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ORIGINAL ARTICLE

What do children understand? Communicating health behavior in a European multicenter study

Antje Hebestreit · Katharina Maria Keimer · Holger Hassel · Annunziata Nappo · Gabriele Eiben · Juan Miguel Fernández · Eva Kovacs · Helen Lasn · Monica Shiakou · Wolfgang Ahrens

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Abstract
Background Diet and physical activity are important factors in the prevention of childhood overweight. This article stresses the importance of effective communication for health behavior.
Methods Transcription, description and analysis of standardized focus group discussions (FGD) in seven European countries using standardized questioning routes.
Results Parents are well informed about health-related topics for children, but seem to have difficulties understanding their role in promoting healthy behavior. They mentioned health-related rules, but our results show limited communication between parents and children, and no follow-up of rules. Consequently, children do not understand rules about good health and do not follow them.

On behalf of the IDEFICS Consortium

Annunziata Nappo, Gabriele Eiben, Juan Miguel Fernández, Eva Kovacs, Helen Lasn and Monica Shiakou contributed equally to this work.

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Conclusion Effective and sustainable intervention programs should focus on educational methods and, using parental role modeling, facilitate parents' comprehension of their key role in setting rules and controlling them in order to communicate good health behavior to their children.

Keywords Child obesity · Communication · Focus group · Health behavior · IDEFICS

Background

The increasing prevalence of childhood overweight and obesity enhances the burden for modern health care systems and is a growing public health concern (WHO 2003). Therefore, core aspects of the IDEFICS study intervention program include healthy eating, physical activity (PA) and stress reduction (Bammann et al 2007). The IDEFICS study (**I**dentification and prevention of **D**ietary- and lifestyle-induced health **EF**fects **I**n **C**hildren and infant**S**) is an EU-funded project investigating the effect of diet and lifestyle on overweight and obesity in European children aged 2 to 10 years (Ahrens et al. 2006).

Focus group discussions (FGD) were conducted to identify information channels for health behavior, facilitators and barriers in the target groups (children aged 2 to 10 years and parents) to get a deeper understanding of the communication between parents and children. Based on this information, intervention programs can be designed to assist parents to develop clear education and communication strategies. Previous publications have discussed the IDEFICS FGD with a focus on dietary behavior and physical activity, especially the barriers, facilitators and attitudes of parents and children (Haerens et al. 2009). The focus of our article is on the communication of health behavior between parents and children and what children need to understand health messages.

Methods

FGDs were used for the development of the IDEFICS intervention and were carried out from February to April 2007 in eight IDEFICS intervention centers. FGDs were carried out only in the intervention regions of the IDEFICS study in order to involve the target groups (families, children, teachers and educators) in the development of the intervention program. FGDs were identified as especially useful for the development of the intervention since they assess the need of the target group and assist in the development of effective health promotion programs. This method allows the researcher to gain a broad perspective on a group of individuals that will be affected by the intervention (Petersen-Sweeney 2005).

A focus group describes a group of individuals with a similar background or experience assembled to discuss a topic of relevance (Freeman 2006; Powell and Single 1996); in the IDEFICS study, motivating factors for children to eat healthily and to be physically active were discussed. Focus groups were homogenous with respect to their socioeconomic level and for children with respect to gender (boys and girls in different groups). However, focus groups were heterogeneous with respect to gender in the adult groups (mixed groups of women and men). Due to the age-related problems with filling out questionnaires, demographic variables [e.g., socioeconomic status (SES)] were not assessed in children. The socioeconomic status of parents, educators and teachers was determined through the recruitment channels described below.

The present publication focuses on the results of FGDs held in Cyprus (Strovolos), Estonia (Tallinn), Germany (Bremen), Hungary (Pécs), Italy (Avellino), Spain (Zaragoza) and Sweden (Gothenburg), since these showed a variety of perspectives on the research question "what do children understand" and were hence of particular interest. Main results from all partners' FGDs have been published elsewhere (Haerens et al. 2009).

Recruitment of participants followed similar patterns in all countries: In Cyprus, Estonia, Germany and Spain, participants were recruited through various schools or preschools in deprived/non-deprived areas, involving the nurses/teachers and headmasters. In Sweden participants were recruited by telephone contact through the research institute directly. In Hungary, the children were recruited through existing contacts in a different study. Parents were recruited through the schools and kindergartens in areas with a low/medium SES population. In Italy parents and children were invited to participate in the focus groups (unpublished reports). The research focus of this qualitative method is to highlight the communication between parents and children concerning nutrition and physical activity. Hence, not only obese children and their parents were included.

For the exact numbers of participants in each country's FGD, see Table 1.

The FGDs were timed to last around 2 h; sessions with children were timed to be shorter (approximately 30 min). The shorter time span is recommended for FGDs with children. All FGDs were undertaken in an environment familiar to the participants and were offered at different times of the day to increase participation (University of Ghent 2006; Morgan 1998; Krueger 1998).

All FGDs were "led" by a trained moderator, whose role was to guide the discussion and listen to what was said but not to participate, share views, engage in discussions or

Table 1 Number and type of focus groups by country

Country	Parents (with kindergarten children)	Age range (years)	Parents (with school-aged children)	Age range (years)	Boys (6-8years old)	Girls (6-8years old)
Cyprus*	Medium SES group 1: 8W	Age=28–34	Medium SES group 1: 1M and 5W	Age=30–38	Group 1: 6B	Group 1: 6 G
	Medium SES group 2: 6W	Age=28–39	Medium SES group 2: 6W	Age=30–40		
Estonia*	Low SES group 1: 5W and 1M	Age=30–35	Low SES group: 6W	Age=35–43	Group 1: 14B	Group 1: 13G
	Low SES group 2: 4W	Age=30–35				
	Mixed SES group: 3W and 2M	Age=28–37	Mixed SES group: 7W	Age=32–40		
Hungary*	Low SES group 1: 6W	Age=19–47	Low SES group: 5W and 1M	Age=25–38	Group 1: 5B and 7G	
					Group 2: 6B and 8G	
					Group 3: 12B and 17G***	
	Low SES group 2: 6W	Age=20–31				
	Mixed SES group: 7W	Age=23–61**	Mixed SES group: 3W and 3M	Age=26–37		
Italy*	Mixed SES group: 7W and 3M	Age=35–43	Mixed SES group: 9W and 2M	Age=35–47	Group 1: 6B and 6G	
Germany*	Low SES group: 11W and 1M	Age=32–40	Low SES group: 2W	Age=36–42	Group 1: 7B	Group 1: 7G
	Medium/ high SES: 7W and 1M	Age=29–42	Medium/ high SES: 6W	Age=38–50		
Spain*	Low SES group: 10W	Age=29–39	Low SES group: 8W and 2M	Age 35–48	Group 1: 6B and 6G	
	Mixed SES group: 8W	Age=32–38	Mixed SES group: 8W	Age=34–44		
Sweden*	Low SES group: 4M	Age=36–44	Low SES group: 3W	Age=25–34	Group 1: 6B and 5G	
	Mixed SES group: 2W	Age=42–43				
	High SES group: 6W and 1M	Age=33–43				

W=women; M=men; B=boys; G=girls; SES=socioeconomic status

*Unpublished report

**One participant was the grandmother of a child

***Exceptional, an entire class participated

shape the view of the outcome (Morrison-Beedy et al. 2001). The moderator was familiar with the questioning route, which covered key questions on healthy eating and PA (Beyea and Nicoll 2000). A co-moderator assisted the moderator during all FGDs (Pelz et al. 2004). After each session, the moderator and co-moderator summarized the main points to compare this summary with the transcription later on (University of Ghent 2006; Krueger 1998).

All FGDs were audio-taped. Each tape was transcribed, described and analyzed in the local language of the participating country. The transcripts were analyzed by grouping the comments into categories (e.g., diet, PA, barriers, facilitators, family, parents, children). In this way, specific themes could be easily identified and summarized. The standardized questioning route served as the basic outline for selecting the most important quotes, those that delivered valuable information for the development of the IDEFICS intervention (Haerens et al. 2009). Focus group summary reports were written using a standardized template that was developed for each of the moderators and co-moderators to complete in English based on the audio tapes of the sessions in the original language. The extensive summary reports for each center detailed all tape recorded results around the key questions using the standardized templates.

Results

A total of 186 parents participated in the FGDs (164 women; 22 men). Sixty-eight boys between 6 and 8 years of age and 75 girls in the same age group participated (see Table 1).

All results are based on the analysis of the FGDs of the participating IDEFICS centers and have been generalized to fit the purpose of shaping an IDEFICS intervention program.

This publication focuses on communication channels between children and parents in the IDEFICS centers. First, the parents' attitudes regarding a healthy diet and PA were worked out as well as how they understoond their own role, e.g., setting and controlling rules or role modeling. The second and third steps summarize how parents effectively implement a healthy diet and PA in the children's lifestyles as well as barriers to and facilitators of the implementation. Finally, the children's own understanding of rules, controlling them and role modeling are examined. Following this line of argument, we will determine to what extent the participating families were able to communicate health rules successfully (see Table 2).

Findings about healthy diet: parent's attitude and self-concept

In all countries, interviewed parents asserted the presence of rules regarding healthy eating habits and saw their main responsibility as "strengthening the child's individual responsibility for healthy eating," in setting a good example, in enhancing the availability of healthy foods and in limiting unhealthy foods and soft drinks at home. During weekends and on special occasions, parents allow their children to eat what they like and allow some junk food (Sweden, Spain, Cyprus, Hungary). German and Hungarian parents set rules for family meals with table rules, and a few parents do not allow eating in front of the TV (Germany, Italy). Also, Spanish and Hungarian parents report the use of sweets as rewards.

Findings about healthy diet: implementation and barriers/facilitators

Generally parents decide what kind of food the children eat at home (Sweden) and offer a wide variety of foods (Italy). Estonian parents often warm up leftovers for dinner, and soft drinks are available. In general, they "do not force children into healthy eating."

Parents reported more on barriers than on facilitators, like the lack of time because of a busy work schedule and lack of money to buy high quality food: convenience food is perceived to require less preparation time and to be cheaper. Parents consider the different food preferences of children and adults as a main problem and therefore feel pressure from children, who prefer fast food; this latter influence is reinforced by TV advertisements. Another main barrier to the parents' opinion is the lack of communication between children and parents; also, other family members (e.g., grandparents) break existing rules.

The few facilitators mentioned were: "healthy food availability at home" (e.g., fruit and vegetables cut in handy pieces, drinking water) as well as parental consumption of healthy foods.

Findings about healthy diet: understanding and behavior of the child

When asked, children were unaware of existing rules or limitations (Germany, Estonia, Hungary, Spain), or mentioned various rules about the availability of sweets (Sweden). Only Italian children mentioned one clear rule: "no watching TV while eating," and Hungarian children clearly understood the family eating traditions and table culture. Cypriot children followed the parent's eating habits and listed the consumption of fruits and vegetables or the restriction of sweets at home.

Findings about PA: parent's attitude and self-concept

In all countries, parents believe that PA and outdoor activities are good for the child. Italian and German parents

Table 2 Qualitative results of focus group discussions listed by country

Country	Area	Parents' attitude and self-concept	Parental realization, implementation	Parental barriers/ facilitators	Understanding or behavior of children
Cyprus	Diet/ nutrition	Parents… • Must cook healthy meals and act as role models • Offer no junk food	Rules are • No sweets if meal is not finished • Soft drinks and sweets only on special occasions	Parents mention: • Busy work schedule • No standard meal times	Children imitate parents eating habits and are not allowed to eat chocolates, sweets and chips at home
	Physical activity	Parents encourage children to exercise in general and play outside	Parents… • Enroll children in exercise classes • Set rule not to leave the yard or talk to strangers • Ensure supervision by adult	Parents list: • Lack of time • Environmental dangers • Limited activities for children after school and during weekends • Availability of peers, house yards and Cyprus' weather	All children are driven to school by car everyday
Estonia	Diet/ nutrition	Parents… • Want to offer healthy food • Are generally worried about the snacks and soft drinks available at schools • Allow sweets sometimes	Parents… • Do not push to eat healthy food • Prepare ready-to-eat pieces of fruit and vegetables • Buy healthy, local, seasonal foods without artificial additives • Warm up food from previous day	Parents mention: • Lack of time • No family traditions • Pressure from children • Availability of convenience food • Grandparents break rules • Advertisements • Lack of motivation and communication	Children… • Are not offered different tastes at home • Eat snacks between meals
	Physical activity	Parents… • Live an inactive lifestyle • Support sports activities (walking, swimming, hiking) • Think that playing outside is good for the child	(Grand) Parents… • Take children along to sports activities • Take children along by foot and bicycle • Take the children to a garden on weekends • Parents do not allow to talk to strangers or to play in parks	Parents list: • Lack of time • Lack of parental energy/motivation • Lack of money • Environmental dangers • Children like TV, PC • Playing with friends outside	No information available*
Germany	Diet/ nutrition	Parents want to… • Offer a healthy diet • Strengthen individual responsibility for healthy eating	Children are allowed to eat sweets and salty snacks in moderate amount and frequency	Parents mention: • Lack of time • Lack of money	Children • Are not aware of any rule • Like the foods offered at home

Table 2 (continued)

Country	Area	Parents' attitude and self-concept	Parental realization, implementation	Parental barriers/ facilitators	Understanding or behavior of children
		• Avoid family meals in front of the TV		• Personnel problems in schools/ kindergartens	
	Physical activity	Parents see physical activity as a responsibility of the school/ kindergarten	No information available*	Parents mention • Lack of space • Personnel problems in schools/ kindergartens	Children play during breaks in the school/ kindergarten yard
		Parents offer stimuli, trust the children and let them experience things	Laissez-faire parents: • No/little control of the child's activities Very protective parents: • Drive children to school/ kindergarten	Parents list • Lack of space (low SES) • Small appartments, no garden or yard • Concerns about harm or sickness • Weather conditions	Children • Are not allowed to romp at home • Can watch TV or play PC • Play outside without parents
Hungary	Diet/ nutrition	Parents state that (family) tradition is very important	• Parents prepare family dinner/ meal on weekends • Table rules	Parents list: • Lack of parental energy/motivation • Food industry	Cultural rules of eating are known and accepted as natural
		Offering and buying healthy foods are responsibility of the parents	Parents state that… • They allow sweets only after a meal • Sweets are used as reward • They prefer shopping without children	Parents mention: • Lack of money • Lack of knowledge about healthy nutrition • Lack of coping skills and parenting skills	No clear rules: One sweet is always bought for the child while shopping
	Physical activity	Parents think that physical activity is generally important for the child	• Parents do not do any sports • Sports equipment is available at home, even in poor families	Parents list: • Lack of time • Lack of parental energy/motivation • Inactive school activities in the afternoon • Sports activities from the school	Boys prefer group sports
Italy	Diet/ nutrition	Parents provide a large variety of food	• Motivate the children to eat all kinds of food • All kinds of foods are usually available at home	Parents list: • Lack of time • Food labels not clear	No information available*
		Parents do not allow children to eat in front of TV	Clear rules against eating in front of the TV	Parents mention no control over meals consumed at grandparents home	Children do not watch TV while eating
	Physical activity	Parents see physical activity as a responsibility of the school/ kindergarten	• Playing outside without disturbing other people • Playing with other children in a safe way	Parents list: • Poor availability or even absence of public spaces • Lack of money	Children state: • Playing outside is better with friends • When alone children prefer TV or video games.

Spain	Diet/ nutrition	Parents… • Limit unhealthy foods and soft drinks • Use sweets as a reward for children for finishing their meal	Parents… • Hide some conflict-causing foods • Use weekends to present favorite foods to the kids	Parents list: • Lack of time to cook with fresh foods • Difficult to deny the pleasure of favorite foods to the children	Children… • Are not aware of any rules • Accept to eat when getting sweets as reward
	Physical activity	Parents… • Understand that when children do exercise, they feel better/ more relaxed • Are worried about sedentary behavior	Parents… • Let children play outside and use the municipal and school facilities • Motivating the children to exercise	Parents mention: • Lack of time • Lack of money • Weather conditions • Lack of appropriate places to play outside	Children… • Like to go outside • Play with friends
Sweden	Diet/ nutrition	Availability of healthy foods and limiting the availability of sweets/ snacks	Parents serve food everyone in the family likes	Parents list: Lack of time Planning the weekly shopping	Children mention various rules: never have sweets at home, sweets during the weekend, sweets always available
		Fridays and Saturdays are special days when children can eat what they like	Children eat healthy during the week at school	Parents and children enjoy junk food and sweets at weekends	Children have a say in their food choices
	Physical activity	• Set rules against indoor inactivity	No TV in the children's room	No limits for inactivity like watching TV, playing computer games after school	Children understand no clear rules for time spent playing computer games or watching TV
		Outdoor life is regarded as very important	Older children (7-8 years) are allowed to play outside	Parents mention environmental dangers	Boys seem to be more active outdoors than girls
		Physically active parents are very important for the child's decision to play outside	Parents themselves participate in outdoor playing but drive their children to school	Parents list: • Lack of time • Weather conditions	No information available*

*After analysis of the focus group results, no information could be extracted for this item

see PA as the responsibility of the school/kindergarten. However, they stated that they offer stimuli and motivate children to play outside. Cypriot parents also indicated the school's responsibility for PA, but in a different context: due to a busy school schedule and a lot of homework, children do not find the time for playing outdoors or sports. Parents set rules against indoor inactivity (Germany, Sweden) and see their responsibility in setting a good example (Estonia, Sweden).

Findings about PA: implementation and barriers/ facilitators

In all countries, parents set clear rules regarding outdoor safety ("do not talk to strangers," it is allowed to talk and play with other kids, and "avoid parks and strange groups of teenagers"), but offer support in different ways and to different degrees. Swedish and German parents drive their children to school, but confirmed their own participation in playing outdoors, where Spanish parents motivate children to make more use of activities offered by the school or municipal facilities. Hungarian parents describe an inactive lifestyle and do not act as role models.

The most mentioned barriers in all countries were the lack of space, the lack of time, lack of parental motivation, and concerns about harm or sickness because of bad weather and environmental dangers. Also high costs for equipment and sports club fees and the attractiveness of TV and PC games were mentioned as barriers. Facilitators were: playing with friends and siblings, and if children were allowed to get dirty (proof of fun play).

Findings about PA: understanding and behavior of the child

IDEFICS children mention that they are not allowed to romp at home, so they watch TV or play with the PC when the weather is bad or when they are alone at home (Germany, Italy, Sweden). When the weather allows for it, they play outside with friends or siblings after finishing homework (Sweden, Cyprus, Italy, Spain).

Discussion

A positive energy balance (increase of body fat) results from long-term low energy expenditure while the energy intake is high. Behavior patterns that lead to the development of a positive energy balance are: frequent access to a comprehensive food supply together with a reduced PA rate (Maffeis 2000). Here, behavior is mainly influenced by the modern environment, including food availability, portion sizes, media consumption and the degree of automation (Davison and Lawson 2006; Nielsen and Popkin 2003). However, parents also influence the child's eating habits and PA levels, mainly through three different channels: setting a good example (role modeling), conveying rules and controlling the rules (rigid or flexible). The quality of control seems to be important since it determines the success of an intervention: foods as a reward or punishment and rigid portion sizes may enhance eating disorders (Birch and Fisher 1995).

Role modeling

Research shows that parents mainly influence the child's eating behavior through their own behavior (Birch and Fisher 1995). This was associated with a higher fruit juice and vegetable intake among pre-school children and with a higher calcium intake from cow's milk among adolescent girls (Cullen et al. 2001; Lee and Reicks 2003). Our FGD results show that Cypriot parents seem to be good role models: their children confirmed identical eating habits and preferences, and identical foods available at home. This evidence of conformity indicates that the consistent behavior of the parents is understandable for the children, and as a result they imitate the parent's healthy eating habits.

Regarding PA, children with active parents show a significantly higher activity level than children with inactive parents. Here, mothers tend to support PA through logistic support (e.g., transport), whereas fathers preferably join the activities (Davison et al. 2003; Nelson et al. 2006).

The Swedish FGD revealed that parents give the impression of leading active lifestyles, but drive the children to school. When playing outside, Swedish children play with siblings or friends, but parents do not join them. Here parents do not act as role models, even if they consider parental role modeling as an important motivator.

Consistent role modeling may enhance children's understanding and acceptance of a healthy diet and regular (outdoor) PA in order to prevent overweight (Ritchie et al. 2005). Our results suggest that healthy eating may be easier to realize on a daily basis than living an active lifestyle. Hence, an effective intervention program should support parents with ideas and activities that are easy to implement, even on busy days and in all kinds of weather.

Rules

Birch (1999) found that strict control of eating by the parents is associated with obesity among girls. Parents should aim to develop their children's capacity to self-control meal timing, meal size and food selection, because children exhibit an innate ability to regulate their energy intake (Birch and Fisher 1998; Fox et al. 2006).

Spanish and Cypriot parents restrict unhealthy foods such as sweets or salty snacks. The restriction of unhealthy

foods is one (parental) tool to increase the consumption of healthy foods. However, research shows that restricting certain foods enhances their desirability for children. Thus, intake increases when the food is available (Birch and Fisher 1995; Birch 1999; Fisher and Birch 1999).

Parents often have clear attitudes about healthy eating. In reality behavior is contradictory to attitude. As was seen in Hungary and Spain, parents use sweets as a reward. Also Estonian children eat unhealthy snacks between meals, and Swedish children mention different rules for the availability of sweets and junk food. In all four countries, the communication of rules between children and parents may be lacking or ambiguous. As a result, children are confused or unaware of rules and therefore react in contradictory ways.

By contrast, Cypriot children understand the rules and follow them—even if they preferred junk food. Here the consistent compliance with the rules by the parents leads to healthier eating behavior of the children. In terms of cultural rules, Estonian and Cypriot parents fail to establish eating traditions and family meal times, even though they highlight their importance. Unlike Hungarian parents, they clearly state cultural rules, and the children understand and accept them. Italian and German parents require the family to eat together and not in front of the TV. When asked, German children are unaware of this rule and eat in front of the TV. In contrast, Italian children are aware of this rule. This example demonstrates that German parents do not ensure adherence to the rule, whereas Italian parents obviously communicate the consequences for a breach with their children.

Fewer children walk or bike to school, but rather use automated transport (bus, parental transport) (Carver et al. 2008; Goran and Treuth 2001). Carver mentions that 'stranger danger' and road safety are stronger arguments than health aspects for parents, who feel themselves under social pressure to chauffeur their children, since letting the children walk to school could be seen as being less caring (Carver et al. 2008). Also Swedish, German, Hungarian and Cypriot parents do not allow their children to walk or cycle to school and consequently increase their moderate activity before and after school.

Especially moderate activity seems to counteract obesity most efficiently, particularly when individuals change from sedentary behavior (Davison and Lawson 2006; Carrel et al. 2005; Strauss et al. 2001; Robinson 1999). One successful approach to prevent obesity among 3- to 7-year-old children is increasing the time spent physically active instead of watching television (Jago et al. 2005). The FGD results show that parents (Estonia, Germany, Italy, Sweden) set rules against watching TV and playing with the PC, so that the children are more physically active. But they also mention barriers: lack of time, their own laziness, lack of space and environmental dangers (for outdoor activities). As a result, children (in Estonia, Germany, Italy) watch TV and play with PCs, and are not aware of the screen time restriction.

The findings may encourage parents to communicate clear regulations and to adhere to the rules consistently; in doing so, they can help children understand and accept rules.

Control

Availability and accessibility are important predictors of children's food choices and food intake (Cullen et al. 2001). This type of control, emphasizing the availability of healthy foods and enhancing healthy food choices, is stated by all parents and supported by the literature (Birch and Fisher 1995; Birch 1999; Orrell-Valente et al. 2007). In most countries, however, parents accept junk food and sweets once in a while and state that children should have access in order to develop individual responsibility and self-control. These contradictory findings show that parents do not understand their role: offering a variety of healthy foods plus controlling the child's healthy food choices. In most countries, strengthening the child's individual responsibility was impeded by a lack of money for fresh foods, seasonal changes and the child's food preferences, and the lack of time on work/school days is the most important barrier. This can be seen in Estonia: after school, children eat anything they find at home and later parents tend to offer snacks or re-warm meals for dinner. There is no family eating routine, which has been described to be important (Gillman et al. 2006).

In general, a lack of communication and motivation between parents and children seems to be a problem: parents set rules but they do not control the children's food choices or make healthy foods available at home.

Our results illustrate notably that parent-child communication is one key element of health education. We also found that parents were well informed about the benefits of a healthy diet and PA for their children. Even though parents have a clear attitude about a healthy family lifestyle, we found that implementing rules for good health and a healthy lifestyle seemed to be difficult in the daily routine. How can the gap between a healthy parental attitude and the children's understanding be bridged? Our findings reveal that the development of effective and sustainable intervention programs requires educational methods and communication channels for parents. They can help parents to understand their key role, using parental role modeling, rules and control mechanisms to communicate health behavior to their children, as also stated by Golan and Crow (Golan and Crow 2004). According to our findings, an effective intervention program should consider that role modeling (healthy parental lifestyle) and responsive control

(supporting PA and availability of healthy foods) result in a healthier diet (smaller portions, large variety, less sugar and less fat intake) and higher PA levels.

Thanks to the design of the IDEFICS FGD, parents trying to make socially desirable statements was a minor problem: after comparing parental answers with the children's statements, the deficiencies in health communication were obvious. Statements that illustrate the parental attitude to a healthy lifestyle may be colored by social desirability, but also show the high level of information due to media campaigns, intervention programs and easy media access. So, those communication channels and instruments work well for the dissemination of health messages in adults. However, the fact that the children were not aware of restrictions supports the importance of intervention activities and communication strategies suitable for children.

One limitation of this study is the questioning route of the FGD; it did not query the quality of communication (rigid or flexible), and our results do not provide very detailed information on how exactly rules are communicated and if consequences follow. Hence, we recommend including questions about communication channels that aim to identify the most effective intervention strategies when developing FGD questioning routes.

Inexplicably children and parents in all countries associate the "healthy eating" concept with the quality of foods, but not with quantity, even though portion sizes and meal frequencies are part of the overeating problem. Parents with a weak or no control over their own eating behavior (portion size, meal frequency) may promote the development of eating disorders and in consequence overweight in their children (Birch and Davison 2001; Contento et al. 1993). Children, like adults, eat more when large potions are available and energy intake is high due to overeating (Nicklas et al. 2001), whereas eating frequency is inversely associated with a lower degree of adiposity (Barba et al. 2006; Toschke et al. 2005). Regarding the development of effective intervention programs, education mechanisms concerning healthy quantities of food and frequencies of eating should be considered.

Mechanisms leading to a healthier lifestyle through PA and nutrition are definitely very complex. In addition to other factors, communication channels obviously seem to play an important role in the multifactorial problem of "childhood obesity."

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