity of the CFPQ in the present sample. Although a few subscales and items appeared problematic as a result of statistical scale analyses (e.g. the items of the (Home) environment subscale split into two factors, the items of the Encourage balance and variety and Teaching nutrition subscales loaded onto the same factor), face validity indicated that most items still were relevant for measuring feeding practices in parents of 10-12-year-olds (Melbye, Øgaard, & Øverby, 2011 a).

5.2 Study 2

The aim of study 2 was to explore the roles of child cognitions and parent-reported feeding practices in explaining the variance in child intentions and behavior regarding F&V consumption. A large portion of child intention and behavior regarding fruit consumption was explained by child cognitions (29% and 25% respectively). This also applied to child intention and behavior regarding vegetable consumption (42% and 27% respectively). Parent-reported feeding practices added another 3% to the variance explained for child intention to eat fruit, and 4% to the variance explained for child vegetable consumption. Although our results showed that child cognitions played a greater role than parent-reported feeding practices in explaining the variance in child intentions and behavior, there are indications that

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parental feeding behavior (as reported by parents) do have an influence. However, only a few of the measured feeding practices were associated with child intentions and behavior regarding F&V consumption. The variable Child control was negatively associated with both child intention to eat fruit and child vegetable consumption, and the variables (Home) environment and Encourage balance and variety were positively associated with child vegetable consumption. Furthermore, the portion of variance explained by these parental feeding practices was rather small (Melbye, Øverby, & Øgaard, 2011).

5.3 Study 3

The aim of study 3 was to explore both direct and indirect associations between different parental feeding practices and child vegetable consumption, addressing potential mediating effects of child cognitions. Three of the measured feeding practices were indirectly associated with child vegetable consumption (indicating mediation through child cognitions): Child control, Encourage balance and variety and Restriction for health. Only one feeding practice was directly associated with child vegetable consumption (i.e. no m ediation), namely (Home) environment. Although the associations between parental feeding practices and child vegetable consumption were weak, our results indicate that parental feeding practices do have an influence on child eating behavior, some of them working through child cognitions as part of a socialization process, and others working directly as part of parents' arrangement of the physical food environment (Melbye, Øgaard, & Øverby, 2011 b).

5.4 Listwise deletion and t-tests

As listwise deletion was applied on the dyadic data in studies 2 and 3, t-tests were conducted to check for potential differences between dyads included and those not included in model analyses. Only negligible differences were found for 2 out of 26 variables tested, thus there is

little reason to believe that the listwise deletion biased the sample (Melbye, et al., 2011 b ; Melbye, et al., 2011).

6 Discussion

This thesis aims to contribute to the understanding of the associations between personal (cognitive) and environmental (parental) factors and child eating behavior. The following discussion first addresses the theory, design and methods applied. Next, the overarching matters of the three studies included in the thesis will be discussed: 1) validation of a new, comprehensive feeding measure with parents of preadolescent children, 2) exploration of the roles of child cognitions and parental feeding behaviors in explaining child healthy eating, and 3) investigation of the pathways of the associations between parental feeding behaviors and child healthy eating, addressing potential mediating effects of child cognitions. Finally, the strengths and limitations of the thesis will be addressed.

6.1 Theory, design and methods

Of the many factors potentially influencing child eating behavior, this thesis has its focus on the influence of personal and environmental factors (i.e. child cognitions and parental feeding behaviors). Since cognitive theories derived from social psychology are seen as comprehensive models for explaining eating behaviors (and other health-related behaviors) (E. S. Anderson, et al., 2007; Backman, et al., 2002; DeJong, et al., 2009; Åstrøm & Rise, 2001), this thesis is largely based on such a model, the Attitude-Social Influence-Self-Efficacy (ASE) model (De Vries, et al., 1988). However, some studies have questioned the ability of cognitive models to account for distal variables like the social and physical environment (Conner & Abraham, 2001; Courneya, Bobick, & Schinke, 1999; De Bruijn, Kremers, Schaalma, Van Mechelen, & Brug, 2005). Moreover, some distal variables are hypothesized to have a direct effect on behavior, thus bypassing the proximal cognitive factors (De Bruijn, Kremers, de Vries, van Mechelen, & Brug, 2007). Consequently, distal variables

such as the social and physical environment might influence eating behaviors both directly and indirectly, and more research is needed to document the extent of environmental influences and *how* they affect different individuals (Booth et al., 2001; Jeffery, 2004; Kremers, et al., 2006). The current thesis examines these underexplored associations by investigating the direct and indirect roles that parental influence (distal variables) and child cognitions (proximal/personal variables) play when it comes to explaining child healthy food consumption. That is; the (cognitive) ASE model is expanded by including parental feeding behaviors representing children's social and physical food environments. Given the lack of validated instruments measuring feeding behaviors and styles (Faith, Storey, Kral, & Pietrobelli, 2008), especially among parents of older children and adolescents (Kaur et al., 2006), this thesis also includes validation of the feeding measure applied in the expanded ASE model; the CFPQ (Musher-Eizenman & Holub, 2007).

Due to limitations regarding time, personnel and finances, a cr oss sectional design and a survey approach was chosen to explore the above-mentioned associations between personal and environmental factors and child healthy eating. For the same reasons participants were recruited through local schools, and the instruments applied were based on existing measures sourced from the literature. A more detailed discussion of theoretical and methodological issues is offered in the Strengths and limitations part of this section.

6.2 Validation of the CFPQ with parents of preadolescents

The validation of the CFPQ in study 1 (Melbye, et al., 2011 a) makes an important contribution to the child feeding literature, as validations of feeding measures are generally scarce (Faith, et al., 2008). To our knowledge, only one previous study has validated a pure feeding

measure with parents of older children and adolescents. In this study by Kaur et al (2006), a modified version of Birch et al's (2001) CFQ was validated in a multi-ethnic sample of 260 pa rents of 10-19-year-olds (mean age:15 years). The psychometric properties of the modified CFQ were found to be similar to those of the original CFQ. However, consistent with the evolving independence of adolescents, the factor scores for the controlling feeding practices measured by the CFQ decreased with increasing age of the child/adolescent. That is; controlling feeding strategies seemed to be less used by parents of older children and adolescents than for younger ones. Since the CFQ includes mainly controlling and restrictive feeding practices, it might not be an optimal measure of feeding behaviors among parents of older children and adolescents.

The instrument tested in the current study (the CFPQ) includes a broader range of feeding practices, some of which might be more relevant to parents of older children and adolescents (e.g. Teaching nutrition, (Home) environment). Analyses at the subscale level indicated some problems with 4 of the 10 CFPQ subscales tested: Child control, (Home) environment, Modelling and Teaching nutrition. Some very low communality items were revealed, and one item did not load onto its assigned scale. Consequently, internal consistency and variance explained was suboptimal for some scales.

Further testing of subscale validity and exploration of the CFPQ factor structure resulted in a 10-factor solution that was supported by theory and face validity. In this solution the majority of items clustered to form factors corresponding with the original instrument, showing a simple structure, and explaining 57% of the variance in our data. However, there were some notable differences compared to the original CFPQ. The most important ones are discussed here: The items on the Encourage balance/variety and Teaching nutrition subscales loaded onto the same factor, indicating a lack of discriminant validity. A

certain overlap between these scales could be expected, as they both deal with explicit nutrition communication with the child. However, the bivariate correlation between the two subscales was not high enough to suggest a complete conceptual overlap. Moreover, the four items on the (Home) environment subscale split into two different factors, one containing items reflecting availability of healthy foods in the home environment, and another one containing items reflecting availability of unhealthy foods in the home environment. The factor reflecting to what extent healthy foods are available in the home also included item 41 ("I model healthy eating for my children by eating healthy myself") on the original Modelling subscale, and item 42 ("I often put my child on a diet to control his/her weight") on the original Restriction for weight subscale.

Regarding item 41 ("I model healthy eating for my children by eating healthy myself"), this finding supports the problems revealed when running analysis on the subscale level (item 41 had a very low communality compared to the other items on this scale). One obvious assumption for healthy eating is availability of healthy foods. Thus, if parents practice healthy eating, healthy foods are most likely available in the home. Collectively, studies do suggest that readily available and easily accessible healthy foods within the home are likely to enhance healthy eating among families (Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008). To sum up on this; healthy eating practices among parents might be more related to the availability of healthy foods in the home environment than to "active" modeling of healthy eating.

Regarding item 42 ("I often put my child on a diet to control his/her weight"), its suboptimal performance was not revealed by initial analysis on the individual subscales. Nevertheless, like for healthy eating, (successful) dieting also requires availability of healthy foods in the home. Thus, item 42 might be more related to the availability of healthy foods in the home environment than to restriction for weight

control reasons. Moreover, if we see the suboptimal performance of item 42 in light of the general recommendation about not focusing on dieting in front children and adolescents (Rosenvinge & Børresen, 2004), the unsubstantial loading of this item on its assigned scale was not totally unexpected. Besides, the CFPQ was first developed and tested in the US, where overweight and obesity is substantially more prevalent than in Norway ("www.nationmaster.com," 2011). Thus, this item might be more appropriate in an American than in a Norwegian setting.

Relations between CFPQ subscales, and between CFPQ subscales and related attitude scales, largely confirmed the discriminant and nomological validity of the scales. Some anticipated substantial correlations between CFPQ subscales were found, but these correlations were not large enough to compromise the discriminant validity. Moreover, significant correlations between CFPQ subscales and related attitude scales supported theoretically expected relations, placing the CFPQ dimensions within the nomological network of parental feeding behavior.

In total, our findings largely support the validity of the 42 item version of the CFPQ with parents of preadolescent children in a Norwegian setting. Although some items seem problematic as a result of statistical scale analysis, face validity indicates that most of these items still are relevant for measuring feeding practices in parents of 10-to-12-year-olds. It is also important to note that the findings are sample specific, and thus cannot be used as a sole foundation for changing the original CFPQ subscales. Since this instrument has previously only been validated with parents of younger children, and in other cultural settings (USA; Musher-Eizenman & Holub, 2007, and France; Musher-Eizenman et al., 2009), some differences when it comes to factor structure and other validity measures could be expected. Also other sample differences between the previous studies and the present one,

such as the respondents' educational level, income level, gender and age range may interfere with the performance of the instrument (Reichenheim & Moraes, 2007).

The present study is considered part of an early phase validation of the CFPQ (which is not yet an established instrument), and studies 2 and 3 of this thesis extends this validation by applying the instrument in model analyses.

6.3 Child healthy eating: the roles of child cognitions and parental feeding behaviors

Study 2 of this thesis (Melbye, et al., 2011) builds upon the conceptual framework of Hewitt and Stephens (2007), which to our knowledge is the first to see child cognitions in conjunction with a pure measure of parental feeding practices in studying determinants of child healthy eating. Hewitt and Stephens created a model based on Ajzen's (1991) TPB and Birch et al's (2001) CFQ (which is a measure focusing on controlling and restrictive practices) to examine the roles of child cognitions and parental feeding behaviors in explaining the variance in child healthy eating. That is; they aimed to test if the inclusion of parental feeding practices could add to the variance explained by the TPB. Hewitt and Stephens found that the inclusion of parent-reported feeding practices measured by the CFQ did not increase the explanatory power of the TPB. Thus, they concluded that the role of parental feeding practices in terms of control and restriction seemed to have no direct relation to children's reported intentions and behaviors regarding healthy eating, and they suggested that the role of parental influence should be further examined.

In the current study, which can be considered a first sequel to Hewitt and Stephens' suggestion, a model based on variables from the ASE model (which is very similar to the TPB) and the CFPQ (which is an

extensive feeding measure) was constructed to examine the roles of child cognitions and multiple parental feeding practices in explaining child intentions and behaviors regarding F&V consumption. More specifically, we aimed to test if the inclusion of *multiple* parental feeding practices (not only controlling and restrictive practices, as measured by the CFQ) could increase the explanatory power of the cognitive model, and to assess the importance of each variable in explaining the variance in child intention and behavior regarding F&V consumption.

Results from stepwise regression analyses showed (as expected) that child cognitions explained a large portion of the variance in child intentions and behavior regarding F&V consumption. However, some parent-reported feeding practices also contributed, though to a small extent compared to child cognitions: The variable Child control was negatively associated with both child intention to eat fruit and child vegetable consumption, and the variables (Home) environment and Encourage balance and variety were positively associated with child vegetable consumption.

Both the current study and the study by Hewitt and Stephens support the application of social-cognitive models in explaining the variance in child (healthy) eating behavior. However, they are not consistent regarding the role of parental feeding practices. While Hewitt and Stephens' results indicate that feeding practices in terms of parental control and restriction has no direct effect on child healthy eating, the results of the current study shows that there might be a direct effect of other (than controlling and restrictive) practices on child vegetable consumption. The inconsistent results from these studies illustrate the need for an exploration of the pathways between parental feeding practices and child (healthy) eating behavior.

6.4 Parental feeding behaviors and child healthy eating: mediation by child cognitions?

Study 3 (Melbye, et al., 2011 b) builds upon and applies the same data material as study 2, and aims to explore the pathways between parental feeding practices and child (healthy) eating behavior. Since no significant associations were found between parental feeding practices and child consumption of fruit in study 2, s tudy 3 focuses on t he associations between parental feeding practices and child vegetable consumption. Given that children and adolescents may have less autonomy in making dietary choices, it's reasonable to presume that some parental feeding practices can have a d irect influence on their food intake (as suggested in study 2). Direct influences reflect the automatic, unconscious influence of environmental factors on behavior (Bargh & Chartrand, 1999). As opposed to this, indirect influences reflect the mediating role of behavior-specific cognitions on t he relationship between environment and behavior (Kremers, et al., 2006). The aim of study 3 was to pick up l oose ends from study 2 (and the study by Hewitt & Stephens) and explore both direct and indirect associations between parental feeding practices and child (healthy) eating behavior (i.e. child vegetable consumption), addressing potential mediating effects of child cognitions.

Stepwise, multiple regressions showed that three of the measured feeding practices were indirectly associated with child vegetable consumption, indicating mediation through child cognitions: Child control (negative association), Encourage balance/variety (positive association) and Restriction for health purposes (negative association). Parent-reported child control seemed to be mediated by child *attitude* towards vegetables, parental encouragement seemed to be mediated by child *intention* to eat vegetables, and parental restrictions seemed to be mediated by child *self-efficacy* to eat vegetables. The potential mediating mechanisms were further explored in accordance with Baron

& Kenny's (1986) mediation analysis procedure, assessing bivariate relations between 1) the parent-reported feeding practices (predictor variables) and child cognitions toward vegetables (potential mediators), and 2) between child cognitions toward vegetables and child vegetable consumption (outcome variable). These analyses supported mediation of the associations between parental encouragement and child vegetable consumption (by intention) and between parental restriction and child vegetable consumption (by self-efficacy). However, mediation of the association between parent-reported child control and child vegetable consumption (by child attitude) was not supported, as no bivariate relation was found between the predictor (parent-reported child control) and the potential mediator (attitude). The lacking association between parent-reported child control and child attitude toward vegetables might be caused by a difference in specificity of the measures. That is; parent-reported child control is a *general* measure of the extent to which parents allow their child control over his/her eating behaviors and parent-child feeding interactions, while the measure child attitude toward vegetables is *specific* to vegetable consumption. Difference in specificity of the measures seemed to be less problematic for the remaining two (potentially) mediated associations. No mediating effect was found for the (positive) association between (Home) environment and child vegetable consumption (i.e. direct relation). Also previous research suggests that home availability seems to be a significant physical environmental correlate of both fruit and vegetable consumption (Bere & Klepp, 2004; Hanson, Neumark-Sztainer, Eisenberg, Story, & Wall, 2005; Reynolds, Hinton, Shewchuk, & Hickey, 1999; Young, Fors, & Hayes, 2004).

Although the statistical analyses in studies 2 a nd 3 resulted in weak associations between parental feeding practices and child intentions and behavior regarding F&V consumption, the results of these studies suggest that parental feeding practices do have an influence on child eating behavior, some of them working through child cognitions as part

of a socialization process, and others working directly as part of parents' arrangement of the physical food environment. There might be multiple reasons for the small contribution of parental feeding behaviors in the models. First of all, there might be a gap between parental reports of their feeding behaviors and child perceptions of them. Secondly, mono-method bias (because of child reports of both cognitions and behavior) might contribute to the much stronger relations between child cognitions and child behavior than between parental feeding practices (reported by parents) and child behavior. It is also likely that the difference in specificity of parental and child measures plays a role: The CFPQ variables seems to be general measures of feeding practices related to healthy eating, while the measured child cognitions are specific to F&V consumption, which is the outcome of interest in the current studies.

Moreover, there is a possibility that measuring more overarching, general types of parenting *styles* instead of (or in addition to) feeding *practices* would result in a stronger parent-linked contribution to the variance explained by the expanded ASE model. Scholars within the research field of parent-child interactions emphasize the need to consider the combined and interactive effects of various dimensions of parental behavior, usually combining an index of parental warmth, acceptance, support or involvement with an index of parental control or strictness (Maccoby & Martin, 1983). The combination of these two dimensions results in the fourfold typology of parenting style first identified by Baumrind (1991): authoritative (parents who are both firm and supportive/involved), authoritarian (parents who are strict but not warm/involved), permissive/indulgent (parents who are involved, but not strict) and neglectful (parents who show low levels of both strictness and involvement).

The literature on parenting styles provides consistent evidence that an authoritative style, where parents grant their children some autonomy,

leads to positive developmental outcomes in children and adolescents, such as higher academic achievements, fewer depressive symptoms, fewer risk-taking behaviors, and reduced odds of being overweight (Aunola, Stattin, & Nurmi, 2000; Glasgow, Dornbusch, Troyer, Steinberg, & Ritter, 1997; Radziszewska, Richardson, Dent, & Flay, 1996; Rhee, Lumeng, Appugliese, Kaciroti, & Bradley, 2006). Regarding child and adolescent eating, Kremers et al (2003) found that adolescents raised in authoritative homes had higher fruit intakes and more positive cognitions towards fruit. More recent research also suggest that an authoritative parenting style is associated with increased family meal frequency and child healthy eating (Berge, Wall, Neumark-Sztainer, Larson, & Story, 2010). Parenting style differs from parenting practices in that it describes parent-child interactions in a wide range of situations, whereas parenting practices are domain-specific (e.g. food-related practices). Moreover, it is argued that the efficacy of specific parenting practices is moderated by the general parenting style (Darling & Steinberg, 1993). For example: controlling feeding practices may lead to adverse effects in child dietary intake in an authoritarian atmosphere, while the same practices may lead to positive effects in an authoritaritive atmosphere (Van der Horst, Kremers, et al., 2007; Van der Horst, Oenema, et al., 2007).

6.5 Strengths and limitations

The strengths of this thesis include contributions to 1) the current research on parent-child feeding interactions and 2) the general health behavior and food consumption research fields. Both the validation study (study 1) and the studies on the influence of child cognitions and parental feeding behaviors on child healthy eating (studies 2 and 3) address clear shortcomings within the literature.

The high participation rate (92% and 66% for children and parents respectively) and large sample size (796 children and 963 parents) is

also a strength of this thesis, as it allows the application of quite sophisticated statistical analyses and increases the statistical power of the results. Moreover, in study 1 Churchill's (1979) classical validation framework is followed rather rigorously, giving a strong validity test of the CFPQ among parents of preadolescent children. In addition, reports from two different sources (parents and children) in studies 2 and 3 might be considered a strength, since the "common methods problem" regarding parental feeding practices (reported by parents) and child cognitions and behavior regarding F&V consumption (reported by children) is reduced. However (as previously mentioned), this could also be a limitation, as there might be a gap between parental reports of their feeding practices and child perceptions of them.

In spite of these strengths, there are some limitations that must be considered when assessing the overall contribution of this work. The most obvious limitation of the thesis is its cross-sectional design, which does not allow for causal inferences. Thus, the investigated relationships in studies 2 and 3 can only be referred to as associations or correlations. Nevertheless, a causal model is the theoretical basis for the exploration of potential mediating mechanisms in study 3, and the time aspect of a causal model has to be considered when trying to explain the results found in this study. For instance, the stronger relations found between potential mediators and outcome variables, compared to the relatively weaker relations found between predictor variables and mediators might be explained by a difference in time. That is; parental feeding practices (as reported by parents) might be considered "past events" (distal variables) compared to child cognitions which are related to children's usual, "here and now" behaviors (proximal variables). Thus, a time gap between parental (distal) and child (proximal) variables can possibly explain some of the differences in relationship strengths in the pathway *parental feeding practices → child cognitions → child eating behaviors*. The generally weak associations between parental feeding behaviors and child eating in

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studies 2 and 3 might also be a result of limitations in the measures applied in the study models. This issue is already elaborated on in the previous section (section 6.4).

At first glance, the application of a self-report food frequency questionnaire for the assessment of child F&V consumption in studies 2 and 3 might also be considered a limitation. According to a review conducted by McPherson et al (2000), 24-h recalls and records (food diaries) seem to work better among school-aged children than food frequency questionnaires. Frequency questions asking about usual intake require abstract thinking, as well as basic reading and arithmetic skills, which may be too advanced for young children. Furthermore, children may have difficulties recalling past events (Friedman, Reese, & Dai, 2011; Randall, 1991). However, the children included in the present study were preadolescents (10-12-year-olds). Children this age have made major cognitive advances compared to younger children, which facilitates their ability to report their cognitions and behavior (Harter, 1999). Moreover, Andersen et al (2004) found that food frequency questionnaires tended to overestimate the intake of F&V compared to 7-day food records. This was also observed by Baranowski et al (1997) and van Assema et al (2002). On the other hand, Andersen et al (2004) found that the energy intake based on food-records was underestimated with around 20%. This underestimation may also influence the data on F&V, thus the overestimation observed with food frequency questions may actually, to some extent, be counterbalanced.

Undoubtedly, 24-hr recalls and food diaries are stronger approaches when it comes to *accuracy* of the amount of foods or nutrients ingested. However, such accuracy was not a key issue in the current thesis where the intention was to rank individuals according to their usual consumption of fruit and vegetables in terms of frequency (times per week). Applying a food frequency measure asking about usual

consumption patterns seemed better for this purpose than using a 24-hr recall. A single 24-hr recall is not appropriate to characterize an individual's usual consumption simply because most individuals' diets vary greatly from day to day (the principal use of a 24-hr recall is to describe the average dietary intake of a *group)*, thus repeated 24-h recalls would be a better approach. Another reason for choosing a food frequency approach before a "stronger" approach such as repeated 24-h recalls or a diary approach is that repeated 24-h recalls and diaries on such a big sample would not be feasible within this project's limited resources in terms of money, time and staff. Furthermore, it would probably lead to many drop-outs as it is more demanding and time consuming   for   the   participants.

7 Conclusions and implications

This thesis extends the current literature on parent-child feeding interactions. It also makes a contribution to the more general health behavior and food consumption literature, by expanding an established cognitive model often applied within these research fields. Both the validation study (study 1) and the studies on the influence of child cognitions and parental feeding behaviors on child healthy eating (studies 2 and 3) address clear shortcomings within the literature. The results found in these studies and the limitations discussed in the previous section suggest some implications for future research. In the present section theoretical and methodological directions for further research will be discussed. Some potential practical implications will also be considered.

Although the current validation of the CFPQ with Norwegian parents of 10-12-year olds (study 1) yielded positive results for most subscales and items, further fine-tuning of the instrument and inclusion of new items is needed to make it a more complete instrument for use with parents of older children and adolescents. Future fine-tuning and item generation should involve further exploration of the different dimensions of feeding behaviors, and the weights given to the different dimensions, through qualitative research in the target population. If there is an interest in comparing results from research conducted in different cultures and settings, an expanded cross-cultural adaptation, and a general improvement of the psychometric quality of the instrument becomes even more important. Future research should also include validation and application of the CFPQ in a clinical setting, as this measure might have potential as a clinical tool in applied pediatric nutrition and psychology. In nearly all targeted intervention and treatment work with children (regardless of specific health outcome being addressed), two-generation programs are considered essential for

improving child outcomes (Graber & Brooks-Gunn, 1996). In the treatment of childhood obesity, clear benefits have been demonstrated from parental involvement (Golan & Crow, 2004). Thus, providing reliable tools to assess the role of parental influence on child eating is crucial for developing tailored interventions and treatment regimens for children and adolescents.

Since very little is known about the relations between parental feeding practices and eating behavior among older children and adolescents, and because the models explored in studies 2 and 3 of this thesis (i.e. models including both child cognitions and a broad range of parental feeding behaviors) are not previously tested, it was difficult to find extensive theoretical justification and/or other results from the literature that were consistent (or inconsistent) with the patterns observed in the current work. Although the results from this thesis might contribute to unravel the unclear nature of parent-child feeding interactions, which seems to include both direct and indirect associations, more research is needed on this important topic.

Suggestions for future research on parent-child feeding interactions include expansions of the current work by the application of longitudinal and experimental designs to further explore and test the directions of the causal relationships that were modeled in the present work. Additionally, a more extensive child measure of perceived parental feeding practices should be developed to close the possible gap between parents' reports of their feeding practices and children's perceptions of them (i.e. reduction of perceptual biases). Food-specific parental feeding measures should also be developed to fit food-specific child cognitions and behavior measures. Such improvements of the instruments could possibly increase the strength of the associations between parental feeding behaviors and child eating. Last but not least, there is a possibility that measuring more overarching, general types of parenting *styles* instead of (or in addition to) feeding *practices* would

result in a stronger parent-linked contribution to the variance explained by the extended cognitive model. Since preadolescents are in a transitional stage between childhood and adulthood, they are more independent than younger children, starting to make their own decisions on what and when to eat. Thus, measures of parental feeding practices (alone) might not be an optimal approach when studying parent-child feeding interactions within this age group. However, the overall emotional climate and mode of communication between parents and children may be more important for preadolescent children's eating behaviors. Therefore, including the overarching parenting styles might be fruitful when investigating the concurrent influence of child cognitions and parental behaviors on older children's and adolescents' (healthy) eating.

Theoretical models like the ones presented in the current thesis aim to provide variables that might be the foundation for nutrition interventions and/or obesity prevention programs. Although the present work extends the current literature on parent-child feeding interactions, a better understanding of the mechanisms of both the food-related and the more general interactions between parents and preadolescent children is warranted to design effective nutrition interventions and obesity prevention programs targeting this particular group of the population.

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Part II

List of papers

Paper I

Melbye, E. L., Øgaard, T., & Øverby, N. C. (2011). Validation of the Comprehensive Feeding Practices Questionnaire with parents of 10-to-12-year-olds. *BMC Medical Research Methodology, 11* (113).

Paper II

Melbye, E. L., Øverby, N. C., & Øgaard, T. (2011). Child consumption of fruit and vegetables: the roles of child cognitions and parental feeding practices. *Public Health Nutrition*, *in press.*

Paper III

Melbye, E. L., Øgaard, T., & Øverby, N. C. Associations between parental feeding practices and child vegetable consumption: mediation by child cognitions? *Manuscript submitted for publication.*

Paper I

BMC
Medical Research Methodology

Validation of the Comprehensive Feeding Practices Questionnaire with parents of 10-to-12-year-olds

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Abstract

Background: There is a lack of validated instruments for quantifying feeding behavior among parents of older children and adolescents. The Comprehensive Feeding Practices Questionnaire (CFPQ) is a self-report measure to assess multiple parental feeding practices. The CFPQ is originally designed for use with parents of children ranging in age from about 2 to 8 years. It is previously validated with American and French parents of children within this age range. The aim of the present study was to adapt and test the validity of this measure with parents of older children (10-to-12-year-olds) in a Norwegian setting.

Methods: A sample of 963 parents of 10-to-12-year-olds completed a Norwegian, slightly adapted version of the CFPQ. Scale analyses were performed to test the validity of the instrument in our sample.

Results: Although a few problematic items and scales were revealed, scale analyses showed that the psychometric properties of the slightly adapted, Norwegian version of the CFPQ were surprisingly similar to those of the original CFPQ.

Conclusions: Our results indicated that the CFPQ, with some small modifications, is a valid tool for measuring multiple parental feeding practices with parents of 10-to12-year-olds.

Background

Much of our eating behaviors are formed in early childhood and most behaviors are modeled after important caregivers of the child, primarily the parents [1]. Furthermore, parents shape children's early experiences with food and eating [2], and can affect children's diet and eating behaviors in numerous ways. For instance: by encouraging them to eat certain foods, by restricting certain foods, or by passively allowing certain foods in the regular diet. Other important parent-related determinants of children's eating behaviors are the physical and emotional environment in which eating behaviors are developed [3]. Hart, Bishop, and Truby [4], have stated a need for increased knowledge about parental influence on children's eating behavior. Also Zeinstra [5] has suggested that further research on child eating behavior should focus on the role of parental strategies in shaping children's food preferences and consumption.

A barrier to this literature has been a lack of validated instruments for quantifying parental feeding behaviors and styles [6]. Thus, comparability of studies has been a challenge. In a review of 22 studies [7], only the Child Feeding Questionnaire (CFQ) [8] was cross-validated in different parental samples and used in multiple settings. Furthermore, most previous measures of parental feeding practices have included just a few feeding practices, such as restrictive feeding and pressure to eat. These practices are aspects of control over child food intake, and are typically measured with the CFQ [8]. Although controlling feeding practices seem to be widely used by parents in an attempt to secure a well-balanced diet for their children [7], some studies have proved counterproductive effects of these strategies, as parents who exert too much control over child food intake tend to have children with an increased preference for high-fat foods and higher levels of snack-food intake [9].

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The emphasis on parental control in previous feeding practices measures may have left other important feeding practices rather underexplored. This is especially true for feeding practices that are associated with desirable outcomes in children [10]. Parental modelling of healthy eating and exposure to healthy foods are examples of feeding practices that may be effective [11-14]. The extent to which parents try to teach their children about nutrition is another aspect not examined in the previous measures of parental feeding practices [10]. However, more recent research has suggested that additional feeding practices such as these can also be measured in parents and might impact child outcomes [15]. The Comprehensive Feeding Practices Questionnaire (CFPQ) [10] is an extension of previous feeding practices measures, and represents a more complete range of feeding practices that may be relevant to child outcomes. It consists of 49 items representing 12 dimensions (subscales), each including 3-8 items. Initial testing of the CFPQ with American parents of 2-to-8-year-olds showed reasonable validity and reliability [10]. An analysis of nine CFPQ subscales with French parents of 4-to-7-year-olds demonstrated reasonable validity and reliability in this sample as well [15].

Although the CFPQ appears to be a promising instrument for measuring multiple parental feeding practices, it's important to note that this instrument was designed to measure feeding practices in parents of young children (about 2 to 8 years of age). Zeinstra [5] suggests that children's cognitive development influences the strategies that parents use to shape the eating behavior of their children. Thus, feeding practices measures developed for parents of young children will not necessarily be valid for parents of older children and adolescents. As far as we know, only one previous study has validated a (pure) feeding practices measure with parents of older children and adolescents. In this study by Kaur et al [16], a modified version of Birch's CFQ was validated in a multi-ethnic sample of 260 parents of 10-to-19-year-olds (mean age:15 years). The psychometric properties of the modified CFQ were found to be similar to those of the original CFQ. However, consistent with the evolving independence of adolescents, the factor scores for the controlling feeding practices measured by the CFQ decreased with increasing age of the adolescent. That is; controlling feeding strategies seemed to be less used by parents of older children and adolescents than for younger ones. Nevertheless, the fact that parents are considered to be an important social agent impacting upon children's diets, also applies to older children and adolescents [17].

So far, most studies of parental influence on child eating behavior have focused on young children. In the present study, we have focused on feeding practices in parents of children on the onset of adolescence (10-12-year-olds). Adolescence is the period from about the age of eleven to the late teen years, and represents a transitional stage from childhood to adulthood. It is characterized by the elaboration of identity, and it is a time of growing independence when individuals want to make their own decisions including what and when to eat [18,19]. This stage is typically a time of gradual shift from parental to peer influence [20]. Thus, during adolescence parental influence over food choice may be displaced by the effects of advertising and peer pressure [21], and the age at which these changes set in appears to be diminishing [22]. However, the eagerness of adolescents to take over responsibility for food choice is not necessarily matched with their ability to make healthy food decisions. Adolescents have a reputation for unhealthy food choices [23,24], and interventions directed towards this group of the population have had mixed success [25]. Furthermore, research has found that adolescents understand at an abstract level the (un)healthiness of foods, but have limited concern about future health [26]. Therefore, the influence of parents should be assessed at all stages of this "hand-over-of-control" period to assist in the development of concurrent parental and peer group intervention programs [27]. The rationale for focusing on 10-to-12-year-olds in the present study is that children this age are still highly influenced by parents. Accordingly, it might be easier to implement intervention programs involving parents among individuals within this age range than among older ones.

Given the lack of validated instruments measuring feeding practices that might be relevant for parents of older children and adolescents, we aimed to test the validity of the CFPQ with Norwegian parents of 10-to-12-year-olds to check if it is a suitable tool for measuring feeding practices in this part of the population. We believe that development and validation of broad feeding practices measures such as the CFPQ is of great importance for applied research aiming to develop interventions to improve children's and adolescents' diets, whether it is for public health purposes or for clinical purposes.

Methods
Procedures and participants
For practical reasons, participants were recruited through primary schools in two neighbouring municipalities (Gjesdal and Sandnes) in the South-Western part of Norway. All primary schools in these municipalities were asked to participate in the study, and 18 out of 25 schools agreed to participation. Both urban and rural schools were included in the study to secure variance in our data. In total, 1466 parents of children aged 10 to 12 years (grade 5 and 6 students) were invited, forming a cluster sample. Survey packages including information letters, consent forms and self-administered questionnaires were

distributed to the children at school with instructions to bring them home to be completed by one of their parents (the parent most involved in home food issues) within three days. Strategies to enhance the response rate included information about the aim and importance of the study, reassurance that respondent privacy would be protected, that participation would require little effort (not difficult or time consuming) and that participation involved a lottery with the possibility of winning a gourmet restaurant meal.

The study was approved by the Norwegian Social Sciences Data Services (NSD), which is the Privacy Ombudsman for all the Norwegian universities, university colleges and several hospitals and research institutes. The study protocol was also submitted for consideration and approval by the Regional Committee for Medical and Health Research Ethics (REK, Vest). However, the ethics committee decided that the Norwegian Act on Medical and Health Research (The Health Research Act) [28] did not apply to the present study, as the individual health information included in this project was considered marginal. Thus, the study could be conducted without their approval.

We received 963 completed questionnaires (66%). Response rates ranged from 44 to 93% among participating schools. Of the 963 respondents, 820 (85%) were mothers, 118 (12%) were fathers, and 11 (1%) were other caregivers (e.g. stepmother/stepfather). Fourteen participants (2%) did not report their relationship with the child. The average age of the participants were 39,8 years and 91% of the sample was of Norwegian or other Nordic origin (8% had their origin outside the Nordic countries, 1% did not report country of origin).

Measures

The survey questionnaire included a Norwegian version of the CFPQ, items from three related attitude scales, and demographic questions.

CFPQ

The CFPQ items were translated from English into Norwegian by the first author (ELM) and a random sample of 10 items were back translated into English by the third author (NCØ). Both translators are experienced nutritionists, Norwegian native speakers and fluent speakers of the English language. A linguist assessed the quality of the translation by evaluating the semantic equivalence between the two English versions. The quality was considered very good as the meaning of the items were retained after translation/back translation.

The CFPQ was originally developed to measure multiple feeding practices among parents of children in the age span from about 2 to 8 years. In the present study the questionnaire was slightly adapted to fit parents of 10 to 12 year old children. The adaptation was guided by

assessment/pre-testing of the instrument among Norwegian parents of 10-to-12-year-olds (4 mothers, 2 fathers). Four items were considered irrelevant to parents of 10 to 12 year old children, and were therefore removed from the Norwegian version. These items were: 1) "If this child gets fussy, is giving him/her something to eat or drink the first thing you do?" (from the Emotion regulation subscale), 2) "Do you give this child something to eat or drink if s/he is bored even if you think s/he is not hungry?" (also from the Emotion regulation subscale), 3) "I withhold sweets/desserts from my child in response to bad behavior" (from the Food as reward subscale), and 4) "When he/she says he/she is finished eating, I try to get my child to eat one more (two more, etc.) bites of food" (from the Pressure subscale). This study did not involve development of new items to replace the ones that were removed. Thus, the adapted Norwegian version of the CFPQ consisted of 45 items assumed to tap 12 dimensions of parental feeding practices (dimensions/subscales, items and response formats included in the Norwegian version of the CFPQ are presented in Appendix 1).

Related attitude scales

Like Musher-Eizenman & Holub [10], we also asked the parents to respond to items on three related attitude scales adapted from the CFQ [8]: The concern about child overweight scale (3 items), the concern about child underweight scale (3 items) and the responsibility for child eating scale (3 items) (see Appendix 1). These items were included for validation purposes, and they were translated/back translated and pre-tested on parents of 10-to-12-year-olds like the CFPQ items.

Statistical analyses

SPSS Version 15 was used for the statistical procedures. Prior to psychometric scale analysis, the distribution of scores on each subscale was assessed by calculating mean, standard deviation, skewness and kurtosis values. As suggested by Muthen and Kaplan [29], skewness and kurtosis values lying between -1 and +1 were used as an acceptable range for normality.

Psychometric scale analysis was performed as suggested by Churchill [30]. First, factor analysis (Principal Component Analysis; PCA) was performed on the individual subscales as an initial test of the dimensionality and convergent validity of the scales in our sample. Next, internal consistency for each subscale was assessed by Cronbach's alpha. After that, scale composites were made and bivariate correlations between CFPQ scales were run as an initial test of discriminant validity. According to Churchill [30] and Andersen et al [31], analyses at a subscale level is not always sufficient to reveal all poorly performing items. For that reason, the factor structure and discriminant validity was further tested by running factor analysis (PCA) on the unified 42 item version of the instrument.

Finally, like Musher-Eizenman and Holub [10], we ran bivariate correlations between CFPQ subscales and related attitude scales to examine if the scales related to each other in theoretically expected ways (i.e. nomological validity).

For factor analysis, at least three variables per factor is recommended [32]. Consequently, the Emotion regulation and Food as reward subscales were not included in the analyses because they had too few items (one and two items respectively). Thus, the analytical steps described in the previous paragraphs were performed on a 10 subscale, 42 item version of the CFPQ. The suitability of data for factor analysis was assessed by inspection of the correlation matrix, by computing the Kaiser-Meyer-Olkin value (KMO) [33], and by running Bartlett's Test of Sphericity [34] for each subscale as well as for the unified 42 item version of the instrument. Tabachnick and Fidell [35] recommend the presence of coefficients greater than 0.3 in the correlation matrices, KMO values of 0.6 or greater, and significant Bartlett's tests (p < 0.05) for factor analysis to be considered appropriate.

To avoid over- or under-extraction of factors, a combination of the Kaiser criterion (the eigenvalues-greater-than-one-rule) [36], the Monte Carlo PCA for parallel analysis (a simulation method that compares the observed eigenvalues with eigenvalues obtained from a large number of random data sets) [37,38], and substantive evaluation based on previous research, was used for deciding the number of factors to retain. Since there is evidence that some feeding practices are significantly correlated [10], oblique rotation was chosen to clarify the data structure [39,40]. Communalities of 0.5 or higher and/or factor loadings of 0.4 or higher on assigned scale was used as a criterion for convergent validity, while cross loadings of less than 0.4 on any other scale was used as a criterion for discriminant validity [41].

Results

Distribution of scores
Mean scores, standard deviations, skewness and kurtosis values of the ten CFPQ subscales and three related attitude scales are presented in Table 1. The skewness and kurtosis values indicated that the scales were relatively normally distributed thus satisfying the normality assumption in multivariate analysis.

Initial subscale analyses
Initial scale analyses included assessment of each subscale's dimensionality (convergent validity) and internal consistency. Inspection of the subscales' correlation matrices showed consistently significant positive correlations, most of them larger than 0.3. The KMO values for the subscales ranged from 0.54 to 0.87, and Bartlett's

Table 1 Mean scores, standard deviations, skewness and kurtosis for 10 CFPQ subscales and 3 related attitude scales

	Mean (SD)	Skewness	Kurtosis
CFPQ subscale (number of items)			
Child control (5)	2.4 (0.6)	0.49	0.41
Encourage balance and variety (4)	4.5 (0.5)	**-1.04**	0.93
Environment (4)	3.9 (0.7)	-0.43	-0.28
Involvement (3)	3.5 (0.8)	-0.25	-0.47
Modeling (4)	3.9 (0.7)	-0.56	0.31
Monitoring (4)	4.0 (0.6)	-0.50	**1.11**
Pressure (3)	2.8 (1.0)	-0.05	-0.65
Restriction for health (4)	2.9 (1.0)	0.05	-0.78
Restriction for weight control (8)	2.2 (0.8)	0.58	-0.08
Teaching nutrition (3)	4.1 (0.7)	-0.67	-0.10
Related attitude scales (number of items)			
Responsibility for child eating (3)	4.0 (0.5)	-0.39	0.62
Concern for child overweight (3)	1.7 (1.0)	**1.32**	0.68
Concern for child underweight (3)	1.8 (1.0)	**1.15**	0.41

Note: All response formats are 5-point Likert type scales (see appendix for details). Skewness and kurtosis values exceeding the absolute value of 1 are written in boldfaced type.

Test of Sphericity reached statistical significance (p = 0.000) for all subscales, supporting the factorability of the correlation matrices. PCA with parallel analysis on each individual subscale revealed that 9 out of 10 subscales were unidimensional, whereas one subscale (Environment) showed a two-factor solution as one of its items (item 20: "A variety of healthy foods are available to my child at each meal served at home") loaded onto a second factor. A few very low communality items were also revealed: item10 on the child control subscale (0.24), item 41 on the Modelling subscale (0.24) and item 39 on the Teaching nutrition subscale (0.20). Internal consistency coefficients (Cronbach's alpha) ranged from 0.44 to 0.84 (Table 2).

Correlations between CFPQ subscales
Discriminant validity was initially assessed by running bivariate correlation analysis between the CFPQ subscales. Before running correlation analysis, composites were made by averaging the item scores on each subscale. Since there is no reason to believe that the items are of different importance [10], all items were weighted equally. Discriminant validity of the CFPQ subscales was supported, as the majority of correlations between scales were weak to moderate (0.01-0.56) (Table 3). The highest correlations were found between the Restriction for health and Restriction for weight control subscales (r = 0.56, p < 0.01), and between the Teaching nutrition and Encourage balance and variety subscales (r = 0.52, p < 0.01). However, these

Table 2 Subscale names, item numbers, factor loadings, communalities, internal consistency coefficients (Cronbach's alpha), and variance explained by the first factor (%) for the individual CFPQ subscales

Subscale name (item numbers)	Factor loadings, min-max	Communalities, min-max	Cronbach's alpha	Variance explained by first factor
Child control (item 5, 6, 8, 9, 10)	0.49-0.66	0.24[b] -0.44	0.55	37%
Encourage balance and variety (item 11, 22, 24, 35)	0.66-0.78	0.44-0.60	0.66	50%
Environment (item 12, 14, 20, 34)	0.66-0.82 (0.86)[a]	0.60-0.82	0.57	47%
Involvement (item 13, 18, 30)	0.78-0.79	0.61-0,62	0.67	61%
Modeling (item 41, 43, 44, 45)	0.49-0.86	0.24[b] -0.74	0.66	52%
Monitoring (item 1, 2, 3, 4)	0.74-0.91	0.54-0.82	0.84	70%
Pressure to eat (item 15, 28, 36)	0.57-0.84	0.33-0.71	0.61	57%
Restriction for health (item 19, 26, 37, 40)	0.64-0.80	0.41-0.64	0.73	55%
Restriction for weight (item 16, 25, 27, 31, 32, 33, 38, 42)	0.43-0.80	0.44.0.73	0.83	47%
Teaching nutrition (item 23, 29, 39)	0.45-0.81	0.20[b] -0.65	0.44	50%

[a] Item 20 on the Environment subscale did not load onto its assigned scale, but had a high loading onto a second factor.
[b] The following items had very low communalities: item 10 on the child control subscale, item 41 on the Modeling subscale, and item 39 on the Teaching nutrition subscale.

correlations were not large enough to compromise the discriminant validity of the scales (see discussion).

Analysis of the unified 42 item version of the CFPQ
Since analysis at a subscale level is not always sufficient to reveal all poorly performing items, factor structure and discriminant validity was further assessed by running factor analysis (PCA) on the unified 42 item version of the instrument. Inspection of the correlation matrix for the complete 42 item version revealed (as expected) the presence of many correlation coefficients of 0.3 and above. The KMO value was 0.82, and Bartlett's Test of Sphericity showed statistical significance (p = 0.000), supporting the factorability of the correlation matrix. The

Kaiser criterion (which tends to over-extract factors) suggested that 10 factors should be retained, while parallel analysis (which is one of the most recommendable rules for factor-extraction) suggested 8 factors. Based on these results, we compared 8-, 9-, 10- and 11-factor solutions to decide how many factors to retain. In our sample, the 10-factor solution was found to be conceptually more reasonable than the others. In this solution the majority of items clustered to form factors corresponding with the original instrument, showing a simple structure, and explaining 57% of the variance in our data (Table 4). However, there were some differences worth noting: the items on the Encourage balance and variety and the Teaching nutrition subscales loaded onto the same

Table 3 Bivariate correlations between the 10 CFPQ subscales

	CC	Enc	Env	Inv	Mod	Mon	Pre	RH	RW	Teach
Child control (CC)	-									
Encourage bal./var. (Enc)	**-.24**	-								
Environment (Env)	**-.18**	**.26**	-							
Involvement (Inv)	.04	**.31**	**.16**	-						
Modeling (Mod)	**-.14**	**.43**	**.27**	**.21**	-					
Monitoring (Mon)	**-.22**	**.20**	**.16**	.04	**.11**	-				
Pressure to eat (Pre)	-.02	-.03	**-.16**	-.05	.06	-.08	-			
Restriction for health (RH)	.03	.08	-.06	-.02	**.16**	-.04	-.01	-		
Restriction for weight (RW)	-.03	.09	.05	.08	**.17**	.01	**-.12**	**.56**	-	
Teaching nutrition (Teach)	**-.19**	**.52**	**.34**	**.28**	-.10	**.13**	-.10	.02	**.11**	-

Note: Correlations in bold are significant at the .01 level.

Table 4 Factor structure of the unified 42 item version of the CFPQ (our 10-factor solution), and variance explained for each factor

CFPQ items	CC	Enc/Teach[b]	Env_U[c]	Env_H[c]	Inv	Mod	Mon	Pre	RH	RW
CC5	0.73									
CC9	0.62									
CC6	0.61									
CC8	0.51									
CC10[a]										
Enc22		0.69								
Enc35		0.61								
Enc24		0.53								
Enc11		0.48								
Env14			0.89							
Env34			0.85							
Env20				0.64						
Env12				0.57						
Inv13					0.79					
Inv18					0.76					
Inv30					0.74					
Mod44						0.87				
Mod43						0.78				
Mod45						0.65				
Mod41				0.57[d]						
Mon2							0.92			
Mon1							0.91			
Mon4							0.81			
Mon3							0.71			
Pre36								0.77		
Pre28								0.73		
Pre15								0.64		
RH40									0.65	
RH26									0.62	
RH19									0.61	
RH37									0.50	
RW25										0.82
RW31										0.80
RW27										0.75
RW33										0.64
RW32										0.61
RW38										0.60
RW16										0.50
RW42				0.40[e]						
Teach23		0.64								
Teach29		0.40								
Teach39		0.42								
Variance expl. (%)	2.5	11.0	2.9	4.1	4.7	3.0	6.8	5.1	3.7	13.1

Note: Original CFPQ subscales (and item prefixes) are labeled as follows: Child control (CC), Encourage balance and variety (Enc), Environment (Env), Involvement (Inv), Modeling (Mod), Monitoring (Mon), Pressure (Pre), Restriction for health (RH), Restriction for weight (RW), Teaching nutrition (Teach). Only factor loadings higher than the absolute value of 0.40 are reported.

[a] Item 10 on the original Child control subscale did not have a substantial loading onto any factors in our solution.

[b] Items from the Encourage balance and variety and Teaching nutrition subscales loaded onto the same factor, creating a new Enc/Teach factor.

[c] The original Environment subscale was not confirmed, but was split into two different factors reflecting availability of healthy foods in the home environment (Env_H) and availability of unhealthy foods in the home environment (Env_U) respectively.

[d] Item 41 from the Modeling subscale did not load onto the Modeling factor, but onto the new Env_H factor.

[e] Item 42 from the Restriction for weight (RW) subscale did not load onto the RW factor, but onto the new Env_H factor.

factor. In addition, the four items on the Environment subscale split into two different factors, one containing items reflecting availability of healthy foods in the home environment, and another one containing items reflecting availability of unhealthy foods in the home environment.

Also important to note, is that item 10 on the Child control subscale ("Do you allow this child to leave the table when s/he is full, even if your family is not done eating?") did not have a substantial loading onto any factor in our solution. Furthermore, one item on the Modeling subscale (item 41: "I model healthy eating for my child by eating healthy myself"), and one item on the Restriction for weight subscale (item 42: "I often put my child on a diet to control his/her weight"), did not load onto their assigned scales, but loaded together with the items reflecting availability of healthy foods in the home environment (see discussion).

Correlations between CFPQ subscales and related attitude scales

Nomological validity was assessed by running bivariate correlation analysis between the CFPQ subscales in our 10-factor solution and related attitude scales derived from Birch et al [8] (see Appendix 1). Theoretically expected relations between CFPQ subscales and related attitude scales were supported by our analyses (see Table 5), thus placing the CFPQ subscales in the nomological network of the multidimensional domaine of parental feeding behavior (see discussion).

To sum up, the results from our quite comprehensive scale analyses largely supported the validity and internal consistency reliability of the CFPQ subscales in the present sample. However, a few problems were revealed, and these problems form the basis of the discussion below.

Discussion

The aim of the present study was to test the validity of a slightly adapted version of the CFPQ with Norwegian parents of 10 to12 year old children. Analyses of both the individual subscales and a unified 42 item version of the instrument suggested reasonable validity of the CFPQ in our sample.

The initial scale analyses included assessment of subscale dimensionality (convergent validity) and internal consistency. Reasonable convergent validity and internal consistency was found for most scales. However, there

were indications of some problems within the following four subscales: Child control, Environment, Modelling, and Teaching nutrition. We found some very low communality items within the Child control, Modelling and Teaching nutrition subscales, and the Environment subscale showed a two-factor solution, thus indicating some problems with the convergent validity of these scales. Moreover, the low alphas found in three of these scales may be questioned (Child control = 0.55, Teaching nutrition = 0.44, Environment = 0.57). Some low alphas were also found by Musher-Eizenman & Holub (2007) (e.g. Encourage balance and variety = 0.58 for American mothers) and Musher-Eizenman et al [15] (e.g. Teaching nutrition = 0.54 and 0.56 for French mothers and fathers respectively). However, it is important to note that all CFPQ subscales have few items. According to Cortina [42], it is well known that the number of items has an effect on alpha, especially at low levels of average item inter-correlation. That is, if a scale has enough items (e.g. more than 20), then it can have an alpha of ≥ 0.70 even when the correlation among items are very small [42]. Thus, lower values of alpha can be expected from shorter scales like the subscales of the CFPQ. Developing survey instruments always involves a trade-off between internal consistency (using multiple items) and practicality. The CFPQ is an instrument aiming to tap many different aspects of feeding practices. Using only a few items in each subscale makes it less tiresome, and therefore more applicable. However, one may question if the brief subscales of the CFPQ sufficiently captures the different aspects of feeding practices.

Initial testing of discriminant validity by running correlation analyses between the CFPQ subscales revealed some substantial correlations, but these were not large enough to compromise the discriminant validity of the scales [40]. The correlation (r = 0.56, p < 0.01) between the Restriction for weight control and Restriction for health subscales could be expected, as these scales represent conceptually close constructs. Musher-Eizenman and Holub [10] indicated that parents may not spontaneously differentiate between restriction motivated by weight and by health, suggesting that parents who limit or restrict child food intake for weight control reasons may also be doing so for health reasons (or vice versa). Yet, Musher-Eizenman and Holub [43] was the first to articulate the distinction between restriction for health

Table 5 Bivariate correlations between CFPQ subscales (our 10-factor solution) and related attitude scales

	CC	Enc/Teach	Env_U	Env_H	Inv	Mod	Mon	Pre	RH	RW
Responsibility for child eating	**-.16**	.04	.08	**.24**	.09	**.36**	**.20**	.03	**.20**	**.33**
Concern overweight	.04	.03	-.03	.01	-.01	**.10**	-.10	-.14	**.47**	**.64**
Concern underweight	**.14**	.07	**-.14**	-.00	.04	.03	**-.16**	**.36**	.06	-.06

Note: Correlations in bold are significant at the .01 level.

reasons and restriction for weight control reasons. They argue in favor of the distinction between different types of restrictive feeding, as there may be many different motivations behind the restriction, including child health outcomes, child weight loss or maintenance, to teach the child healthy eating habits for the future, or for religious or ethical beliefs. In their directions for future research, they suggest further exploration of the effect of different restrictive feeding practices on child eating, weight and health outcomes. The correlation ($r = 0.52$, $p < 0.01$) between the Encourage balance and variety and Teaching nutrition subscales was also expected, as these scales both deal with explicit nutrition communication with the child. The relation and discrimination between these scales are further discussed below.

When running factor analysis on the unified 42-item version of the CFPQ, a 10-factor solution, largely corresponding with the original instrument developed by Musher-Eizenman and Holub [10], was found to be conceptually sound in our sample. However, there were some small, but noteworthy differences in factor structure between our solution and the one suggested by Musher-Eizenman and Holub [10]: In our solution the items on the Encourage balance and variety and Teaching nutrition subscales clustered together to form one factor. Moreover, the four items on the Environment subscale split into two different factors reflecting availability of healthy and unhealthy foods respectively. Also worth noting, is that the following items did not load onto their assigned scales: item 10 on the Child control subscale, item 41 on the Modeling subscale, and item 42 on the Restriction for weight subscale.

If we take a closer look at the problematic scales and items revealed by our analyses, it may seem as if some of the items are not conceptualized in an adequate way. Starting with the low-communality item 10 ("Do you allow this child to leave the table when s/he is full, even if your family is not done eating?") on the Child control subscale, this item might reflect a breach of meal-related social norms rather than child control over what and when to eat. In other words, leaving the table when full before the rest of the family is done eating, might reflect a breach of good table manners, an ideal learned through family meals in most Western cultures [44]. Thus, item 10 did not seem feasible as a measure of child control over food intake in our sample.

Moving on to the Environment subscale, the items of this scale split into two different factors with items 12 ("Most of the food I keep in the house is healthy") and 20 ("A variety of healthy foods are available to my child at each meal served at home") loading onto one factor reflecting to what extent healthy foods are available in the home environment, and items 14 ("I keep a lot of snack food in my house") and 34 ("I keep a lot of sweets

in my house") loading onto a second factor reflecting to what extent unhealthy foods are available in the home environment. Both correlation analysis between the two "new" factors ($r = 0.21$, $p < 0.01$) and face validity supports this distinction. Thus, the items on the original Environment subscale seem to specify two different kinds of behavior (having healthy foods available in the home vs. having unhealthy foods available in the home) in our sample.

Initial analysis of the Modelling subscale revealed one low-communality item that needed further investigation (item 41 "I model healthy eating for my child by eating healthy myself"). This item is distinct from the other items on the Modelling scale, as it seems to reflect a general, "passive" form of modelling (...eating healthy myself...), while the remaining three items involve specific, "active" components (...eating healthy foods *in front of my child*..., ...*show enthusiasm* about eating healthy foods..., ...*show how much I enjoy* eating healthy foods...). This distinction was supported when running factor analysis on the unified 42 item CFPQ; item 41 did not load onto the Modelling factor, but onto the factor reflecting availability of healthy foods in the home environment. One obvious assumption for healthy eating is availability of healthy foods. Thus, if parents practice healthy eating, healthy foods are most likely available in the home. Collectively, studies do suggest that readily available and easily accessible healthy foods within the home are likely to enhance healthy eating among families [45]. To sum up on this; healthy eating practices among parents might be more related to the availability of healthy foods in the home environment than to "active" modeling of healthy eating.

The initial scale analyses revealed that the Teaching nutrition subscale had one very low communality item (item 39 "I tell my child what to eat and what not to eat without explanation") and two high communality items (item 23 "I discuss with my child why it's important to eat healthy foods", and item 29 "I discuss with my child the nutritional value of foods"). Item 39 seems to reflect an authoritarian interaction with the child, while a more democratic, authoritative mode of interaction is reflected by items 23 and 29. In the feeding domain, authoritarian practices include parental control and indisputable instructions on what to eat [46,47], while authoritative practices include using discussion, negotiations, and reasoning for desirable eating behavior [48]. In light of this, item 39 seems to reflect a different type of parental food-related behavior than items 23 and 29, which might explain its lack of communality with the latter two. A suboptimal performance of the Teaching about nutrition scale was also found by Musher-Eizenman and co-workers [15].

When running factor analysis on the unified 42 item version of the CFPQ the items on the Teaching

nutrition and Encourage balance and variety subscales loaded highly onto the same factor, indicating a lack of discriminant validity between the scales. A certain overlap between these measures could be expected since they both deal with explicit nutrition communication with the child. Although the bivariate correlation between them (r = 0.52, p < 0.01) was not high enough to suggest a complete conceptual overlap, factor analysis did not support the discriminant validity of the two scales in our sample.

While item 42 ("I often put my child on a diet to control his/her weight") on the Restriction for weight subscale performed well in the initial analysis on the individual subscales, factor analysis of the unified version of the CFPQ showed that item 42 did not load onto its assigned scale, but loaded (together with item 41) onto the factor reflecting availability of healthy foods in the home environment. Like for healthy eating, (successful) dieting also requires availability of healthy foods in the home. Thus, item 42 might be more related to the availability of healthy foods in the home environment than to restriction for weight control reasons. If we see this in light of the general recommendation about not focusing on dieting in front of children and adolescents [49], the unsubstantial loading of item 42 on its assigned scale was not totally unexpected. Furthermore, the CFPQ was first developed and tested in the US [10], where child overweight and obesity is substantially more prevalent than in Norway [50,51]. Thus, one might speculate if this item is more appropriate in an American than in a Norwegian setting.

Regarding nomological validity, significant correlations between CFPQ subscales in our 10-factor solution and related attitude scales supported theoretically expected relations. For instance; parents who were concerned about their child being or becoming overweight reported more restrictive feeding practices of both types, whereas parents who were concerned about their child being or becoming underweight reported more pressure to eat. Furthermore, parents feeling responsible for child eating reported less child control over feeding interactions, a healthier home environment, more modelling, monitoring, encouragement and teaching about nutrition, and more restriction of both types.

To sum up: our findings largely supported the validity of a slightly adapted, 42 item version of the CFPQ with parents of 10 to12 year old children in a Norwegian setting. Although some subscales and items seemed problematic as a result of our statistical scale analyses, face validity indicated that most of these items still were relevant for measuring feeding practices in parents of 10-to-12-year-olds. Furthermore, it is important to note that our findings are sample specific, and thus cannot be used as a sole foundation for changing the original CFPQ subscales. The

CFPQ has previously been validated with parents of younger children, and in other cultural settings (USA; Musher-Eizenman & Holub, 2007, and France; Musher-Eizenman et al., 2009). Thus, some differences when it comes to factor structure and other validity measures between these studies and the present one are not unexpected.

Strengths and limitations
Among the strengths of this study is its large sample size. According to Guadagnoli and Velicer [52], a sufficiently large sample size is one of the most important factors for determining a stable factor structure. Pett, Lackey and Sullivan [40] recommend that there be at least 10 to 15 subjects per item, preferably aiming for a sample size of 500 or more. We more than satisfy these recommendations with our sample of 963 respondents. Furthermore, most previous validation studies on feeding practices measures have focused on parents of young children and on rather parsimonious instruments largely tapping aspects of parental control over child eating behavior. Thus, the present study extends the current literature by validating a multi-dimensional feeding practices instrument with parents of older children. We believe this is a relevant contribution, as valid instruments are needed to assess a wider range of feeding practices in diverse groups of parents, including parents of older children and adolescents [6].

A few limitations of this study need comments. The findings are limited to Norwegian parents of pre-adolescent children. Furthermore, four items were excluded from the Norwegian version of the CFPQ, and only 10 out of 12 subscales were validated in the present study (thus, a reduced version of the CFPQ was tested). Second, the study sample was a cluster sample drawn from a confined geographic area (two municipalities in the South-Western part of Norway). However, as Norway is a rather homogeneous country [53], we believe the results are likely to be generalized to other areas in Norway.

Conclusions
The psychometric properties of the slightly adapted Norwegian version of the CFPQ were found to be surprisingly similar to those of the original CFPQ. Thus, we suggest that the CFPQ, with some modifications, is a valid tool for assessing parental feeding practices with parents of 10-to-12-year-olds in a Norwegian setting. The good response rate (66%) indicates that the content of the CFPQ is considered relevant by this group of the population. However, the CFPQ is not yet an established instrument, and the present study can be considered part of an early phase validation process. Although our validation of a Norwegian version of the CFPQ with parents of 10-to-12-year olds yielded positive results for most subscales and

items, we suggest further fine-tuning of the instrument and inclusion of new items to make it an even more complete instrument for use with parents of older children and adolescents. Future fine-tuning and item generation should involve further exploration of the different dimensions of feeding practices, and the weights given to the different dimensions, through qualitative research in the target population. Based on our results, special attention should be given to the dimensions of restrictive feeding practices and the dimensions reflecting home food environment and nutrition communication between parents and children. An expanded cross-cultural adaptation and further improvement of the psychometric quality of this instrument becomes even more important if there is an interest in comparing results from research conducted in different cultures and settings. Nevertheless, our results indicate that the CFPQ is a promising tool for future comparative studies and much needed accumulation of knowledge about parent-child feeding interactions.

Appendix 1

Includes subscale names, brief operational definition of subscales, and items retained in the Norwegian version of the CFPQ and the related attitude scales adapted from the CFQ. Item numbers indicate the order in which they were presented in the survey questionnaire. Items numbered 1-11 utilize a 5-point "frequency scale"; never, rarely, sometimes, mostly, always. Items numbered 12-48 utilize a 5-point "agreement scale"; disagree, slightly disagree, neutral, slightly agree, agree. Items numbered 49-54 utilize a 5-point "concern scale"; unconcerned, a little concerned, concerned, fairly concerned, very concerned. Items marked with an **R** were reversed coded.

CFPQ subscales and items

Child control - parents allow the child control of his/her eating behaviors and parent-child feeding interactions

5. Do you let your child eat whatever s/he wants?

6. At dinner, do you let this child choose the foods s/he wants from what is served?

8. If this child does not like what is being served, do you make something else?

9. Do you allow this child to eat snacks whenever s/he wants?

10. Do you allow this child to leave the table when s/he is full, even if your family is not done eating?

Emotion regulation - parents use food to regulate the child's emotional status

7. Do you give this child something to eat or drink if s/he is upset even if you think s/he is not hungry?

Encourage balance and variety - parents promote well-balanced food intake, including the consumption of varied foods and healthy food choices

11. Do you encourage this child to eat healthy foods before unhealthy ones?

22. I encourage my child to try new foods

24. I tell my child that healthy foods taste good

35. I encourage my child to eat a variety of foods

Environment - parents make (un)healthy foods available in the home

12. Most of the food I keep in the house is healthy

14. I keep a lot of snack food (potato chips, Doritos, cheese puffs) in my house **R**

20. A variety of healthy foods are available to my child at each meal served at home

34. I keep a lot of sweets (candy, ice cream, cake, pastries) in my house **R**

Food as reward - parents use food as reward for child behavior

17. I offer my child his/her favorite foods in exchange for good behavior

21. I offer sweets (candy, ice cream, cake, pastries) to my child as a reward for good behavior

Involvement - parents encourage child's involvement in meal planning and preparation

13. I involve my child in planning family meals

18. I allow my child to help prepare family meals

30. I encourage my child to participate in grocery shopping

Modeling - parents actively demonstrate healthy eating for the child

41. I model healthy eating for my child by eating healthy myself

43. I try to eat healthy foods in front of my child, even if they are not my favorite

44. I try to show enthusiasm about eating healthy foods

45. I show my child how much I enjoy eating healthy foods

Monitoring - parents keep track of child's intake of less healthy foods

1. How much do you keep track of the sweets (candy, ice cream, cake, pastries) that you child eats?

2. How much do you keep track of the snack food (potato chips, Doritos, cheese puffs) that your child eats?

3. How much do you keep track of the high-fat foods that your child eats?

4. How much do you keep track of the sugary drinks this child drinks?

Pressure - parents pressure the child to consume more foods at meals

15. My child should always eat all of the food on his/her plate

28. If my child says, "I'm not hungry", I try to get him/her to eat anyway

36. If my child eats only a small helping, I try to get him/her to eat more

Restriction for health - parents control the child's food intake with the purpose of limiting less healthy foods and sweets

19. If I did not guide or regulate my child's eating, s/he would eat too much of his/her favorite foods

26. If I did not guide or regulate my child's eating, s/he would eat too many junk foods

37. I have to be sure that my child does not eat too much of his/her favorite foods

40. I have to be sure that my child does not eat too many sweets (candy, ice cream, cake, pastries)

Restriction for weight control - parents control the child's food intake with the purpose of decreasing or maintaining the child's weight

16. I have to be sure that my child does not eat too many high-fat foods

25. I encourage my child to eat less so s/he won't get fat

27. I give my child small helpings at meals to control his/her weight

31. If my child eats more than usual at one meal, I try to restrict his/her eating at the next meal

32. I restrict the food my child eats that might make him/her fat

33. There are certain foods my child shouldn't eat because they will make him/her fat

38. I don't allow my child to eat between meals because I don't want him/her to get fat

42. I often put my child on a diet to control his/her weight

Teaching about nutrition - parents use explicit didactic techniques to encourage the consumption of healthy foods

23. I discuss with my child why it's important to eat healthy foods

29. I discuss with my child the nutritional value of foods

39. I tell my child what to eat and what not to eat without explanation **R**

Related attitude scales and items adapted from the CFQ

Responsibility for child eating - parents feel responsible for their child's eating

46. I feel that I have an important role in establishing lifelong eating habits in my child

47. I feel responsible for determining portion sizes for my child

48. I feel responsible for providing a healthy diet for my child

Concern for child overweight - parents are concerned about their child being/becoming overweight

49. How concerned are you about your child eating too much when you are not around him/her?

50. How concerned are you about your child having to diet to maintain a desirable weight?

51. How concerned are you about your child becoming overweight?

Concern for child underweight - parents are concerned about their child being/becoming underweight

52. How concerned are you about your child eating too little when you are not around him/her?

53. How concerned are you about your child having to eat more to maintain a desirable weight?

54. How concerned are you about your child becoming underweight?

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Authors' contributions
ELM designed the study, collected and analyzed the data, and drafted the manuscript. NCØ and TØ supervised the study and contributed to the analyses and writing of the article. All of the authors read and approved the final manuscript.

Competing interests
The authors declare that they have no competing interests.

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Paper II

Child consumption of fruit and vegetables: the roles of child cognitions and parental feeding practices

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(POSTPRINT VERSION)

1   **Abstract**

2

3   *Objective:* To examine the roles of child cognitions and parental feeding practices in explaining

4   child intentions and behavior regarding fruit and vegetable consumption.

5   *Design:* Cross-sectional surveys among pre-adolescent children and their parents.

6   *Setting:* The child questionnaire included measures of fruit and vegetable consumption and

7   cognitions regarding fruit and vegetable consumption as postulated by the Attitude-Social

8   Influence-Self-Efficacy (ASE) model. The parent questionnaire included measures of parental

9   feeding practices derived from the Comprehensive Feeding Practices Questionnaire (CFPQ).

10   *Subjects:* In total 963 parents and 796 grade 5 and 6 students from 18 schools in the South-Western

11   part of Norway participated.

12   *Results:* A large portion of child intention to eat fruit and child fruit consumption was explained by

13   child cognitions (29 and 25%, respectively). This also applied to child intention to eat vegetables

14   and child vegetable consumption (42 and 27%, respectively). Parent-reported feeding practices

15   added another 3% to the variance explained for child *intention* to eat fruit, and 4% to the variance

16   explained for child vegetable *consumption*.

17   *Conclusion:* The results from this study supported the application of the ASE model for explaining

18   the variance in child intentions to eat fruit and vegetables and in child consumption of fruit and

19   vegetables. Furthermore, our findings indicated that some parental feeding practices do have an

20   influence on child intentions and behavior regarding fruit and vegetable consumption. However, the

21   role of parental feeding practices, and the pathways between feeding practices and child eating

22   intentions and behavior, needs to be further investigated.

23

24   **Introduction**

25

26   Norwegian dietary surveys from 2000 showed that the average intake of fruit and vegetables (F&V)

27   among children and adolescents was less than half the recommended amount [1]. Subsequent cross-

28   national surveys among children and adolescents also found that the F&V intake was far from

29   reaching population goals and food-based dietary guidelines in all the surveyed countries [2]. The

30   promotion of healthy eating (including daily F&V consumption) in pre-adolescent children is

31   important, since food habits established in childhood may to a certain extent track into adolescence

32   and adulthood [3-5]. Furthermore, food habits in pre-adolescent children may be more flexible to

33   change than food habits in adolescents and adults [3]. According to Hanson et al [6], at age 11,

34   parents are considered to be the most important social agent impacting upon diet. In line with this,

35   De Bourdeaudhuij et al [7] indicated that parental influence is important for daily F&V consumption

1

36   in 11-year old children. We believe that increased knowledge about the relations between parental

37   influence and eating behavior in pre-adolescent children is needed to develop successful

38   interventions for this group of the population.

39

40   Parents influence their children's eating behavior in many different ways, especially through their

41   feeding practices [8]. Most previous studies assessing parental feeding practices as determinants of

42   children's eating behavior have included just a few feeding practices, such as restrictive feeding and

43   pressure to eat. These practices are aspects of control over child food intake, and are typically

44   measured with the Child Feeding Questionnaire (CFQ) [9]. Although controlling feeding practices

45   seem to be widely used by parents in an attempt to secure a well-balanced diet for their children [10],

46   some studies have proved counterproductive effects of these practices, as parents who exert too

47   much control over child food intake tend to have children with an increased preference for high-fat

48   foods and higher levels of snack-food intake [11]. The emphasis on parental control in previous

49   feeding practices measures has lately been accompanied by increased research on other important

50   practices. Parental modeling of healthy eating and exposure to healthy foods are examples of other

51   feeding practices that may be effective [12-15].

52

53   Traditionally, the Theory of Planned Behavior (TPB) [16], the Attitude-Social Influence-Self-

54   Efficacy (ASE) model [17], and similar cognitive theories derived from social psychology are seen as

55   comprehensive models for explaining and predicting health behavior, including eating behavior. In

56   the TPB and the ASE model, attitude, subjective norm (social influence) and perceived behavioral

57   control (self-efficacy) are the central cognitive factors. These factors are believed to influence

58   behavioral intention, which is assumed to be the primary determinant of behavior. More distal

59   variables, such as the social and physical environment, are theorized to influence health behavior

60   through the variables of these models [16]. However, some studies suggest that cognitive models

61   such as these are unable to fully account for the more distal variables [18-20]. Moreover, some distal

62   variables are hypothesized to have a direct effect on health behavior, thus bypassing the proximal

63   cognitive factors [21].

64

65   In the present study we built upon the conceptual framework of Hewitt and Stephens [22], and

66   constructed a model based on variables from the ASE model and the Comprehensive Feeding

67   Practices Questionnaire (CFPQ) [23] to examine the roles of child cognitions and parental feeding

68   practices in explaining child intention to eat F&V, and child self-reported F&V consumption. More

69   specifically, we aimed to test if the inclusion of multiple parental feeding practices (not only

70   controlling and restrictive practices) could increase the explanatory power of the ASE model, and to

71 assess the importance of each variable in explaining the variance in child intention to eat F&V, and

72 in child self-reported consumption of F&V. The relations under study are presented in Figure 1.

73

74 ---Figure 1 about here---

75

76 **Methods**

77

78 *Procedures and participants*

79 Participants were recruited through primary schools in two neighboring municipalities (Gjesdal and

80 Sandnes) in the South-Western part of Norway. All primary schools in these municipalities were

81 asked to participate in the study, and 18 out of 25 schools (72%) agreed. In total, 1466 grade 5 and

82 6 students, and one of their parents, were invited. First, parents' survey packages including

83 information letters, consent forms and self-administered questionnaires were distributed to the

84 children at school with instructions to bring them home to be completed by one of their parents (the

85 parent most involved in home food issues) within three days. Next, after receiving written consent

86 from the parents, child questionnaires were distributed and completed by the students at school. The

87 study was approved by the Norwegian Social Sciences Data Services (NSD).

88

89 We received 963 completed parent questionnaires (66%). Response rate ranged from 20 to 100%

90 among participating classes. Of the 963 parent respondents, 85% were mothers. The average age of

91 the parents was 39.8 years, and 91% of the sample was of Norwegian or other Nordic origin. Out of

92 865 students having written consent from their parents to participate in the study, 796 (92%)

93 completed the child questionnaire. Of the 796 child respondents, 51% were girls. Average age was

94 10.8 years (SD=0.6 years).

95

96 *Measures*

97 Both parent and child questionnaires were pre-tested for clarity and length among parents (n=6) and

98 children (n=8) not taking part in the study.

99

100 *Parent questionnaire*

101 The parent questionnaire included an adapted, validated, Norwegian version of Musher-Eizenman

102 and Holub's [23] Comprehensive Feeding Practices Questionnaire (CFPQ). The process of

103 translation, adaptation and validation of the CFPQ is described in detail elsewhere [24].

104

105 *Child questionnaire*

106 The items constituting the child questionnaire has previously been validated and widely used among
107 Norwegian 6th graders [7, 25-30].

109 The child questionnaire consisted of two parts; one part assessing child cognitions related to F&V
110 intake, and another part assessing child consumption of F&V. The cognitions part was adapted from
111 the Pro Children study [27], and included variables based on the ASE model. Attitudes were
112 measured with two items for fruit and vegetables respectively (To eat fruit/vegetables every day
113 gives me more energy, and to eat fruit/vegetables every day makes me feel good). Social influence,
114 which in the present study was limited to parental influence, was measured by four items. Two of
115 these items reflected parental descriptive norms or modeling (My mother/father eats fruit/vegetables
116 every day), and two items reflected active parental encouragement (My mother/father encourages
117 me to eat fruit/vegetables every day). Self-efficacy was measured with two items (It's easy for me
118 to eat fruit/vegetables every day, and if I decide to eat fruit/vegetables every day, I can do it), and
119 intention with one item (I want to eat fruit/vegetables every day). All items had five response
120 categories (1=fully disagree, 2=partly disagree, 3=neither agree nor disagree, 4=partly agree,
121 5=fully agree).

123 Pre-testing of the cognitions part of the questionnaire led to some small adjustments compared to
124 the original items formulated by De Bourdeaudhuij et al [27]: The wording of one of the self-efficacy
125 items was changed from negative ("It's difficult for me to eat fruit/vegetables every day") to
126 positive ("It's easy for me to eat fruit/vegetables every day"), as the children perceived positive
127 wording as more natural. Furthermore, we reversed the response categories from descending
128 numbers (5=fully disagree to 1=fully agree) to ascending numbers (1=fully disagree to 5=fully
129 agree), as it seems more logical that increasing agreement with statements and increasing numbers
130 accompany each other.

132 Child consumption of F&V was assessed using frequency questions adapted from the work of
133 Andersen et al [25]. The present study included four questions about the consumption of F&V: "How
134 often do you eat vegetables for dinner", "…other vegetables", "…apple, orange, pear and banana",
135 and "…other fruit and berries". All questions had 10 response categories (never=1, less than once a
136 week=2, once a week=3, twice a week=4,…., six times a week=8, every day=9, several times every
137 day=10), which were re-coded to reflect consumption in times per week (0, 0.5, 1, 2, …, 6 , 7, 10)
138 as suggested by Bere et al [28].

140 ***Data analyses***

4

141 SPSS Version 18 was used for the data analyses. First, the proportion of children reporting daily

142 F&V consumption (i.e. 7 times or more per week) was calculated. This was done by 1) making

143 sum-scores of the recoded fruit and vegetable items respectively, 2) dichotomizing the sum-scores:

144 0=not eating fruit/vegetables every day (scores 0 through 6), 1=daily consumption of

145 fruit/vegetables (scores 7 and above), and 3) running frequencies to find the proportion of children

146 reporting daily fruit and vegetable consumption respectively. Next, the distribution of scores on

147 each scaling variable was assessed by calculating mean, standard deviation, skewness and kurtosis

148 values. As suggested by Kline [31], we chose to apply cut-off values of 3.0 and 8.0 for skewness and

149 kurtosis respectively. Cronbach's alpha coefficients were computed to measure internal consistency

150 of the scales. Bivariate correlation analyses were run between all variables to test for

151 multicollinearity between independent variables, and to get a first impression of relations between

152 independent and dependent variables. As suggested by Haerens and coworkers [32], we applied a

153 cut-off value of 0.80 or greater for multicollinearity.

154

155 To examine the contribution of parental feeding practices in explaining the variance in child

156 intentions and behaviors regarding F&V consumption, taking into account the effects of child

157 cognitions, hierarchical regression analyses were conducted with child intentions to eat F&V, and

158 child self-reported F&V consumption, as dependent variables. Thus, child cognitions were entered

159 into the first block and parental feeding practices were entered into the second block for fruit and

160 vegetable intentions and consumption respectively.

161

162 Since fruit and vegetable consumption can be seen as different behaviors, influenced by different

163 factors [33], analyses were run separately for these behaviors. We chose a rather puritan approach to

164 our data, and listwise deletion was applied for all model analyses. Thus, only dyads with complete

165 data sets for each of the four models tested were included in these analyses (regression on child

166 intention to eat fruit/child fruit consumption: n=643/n=628, regression on child intention to eat

167 vegetables/child vegetable consumption: n=658/n=622). Independent-samples t-tests were

168 conducted to test for differences between dyads included in model analyses and those not included

169 due to incomplete data.

170

171 **Results**

172

173 *Daily F&V consumption*

174 Daily fruit consumption was reported by 72% and daily vegetable consumption by 58% of the

175 children.

Distribution of scores

177 Mean scores, standard deviations and Cronbach's alphas for F&V consumption and child cognitions

178 regarding F&V consumption are presented in Tables 1 and 2 for fruit and vegetables respectively.

179 Means, standard deviations and alphas for parental feeding practices are presented in Table 3.

180 Screening for skewness and kurtosis showed that all child and parent variables had values well

181 within the range of chosen cut-offs (skewness: -2.24 - 1.81, kurtosis: -0.80 - 5.46). Cronbach's

182 alphas ranged from 0.44 to 0.84.

183

184 ---Table 1, 2 and 3 about here---

185

186 ***Correlations between variables***

187 No multicollinearities were found between the independent variables. Bivariate correlations

188 between independent and dependent variables are presented in Table 4. All ASE-based variables

189 showed moderate to high correlations with both child intention to eat F&V, and with child F&V

190 consumption. Only a few CFPQ-based variables correlated (weakly) with child intentions and

191 behavior regarding fruit consumption, while several CFPQ-based variables correlated (weakly) with

192 child intentions and behavior regarding vegetable consumption.

193

194 ---Table 4 about here---

195

196 ***Regression analyses***

197

198 *Intention to eat fruit and fruit consumption*

199 Hierarchical regression analyses on child *intention* to eat fruit every day revealed that child

200 cognitions accounted for 29% of the variance explained. Including parental feeding practices in the

201 model, added another 3% to the variance explained (Table 5). All ASE-based variables were

202 positively related to child intention to eat fruit (in order of importance): *Self-efficacy* (β=.28,

203 p<.001), *attitude* (β=.25, p< .001), and *parental influence* (β=.18, p<.001). Expanding the ASE

204 model by adding parental feeding practices, revealed that the variable *child control* was negatively

205 related to child intention to eat fruit (β=-.14, p< .001).

206

207 Hierarchical regression analyses on child self-reported fruit *consumption* revealed that child

208 cognitions (including intention), accounted for 25% of the variance. The following ASE-based

209 variables were positively related to fruit consumption (in order of importance): *Intention* (β=.23,

210   p<.001), *self-efficacy* (β=.22, p<.001), and *parental influence* (β=.14, p<.001). Inclusion of parental

211   feeding practices in the model did not contribute significantly to explaining the variance in child

212   fruit consumption (Table 6).

213

214   ---Table 5 and 6 about here---

215

216   *Intention to eat vegetables and vegetable consumption*

217   Hierarchical regression analyses on child *intention* to eat vegetables every day revealed that child

218   cognitions accounted for 42% of the variance. All ASE-based variables were positively related to

219   child intention to eat vegetables (the order of importance was the same as for child intention to eat

220   fruit): *Self-efficacy* (β=.37, p<.001), *attitude* (β=.25, p<.001), and *parental influence* (β=.19,

221   p<.001). Adding parental feeding practices to the model did not increase the variance explained

222   (Table 7).

223

224   Regarding child self-reported vegetable *consumption*, hierarchical regression analyses revealed that

225   child cognitions (including intention) accounted for 27% of the variance explained, and inclusion of

226   parental feeding practices accounted for an additional 4% (Table 8). The following variables within

227   the ASE model were positively related to child vegetable consumption (in order of importance):

228   *Self-efficacy* (β=.28, p<.001), *intention* (β=.16, p<.001) and *parental influence* (β=.16, p<.001).

229   Adding parental feeding practices to the model revealed that only the *environment* variable (β=.11,

230   p<.01) was significantly, and positively, related to child vegetable consumption.

231

232   ---Table 7 and 8 about here---

233

234   ***Differences between dyads included and dyads not included***

235   Independent-samples t-tests were conducted to compare variable scores (model variables and socio-

236   demographic variables) for dyads included in model analyses and those not included due to

237   incomplete data. Of the 26 variables tested, we found only two variables with significantly different

238   scores for dyads included and dyads not included. These variables were (child-reported) self-

239   efficacy regarding fruit consumption (M=4.58, SD=0.70 for dyads included and M=4.37, SD=0.91

240   for dyads not included, t(142)=2.32, p=0.02) and (parent-reported) child control (M=2.41, SD=0.57

241   for dyads included and M=2.29, SD=0.59 for dyads not included, t(725)=1.93, p=0.05). The

242   magnitude of the differences in means (mean difference= 0.21 for self efficacy and mean

243   difference= 0.12 for child control) was very small (eta squared=0.007 for self efficacy and eta

244   squared=0.005 for child control). Thus, these results suggested that the differences between dyads
245   included and dyads not included in our model analyses were negligible.
246
247   **Discussion**
248
249   The aim of the present study was to explore the roles of child cognitions and parent-reported
250   feeding practices in explaining the variance in child intentions and behavior regarding F&V
251   consumption. Our results showed that both child cognitions and (some) parent-reported feeding
252   practices were associated with child intentions and behavior regarding F&V consumption.
253   However, child cognitions played a greater role than parent-reported feeding practices in explaining
254   the variance in both child intentions and behavior.
255
256   Regression analyses showed that a large portion of the variance in child intention to eat fruit, and in
257   child fruit consumption (29 and 25%, respectively), could be explained by child cognitions as
258   postulated by the ASE model. This also applied to intention to eat vegetables, and to consumption
259   of vegetables (42 and 27%, respectively). Thus, our results support the use of the ASE model for
260   this purpose. Among the ASE-based variables measured in our study, *self-efficacy* appeared as the
261   single most important variable in explaining intentions and behavior regarding F&V consumption.
262   According to the ASE model, self-efficacy can be expected to have a direct effect on behavior as
263   opposed to other cognitions such as attitudes and perceived social influence, which effects seem to
264   be mediated through intentions [17, 34]. However, previous research is inconsistent about the
265   relationship between self-efficacy and F&V consumption [29, 35-40]. This may be due to different
266   operationalizations of the self-efficacy construct [7]. For example, positive versus negative wording
267   of the self-efficacy items might have an impact on the results. The self-efficacy measure in the
268   present study was derived from the Pro Children project [27]. However, we changed the wording of
269   one of the original self-efficacy items from negative to positive, leading to an increase of the
270   internal consistency of the measure compared to studies using an unrevised version of the Pro
271   Children self-efficacy measure [27, 41]. The alphas in the present study were 0.59 and 0.73 for self-
272   efficacy regarding fruit and vegetables respectively. The studies by De Bourdeaudhuij et al [27] and
273   Sandvik et al [41] both had alpha levels below 0.50 (0.39-0.49) for self-efficacy regarding F&V
274   consumption. Revision of the Pro Children self-efficacy measure was encouraged by Sandvik and
275   coworkers [41], and in a later study the measure was revised by simply removing the negatively
276   worded item. Still, no direct relation from self-efficacy to child F&V consumption was found [29].
277   Revision of the self-efficacy measure in the present study (by changing the wording from negative
278   to positive) resulted not only in an increased internal consistency; it also resulted in a large direct

279 effect of self-efficacy on F&V consumption as postulated by the ASE model. Thus, it seems like the

280 wording and composition of measures may have great impact on the results.

281

282 *Parental influence* (as perceived by the children) also appeared as a significant correlate of both

283 intentions and behavior regarding F&V consumption. In a study by De Bourdeaudhuij et al [7] both

284 parental modeling and active parental encouragement (as perceived by the children) were found to

285 be associated with daily consumption of F&V. Several previous studies also reported (perceived)

286 parental modeling as a correlate of child F&V consumption [25, 39, 42-44]. *Attitudes*, however, were

287 strong correlates of intentions to eat F&V, but seemed to have no relation to F&V consumption in

288 our sample. This is in line with previous research, which found only weak associations between

289 attitudes and F&V consumption [7, 38]. Strong associations between attitudes and intention and weak

290 associations between attitudes and consumption could be expected, as intention is theorized to

291 mediate the relationship between attitudes and behavior [16, 17].

292

293 Expanding our ASE-based model by including parents' reports of their feeding practices, indicated

294 that some parental feeding practices do have an influence on child intentions and behavior regarding

295 F&V consumption: The variable *child control* was negatively associated with child intention to eat

296 fruit, and the variable *environment* was positively associated with child vegetable consumption.

297 However, the portion of variance explained by these feeding practices was rather small. There are

298 many possible explanations for this. First of all, there might be a gap between the parents' report on

299 their own behavior and their children's perception of it. This is supported by our finding of a highly

300 significant positive association between parental influence (parental modeling and active parental

301 encouragement), as perceived by the children, and child intentions and behavior regarding F&V

302 consumption. However, it is also possible that the child reports were more highly related to the

303 outcomes of interest because of mono-method bias. Alternatively, the weak associations between

304 parent-reported feeding practices and the dependent variables compared to the strong associations

305 between child cognitions and the same dependent variables may be caused by a difference in

306 specificity of the independent variables. That is; the parent-reported feeding practices measure

307 (CFPQ) assess general constructs of (un)healthy eating, while the items for the child-reported social

308 cognitions are specific to F&V consumption. Another possible explanation for our findings might

309 be that parental feeding practices are internalized within the child through a socialization process,

310 which in turn is expressed via child cognitions.

311

312 As far as we know, only one previous study [22] has used a combination of a cognitive model and a

313 pure feeding practices measure to assess the role of child cognitions and parental influence (as

9

314 reported by parents) on child healthy eating intentions and behavior. This study by Hewitt and

315 Stephens [22] was very similar to ours, as it examined the roles of child cognitions measured by

316 Ajzen's [16] TPB, and parental feeding practices measured by Birch et al's [8] CFQ, in predicting

317 healthy eating intentions and behavior among 10-13-year-old New Zealand children. Thus, it seems

318 worthwhile to compare these studies. An objective in both studies was to test if an expansion of the

319 social cognition model, by including parents' reports on feeding practices, could increase the

320 variance explained for child healthy eating intentions and behavior. Both studies supported the

321 application of cognitive models for this purpose. However, the inclusion of parent-reported feeding

322 practices did not increase the explanatory power of the social cognition model in Hewitt and

323 Stephens' [22] study. They concluded that the role of parental feeding practices in terms of control

324 and restriction seemed to have no relation to the children's reported intentions and behaviors

325 regarding healthy eating, and they suggested that the role of parental influence should be further

326 examined. The present study can be considered an answer to their suggestion, as we included a

327 broader spectrum of parental feeding practices in our model (not only controlling and restrictive

328 practices).

329

330 **Strengths and limitations**

331 Among the strengths of this study, is that we have reports from two different sources; parents and

332 children. Thus the "common methods problem" regarding parental feeding practices (reported by

333 parents) and child intention and behavior regarding F&V consumption (reported by children) is

334 reduced. However, this might also be a limitation, referring back to the above mentioned possible

335 gap between parental reports and child perceptions. Another strength of the present study is its large

336 sample size, which allows the application of rather sophisticated statistical analyses, and increases

337 the statistical power of the results.

338

339 One obvious limitation of the study is its cross-sectional design, which does not allow for causal

340 inferences. Another limitation is the application of a self-report food frequency questionnaire (FFQ)

341 for the assessment of child F&V consumption. According to a review conducted by McPherson et al

342 [45], 24-h recalls and food records seem to work better among school-aged children than FFQs.

343 Frequency questions asking about usual intake require abstract thinking, as well as basic reading

344 and arithmetic skills, which may be too advanced for young children. Furthermore, children may

345 have difficulties recalling past events [46]. Andersen et al [25] found that FFQs tended to *overestimate*

346 the intake of F&V compared to 7-day food records. This was also observed by Baranowski et al [47]

347 and van Assema et al [48]. On the other hand, Andersen et al [25] found that the energy intake based

348 on food-records was *underestimated* with around 20%.

349 The presence of some low alphas might also be a limitation, as low internal consistencies may
350 obscure the relationship between variables [49]. In particular, the low alphas found in some of the
351 CFPQ scales may be questioned. Some low alphas were also found by Musher-Eizenman & Holub
352 [23] and Musher-Eizenman et al [50]. However, it is important to note that all CFPQ subscales have
353 few items. According to Cortina [51], it is well known that the number of items has an effect on
354 alpha, especially at low levels of average item inter-correlation. That is, if a scale has enough items
355 (e.g. more than 20), it can have an alpha of ≥ 0.70 even when the correlations among items are very
356 small [51]. Thus, lower values of alpha can be expected from shorter scales like the subscales of the
357 CFPQ. Developing survey instruments always involves a trade-off between internal consistency
358 (using multiple items) and practicality. The CFPQ is an instrument aiming to tap many different
359 aspects of feeding practices. Using only a few items in each subscale makes it less tiresome, and
360 therefore more applicable. However, one may question if the brief subscales of the CFPQ
361 sufficiently captures the different aspects of feeding practices.
362
363 **Conclusions and implications**
364 In this study, child cognitions explained a large portion of child intentions and behavior regarding
365 F&V consumption. However, a few parent-reported feeding practices also contributed, though to a
366 small extent, to the explained variance in child intentions to eat fruit and in child consumption of
367 vegetables. We suggest that future research on this topic address possible mediating effects of child
368 cognitions on the relationships between parent-reported feeding practices and child healthy eating
369 intention and behavior. Extended knowledge about the pathways of these variables is warranted to
370 inform future parent-child intervention programs. Additional suggestions include the development
371 and application of 1) a more extensive measure of perceived parental feeding practices among
372 children, to close the possible gap between parents' reports of their feeding practices and children's
373 perceptions of them, and 2) food specific measures of parental feeding practices. Moreover, the
374 findings of this study needs to be replicated with more valid and reliable measures of fruit and
375 vegetable consumption.

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Table 1. Means, standard deviations (SD) and Cronbach's alphas (α) for child fruit consumption and ASE-based variables regarding fruit consumption

Variable/scale (number of items)	Mean	SD	α
Fruit consumption (2)	6.39	2.17	0.67
Attitudes, fruit (2)	4.15	0.87	0.63
Social (parental) influence, fruit (4)	3.47	0.99	0.79
Self-efficacy, fruit (2)	4.55	0.74	0.59
Intention, fruit (1)	4.25	1.07	-

Table 2. Means, standard deviations (SD) and Cronbach's alphas (α) for child vegetable consumption and ASE-based variables regarding vegetable consumption

Variable/scale (number of items)	Mean	SD	α
Vegetable consumption (2)	5.48	2.22	0.50
Attitudes, vegetables (2)	3.67	1.07	0.78
Social (parental) influence, vegetables (4)	3.55	1.01	0.82
Self-efficacy, vegetables (2)	3.99	1.06	0.73
Intention, vegetables (1)	3.56	1.29	-

Table 3. Means, standard deviations (SD) and Cronbach's alphas (α) for parental feeding practices (CFPQ-based variables)

Variable/scale (number of items)	Mean	SD	α
Monitoring (4)	4.05	0.56	0.84
Child control (5)	2.38	0.58	0.55
Encourage balance and variety (4)	4.47	0.51	0.66
Environment (4)	3.92	0.68	0.57
Involvement (3)	3.46	0.83	0.67
Pressure to eat (3)	2.77	0.97	0.61
Restriction for weight (8)	2.20	0.80	0.83
Food as reward (2)	1.56	0.79	0.69
Restriction for health (4)	2.88	1.00	0.73
Teaching nutrition (3)	4.13	0.66	0.44
Modeling (4)	3.86	0.74	0.66
Emotion regulation (1)	1.47	0.75	-

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534 **Table 4. Pearson's correlation between independent and dependent variables**

Independent variables	Intention to eat fruit	Fruit consumption	Intention to eat vegetables	Vegetable consumption
Child cognitions (ASE-based)				
Attitude	.41*	.31*	.51*	.34*
Social (parental) influence	.36*	.35*	.43*	.36*
Self-efficacy	.46*	.41*	.58*	.47*
Intention	1.00	.41*	1.00	.41*
Parental feeding practices (CFPQ-based)				
Monitoring	.02	.03	-.00	.08***
Child control	-.12**	-.06	-.08***	-.15*
Encourage balance and variety	.02	.08***	.08***	.18*
Environment	.02	.10**	.05	.20*
Involvement	.01	.04	.06	.10***
Pressure to eat	-.04	-.03	-.09***	-.09***
Restriction for weight	-.03	.05	-.00	-.02
Food as reward	-.07	-.04	-.07***	-.09***
Restriction for health	-.05	-.04	-.09***	-.12**
Teaching nutrition	.06	.09***	.07***	.15*
Modeling	.06	-11**	.05	.09***
Emotion regulation	-.08***	-.02	-.04	-.03

535 * p<.001, ** p<.01, *** p<.05
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Table 5. Hierarchical regression analyses on child intention to eat fruit every day (n=643)

Independent variables	Block 1 β	Block 2 β
Child cognitions (ASE-based)		
Attitude	.25*	.26*
Social (parental) influence	.18*	.17*
Self-efficacy	.28*	.28*
Parental Feeding practices (CFPQ-based)		
Monitoring		-.02
Child control		-.14*
Encourage balance and variety		-.06
Environment		-.07
Involvement		-.00
Pressure to eat		-.02
Restriction for weight		-.07
Food as reward		-.00
Restriction for health		-.04
Teaching nutrition		-.04
Modeling		-.06
Emotion regulation		-.03
R^2 (Explained variance)	.29	.32
R^2 change		.03**

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

Table 6. Hierarchial regression analyses on child fruit consumption (n=628)

Independent variables	Block 1 β	Block 2 β
Child cognitions (ASE-based)		
Attitude	.07	.08
Social (parental) influence	.14*	.13**
Self-efficacy	.22*	.22*
Intention	.23*	.24*
Parental Feeding practices (CFPQ-based)		
Monitoring		-.01
Child control		.02
Encourage balance and variety		.00
Environment		.06
Involvement		-.01
Pressure to eat		.02
Restriction for weight		.04
Food as reward		-.00
Restriction for health		-.03
Teaching nutrition		.04
Modeling		.04
Emotion regulation		.04
R^2 (Explained variance)	.25	.26
R^2 change		.01

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

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Table 7. Hierarchical regression analyses on child intention to eat vegetables every day (n=658)

Independent variables	Block 1 β	Block 2 β
Child cognitions (ASE-based)		
Attitude	.25*	.24*
Social (parental) influence	.19*	.19*
Self-efficacy	.37*	.37*
Parental Feeding practices (CFPQ-based)		
Monitoring		-.01
Child control		-.03
Encourage balance and variety		-.03
Environment		-.05
Involvement		-.02
Pressure to eat		-.03
Restriction for weight		.04
Food as reward		-.01
Restriction for health		-.03
Teaching nutrition		-.01
Modeling		.01
Emotion regulation		-.01
R^2 (Explained variance)	.42	.42
R^2 change		.01

*p<.001

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Table 8. Hierarchial regression analyses on child vegetable consumption (n=622)

Independent variables	Block 1 β	Block 2 β
Child cognitions (ASE-based)		
Attitude	.08	.08***
Social (parental) influence	.16*	.14**
Self-efficacy	.27*	.24*
Intention	.15**	.15**
Parental Feeding practices (CFPQ-based)		
Monitoring		-.00
Child control		-.06
Encourage balance and variety		.08
Environment		.10**
Involvement		.01
Pressure to eat		-.02
Restriction for weight		.01
Food as reward		.00
Restriction for health		-.07
Teaching nutrition		.02
Modeling		.00
Emotion regulation		.06
R^2 (Explained variance)	.27	.31
R^2 change		.04**

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

Figure 1. Expansion of the ASE model by inclusion of parent-reported feeding practices measured by the CFPQ
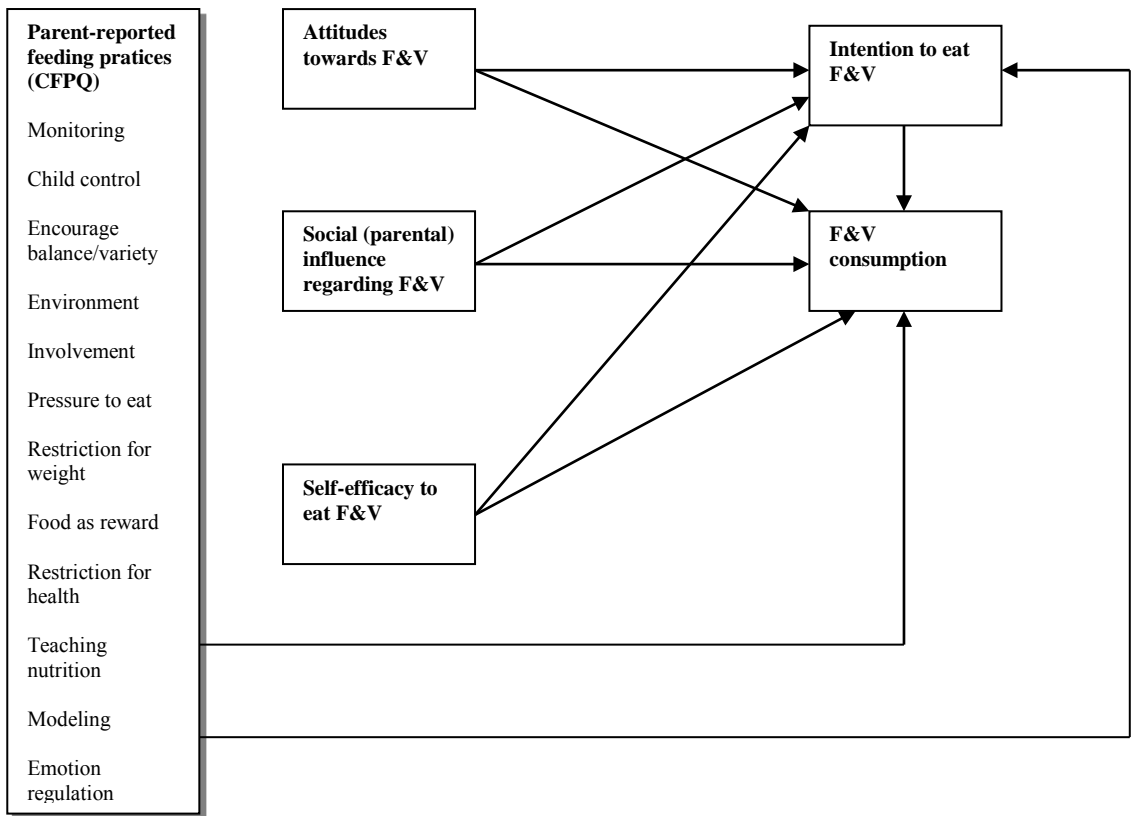
Parent-reported feeding pratices (CFPQ)

Monitoring

Child control

Encourage balance/variety

Environment

Involvement

Pressure to eat

Restriction for weight

Food as reward

Restriction for health

Teaching nutrition

Modeling

Emotion regulation

Attitudes towards F&V

Social (parental) influence regarding F&V

Self-efficacy to eat F&V

Intention to eat F&V

F&V consumption

Paper III

Appendix A

Norsk samfunnsvitenskapelig datatjeneste AS
NORWEGIAN SOCIAL SCIENCE DATA SERVICES

Elisabeth Lind Melbye
Norsk hotellhøgskole - Institutt for økonomi og leiing
Universitetet i Stavanger
4036 STAVANGER

Vår dato: 29.04.2009   Vår ref: 21716 / 2 / GRH   Deres dato: Deres ref:

KVITTERING PÅ MELDING OM BEHANDLING AV PERSONOPPLYSNINGER

Vi viser til melding om behandling av personopplysninger, mottatt 30.03.2009. Meldingen gjelder prosjektet:

21716	Matvaner blant 5. og 6. klassinger. En studie basert på teorier fra sosial- og utviklingspsykologi
Behandlingsansvarlig	Universitetet i Stavanger, ved institusjonens øverste leder
Daglig ansvarlig	Elisabeth Lind Melbye

Personvernombudet har vurdert prosjektet og finner at behandlingen av personopplysninger er meldepliktig i henhold til personopplysningsloven § 31. Behandlingen tilfredsstiller kravene i personopplysningsloven.
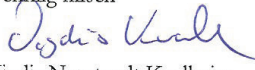
Personvernombudets vurdering forutsetter at prosjektet gjennomføres i tråd med opplysningene gitt i meldeskjemaet, korrespondanse med ombudet, eventuelle kommentarer samt personopplysningsloven/-helseregisterloven med forskrifter. Behandlingen av personopplysninger kan settes i gang.

Det gjøres oppmerksom på at det skal gis ny melding dersom behandlingen endres i forhold til de opplysninger som ligger til grunn for personvernombudets vurdering. Endringsmeldinger gis via et eget skjema, http://www.nsd.uib.no/personvern/forsk_stud/skjema.html. Det skal også gis melding etter tre år dersom prosjektet fortsatt pågår. Meldinger skal skje skriftlig til ombudet.

Personvernombudet har lagt ut opplysninger om prosjektet i en offentlig database, http://www.nsd.uib.no/personvern/prosjektoversikt.jsp.

Personvernombudet vil ved prosjektets avslutning, 01.12.2011, rette en henvendelse angående status for behandlingen av personopplysninger.

Vennlig hilsen

Vigdis Namtvedt Kvalheim   Grethe Halvorsen

Kontaktperson: Grethe Halvorsen tlf: 55 58 25 83
Vedlegg: Prosjektvurdering

Personvernombudet for forskning

Prosjektvurdering - Kommentar

Utvalget består av alle barn i 5. og 6. klasse i grunnskolen i to kommuner samt en av deres foreldre, totalt rundt 4000 personer.

Barna informeres muntlig i klasserommet og får i tillegg et informasjonsskriv om prosjektet som er tilpasset barnas alder. Foreldre informeres skriftlig om prosjektet og bes om skriftlig samtykke til henholdsvis barnets og egen deltakelse.

Opplysningene samles inn via et spørreskjema til barna og et spørreskjema til foreldre.

I og med at datainnsamlingen ikke er anonym (bruk av løpenummer som refererer til foreldres navn), forutsetter vi at det gjøres følgende endringer i informasjonen som følger spørreskjemaene samt i informasjonsskrivet "til deg som går i 5. eller 6. klasse":
- På spørreskjemaene til barna og foreldrene slettes setningen "undersøkelsen er anonym".
- I skrivet "til deg som går i 5. eller 6. klasse", slettes setningen ""spørreskjemaundersøkelsen er anonym" og setningen "På den måten er det ikke mulig for andre å vite hva du har svart". Eventuelt kan setningene erstattes med "ingen på skolen din eller andre du kjenner får vite hva du har svart".

Informasjonsskrivet til barna informerer om at det er frivillig å delta. Vi forutsetter at også spørreskjemaet til barna tilføyes en setning om at deltakelsen er frivillig.

Opplysningene anonymiseres ved prosjektslutt, 1. desember 2011.

Apendix B

Elisabeth Lind Melbye
NHS
Universitetet i Stavanger
Ellen og Axel Lunds Hus
4036 Stavanger

Deres ref	Vår ref	Dato
	2009/4497-ØYSV	06.05.2009

Ad. prosjekt: Matvaner blant 5. og 6. klassinger: en studie basert på teorier fra sosial- og utviklingspsykologi. (103.09).

Det vises til din søknad om godkjenning av forskningsprosjekt, datert 27.03.09.

Komiteen behandlet søknaden i møte den 23.04.09.

REK Vest anser de individuelle helseopplysningene som vil inngå i undersøkelsen for å være av marginal art. Prosjektet faller derfor utenfor komiteens mandat.

Vedtak: *Prosjektet avvises da det ligger utenfor komiteens mandat. Prosjektet kan således gjennomføres uten godkjenning fra REK.*

Vennlig hilsen

Jon Lekven
leder

Øystein Svindland
førstekonsulent

De regionale komiteene for medisinsk og helsefaglig forskningsetikk foretar sin forskningsetiske vurdering med hjemmel i Forskningsetikklovens § 4. Saker vedrørende forskningsbiobanker behandles i samsvar med Biobankloven. Saksbehandlingen følger Forvaltningsloven.

Komiteenes vedtak etter Forskningsetikklovens § 4 kan påklages (jfr. forvaltningsloven § 28) til Den nasjonale forskningsetiske komité for medisin og helsefag. Klagen skal sendes REK-Vest (jfr. forvaltningsloven § 32). Klagefristen er tre uker fra den dagen du mottar dette brevet (jfr. forvaltningsloven § 29).

Postadresse	rek-vest@uib.no	Regional komité for medisinsk	Besøksadresse
Postboks 7804	www.etikkom.no/REK	og helsefaglig forskningsetikk,	Haukeland Universitetssykehus
5020 Bergen	Org no. 874 789 542	Vest-Norge	
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