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# ANALYZING PARENTAL INFLUENCE ON FRUIT AND VEGETABLE CONSUMPTION

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# **Analyzing Parental Influence on Fruit and Vegetable Consumption**

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## **Abstract**

Most parents are aware of fruits and vegetables being healthy for children, but children's and adolescents' dietary intake of F&V is still below the recommendations. The question to be investigated is: what fills the gap between parents' nutritional knowledge and children's diet? A mixed methods research was conducted to study parental perspective of children nutrition. Parental information needs were explored conducting a content analysis of 178 nutrition questions posed by parents 2008 contacting the helpdesk of a public funded consumer website. Each question was coded for main and sub topics, worries and fears, using a standardized coding form. Based on this study a questionnaire was developed inquiring parental knowledge, attitudes and perceived difficulties regarding children's nutrition. A sample of 731 parents of children between 3 to 10 years completed the questionnaire including a fruit and vegetable frequency questionnaire and sociodemographic characteristics. Exploratory factor analysis was applied to include highly correlated items as independent variables. Robust OLS regression analysis was conducted, to assume the relationship between F&V consumption of children and the parental predictor variables. Content analysis revealed two main topics of parent's questions: nutrition behaviour related questions (32%) and knowledge related questions (26%). Regression analysis showed that parents' habit to provide fruit and vegetables daily as well as knowledge related aspects has a significant positive impact on children's F&V intake while the opposite holds for the determinants perceived difficulties (factor 1) and indulgent and pragmatic attitudes (factor 2). This study adds to the existing literature in that it investigates personal barriers and facilitators of parents towards their children's F&V consumption. Parental awareness of difficulties regarding fruit and vegetable consumption seems to be a strong mediator of low F&V consumption. Results suggest that nutrition information might enhance difficulties if parents lack of procedural and behavioural abilities to transform knowledge into everyday life.

## **1. Introduction**

There is compelling scientific evidence that a diet rich in fruits and vegetables (F&V) is associated with multiple health benefits. F&V are in general low in calories while being an important source of fibre, vegetable proteins, and protective micronutrients such as vitamins, minerals or secondary metabolites (e.g. see Blom-Hoffman, 2008). A substantial amount of scientific evidence shows that high fruit and vegetable intake can reduce the risk of e.g. cancer, cardiovascular diseases (CVDs), diabetes, and cavity (e.g. see Buijsse et al., 2009; Rechkemmer 2002; Lock et al., 2005; Boeing et al., 2007; Bazzano 2005) and may protect against a range of childhood illnesses such as respiratory symptoms (Antova et al., 2003 cited in Knai et al., 2006). In addition, several studies provide some indication that there is an inverse relationship between F&V intake and weight gain (Tohill et al., 2005; Ledoux et al., 2010). Recommendations laid down by the FAO/WHO Expert Consultation advocate the intake of a minimum of 400 g of fruit and vegetables equivalent to five servings per day excluding potatoes and other starchy tubers (WHO, 2003).

Despite the health benefits of diets rich in F&V, national health surveys indicate that children's and adolescents' dietary intake of F&V falls well below those recommendations. In Germany a nation-wide survey of 17,641 children and adolescents (Robert Koch Institute 2006) revealed that only 30 per cent of the respondents consume at least two servings of F&V every day. 20% fail to even eat one serving of F&V on a daily basis. The results also show that the discrepancy between actual and recommended consumption increases with age of the children and adolescents. This holds for fruits and vegetables alike. In this regard, boys are eating less F&V compared to girls (see also Mensink et al., 2007). The results of similar studies for other countries confirm that F&V intake of children and adolescents is far below dietary guidelines (see e.g. Yngve et al., 2005; Guenther et al., 2006; Larson et al., 2007; Krebs-Smith et al. 1996; Dennison et al., 1998; an overview is given in Rasmussen et al., 2006). As food experience early in life is a prominent factor in shaping food trajectory over future periods of life, early experience with F&V or a lack thereof provides lasting 'food roots' (Yeh et al., 2008; Devine et al., 1998; Kelder et al., 1994; Mikkilä et al., 2004).

Though parents play a pivotal role in influencing the dietary behaviour of their offspring (Birch and Anzman 2009, Ventura and Birch 2008, Scalioni et al., 2008, Lindzay et al., 2006) most intervention strategies are school based interventions with focus on school-aged children. By the time children enter school basic determinants for nutritional behavior are already established. Birch and Ventura therefore propose that interventions should include parents and family in home and childcare settings (Birch and Ventura 2009). But systematic

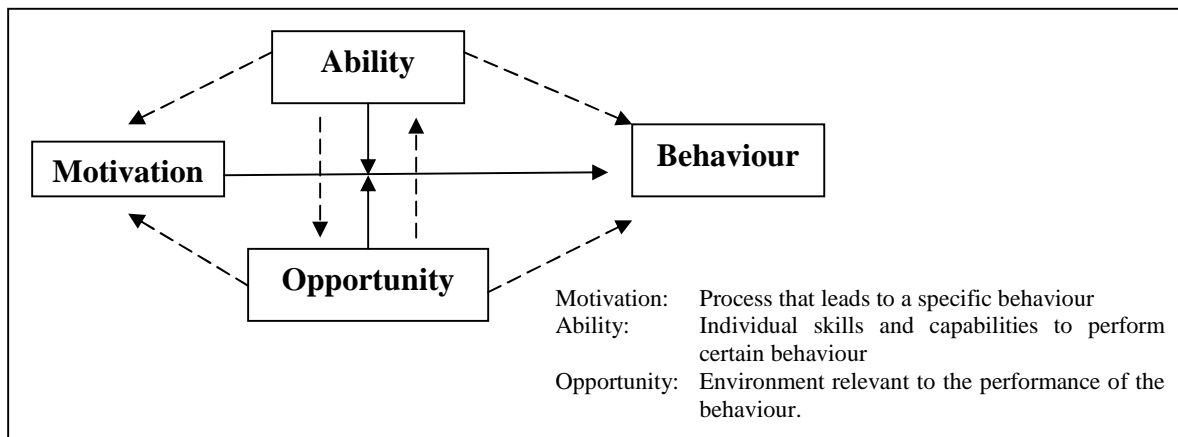
research on parental involvement is still rare and there remain a lot of questions regarding the best way to involve parents in changing children's diet to improve health (Hingle et al., 2010). To develop effective programs and information campaigns that support parents in their efforts to upgrade their children's diet best, it is important to better understand information needs, perceived difficulties and attitudes of parents and how those influence children's intake of F&V. This paper aims to shed light on these issues and therewith to contribute to the literature by analyzing parental determinants of children's F&V consumption.

The paper is structured as follows. Based on the theoretical framework of Motivation–Ability–Opportunity section 2 provides a brief overview regarding the role of parents in shaping consumption decisions regarding F&V. In the empirical part of the paper the parental perspective of and influence on children nutrition is investigated in a two-step procedure. First, information needs and attitudes of parents are examined by content analysis of nutrition questions posed by parents on a public funded consumer website (study 1). Those results were used to develop research questions and hypotheses which are tested by conducting a consumer survey among 730 German parents (study 2). Some concluding remarks are provided in section 5.

## **2. The Motivation–Ability–Opportunity (MAO) framework**

Eating behaviour is highly complex and the result of the interplay of multiple influences. The Motivation–Ability–Opportunity (MAO) framework originally developed by MacInnis, Moormann and Jaworski (1991) acknowledges these multilevel linkages (see figure 1). First applied to analyse the extent to which brand information processing from advertisements is influenced by consumers' motivation, ability and opportunity levels, the MAO concept has also been used to explain, the management of public health and social behaviours (Rothschild, 1999) as well as the determinants of healthy eating (Brug 2008).

**Figure 1: The Motivation–Ability–Opportunity framework**



Source: Brug, 2008.

In this regard, motivation is supposed to influence behaviour which is moderated by both ability and opportunity. Motivation, ability and opportunity are assumed to be interrelated. For instance, repeated exposure (opportunity) to the taste of a specific vegetable can increase children’s liking (motivation) and result in higher vegetable consumption (behaviour) (Wardle et al., 2003).

The most directly related components of motivation are self-interest and attitudes. Individuals are motivated to behave in a certain way when they can discern that their self-interest is served, i.e. values and norms they adhere to (Rothschild, 1999). Evidence-based motivational factors referring to the F&V intakes of children are preferences (taste, liking) and positive attitudes (Rasmussen et al., 2006; Brug et al., 2008).

Ability refers to knowledge, skills and capabilities of a person that are essential to the performance of a specific behaviour. It also relates to self-efficacy i.e. people’s confidence in their ability to perform the behaviour of interest (Brug et al., 2008, Schwarzer 2008). Research shows that self-efficacy and nutritional knowledge are two out of several factors which are positively associated with children and adolescents’ fruit and/or vegetable consumptions (Rasmussen et al., 2006; De Bourdeaudhuij et al., 2008).

While motivation and ability refer to individual determinants shaping food consumption behaviour, it is increasingly acknowledged that healthy choices can occur only in a supportive environment providing the opportunity for healthy eating. According to Brug (2008), environment can be differentiated into micro-environmental settings like homes, schools, workplaces or neighbourhoods and macro-environments including marketing, legislation and media. Micro-environmental determinants with a positive impact on the fruit and vegetable consumption of children are home or school availability (e.g. see Cullen et al., 2003; Rasmussen et al., 2006), parental/peer modelling and intake of F&V, family rules of

eating F&V and bringing fruit to school (e.g. Rasmussen et al., 2006; Pearson et al., 2008; De Bourdeaudhuij et al., 2008) and a high socio-economic position (e.g. Rasmussen et al., 2006). Analyses of macro-environmental determinants on F&V consumption are still rare (Brug, 2008).

Parents directly influence every category of the MAO-Model:

- Parents may **motivate** their children to eat F&V by encouraging or controlling certain behaviour. More subtly, they influence children's eating behaviour by providing positive or negative role models. Empirical evidence shows that active parental encouragement and facilitation is associated with daily F&V intake of children (Verzeletti et al., 2010; Pearson et al., 2008; Brug, et. al., 2008; Rasmussen et al., 2006). Several studies show that parent's consumption of F&V is a strong predictor of their child's F&V intake (e.g. Cooke et al., 2003, Wardle et al., 2005)
- Parents may impart theoretical and practical skills and knowledge to their children influencing the **ability** of their offspring to know and to prepare F&V. Vereecken and Maes (2010) found lower dietary adequacy in children of mothers with lower levels of education, medium ranked occupation and both lower nutritional knowledge and food-related attitude (Verecken and Maes 2010).
- Parents determine what foods are available and accessible at home, how foods are prepared and in what quantity (Anzman et al., 2010). By providing F&V they offer **opportunities** to eat F&V and promote liking through repeated taste exposure. Home availability has also been found to be associated with F&V intake levels in children (Jago et al., 2007; Cullen et al., 2003). While parents directly shape a considerable part of the micro-environment they also influence macro-environmental factors. For instance by determining how many hours a child is allowed to watch TV and what channels it may select parents can regulate the influence media may have on their child.

The considerable parental influence on children's F&V intake is confirmed by Gross and colleagues who report that family and home environment factors explain more than 50 % of the variance in children's F&V consumption (Gross et al., 2010).

### **3. Study 1: Information needs of parents**

#### **3.1 Methodological background**

To be able to support parents in their endeavour to improve children's dietary behaviour insights into parent's information needs and concerns associated with F&V consumption of

their children are of great importance but have not been extensively studied yet. We identify those requests and concerns applying content analysis to nutrition questions of parents, posted in 2008 on forums of the publicly funded consumer website [www.was-wir-essen.de](http://www.was-wir-essen.de) (what-we-eat). This website is provided by the 'aid infodienst e.V.', a German organisation for agricultural and nutritional information and education. The organisation offers free nutrition counselling for consumers via Internet.

The code book (coding form) was developed by the authors and 12 graduate students at Bonn University in 2009. According to Rössler (2005) steps of the coding procedure were 1) formulating the research questions to be answered, 2) defining the main categories to be applied, 3) generalising the constructs, 4) developing and 5) testing the coding form, pretesting and revising the coding form, 6) coding of parents questions and 7) testing of inter-coder reliability.

Leading research questions were: What kind of information needs do parents have? Which topics lead parents to mention worries? First parental questions of 2006 were analyzed to identify main topics. This process led to the construction of a coding instrument which resulted in seven main topics and two additional categories: nutrition recommendations, illness of the child, nutritional behavior of the child, weight of the child, food safety, food preparation and storage, as well as contaminants and toxins in food. Worries were coded when parents indicated that they feel worried, anxious or desperate. F&V neophobia was selected when parents mentioned that their child dislikes fruit or vegetables.

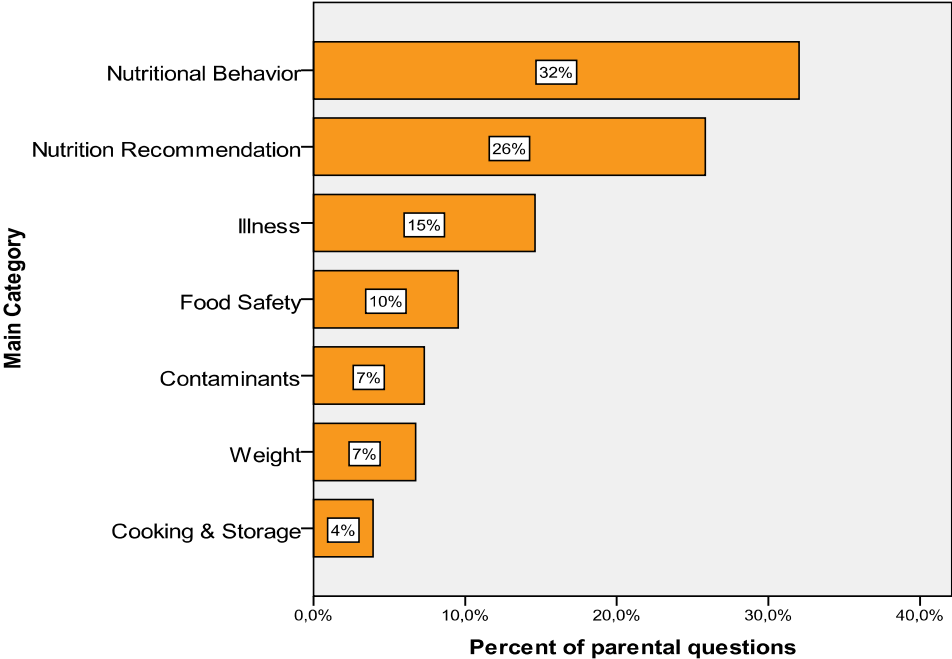
For the coding procedure itself parents' questions in 2008 were used. Only questions concerning children aged 1-10 were selected (n=178). Each question was categorized into one of the seven main topics and the two additional categories: Every question was coded twice, first by a group of four trained students and second by one of the authors. One independent coder was trained to code 25 % of the questions to provide separate checks with the final coding of the author. Intercoder reliability (Holsti's coefficient of reliability) for each main topic was as follows: nutrition recommendation .87, illness of the child .96, nutritional behavior of the child .94, weight of the child .94, food safety .96, food preparation and storage .91, and contaminants and toxins in food .96, F&V neophobia of the child .96 and indication of worries .85. Overall agreement between the author and independent coder was .93 (Rössler 2005). Thus, for all main topics as well as for the overall analysis the obtained Holsti's coefficients exceeded the recommended acceptance levels and thus the statistical test suggests that there is no major problem with intercoder reliability.



The frequency and percentage of content characteristics occurring within each of the questions were determined. Chi-square statistics were used to determine the association of main categories to the statement of worries. Data were analyzed using Statistical Package for the Social Sciences (Version 17.0, 2010, SPSS Inc Chicago).

**3.2 Empirical results**

Most often parents pointed out problems with nutritional behavior of their child (32 %), followed by questions regarding nutrition recommendations (26 %), illnesses of the child (15 %), food safety (10 %), weight of the child (7 %), contaminants and toxins in food (7 %), and food preparation and storage (4 %). 10 % of parents mentioned their child dislikes F&V and 24 % of parents reported being worried or concerned. The share of main topics is displayed in figure 1.



**Figure 1: Main topics of parental questions regarding the nutrition of children aged 1-10 years on www.was-wir-essen.de in 2008**

The awareness of worries differed significantly by main topic ( $\chi^2 = 44.0$ ;  $P < 0.001$ ). In fact none of the parents asking for nutrition recommendations indicated worries and only one parent who made reference to the illness of the child revealed to be anxious, but more than 50 % of parents describing problems with nutritional behaviour of their child claimed to be anxious, troubled or concerned. Questions describing F&V dislikes of children were significantly associated with worries ( $\chi^2 = 17.6$ ;  $P < 0.001$ ).

Interpreting the results of the content analysis it must be taken into account that only motivated parents use forums to seek nutritional advice. Nevertheless, the study provides first hints regarding the information needs of parents. A considerable share (26%) of parents poses typical “knowledge questions” regarding food recommendations. They want to know what foods do children need, how much they should eat, what foods should be avoided and what foods are appropriate at what age. However, problems concerning nutritional behaviour of the child and perceived difficulties seem to play an even greater role. Interesting is, that especially those parents who pose questions regarding nutritional behaviour indicate in their request for information that they are anxious, troubled or concerned.

Therefore, the second step of our empirical investigation is to focus in study 2 on the following research questions: 1) What is the contribution of parent’s knowledge to F&V consumption of the child? 2) What is the contribution of parent’s perceived difficulties regarding the nutritional behaviour of the child on her/his F&V consumption?

#### **4. Study 2: Parental influence of children’s F&V consumption**

##### **4.1. Design of the study**

Parents with children aged 3-10 years were selected by convenience in different places of Germany in January 2010. 733 parents completed the questionnaire including a F&V frequency questionnaire and socio-demographic characteristics. Data on two children were not included in the analyses because the children were older than 10.

A written questionnaire was developed based on the findings of Study 1 and a literature review on parental factors influencing children’s F&V consumption. Background characteristics included age and gender of parents, highest level of education, occupational status and questions about family composition (marital status, number of children aged 3-10). Household net income was determined by the respondents’ self-classification in pre-defined income categories. In addition the questionnaire included age and gender of the oldest child in the family aged 3-10 years. Furthermore, the questionnaire contained 5-point Likert scales, with items addressing knowledge, skills, perceived difficulties and attitudes towards children’s nutrition.

F&V Frequency: Children’s F&V consumption frequency was measured using validated items based on those developed for the German Health Survey for Children and Adolescents (KIGGS) (RKI, 2006). Respondents were asked: “How often does your child eat the following items?” This was followed by different food types including fresh fruit, canned

fruit, fresh salad/vegetables and cooked vegetables. Possible answers were: never, less than once a week, ..., more than 5 times a day, yielding a 9-point response scale.

**Knowledge, skills and habit:** Knowledge was measured by three questions. The first item of the questionnaire to be filled out was an open-ended question asking “What comes into your mind when you think of healthy nutrition for children?” Answers were transferred into a binary variable “F&V regarded as healthy” (1 = F&V quoted; 0 = F&V not quoted). The second item asked for perceived knowledge: How knowledgeable are you when it comes to children nutrition? (very good, ..., very bad; 5-point scale). The third question tested the knowledge of the five-a-day optimum: How many servings of fruits, vegetables and juice should children consume every day? (1 serving, 2 serving, ..., 5 servings). The answers were used to develop the variable “Beliefs of F&V recommendation”. To elicit self-perceived cooking skills the following statement was used: “I am able to prepare F&V in a way that children like it” (I totally agree, ..., totally disagree; 5-point scale). Parents’ habit to provide the child with F&V on a daily basis was assessed by asking respondents how strongly they agree to the following item: “I pay attention to daily F&V consumption of my child” (I totally agree, ..., totally disagree; 5-point scale).

**Perceived difficulties:** Perceived difficulties were assessed by four items with 5-point Likert scales. “My child has an unbalanced diet.” (I totally agree, ..., totally disagree), “It is difficult to make my child eat vegetables every day.” (I totally agree, ..., totally disagree), “It is difficult to make my child eat fruits every day.” (I totally agree, ..., totally disagree)“ and “How often do you worry about your child’s nutrition?” (always, very often, sometimes, rarely, never)

**Attitudes:** Attitudes towards children’s nutrition were assessed with three items using the 5-point Likert scale: “I like to do my child a favor, even if the food is not healthy”, “My child should feel comfortable, there is too much discussion about nutrition” and “I have to make compromises in daily nutrition”.

The questionnaire was field tested for face and content validity and refined based on the results of the field test.

## **4.2 Methodological background**

Data were analyzed using Statistical Package for the Social Sciences (Version 17.0, 2010, SPSS Inc Chicago) as well as STATA 9.0. The relationship between children’s F&V consumption and parental influence were at first examined using Spearman correlation coefficients. Afterwards, variables showing significant associations with children’s F&V

consumption were first entered into a robust OLS regression model to determine relative contribution to the explained variance. To be able to include highly correlated items as independent variables in the analysis we applied exploratory factor analysis to reduce the attribute space from a larger number of more or less highly correlated variables (item pool) into a few unrelated, independent factors. Our criteria for determining the number of factors were principal component analysis (PCA) and varimax as the rotational strategy. The following factors were generated:

#### **Factor (F) 1: Awareness of difficulties**

F1 contains the items which express the awareness of difficulties regarding a child's unbalanced diet, difficulties with making a child eat vegetables and fruits every day and also worries regarding a child's nutrition (Cronbach's alpha: 0.75).

#### **Factor (F) 2: Indulgent and pragmatic attitudes**

F2 sums up the statements which express that they like to do their child a favor, even if the food is not healthy. Also, they think that the child should feel comfortable and that there is too much discussion going on about nutrition. Furthermore, they hold the attitude that one has to make compromises in daily nutrition (Cronbach's alpha: 0.51).

### **4.3 Descriptive results**

#### *Sample characteristics*

The questionnaire was mostly filled out by mothers (82 %). Of the respondents who completed the questionnaire 33 % had a low (corresponding to 9-10 years of education), 22 % had an intermediate (13 years of education) and 45 % had a high (higher vocational school or university corresponding to 17 years of education) level of education. The average household net income counted 2,862.40 € which is comparable to the average household net income of German households in 2003 with 2,833 € (Federal Statistical Office 2010), but our sample included less households with lower income levels (9 % instead of 20 %). A quarter of respondents had a full-time job (26 %) and 47 % worked part-time. The average age of the parent was 36 (SD 5.8) years, the average age of the child for whom the questions were filled out was 7 years (SD 2.3), 47 % of the children were female.

#### *Frequency of fruit and vegetable consumption*

The average child was reported to eat 3 times fruit and vegetables per day (SD 1.8) resulting in 64 % of children eating 1, 2 or 3 times F&V per day.

### *Perceived knowledge, skills and habit*

83 % of the parents indicated F&V when they were asked about healthy food for children, 60 % of respondents believed to have good or very good nutritional knowledge (Mean 3.7, SD 0.82), in contrast to that only 15 % knew about the five-a-day optimum for F&V for children (Mean 2.9, SD 1.2). Most parents (68 %) felt able “to prepare F&V in a way that children like it” (Mean 3.9, SD 0.9) and even 80 % indicated strong or modest agreement with the item “I pay attention to daily F&V consumption of my child” (Mean 4.3, SD 0.9).

### *Awareness of difficulties*

One fifth of the respondents (20 %) mentioned to worry sometimes, very often or always about the diet of their child (Mean 2.0, SD 0.9). A considerable amount of participants (32 %) agreed that it is “difficult to make my child eat vegetables every day” (Mean 2.8, SD 1.3) and even 22 % indicated problems with daily fruit consumption of the child (Mean 2.4, SD 1.3). 12 % of parents agreed that their child has an unbalanced diet (Mean 2.2, SD 1.0).

### *Attitudes towards children’s nutrition*

Approximately one third of the parents ( 31 %) hold the opinion that one has to make compromises in daily nutrition (Mean 2.9, SD 1.0), 32 % agreed to “do the child a favor, even if the food is not healthy” (Mean 3.1, SD 1,1). Only 13 % were convinced that their “child should feel comfortable, there is too much discussion about nutrition”.

### *Correlations among variables*

All items are significantly correlated ( $p < 0,001$ ) with the frequency of children’s F&V intake. Spearman’s rho regarding consumption frequency ranged from -0.15 (worries) to 0.54 (habit to provide F&V every day). Difficulties regarding vegetable consumption were moderately negative correlated with the ability to prepare F&V for children ( $r = -0.46$ ). Knowledge related factors like “Perceived knowledge of children’s nutrition” and “Beliefs of fruit and vegetable recommendation” were highly significant but with a weakly positive association to F&V consumption frequency ( $r = 0.32$  respective  $r = 0.28$ )

## **4.4 Econometric results and discussion**

To analyze parents’ influence on children’s F&V consumption the variables described in section 4.1 were included in the OLS regression model. Results were estimated using STATA 9.0. The frequency of F&V consumption per day served as dependent variable. Independent variables included in the analysis were perceived knowledge and habit, awareness of difficulties, indulgent and pragmatic attitudes and socio-demographics. Table 1 presents the regression results. The model is statistically significant with an  $R^2$  of 0.36.

**Table 1: Hierarchical multiple regression predicting fruit and vegetable consumption of children**

<b>Child's F&amp;V consumption frequency</b>	<b>Coef.</b>	<b>Std. Err.</b>	<b>t-value<sup>a</sup></b>	
Perceived nutritional knowledge	0.167	0.096	1.74	*
Believes of F&V recommendation	0.205	0.062	3.33	***
F&V regarded as healthy	-0.070	0.181	-0.39	
Habit	0.516	0.077	6.74	***
F1: Awareness of difficulties	-0.465	0.065	-7.19	***
F2: Indulgent and pragmatic attitudes	-0.172	0.061	-2.80	***
Household net income in €	0.000	0.000	2.85	***
Years of education	-0.008	0.023	-0.34	
Gender (female)	-0.196	0.168	-1.17	
Age of parent in years	-0.036	0.014	-2.60	*
Gender child (female)	-0.059	0.120	-0.49	
Age child in years	-0.053	0.032	-1.66	*
Constant	1.085	0.649	1.67	*

<sup>a</sup> p<0.1 = \*; p<0.05 = \*\*; p<0.001 = \*\*\*

F(12, 534) = 32.53, Prob > F = 0.000; R-squared = 0.36; Root MSE = 1.392

Empirical results show a moderate significantly positive effect of the variable “perceived nutritional knowledge”. This means the more knowledgeable parents feel the higher the F&V consumption frequency. The knowledge related variable “Believes of F&V recommendation” is highly significant associated with F&V consumption. The more servings of F&V parents believe to be recommended the more frequently children consume F&V. Also, the more parents agree to provide F&V every day (habit), the higher the F&V consumption frequency. At the same time results indicate that awareness of difficulties and indulgent and pragmatic attitudes significantly reduce the F&V consumption frequency. With regard to socio-demographics results suggest that income is positively while age is negatively related to F&V consumption frequency.

In our study parents’ perceive F&V as healthy in general. This is consistent with other studies reporting that parent’s descriptions of healthy foods generally suggest good knowledge (e. g. Lopez-Dicastillo et al., 2010, Hesketh et al., 2005). But this theoretical knowledge was neither associated with F&V intake of children nor related to any other factor influencing F&V consumption of children. Two other knowledge related factors had a small but significant relationship to F&V intake. “Believes of F&V recommendation” were significantly associated with F&V intake. The more servings of F&V parents thought to be recommended the more frequently children consumed F&V. The perceived knowledge (feeling informed about children’s nutrition) showed as well a small but significant relation with F&V intake of children. These results support the findings of other studies pointing out

that knowledge is one factor of nutritional behaviour among others. Results of the Pro Children Project for example show that positive knowledge of the national guidelines for fruit and vegetable intake is one of nine (twelve) factors positively associated with daily fruit (vegetable) intake (De Bourdeaudhuij et al., 2008).

Knowledge has to be transformed into practical behaviour; therefore practical skills are part of the construct of ability. In default of validated items to measure practical skills little is known about parent's procedural knowledge regarding child nutrition. Our study showed a moderate but significant correlation between awareness of difficulties and self estimation of practical skills to prepare F&V for children. John and Ziebland (2004) noted as well, that practical skills could influence F&V consumption. Lack of cooking skills to prepare vegetarian dishes was one barrier that countered once participants tried to make changes to their fruit and vegetable consumption. Other studies demonstrated positive outcomes from food preparation activities. Brown and Hermann report positive impact of cooking classes on fruit and vegetable intake in youth and adults (Brown and Hermann 2005). Cullen and colleagues showed that home recipe preparation was correlated with dietary change among children (Cullen et al., 2007). Wansink demonstrated that vegetable lovers differ from fruit lovers in both their cooking habits and their food preferences (Wansink 2004). He therefore proposes different communication strategies to food-prone lovers and to vegetable-prone lovers.

The habit to provide F&V every day shows a highly significant positive association to F&V consumption frequency. This is consistent with findings of Reinaerts and colleagues (2007) who found as well that habit was the most influential correlate of F&V consumption.

Our findings show that parent's awareness of difficulties is significant associated with children's inadequate fruit and vegetable consumption. These findings are consistent with results of several - mainly qualitative - studies. Sonnevile and colleagues reported that parent's barriers to adopting obesity prevention recommendations were primarily child and family preferences and resistance to change (Sonneville et al., 2009). Slater and colleagues found that 14 % of Australian parents indicated concern about nutrition. The most commonly reported barrier of healthy eating was resistance from their child. (Slater et al., 2009). John and Ziebland found household preferences including reluctance of partners and children and the additional time required to prepare these foods most common barriers to eating more fruit and vegetables (John and Ziebland 2004). A study of Lopez-Dicastillo and colleagues showed that parents believe their classification of foods would be inversely related to children's preferences. A perception of children as picky eaters made parents worry, because they like

children to eat well (Lopez-Dicastillo et al., 2010). Hesketh and colleagues report that parents were aware that their family diet and activity levels were not as healthy as they would like. Parents themselves reported the need for strategies to encourage their children to eat healthy foods and strategies to resist the demands of their children for unhealthy foods (Hesketh et al., 2005)

One important question to be addressed is: Is low F&V consumption of children a cause or a consequence of perceived difficulties and conflicts? Recent literature suggests that this relation might be bidirectional: Ventura and Birch (2008) state that parenting influences child eating, but child's eating behaviour also influences parenting. Wardle and colleagues report that parental control was positively correlated with children's food neophobia ( $r=0,26$ ), whereas neophobia was negatively correlated with children's consumption of fruit and vegetables. He suggested that the imposition of more control over feeding could be a response to the child's inadequate F&V consumption (Wardle et al., 2005). Kremers et al. (2003) state that concerned parents may adopt controlling child-feed practices. Strict parental control practices however may provoke adverse effects. Higher levels of parental pressure are associated with lower levels of child intake and weight and higher child pickiness. Therefore pressure may result in food dislikes and reduced intake (Anzman et al., 2010; Ventura and Birch 2008).

Bearing in mind that parents who are concerned about their children's food intake may increase parental pressure which in turn discourages children to eat FV our results indicate, that five a day intervention may boost problematic behaviour if parents do not have adequate procedural and behavioural knowledge for adequate nutrition communication and education. This finding is supported by a growing body of literature. Experts of public health nutrition for years stressed the importance of flexible and realistic approaches of nutrition communication and education which include experiences and problems of the target - the "how rather than the what may be beneficial" (Yngve and Tseng 2010, Lopez-Dicastillo et al., 2010, John and Ziebland 2004, Hart et al. 2003; Worsley 2002, Cannon 2002). John and Ziebland emphasise the development of health promotion interventions which offer flexibility rather than fixed targets, Borra and colleagues recommend attainable goals and small steps to healthful eating, healthful meal, snack and recipe suggestion" (John and Ziebland 2004, Borra et al., 2003). Unfortunately, few parents receive any guidance in how to promote food acceptance (Wardle and Cooke, 2008). School based dietary intervention often only minimally involve parents, though parents focussed lessons on child-feeding strategies is feasible and can be effective (Gribble et al., 2003).



## **5. Conclusion and research limitations**

Overall, our findings contribute to the literature by showing that especially parent's habit and parents' awareness of difficulties significantly are associated with children's F&V intake. Therefore nutritional advice ignoring everyday life may be contradictory. To avoid contradictions between theoretical knowledge and everyday life communication strategy as well as nutrition education approaches should teach procedural knowledge and behavioural techniques. Our study supports the need for parents in that they learn how to talk to their children about eating in positive and encouraging ways (Gruber et al., 2009; Borra et al. 2003).

However, there is still no theory developed to explain family involvement in promoting health behaviour change (Gruber 2009) and little information is available for nutrition educators how to help family members communicate effectively and constructively to reach a more healthful diet for the entire family (Kaplan et al., 2006). Our model suggests that some advantage may be obtained by including awareness of difficulties into health behaviour theories. Our results suggest as well, that procedural skills might be a component of F&V consumption. Parental behavioural and procedural knowledge therefore would benefit from more intensive investigation. Further research is needed about how parents use already existing knowledge and what kind of support they need to enhance behavioural and procedural abilities.

Some research limitations are to be mentioned. All data were self reported by parents. This may result in less reliable data on F&V intake of children. Skills to prepare F&V were measured with one item only. This item showed a moderate correlation to the concept of difficulties but there is still no validated item to explore the abilities of preparing F&V. The concept of "procedural knowledge" therefore needs further investigation. Furthermore, the concept of "perceived difficulties" is not validated yet. Future studies should consider the relative importance of perceived difficulties and how these barriers interact with other important psychosocial concepts like self efficacy and habit as examined for example by Reinearts et al. (2007) and Brug and de Nooijer (2006)

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