



**UNIVERSIDAD DE MURCIA  
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**Parental Attitudes and Childhood Overweight.  
The Role of Communication.**

**Actitudes Parentales y Sobrepeso Infantil.  
El Papel de la Comunicación.**

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### TESIS DOCTORAL

Parental Attitudes and Childhood Overweight.  
The Role of Communication.

Actitudes Parentales y Sobrepeso Infantil.  
El Papel de la Comunicación.

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### **MEMORIA**

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# **INTRODUCTION**

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## INTRODUCTION

Adult and childhood overweight has become universal in the last few decades, in particular in western countries (Ng et al. 2014)(Ng et al., 2014). Over 2.000 million people are overweight or obese nowadays. Worldwide, the proportion of adults with a body-mass index (BMI) greater than 25 kg/m<sup>2</sup> (which is associated with overweight and obesity) increased more than 25% between 1980 and 2013, reaching 37% of the male and 38% of the female population (Ng et al., 2014). Furthermore, this pandemic is also reaching developing countries (Popkin et al., 2011).

Despite public efforts, the rate of overweight people is not decreasing, causing high private and public health care costs. Preventing overweight at early stages is easier than treating it. It is easier to fight overweight at childhood than at adulthood (Daniels et al., 2005). A child's weight is highly dependable on their habits, shaped by children's preferences and environmental influences such as parents, family, school, friends and media (Pigeot et al., 2009).

Excess weight in children comes from a systematic higher ingestion of calories than expenditure of energy (Bleich et al., 2011). Parents, schools and politicians are responsible for creating an adequate healthy environment which promotes a healthy lifestyle that balances energy intake and expenditure. Of course, the socio-economic circumstances and personal situation of each family, like marital status, economic status, size of the family, education, etc. make the challenge of fostering a healthy environment more or less difficult.

Antecedents and consequences of overweight children have been well studied. Child weight depends highly on eating, physical activity, sedentary behaviors and sleeping habits (Snell et al., 2007). These habits depend on internal factors such as genes and external factors like family attitudes and habits, school norms and curricula and built environment (Maes et al., 1997). Doak et al., (2006) identify different causes of overweight depending on the scenarios where the child behavior takes place, or who is the decision maker being the most important at school and home. Consequences of overweight are serious in terms of health reduction (Dietz 1998). Overweight children are more likely to become overweight adults and both have greater chances of suffering diabetes, heart diseases, cancer and depression (Reilly and Kelly 2011).

Social marketing seeks to influence social behaviors not to benefit the marketer, but to benefit the target audience and the general society (Kotler and Zaltman 1971). In this dissertation we will review social marketing interventions focusing on reducing

childhood overweight. Interventions which aim to improve the status of overweight children must change their behaviors. The changes can be related to eating patterns, sedentary and active behaviors and sleeping time among others (Snell et al., 2007). There are several settings in which to implement interventions but the most commonly used have been schools (Brown and Summerbell 2009). However, parents play a key role in influencing children's behavior. Surprisingly, despite the important role of parents within the home environment in preventing children overweight there is a lack of research in this field (Lindsay et al., 2006). While a number of studies have successfully changed behavior using interventions modeled on the Theory of Planned Behavior, most of them have focused on the subject attitudes (Hardeman et al., 2002) (e.g. the child). Few studies have investigated the extent to which behavioral changes occur due to the influence of subjective norms (e.g. the parental attitudes and behaviors). These researchers have called for mores studies that explore the mediation effect of these subjective norms or normative beliefs. We will fill this gap by exploring the influence of parental attitudes and behaviors on changing children's behavior.

So far, some research has been conducted relating parental and children healthy behaviors. Children behavior is highly conditioned by parental involvement in children's education (Hoover-Dempsey and Sander, 1995). Likewise, Ohly et al., (2013) revealed strong associations between parent involvement and child diet quality, which clearly illustrates the powerful influence that parents have in these early developmental years. Up to the age of twelve, the parent has one of the greatest influences on children's healthy weight habits: eating right, physical activity and sleeping longer (Rhee 2008). However, despite the importance of the childhood overweight pandemic, researchers have not established an integrated model relating parental attitudes and behaviors with children's behaviors in different behaviors that lead to overweight. In this dissertation we will propose and prove a comprehensive model to understand how parental attitudes and behaviors such as sleeping, TV watching and nutrition account for children weight, filling the existing gap in the literature.

Once we understand how parental attitudes and behaviors shape children's behavior we must discern their drivers and which is the best way to change parental negative attitudes and behaviors. In general, parents' low awareness of healthy weight habits remains a critical impediment to reduce the childhood overweight ratio (Fitzgibbon and Beech, 2009), highlighting the need to change parents' healthy weight attitudes and behaviors through social marketing actions like effective health communication.

If parents have an important role in child behavior, social marketing can target parents in different areas to improve healthy habits among children to foster a healthy weight. Parents can be persuaded of the importance for children of sleeping longer, spending less time watching TV and healthy eating. Healthy eating has several dimensions and one of them is increasing the amount of fruits and vegetables consumed. Increasing children's consumption of fruits and vegetables can be challenging for many parents.

Previous research has found evidence of a positive relation between the highest level of child fruit and vegetable intake and parental feeding style (Zeinstra et al., 2009), home availability/accessibility (Bere and Klepp 2005) and parental eating behavior (Ohly et al., 2013). Parents can influence their child's diet in many ways such as food provision, child-feeding behaviors/strategies, role modeling or social eating environment (Anzman et al., 2010) or even through feeding strategies, such as rules, table food management and verbal instructions (Zeinstra et al., 2009). But also, parental modeling and parental intake are positively associated with children's fruit and vegetable consumption (Pearson et al., 2009). The strongest determinants for fruit and vegetable intake according to the children's reports were availability at home, modeling, demanding family rules and knowledge of recommendations (Kristjansdottir et al., 2009).

Therefore parental awareness of the importance of encouraging healthy habits in children is crucial. To raise awareness among parents, and change their attitudes and behaviors towards healthy habits communication can be used. Authorities and private organizations, by promoting adequate healthy attitudes, can generate safe parental and childhood behaviors and, therefore, reduce the amount of overweight children. Additionally all these healthy behaviors can significantly reduce costs for health systems (Sturm 2002)(Yach et al., 2006). But despite the importance of this health problem there is almost no research on how using social marketing communication and consumer behavior knowledge can help to implement changes in healthy behaviors efficiently, to improve this issue. There is a lack of understanding of which measures are more effective in terms of modifying consumer attitudes and behaviors leading to the prevention of children being overweight. Relieving the consequences of children who are already overweight through diets, drugs and counseling can be classified as both a medical and psychological problem. On the other hand, preventing obesity, creating the adequate conditions to change the attitudes and behaviors of parents and children, to prevent overweight, is a consumer behavior and social marketing problem which must be solved. In light of these challenges, a conceptual framework of the communication scheme is presented in study 2.

This dissertation has two main objectives: Firstly, to confirm parental attitudes and behaviors that lead children to suffer from being overweight. Secondly, to discover persuasive and efficient communication messages to change parental attitudes toward healthy habits that can help reduce the prevalence of overweight children.

In study 1 we propose a model in which we test if parental attitudes towards sleep, TV watching and feeding have an influence on their own behaviors. These behaviors are: family rules, TV at home, healthy and unhealthy food environment at home and family meals. These parental behaviors condition three child behaviors. Sleeping hours and healthy eating have inverse relation and TV watching has direct relationship with child weight.

In study 2 our goal is to find a persuasive message that increases parental intentions to perform healthy habits relating to their children. Specifically, we want to increase the share of low density foods consumed at home, namely fruit and vegetables. There are some reasons for this choice: Eating fruit and vegetables is associated with a lower body mass index (Rolls, Ello-Martin, and Tohill 2004), it can be easier to break an old habit (e.g. eating sugared snacks) by creating a new habit (e.g. eating fruit and vegetables instead) (Verplanken and Wood 2006) and, finally, children eat less fruit and vegetables than they should (Guenther et al., 2006). In order to change children's fruit and vegetable consumption at home, the home environment has to be altered. To do so, parental attitudes, intentions and behavior towards fruit and vegetables must be changed. One method to attain this goal can be communication campaigns targeted to parents, stating the importance of giving fruit and vegetables to children. Nevertheless, despite the importance of this issue, there has been almost no research on how to arrange the most efficient communication message to improve parental intentions to give fruit and vegetables to their children. After a literature review we found that there is little guidance available on how the message should be designed in order to be efficient. Furthermore, we reviewed the elements of the communication process focusing on the message endorser and the message framing.

In order to address these issues an important literature review, a field survey with a cross-sectional design in study1 and an experimental design in study 2 was carried out. The dissertation approaches these topics in five chapters.



## Chapter 1. **Social marketing as a childhood overweight prevention strategy**

The theoretical background of overweight children is reviewed. We analyzed the prevalence, the causes and consequences of being overweight both in childhood and adulthood. Interventions to improve the status of overweight children must change the behaviors of children. The changes can be related to sleeping patterns, sedentary and active behaviors and eating behaviors.

## Chapter 2. **From healthy parental attitudes to children's BMI: Sleeping, screens and nutrition**

In study 1, based on literature we built a framework of parents' attitudes, parents' behavior and children's behavior to better understand how children's weight is formed. Then, drawing on the Theory of Planned Behavior, a model of the antecedents of children's Body Mass Index is developed and tested.

## Chapter 3. **Nutrition interventions: Fruits and vegetables**

We chose nutrition as the tool to improve diet and weight, namely fruits and vegetables. We review the literature related to interventions promoting fruits and vegetables consumption and a description of the determinants of fruits and vegetable consumption is done. Then, we looked at theories that could help interventions to increase the consumption of fruits and vegetables.

## Chapter 4. **The role of communication in changing parental attitudes**

We focus on communication to parents as a means to increase fruits and vegetables consumption at home among children. It is important here to analyze the literature about all the theories of communication and persuasion that can be applied to health communication campaigns in order to change attitudes, intentions and behaviors. Furthermore we review the elements of the communication process focusing on the message endorser and the message framing. All the literature review helped us to build a supportive theoretical background for our hypotheses in chapter 5.

## Chapter 5. **Changing parental attitudes. The message**

Study 2 examines what type of endorsers and message framing are more efficient to increase parental intention to give more fruits and vegetables to children. We want to find out how to design the best message possible to be used in a graphic

communication campaign to change parental attitudes towards fruit and vegetables. To address this issue we propose a framework regarding the endorsement and the message framing. Results can be of great help to implement successful campaigns to promote children's fruits and vegetables consumption among parents.

Our research stemmed from three ideas: children's overweight is an important problem, parents should be responsible for their children and social marketing can make a difference in this issue.

Our research contributes to the literature by demonstrating that parental attitudes towards sleep, TV watching and feeding have an influence on their own behaviors related to family rules, TV at home, healthy and unhealthy food environment at home and family meals. These parental behaviors are antecedents of three child behaviors. When the child sleeps longer, does not watch too much TV and performs healthy eating he/she has a greater chance of having a healthy weight. Furthermore, our research extends extant research that proves that parental attitudes can be changed with communication. Our contribution proves that messages with an expert endorser and/or a positive and/or emotional framed message are more efficient in increasing parental intention to give more fruits and vegetables to their children than messages with an attractive endorser and/or a negative and/or rational framed message.

In addition to contributing to marketing theory our findings will be useful for public administrations and private organizations aiming to implement communication interventions leading to improve healthy habits in children, specifically in the domain of fruits and vegetables consumption.

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**CHAPTER 1**

**SOCIAL MARKETING**

**AS A CHILDHOOD OVERWEIGHT**

**PREVENTION STRATEGY**

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# **1. SOCIAL MARKETING AND THE OVERWEIGHT PROBLEM**

## **1.1. Social marketing**

Social marketing is defined as the design, implementation and control of actions directed to influence the acceptability of social ideas and involving decisions of product planning, pricing, communication, distribution, and marketing research. Social marketing seeks to use marketing concepts to influence behaviors that benefit individuals and communities for the greater social good (Kotler and Zaltman, 1971). Furthermore social marketing seeks to integrate marketing research, best practice and theory to implement, in a efficient and sustainable way, social change programs (Andreasen, 1994; Kotler and Roberto, 1989).

Fox and Kotler (1980) state two main situations in which Social Marketing can be used. Firstly, when communication is needed to promote the practice of safe behaviors and secondly when it is needed to encourage the cessation of an unhealthy habit, this is called counter marketing. In many situations people need to be informed of an opportunity or practice that will improve their lives. Practices such as: Convincing people to boil their water, promoting the use of latrines, encourage breastfeeding, explaining the importance of using iodized salt to prevent goiter, demonstrating how to treat infant diarrhea, encourage the use of seat-belts or emphasize the importance of a healthy diet. On the other hand, counter marketing is needed to explain to consumers the potential harm of certain unhealthy products such as cigarettes, alcoholic beverages, and highly refined foods which can contribute to lung and heart disease, liver damage, overweight, and other health problems.

As Fox and Kotler (1980) also state, certain critics may claim that some social marketers promoting a cause also make a profit in the process. Consider the following examples: Seat belt, bottle water and condom manufacturers are major supporters of car safety legislation, not drinking and driving legislations and AIDS preventions campaigns. All these social campaigns have the potential to increase their sales and profits.

Social marketing can help to promote a healthy lifestyle and therefore to fight the overweight pandemic in two ways: With informational marketing and counter marketing. The promotion of breast feeding (Arenz et al., 2004), consumption of fruits and vegetables (Epstein et al., 2001), and physical activity (Hills et al., 2011) are examples of informational

marketing. Examples of social counter marketing campaigns are: Reduction of prenatal mothers' smoking (Oken et al., 2008), reducing the consumption of sugar-sweetened beverages (Malik et al., 2006) and decreasing TV use (de Jong et al., 2013). Evidently through the use of these social campaigns fighting children overweight there are many companies that will be supportive (e.g. Fruits and vegetables producers and gyms) and others that will lobby strongly against the social campaigns (e.g. tobacco companies and sugared-beverage producers). Social marketing becomes more difficult when concerning others stepping on someone else interests.

## **1.2. The overweight problem**

Individuals who are overweight or obese have a much greater risk of developing many chronic medical conditions (Potter et al., 2015). Prost and Ai (2015) found, in a systematic review, a diverse range of psychological concerns related to people who are overweight or obese. This combination of both physical and psychological diseases creates an economic burden for both, the health system and the individuals who suffer the condition (Finkelstein et al., 2003). Therefore, many public organizations are extremely aware and concerned about the problem and thus, allocate resources in order to improve the situation.

Despite these efforts, excess weight has reached epidemic proportions globally, with more than 1 billion adults being either overweight or obese in 2003 (WHO, 2003). In 2013 this figure increased to more than 2 billion. Growth has been observed across all age groups (Ng et al., 2014). The WHO has called obesity the new tobacco, developing guides to fight against obesity and has urged countries to prevent it actively through all kind of policies, education, prevention methods and cures (WHO, 2014).

As states Ng et al. (2014) in 2010, overweight and obesity are estimated to cause more than 3.4 million deaths, 4% of years of life lost, and almost 4% of disability-adjusted life-years worldwide. Therefore, we can conclude that there is a need to monitor overweight and obesity prevalence worldwide. Controlling overweight and obesity has become a major global health challenge and current information is required to make adequate decisions.

Obesity is caused by a chronic energy imbalance involving both dietary intake and physical activity patterns (Gortmaker et al., 2011). Evidence shows that increased energy intake is causing the rise in obesity (Swinburn et al., 2011; Prentice and Jebb, 2004;



McCrorry et al., 2002) as a result of changes in the global food system: the movement from individual to mass preparation “lowered the time price of food consumption”, and produce more highly processed foods (with added sugar, fats, salt, and flavor enhancers), and market them with increasingly effective techniques. (Hall et al., 2009; Bleich et al., 2007). Additionally, marketing of food and beverages is associated with increasing obesity rates (Goris et al., 2010) and is especially effective among children, (Cairs et al., 2008) and therefore is a focus of policy strategies. As Gortmaker et al. (2011) show, other factors amplify or attenuate the effect of these causes and produce observed disparities in obesity prevalence across and within populations.

As Swinburn et al. (2011) show, obesity is a result of individuals responding naturally to the obesogenic environments they find themselves in. However, not all people respond equally to these growing obesogenic environments. Sutin et al. (2011) show how personality traits are associated with body mass index. Participants higher on neuroticism; extraversion and impulsivity or lower on conscientiousness had greater weight issues.

Obesity also impacts healthcare systems and the economy as a whole. Lehnert et al. (2013) found that economic costs rise with overweight, especially among the obese. The authors also found that as overweight increases in a particular area healthcare costs go up and workforce productivity is reduced within that area. Given the high costs of obesity and comorbidities in terms of health-care expenditure and quality of life, Malik et al. (2012) posit that prevention strategies are paramount, particularly in low-income and middle-income countries because they have to manage both infectious diseases and malnutrition in addition to obesity.

In sum, overweight and obesity are an important health problem because they affect a significant proportion of both the child and adult population and has been growing in the last few decades. This pandemic reduces the sufferers’ quality of life and their productivity while increasing health costs. The causes are diverse, but essentially all of them refer to a complex interplay between genetic susceptibility and behavior, primarily relating to dietary habits and physical activity (Rennie et al., 2005). Consequently larger prevention efforts must be enforced.

### **1.3. Overweight and obesity. Definition and measurement**

Obesity can be defined as a state of increased adipose tissue of sufficient magnitude to produce negative health consequences and is associated with increased morbidity and mortality (Haslam and James, 2005). The easiest way to measure excess fat is simple weighing. The person's weight is measured and compared to an estimated ideal weight. This is the simplest and most common method, but by far the least accurate, as it only measures one quantity (weight) and does not take into account many factors such as height, fat distribution, gender, body type, and relative amount of muscle mass.

As Gómez-Ambrosi et al. (2012) state, body mass index (BMI) is the most frequently used diagnostic tool in the current classification system of obesity. It has the advantage that a subject's height and weight are easy and inexpensive to measure.

Quetelet (1835) developed the body mass index as a measure of a person's weight taking into account their height. The formula to calculate a person BMI is dividing a person's weight in kilograms by the square of the person's height in meters. However, the index was not used as a measure of fatness until Garrow and Webster (1985) discovered this relationship. BMI provides a more accurate representation of body fat content than simply measuring a person's weight. Although it does not take into account certain factors such as pregnancy or bodybuilding; however, the BMI is a fairly accurate reflection of fat percentage in the majority of the adult population.

The World Health Organization (WHO, 1998), the US Preventive Services Task Force and the International Obesity Task Force (Yao, 2013) define overweight as a BMI between 25.0 and 29.9 kg/m<sup>2</sup> and obesity as a BMI >30.0 kg/m<sup>2</sup>. As Gomez-Ambrosi et al. (2012) point out although BMI does not necessarily provide an extremely accurate measure of adiposity (Flegal et al., 2009) these cutoffs points are very useful in epidemiological studies (Flegal et al., 2009).

The advantage of anthropometric measures like BMI is that they are easy to perform. There are however several other common ways to measure the amount of adiposity or fat present in an individual's body. One of these methods is to measure the waist circumference. It has shown to estimate the obesity-associated health risk more effectively than BMI (Balkau et al., 2007). But, even better than waist circumference, the body fat percentage (BF%) can be estimated by different techniques like skinfold measurement

(Bigaard and Frederiksen, 2004). Wagner (2013) proposes ultrasound to measure adipose tissue. Other frequently used methods for measuring body composition include bioelectrical impedance analysis and dual energy X-ray absorptiometry (Houtkooper and Lohman, 1996). Another method is dual-energy X-ray absorptiometry (DEXA). Originally developed to measure bone density, DEXA imaging is also used to precisely determine body fat content by using the density of various body tissues to identify which portions of the body are fat. This test is generally considered very accurate, but requires a great deal of expensive medical equipment and trained professionals to perform (Kaul et al., 2012). More accurate methods include underwater weighing (hydro densitometry) (Goldman and Buskirk, 1961) and air displacement plethysmography (ADP).

The body volume index (BVI) was devised in as a computer, rather than manual, measurement of the human body for obesity and an alternative to the BMI. Body volume index uses 3D software to create an accurate 3D image of a person so BVI can differentiate between people with the same BMI rating, but who have a different shape and different weight distribution. Summarizing, researchers acknowledge that BMI index has limitations to measure body adiposity (e.g. false-negative BMIs, (Shah et al., 2012)). However, BMI continues to be one of the most commonly used methods to measure overweight and obesity by researchers and advisory institutions. It is simple, cheap and relatively accurate way to classify populations in terms of adiposity. However, BMI does not account extremes of muscle mass, some rare genetic factors, the young under 18 year olds, and a few other individual variations. Thus, it is possible for an individual with a BMI of less than 25 to have excess body fat, while others may have a BMI that is significantly higher without falling into this category (Gallagher and Heymsfield, 2000). We know that some of the above methods for determining body fat are more accurate than BMI but with added complexity and therefore are not very functional (Krebs et al., 2007). Subsequently, issued widely in literature, we will use BMI as a proxy variable for body adiposity in our two studies.

#### **1.4. Overweight. Global prevalence and trends**

Worldwide, the proportion of adults with a BMI greater than 25 increased between 1980 and 2013 from 29% to 37% in men, and from 30% to 38% in women (Ng et al., 2014). In adults, the estimated prevalence of obesity (BMI>30kg/m<sup>2</sup>) exceeded 50% in men in Tonga and in women in Kuwait, Kiribati, Federated States of Micronesia, Libya, Qatar, Tonga, and Samoa. Since 2006, the increase in adult obesity in developed countries has gradually decreased.

In the USA, Flegal et al. (2012) as well as many others researchers (Ng et al., 2014; Ogden et al., 2012; Ogden and Carroll, 2010; Hill et al., 2003; Ogden et al., 2002) have followed the trends of the overweight pandemic thanks to the data of the National Health and Nutrition Examination Survey (NHANES). Their results show that, despite institutional efforts to fight obesity, the overweight pandemic shows no evidence of starting to decline. In 2009-2010, the prevalence of obesity was 35.5% among adult men and 35.8% among adult women, with no significant change compared with 2003-2008

Results in Europe do not differ greatly from the USA. In general in western Europe the overweight ratios are not decreasing (Doak and Wijnhoven, 2012). Neither they are in the European eastern countries (Estonia, Latvia, Lithuania, Poland, Bulgaria, Romania, Hungary, Czech, Croatia, Serbia, Slovenia). Webber et al. (2012) performed a modeling situation in order to project the prevalence of overweight in each of the cited countries. All but one, expected to have higher rates of overweight in the near and far future. Only Slovenia was predicted to reduce the percentage of overweight citizens in both females and males for both 2030 and 2050.

The situation in Spain has not evolved in a better way. Gutiérrez-Fisac et al. (2000) made an analytical comparison review between 1987 and 1995/97. In 1987 the prevalence of overweight in the Spanish population aged 25 to 64 was 16.2% (19.1%in men and 12.9% in women) and it rose to 18.4% (22.9%in men and 13.5% in women) in 1995/97. During the same period, the prevalence of obesity increased from 8.2% in 1987 to 12.2% 1995/97. Thus, in 1997, 30.6 % of the Spanish population was overweight or obese. By educational level, the prevalence of overweight increased significantly in men with fewer than 12 years of education (4.7%).

Twelve years later a group of researchers (Gutiérrez-Fisac et al., 2012) found a rate of 23% of the population to be obese. The rate had increased in more than 10 percentage points in less than fifteen years. The authors took data from the ENRICA study, a cross-sectional study carried out, between June 2008 and October 2010, with 12,883 citizens representative of the population of Spain aged 18 years and older. Overweight was considered when BMI was situated in the interval  $25 < \text{BMI} < 30$ , and obesity as  $\text{BMI} > 30$ . The prevalence of obesity was 23% (24.4% in men and 21.4% in women). The frequency of obesity increased with age and affected 35% of persons aged 65 and over. The occurrence of obesity decreased with increasing educational level. For example: 29% of women with primary education or less had obesity vs. only 11% of those with university studies. The prevalence of obesity was very high in the Canary Islands and in the south of Spain.

But obesity is not a problem exclusive to developed countries. Popkin et al. (2011) researched the global nutrition transition and the pandemic of obesity in developing countries. They found that, rapid increases in the rates of obesity and overweight are widely documented, from urban and rural areas in the poorest countries of sub-Saharan Africa and South Asia, to populations in countries with higher income levels.

To summarize, literature review shows that, with few exceptions most countries have increased rates of overweight and obese population. So far we do not foresee any evidence that the situation is going to improve.

### **1.5. Consequences of overweight in adults**

Obesity and overweight have a negative effect on adults' physical health, emotional well-being, and self-esteem. Lower academic performance and lower quality of life also have recognition as consequences of obesity (Sahoo et al., 2015). Primarily, the consequences of obesity have a strong relationship with excess adiposity. Cumulative amounts of large fat deposits in adipose tissue result in fatty liver disease, sleep apnea (Narang and Mathew, 2012), diabetes, asthma, high cholesterol, gallstones, glucose intolerance, insulin resistance, skin conditions, impaired balance, and orthopedic issues (Sahoo et al., 2015) and cancer, cardiovascular disease, and osteoarthritis (Wyatt et al., 2006). Poor dieting habits transmitted by parents have a negative effect on metabolic rates in children as the body adapts to significant changes in adipose tissue, vital organ structure, and brain

development (Ojha et al., 2015). Poor eating habits among pregnant women also have long-term consequences on appetite control in children, as well as on adipose tissue function and distribution. However, high birth weight does not always result in childhood obesity (Ojha et al., 2015). Nutrient intake during gestation affects adiposity in children, though changes in fetal development may also result in consequences for children if they have a genetic predisposition to obesity

But as Prost and Ai (2015) underline in their review, obesity and overweight do not only carry physical problems, these illnesses have also been linked to psychological disturbances such as poor self-esteem, negative self-image, social difficulties, negative affect, sadness, depression, loneliness, and a variety of other psychological concerns. Additionally, research has also proved that adults who are overweight or obese face prejudice, stigmatization (Carr and Friedman, 2005), employment discrimination (Pingitore and Dugoni, 1994), and problems associated with securing affordable insurance (Alford, 2006).

## **2. CHILDREN OVERWEIGHT**

Defining obesity implies having an excess of body fat, though the research literature acknowledges no consensus for locating a cutoff point for this feature in overweight children (Dehghan et al., 2005). As we have seen for adults, there are various methods to measure body fat content. Many of them are more accurate than BMI, but finally BMI is easy to measure, and good enough to estimate body adiposity and therefore more practical than any other type of measurement. Therefore, despite its limitations, BMI has been adopted worldwide to measure overweight and obesity in adults who have already reached their maximum height, normally at the age of eighteen.

### **2.1. Definition**

Defining overweight and obesity in the case of children is a different issue. The algorithm of estimation BMI cannot have the same limits for full grown adults as for underage children and adolescents that are still growing and at a different rate depending whether they are male or female. To solve this situation the International Obesity Task Force (IOTF) held a workshop in Dublin on 16 June 1997. The IOTF was established in 1994 to

address the increase in the worldwide prevalence of obesity. The workshop concluded that the body mass index (BMI; in kg/m<sup>2</sup> ) offered a reasonable measure with which to assess fatness in children and adolescents and that the standards used to identify overweight and obesity in children and adolescents should agree with the standards used to identify grade 1 and grade 2 overweight (BMI of 25 and 30, respectively) in adults (Dietz and Bellizzi, 1999). After this workshop Cole et al. (2000) started working to develop an internationally acceptable definition of child overweight and obesity, specifying the measurement, the reference population, and the age and sex specific parameters . They carried out an international survey of six large nationally representative cross sectional growth studies. BMI was measured from 97,876 males and 94,851 females from birth to 25 years of age from: Brazil, Great Britain, Hong Kong, the Netherlands, Singapore, and the United States. For each country survey, centile curves were drawn that at age 18 years passed through the widely used cut off points of 25 and 30 kg/m<sup>2</sup> for adult overweight and obesity. The resulting curves were averaged to provide age and sex specific cut off points from 2-18 years. The authors proposed widely used ratios (See Table 1) with cut off points, which are less arbitrary and internationally based and that can help to provide internationally comparable prevalence rates of overweight and obesity in children.

Cole and Lobstein (2012) reformulated the study done by Cole et al. (2000). These new parameters were compared with the originals, and with the WHO standards and references, by measuring their prevalence rates based on US and Chinese data. The results were that the new cut-offs points were virtually identical to the originals, giving prevalence rates which differ by < 0.2% on average. The international cut-offs were reformulated to allow BMI to be expressed as a centile or SD score. Additionally, the reformulation leads to very minor changes in the existing cut-offs.

**Table 1. International cut off points for body mass index (Cole et al. 2000)**

Age (years)	BMI=25kg/m <sup>3</sup>		BMI=30kg/m <sup>3</sup>	
	Males	Females	Males	Females
2	18.41	18.02	20.09	19.81
2.5	18.13	17.76	19.80	19.55
3	17.89	17.56	19.57	19.36
3.5	17.69	17.40	19.39	19.23
4	17.55	17.28	19.29	19.15
4.5	17.47	17.19	19.26	19.12
5	17.42	17.15	19.30	19.17
5.5	17.45	17.20	19.47	19.34
6	17.55	17.34	19.78	19.65
6.5	17.71	17.53	20.23	20.08
7	17.92	17.75	20.63	20.51
7.5	18.16	18.03	21.09	21.01
8	18.44	18.35	21.60	21.57
8.5	18.76	18.69	22.17	22.18
9	19.10	19.07	22.77	22.81
9.5	19.46	19.45	23.39	23.46
10	19.84	19.86	24.00	24.11
10.5	20.20	20.29	24.57	24.77
11	20.55	20.74	25.10	25.42
11.5	20.89	21.20	25.58	26.05
12	21.22	21.68	26.02	26.67
12.5	21.56	22.14	26.43	27.24
13	21.91	22.58	26.84	27.76
13.5	22.27	22.98	27.25	28.20
14	22.62	23.34	27.63	28.57
14.5	22.96	23.66	27.98	28.87
15	23.29	23.94	28.30	29.11
15.5	23.60	24.17	28.60	29.29
16	23.90	24.37	28.88	29.43
16.5	24.19	24.54	29.14	29.56
17	24.46	24.70	29.41	29.69
17.5	24.73	24.85	29.70	29.84
18	25	25	30	30



Furthermore, the new data found by Cole and Lobstein (2012) has several benefits: existing cut-offs can be expressed as centiles or SD scores; new cut-offs are easy to derive, and the international and WHO cut-offs can be compared directly.

## **2.2. Children overweight and obesity prevalence**

Wang and Lobstein (2006) performed a meta-analysis using papers published between January 1980 and October 2005 and found that the rate of children who are overweight had increased in almost all countries for which data is available (25), with the exception of Russia and to some extent Poland during the 1990s. Exceptions were also found among infant and pre-school children in some lower-income countries. Obesity and overweight had increased more dramatically in economically developed countries and in urbanized populations. Later Wang and Lim (2012) found the prevalence of overweight children was highest in western and industrialized countries, but still low in some developing countries. The prevalence also varied by age and gender. They also found that the Americas and eastern Mediterranean regions (defined by the WHO) had higher prevalence of overweight and obesity (30-40%) than the European (20-30%), south-east Asian, western Pacific, and African regions (10-20% ). Recent studies (Ng et al., 2014) show the prevalence has increased substantially, in the period 1980-2013, in children and adolescents in developed countries: 23.8% of boys and 22.6% of girls were overweight or obese in 2013. The prevalence of overweight and obesity has also increased in children and adolescents in developing countries, from 8.1% to 12.9% in 2013 for boys and from 8.4% to 13.4% for girls.

Although most authors affirm that the rate of overweight children continues to grow, Olds et al. (2011) found that the rise in the prevalence has slowed substantially. Using data from nine countries (Australia, China, England, France, Netherlands, New Zealand, Sweden, Switzerland and USA), and 467,294 children aged 2–19 years.

As we have seen authors' accord that children overweight prevalence is high worldwide while not equally distributed, the rate is not lowering and depends highly on the sex, age, and socio-economic status of the child. Different geographical areas have different overweight ratios and focus on different issues. We will review some research carried out in the USA, Europe and Spain.

In USA, Cunningham et al. (2014) carried out a research evaluating data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998–1999, a representative prospective cohort of 7738 participants (6807 were not obese at baseline) who were in kindergarten in 1998 in the United States. Weight and height were measured seven times between 1998 and 2007. They found that when the children entered kindergarten (mean age, 5.6 years), 12.4% were obese and another 14.9% were overweight (total= 27.3%). In eighth grade (mean age, 14.1 years), 20.8% were obese and 17.0% were overweight (total= 37.8%). Incident obesity between the ages of 5 and 14 years was more likely to have occurred at younger ages, primarily among children who had entered kindergarten overweight. Furthermore Ogden et al. (2014) research indicated that greater weight in infants and toddlers from birth to two years of age will lead to obesity in later childhood and that ethnic differences do not always account for geographic and socioeconomic differences in the prevalence of obesity in children. Compared to Europe, the presence of childhood obesity in the United States remains extraordinarily high despite having remained stable between 2003-2004 and 2009-2010. More than 17 percent of American children have symptoms of obesity in 2011-2012 (Ogden et al., 2014).

In Europe (namely: Greece, Hungary, Slovenia, Spain, Belgium, Netherlands and Norway) Brug et al. (2012) executed a study with 7234, 10–12 year old children. Findings showed that 25.8% of boys and 21.8% of girls were overweight or obese. Higher prevalence of overweight/obesity was observed in Greece, Hungary, Slovenia and Spain than in Belgium, Netherlands and Norway but in general the rate is lower than in the USA. Large differences between countries were found in intakes of sugar-sweetened beverages, breakfast, active transport and time spent using the TV and computer.

Recently the World Health Organization (WHO) Regional Office for Europe has established the Childhood Obesity Surveillance Initiative (COSI) to monitor changes in overweight in primary-school children due to the fact that intercountry comparisons of overweight and obesity in primary-school children in Europe based on measured data lack a similar data collection protocol. The COSI objective was to present the anthropometric results of data collected in 2007/2008 and to investigate whether there exist differences across countries and between the sexes. Weight and height were measured in 168,832; 6–9-year-old children in 12 countries: Belgium (Flanders), Bulgaria, Czech Republic, Ireland, Italy, Lithuania, Latvia, Malta, Norway, Portugal, Slovenia and Sweden.

Wijnhoven et al. (2012) found that stunting, underweight and thinness were rarely prevalent. However, 19.3-49.0% of boys and 18.4-42.5% of girls were overweight (including obesity and based on the 2007 WHO growth reference). The prevalence of obesity ranged from 6.0 to 26.6% among boys and from 4.6 to 17.3% among girls. Multi-country comparisons suggest the presence of a north-south gradient with the highest level of overweight found in southern European countries.

Two years later, Wijnhoven et al. (2014) wrote a paper to present the anthropometric results of COSI Round 2 (2009/2010) and to explore changes in body mass index (BMI) and overweight among children within and across nine countries from school years 2007/2008 to 2009/2010. The findings suggested the maintenance of a north-south gradient with the highest overweight and obesity prevalence estimates noted in southern European countries. The north-south difference was found in both, OCSI Round1 and COSI Round 2. However the authors found that on Round 2 that while some northern countries had deteriorated some southern regions had improved. The absolute change in mean BMI ranged from a statistically significant decrease of  $-0.4 \text{ kg/m}^2$  (Italy and Portugal) to a statistically significant increase of  $+0.3 \text{ kg/m}^2$  (Norway).

Recently a research was performed in Spain by Pérez and López (2013) to a representative sample of Spanish children between 6 and 9 years. 7569 boys and girls were selected from the ALADINO study (ALimentación, Actividad Física, Desarrollo INfantil y Obesidad—Food, Physical Activity, Child development and Obesity). The prevalence of overweight and obesity was determined using different sets of cut-off criteria: Spanish reference tables (Fundación Orbegozo), IOTF reference values, and WHO growth standards. The tables for the Spanish population published by the Fundación Orbegozo (Sobradillo and Eizaguirre, 2004). Overweight was defined between the 85th and 97th percentiles, and obesity was defined over the 97th percentile; using IOTF reference values (Cole et al., 2000); and using the WHO growth standards the children is classified as overweight when BMI is between these two values ( $1SD < \text{BMI} < 2SD$ ) and obese when  $\text{BMI} \geq 2SD$ . (de Onis et al., 2007). The prevalence of overweight in boys ranged from 14.1% to 26.7%, and in girls from 13.8% to 25.7%, depending on the cut-off criteria. The prevalence of obesity in boys ranged from 11.0% to 20.9%, and in girls from 11.2% to 15.5%. Consequently, the authors found important differences depending on the criteria used. In any case excess weight (overweight + obesity) was high in boys (25.1 % to 47.6%) and girls (25% to 41.2%) no matter which tables they used.

Using a probabilistic representative sample of the Spanish population of 978 children between 8 and 17 years, Sánchez-Cruz et al. (2013) performed a cross-sectional study and found that the prevalence of overweight and obesity in children and young people in Spain remained very high (around 40%), but has not grown in the last 12 years.

Among school-aged children in England, researchers note that while obesity rates in children from economically comfortable families stabilize over time, while rates for children with a lower socio-economic status continued to increase (Knai et al., 2012; Stamakis et al., 2010). As with England, childhood obesity rates in Spain indicate strong geographic and socioeconomic differences. Poorer children tend to have higher obesity rates than those from well-off families (Llauradó et al., 2015; Valdés et al., 2012; Giralt et al., 2011).

Geographic and socioeconomic differences in countries with higher rates of childhood obesity require different interventions, promote healthy lifestyles through encouraging changes in healthy habits (Giralt et al., 2011). However, not all interventions are equally efficient to the decreasing prevalence of childhood obesity.

### **2.3. Consequences of childhood overweight**

Obesity is the natural response of individuals to the obesogenic environments they find themselves in. Support for individuals to counteract obesogenic environments will continue to be important, but the priority should be for policies which reverse the obesogenic nature of these environments (Swinburn et al., 2011).

When we talk about pandemic disease like overweight, almost everyone in the health system will agree that prevention is better, and also far more economical, than a cure. If overweight starts at early stages of life, the earlier the better. Here, we will review if child obesity is essentially an antecedent of adult obesity and if, at this early stage, it also has, negative consequences on the young individual.

In the seventies Charney and Goodman (1976) found that infant weight correlates with adult weight so heavy children become obese adults. Much later, Dietz (1998) presented a review on longitudinal researches and found obesity present in childhood or adolescence seemed to increase the likelihood of adult morbidity and mortality with clear differences between men and women. In men who were obese during adolescence, all-cause mortality and mortality from cardiovascular and colon cancer were increased. In both men

and women who were obese during adolescence, rates of cardiovascular disease and diabetes were increased. Among women but not men, obese during adolescence, obesity has a variety of adverse psychosocial consequences. These include completion of fewer years of education, higher rates of poverty, and lower rates of marriage and household income

The prevalence and severity of obesity have increased in recent years, a likely result of complex interactions between genes, dietary intake, physical activity, and the environment. Biro and Wien 2010 found that the consequences of childhood and adolescent obesity include earlier puberty and menarche in girls, type-2 diabetes and increased incidence of the metabolic syndrome in youth and adults, and obesity in adulthood. These changes are associated with cardiovascular disease as well as with several cancers in adults. A more recent systematic review done by Reilly and Kelly (2011) found that overweight and obesity in childhood and adolescence have adverse consequences on premature mortality and physical morbidity in adulthood. All studies reporting cardio metabolic morbidity found that young overweight and obesity were associated with significantly increased risk of diabetes, hypertension, ischemic heart disease, and stroke in adult life. Other studies examined revealed associations with cancer morbidity were not consistent; on the other hand, some studies on the review found that high BMI in young people was associated with significantly increased risk of disability pension, asthma, and polycystic ovary syndrome symptoms in later life.

Children do not have to wait to be adults to suffer the negative consequences of being overweight (Dietz, 1998). Many of the cardiovascular consequences begin in childhood. Hyperlipidemia, hypertension, and abnormal glucose tolerance occur with increased frequency in obese children and adolescents. Sleep apnea and Blount's disease represent major sources of morbidity. Dietz (1998) found that overweight children impacts psychological aspects. Obese children tend to be taller than their non-overweight peers, they can be viewed as more mature and inappropriate expectations may have an adverse effect on their socialization. Ottova et al. (2012) analyzed the impact of overweight on health-related quality of life (HRQoL) using 13,041 children from 10 European countries Gender and age specific cut-offs of Cole et al. (2000) were used to define overweight and obesity. Overall, 14.2% of the sample was overweight, with prevalence rates ranging between 9.4% in France and 17.6% in Spain. Across all countries, overweight children had lower mean HRQoL scores than normal weight children and adolescents.

Attention-Deficit Hyperactivity Disorder (ADHD) can also be a consequence of children overweight. Erhart et al. (2012) used a sample of 2,863 parents and their children, 4.2% of the respondents met criteria for ADHD. The prevalence of ADHD was significantly higher for overweight/obese (7%) than for normal weight (3.5%) and underweight (4.9%) children. The correlation was significant but the causal relationship could not be proved as the study was transversal.

Obesity in childhood is also a risk factor for early puberty in girls. Currie et al. (2012) used a database of more than 45,000 girl's from 34 countries in Europe and North America to discover that age at menarche was inversely associated with individual BMI. This means the bigger the BMI, the younger the girl experiences her first menstruation.

Overweight does not only have physical consequences for the children suffering from it. Brixval et al. (2012) found that overweight and obese boys and girls are at higher odds of being exposed to bullying (the action of a person who uses strength or influence to harm or intimidate those who are in a weaker position) than their normal weight peers. Moreover, their study found that body image may statistically explain this association between overweight and exposure to bullying. The study was cross-sectional; hypotheses of possibilities for opposite causality are possible

As in the case of an adult, child overweight health costs are higher than those of their normal weight peers (Pelone and Specchia, 2012). Their analysis review confirmed the significance of child obesity related costs and the heterogeneity among available studies. Also as in the case of adults, Reisch and Gwozdz (2011) found that overweight children do not have a sustainable effect on the environment in their paper "Chubby cheeks and climate change: childhood obesity as a sustainable development issue".

#### **2.4. Causes of children overweight**

Most studies highlight that overweight arises, both in adults and children, when the calories expenditure is smaller than the calories intake (Branca et al., 2007). Researchers have categorized three main causes for overweight; eating too much and/or too many inadequate foods, moving the body less than it is designed to and/or performing too many sedentary behaviors and not sleeping enough (Doak et al., 2006). We will review the studies that confirm these behaviors as causes of overweight and, secondly, we will discuss on the determinants that could help many children to behave in a healthier way.

Doak et al. (2006) perform a literature review of interventions aiming to solve the overweight problem. In the review they identify different causes of overweight (See Table 2). We use their table to address the different possible causes/interventions areas of children overweight and obesity.

**Table 2. (Part 1) Causes of children overweight, Doak et al. (2006)**

International factors	National factors	Communiy/locality
1. Convenience foods, sedentary entertainment	1. Transport	1. School buses
2. Marketing of foods to children	2. Urbanization	2. Safety of children
3. Food and nutrition	3. Manufactured/ imported goods	3. Community awareness/attitudes
4. Development: children's spending power	4. Sanitation	4. Adult obesity prevalence
	5. Health	5. Community sports clubs
	6. National education	6. Local school board and Parent Teacher Organizations
	7. Child labor protections	7. Pediatric care
	8. Vending machines	8. Agriculture/gardens
	9. Media and culture	9. Local markets
	10. Economy	10. Playgrounds/parks
		11. Education level of community
		12. Income of community

The authors point out different causes depending on the scenarios where the child behavior takes place or who is the decision maker. Thus, they highlight: international factors, national factors, local or community factors, school determinants, home setting, attitudes and behavior and finally the child's individual personality, attitudes, and behavior.

**Table 2. (Part 2) Causes of children overweight, Doak et al. (2006)**

School	Home	Individual
1. Active play at school: time and space, physical education, school playground	1. Family diet	1. Child's diet and activity patterns at school
2. Walking/cycling to school	2. Number of televisions	2. TV in child's room
3. Teacher knowledge/attitudes	3. Family activity patterns	3. Child's diet and activity outside school
4. School nurse knowledge/attitudes	4. Family SES	
5. School lunch program	5. Child care	
6. School snack shop	6. Parent knowledge/attitudes	
7. Education regarding diet and activity	7. Family pediatrician knowledge/attitudes	

Excess weight comes from a systematic higher ingestion of calories than expenditure of energy. Children who eat too much and move less than they should. But being minors they are not 100 % responsible for their behavior. Their parents, school, and politics are responsible for not creating an adequate healthy environment which promotes a healthy lifestyle. Of course the socio-economic circumstances and personal situations of each family, like marital status, make the challenge bigger or smaller. Overweight is a multidimensional caused concept. We will review all the antecedents of this illness and later will address how to improve the situation.



### 2.4.1. Sleeping behavior

Adequate sleep is important for the growth, maturation and health of children (Matricciani et al., 2012). The authors executed an extensive literature review and discovered the following data. Insufficient sleep has been associated with an array of physical, psychosocial health deficits and lack of wellbeing (Eisenmann, 2006). These include; an impaired ability to concentrate (Wolfson and Carskadon, 1998), retain information (Walker and Stickgold, 2006), mood disorders including anxiety, depression and hyperactivity (Steenari et al., 2003) as well as impaired motor skills (Kuriyama et al., 2004) and poorer overall health and immune function (Sekine et al., 2006). Insufficient sleep has also been associated with impaired academic performance, (Wolfson and Carskadon, 1998) an increased risk of injuries and accidents, (Koulouglioti et al., 2008) suicide ideation (Liu, 2004) and drug and alcohol use (Wong et al., 2004).

Different authors have found that short sleep duration increases the risk of obesity due to the effect on certain human hormones related to nutrition (Spiegel et al., 2004). Both cross-sectional (Cappuccio et al., 2008) and prospective cohort studies on children support this association (Patel and Hu, 2008). Causal inference is difficult due to lack of control for important confounders and inconsistent evidence of temporal sequence in prospective studies. As Van Cauter et al. (2008) highlights, secular decline in sleep duration have been linked to the rise in obesity (Patel and Hu, 2008) . Short sleep can start causing problems as early as infancy. A longitudinal survey, done by Taveras et al. (2008) found that daily sleep duration of less than 12 hours during infancy appears to be a risk factor for overweight and adiposity in preschool-aged children.

In their meta-analysis Chen et al. (2008) show a clear association between short sleep duration and increased risk of childhood obesity. Therefore, the prevalence of childhood obesity may be reduced by increasing sleep duration, independent of other risk factors for childhood obesity. Hart et al. (2011) also found that short sleep is associated with an increased risk for being or becoming overweight / obese or having increased body fat.

Recent studies report that poor quality sleep (short sleep duration, high sleep duration variability and experiencing sleep problems) is not only correlated with overweight but also with obesity promoting diet in children, based on behaviors like high energy density of the diet, increased consumption of added sugar and sugared soft drinks (Kjeldsen and Hjorth,

2014). These behaviors may be partially explained by research such as that performed by Taheri et al. (2004) which found that participants in their study with short sleep had reduced leptin and elevated ghrelin hormones which are likely to increase appetite. In Western societies, where chronic sleep restriction is common and food is widely available, the authors described a model in which short sleep unsettles the hormones of satiety and hunger, additionally, when people sleep less they are more tired and normally reduce their physical activity. Finally when someone spends more time awake, he has greater opportunities to eat. All of the above are markers of overweight.

Matricciani et al. (2012) found over the last 100 years, that there has been a consistent rapid decline in the sleep duration of children and adolescents. They collected data on more than 690,000 children from 20 countries, dating from 1905 to 2008. Rates of change were negative across age, sex and day type categories, but varied according to region, with Europe, the USA, Canada and Asia showing declines and an increase was evident only in Australia, the UK and Scandinavia. The study indicates a decrease of more than one hour per night over the study period.

Knowing the importance of adequate sleep for children, and the decline in allocated time for sleep in the last decades, sleep interventions should be considered in future. Chen et al. (2008) propose that a combination of strategies targeting both earlier bedtimes and later waking times to increase sleep duration may help prevent childhood obesity. Desirable sleep behaviors may represent an important and relatively low-cost strategy (something which is very important) to reduce childhood obesity. Furthermore, Taheri (2006) proposes that sleep may not be the only answer to the obesity pandemic, but its effect should be seriously considered, as even small changes in the energy balance are beneficial. A strong relationship between late bedtimes with short sleeping hours and childhood obesity was found in Japanese children aged 6-7 years old (Sekine et al., 2002). A longitudinal study (Snell et al., 2007) found that children who slept less, went to bed later, or got up earlier, at the time of the first assessment, had higher BMIs 5 years later and were more likely to be overweight. Children who have less sleep are more likely to live in a family with a low educational level and have more chances of being heavy TV watchers and not being engaged in physical activities (Padez and Mourao, 2009).

All of this research allows us to conclude that good sleep could be part of the obesity prevention approach. To address the lack of sleep among adults and children we must

understand the present prevalence of the problem, historical evolution, future trends and the determinants and correlators of the time slept.

#### **2.4.2. Screen use. Sedentary behaviors**

Adequate physical activity reduces the odds of being overweight (WHO, 2010; Janiszewski and Ross, 2007). On the other hand, sedentary behaviors increase the chances of obesity (Prentice-Dunn and Prentice-Dunn, 2011; Tremblay et al., 2011). Despite all the new screen technologies that have appeared in the last few years (e.g. PCs, videogames, tablets and cellular phones), TV viewing is probably the most time consuming sedentary behavior and can be a better predictor of children overweight (Owen et al., 2010; Hu et al., 2003) and for some part of the population can be a marker of sedentary behavior (Sugiyama et al., 2008).

TV watching can be divided into three sources of overweight. Firstly, is sedentary leisure activity, (i.e. is a low energy consuming behavior). Logically when someone is watching TV they are not doing another high energy consuming activity like playing sports. Secondly, people tend to overeat when they watch TV and have a higher propensity to snack unconsciously (Ouwens, Cebolla, & van Strien, 2012). Thirdly, TV commercials tend to over promote obesogenic food compared to healthy foods (Wiecha et al., 2006). This fact pushes TV viewers to overeat high energy-dense food. Nowadays, TV watching is not the only screen sedentary activity. We have PCs, tablets, videogames and cell phones, among others. However, so far, TV appears to still be the leader in promoting overweight (Sisson et al., 2011). A review of the literature will be done to address all these points.

As early as 1985, Dietz and Gortmaker (1985) confirmed that USA children expended yearly more time in front of the TV set than at school. Their literature review confirmed that child TV watching has been proven to have deleterious effects on children's performance and behavior. All results suggested that television viewing may cause obesity. Robinson (1999) concludes that reducing television, videotape, and video game use is a good approach to prevent childhood obesity. Lowry et al. (2002) found that TV viewing was associated with being overweight and eating insufficient fruits and vegetables in high school students. Non-school computer usage and reading were not related to overweight. Salmon et al. (2006) showed that children who watched television for more than 2 h/day

were significantly more likely to be overweight than children who watched television less than 2 h/day.

Evidently, availability increases consumption. Dennison et al. (2002) found that a TV in the child's room is a stronger marker of increased risk of being overweight. Dennison and Edmunds (2008) determine that this problem is not diminishing as more recent surveys find that television sets in children's bedrooms have been increasing. In the USA, between 50% and 70% of youths have a television set in their bedroom. They view more hours of television than those without a television in their bedroom and their viewing is underestimated and often not monitored by parents.

There is a negative relationship between physical activity and television watching. Andersen et al. (1998) found that many US children watch too much television and as a consequence are not doing enough exercise. Marshall et al. (2004) also found a statistically significant and negative relationship between TV viewing and physical activity. While the total amount of time per day engaged in sedentary behavior is inevitably prohibitive of physical activity, media-based inactivity may be unfairly implicated in recent epidemiologic trends of overweight and obesity among children and youth.

TV consumption has a direct and positive relationship with unhealthy eating behavior. Francis et al. (2003) showed that in both overweight and non-overweight families, girls who watched more television consumed more snacks in front of the television. In families where neither parent was overweight, television viewing was the only significant predictor of girls' increase in BMI. Salmon et al. (2006) found that heavy TV watchers were also less likely to have two or more servings/day of fruit and had less chance of participating in any organized physical activity. Similarly, Ouwens et al. (2012) research showed that TV-viewing seems to be more strongly related to snacking in children. Additionally, Lissner et al. (2012) conducted an investigation with European children and found that in children with high-risk television behaviors may passively overconsume higher-fat and particularly higher-sugar diets.

High television viewing is associated with the consumption of calorie-dense low-nutrient foods frequently advertised on television (Wiecha et al., 2006). Therefore, the quantity of advertising on children's television appears to be related to the prevalence of excess body weight among children (Lobstein and Dobb, 2005). Utter et al. (2007) also found that children who watched the most TV were significantly more likely to be higher consumers of

foods most commonly advertised on TV: soft drinks and sugared drinks, some sweets and snacks, and some fast foods. Dennison and Edmunds (2008) found that sophisticated marketing of high fat, high sugar, high calorie foods and beverages is increasingly being targeted to children. These advertisements have been shown to affect children's preferences. Foods eaten as snacks or as meals while viewing television tend to be higher in fat and are less likely to include fruits and vegetables which are also the foods least likely to be advertised.

Drawing on all these problems, Matthews (2008) found that television was the prime promotional medium. He suggests the amendment of the European Union's Television without Frontiers Directive to ban all TV advertising of unhealthy food to children. Other interventions can also be successful. Davison et al. (2011) described a program to promote childhood outdoor play and decreasing television viewing through a family-based intervention. Results were positive and most children culminated in watching television for less than 2 hours per day.

In summary, TV watching is a main sedentary activity that prevents children from doing more physical activity. It promotes overweight due to lack of movement, increasing consumption of high energy-dense advertised foods and decreasing fruits and vegetables intake.

### 2.4.3. Nutrition

Healthy eating is about eating the right things, at the right amount, at the right time (Lobstein and Davies, 2008). In order to have a healthy weight, literature claims that breastfeeding is better for children (Yang and Huffman, 2013), eating breakfast can be recommended (Rampersaud et al., 2005), high density foods and beverages (i.e. high in sugars and fats) should be reduced (e.g. most foods served in fast-food restaurants and sugared sodas) (Malik et al., 2006), and low-density food consumption should be increased (Swinburn et al., 2004). There are other behaviors that have been associated with healthy eating such as: family dining together, no watching TV while eating (Ouwens et al., 2012), seeing few TV food commercials (Wiecha et al., 2006), and understanding the importance of healthy eating. In the following paragraphs we will do a literature review to see the state of the art on all these issues.

Prenatal and breast feeding can determine the future weight of the child. Yang and Huffman (2013) found that poor prenatal dietary intakes of energy, protein and micronutrients were shown to be associated with increased risk of adult obesity in offspring. By influencing birthweight, optimal prenatal nutrition might reduce the risk of obesity in adults. Furthermore, post-natal first type of feeding can have a great influence on future weight. As Yang and Huffman (2013) conducted several systematic reviews of meta-analyses to assess the relationship between breastfeeding and childhood obesity and consistently showed the protective effects of breastfeeding. Arenz et al. (2004) found that breastfeeding reduced the odds of obesity by 22%. Harder et al. (2005) found that 1 month of breastfeeding reduced the odds of being overweight in later life by 4%. Horta et al. (2007) conducted a systematic review of studies of the effect of breastfeeding on prevalence of overweight/obesity and found a statistically significant protective effect. In line with this, the introduction of complementary feeding at a later age (within the range of 2 to 6 months) is protective against overweight in adulthood but does not support a protective effect of a longer duration of breast feeding (Schack-Nielsen et al., 2010)

Nutrition is important not only at every age but also at particular times of the day and especially the first meal of the day. Skipping breakfast is a practice which is done by many children which may have negative consequences. Overall, the literature to date suggests that skipping breakfast is common in children and adolescents, increases with age, may be more common among certain ethnic minorities or low socioeconomic groups, and

seems to be associated with other lifestyle factors that may be detrimental to health, as Rampersaud et al. (2005) show. Breakfast skipping is associated with overweight and obesity (Vanelli et al., 2005). Another study found that cereal consumption as breakfast as part of an overall healthful lifestyle may play a role in maintaining a healthy BMI and adequate nutrient intake among adolescent girls (Barton and Eldridge, 2005). Furthermore, Binns et al. (2014) research suggests that consumption of a protein-based (with eggs) breakfast has the potential to modulate energy metabolism in overweight children through increased thermic effect of food, improved blood glucose regulation, and decreased hunger and therefore reduce BMI.

Affenito and Thompson (2005) found that days of eating breakfast were predictive of lower BMI in models that adjusted for basic demographics (i.e. site, age, and race), but the independent effect of breakfast was no longer significant after parental education, energy intake, and physical activity were added to the model. Rampersaud et al. (2005) performed a meta-analysis and concluded that breakfast eaters generally consumed more daily calories yet were less likely to be overweight, although not all studies associated breakfast skipping with overweight. Van Lippevelde et al. (2012) concluded that future breakfast promotion and obesity prevention interventions should focus on multidimensional family-related factors including the physical home environment and parenting practices.

In summary, the evidence supporting breakfast as a protection against overweight is strong but not conclusive. In any case, having breakfast must be recommended as it is important, as it improves cognitive functions at school (Rampersaud et al., 2005).

### ***Reduction of high energy-dense food***

We refer to high energy density foods as those foods which have a high quantity of kilocalories per 100g. Water has zero calories, pure sugar (carbo-hydrate) has 400 kc/100g and pure oil has 900 kc/100g (lipid) and dry lean meat 400 kc/100g (lipid). Processed foods tend to have higher amounts of fat and sugar to make them tastier (Scherz & Senser, 1994). The problem for people is that palatability can sometimes be opposed to health. On the sugar side we will review some literature regarding: candy bars or chocolate; biscuits, cakes, doughnuts or pies and finally sugared soft drinks. On the fat/lipid side we will review foods that are normally served in fast-foods restaurants: pizza, french fries (chips), hamburgers, sausages or meat pies. Prentice and Jebb (2003) found that humans have a weak innate ability to recognize foods with a high energy density and

to appropriately down-regulate the bulk of food eaten in order to maintain energy balance. Nutritionists recommend maximizing the amount of low density foods as they can provide hunger satiety with lower calorie ingestion than high density foods.

#### *High-fat foods: Fast-foods*

Low-fat diets have been traditionally recommended to maintain an adequate weight (McManus et al., 2001). Fast-foods like pizza, French fries, hamburgers and sausages have been proven to have a high amount of calories from fat (Paeratakul et al., 2003). Related to fast-food and overweight two main issues are treated in literature. Firstly, how the ingestion of fast food affects childrens' BMI (Bowman et al., 2004) . Secondly, how the proximity of the fast-food restaurants affects the consumption of this type of meal and subsequently the BMI (Crawford and Timperio, 2008). Finally, portion sizes, nutritional labeling and TV advertising is also addressed (Bonsmann and Wills, 2012; Andreyeva et al., 2011; Nielsen and Popkin, 2003).

As Prentice and Jebb (2003) found in a research review, the energy density of foods is a key determinant of energy intake and most fast foods have an extremely high energy density. Regular consumers are likely to consume excess energy and hence promote weight gain and obesity. Consumption of fast food among children in the USA seems to increase risk of overweight (Bowman et al., 2004). Children who ate fast food consumed more total energy and more-sweetened beverages. They consumed less fiber, milk, and fewer fruits and non-starchy vegetables. Pereira et al. (2005) found that fast-food consumption has strong positive associations with weight gain. Nielsen and Popkin (2003) found that increasing portion sizes served at restaurants may increase the rates of overweight and obesity. But the situation deteriorates when the children get older. Fast food consumption increases during the transition to adulthood, and this dietary behavior is associated with increased weight gain from adolescence to adulthood, (Niemeier et al., 2006). Furthermore, TV watching does not help. Television advertising increases fast-food consumption and therefore overweight (Chou et al., 2008). The authors propose a ban on these advertisements and/or the elimination of the tax deductibility of this type of advertising. Authorities try to find solutions such as nutritional labeling. But these efforts do not appear to be the solution, at least in low income communities. A recent research found that adolescents notice calorie information at similar rates as adults, although, they report being slightly less responsive to it than adults. The authors (Elbel et al., 2011) did not find



evidence that labeling influenced adolescent food choice or parental food choices for children in this population.

On the contrary, homes and schools just a short distance from fast-food outlets appear to be related to overweight (Austin et al., 2005). Conversely, Currie et al. (2009) found that close the presence of non-fast food restaurants is uncorrelated with weight outcomes. Burdette (2004) concluded that preschoolers' overweight was not associated with proximity and fast food restaurants. Reversely, Davis and Carpenter (2009) found that exposure to poor-quality food environments has important effects on adolescent eating patterns and overweight. Their opinion is that policy interventions limiting the proximity of fast-food restaurants to schools could help reduce adolescent obesity. The same relationship was found among older adults (Li et al., 2010). In Europe, a study also discovered a positive relationship between the density of fast food outlets and the obesity status of children (Fraser and Edwards, 2010). However, the relationship was not found relevant for Australian children between 8-15 years. While consumption of fast food has been shown to be associated with obesity, Crawford and Timperio (2008) study provides little support for the concept that exposure to fast food outlets in the local neighborhood increases risk of obesity.

#### *Sugared foods and beverages*

Although many people think that reducing fat reduces or maintains weight, evidence from a systematic review (Hession et al., 2009) demonstrates that low-carbohydrate/high-protein diets are more effective than low-fat diets in reducing weight. Apparently, it is better to reduce sugar than fat consumption to maintain a healthy weight. Sugar consumption has been increasing since the nineteenth century continues to grow in developing countries (Marriott et al., 2014). Although some consumers in developed countries are changing their positive attitudes into negative attitudes towards sugar (Horne, 2011). Sugar has increased its popularity because most people prefer the sweet flavor and it is a cheap source of calories (Mintz, 1985). As Avena et al. (2008) affirm, sugar can also be addictive. Sugar is noteworthy as a substance that releases opioids and dopamine and thus might be expected to have addictive potential. Furthermore, sugar consumption has traditionally been linked with caries although Burt and Pai (2001) concluded in their literature review that the relationship between sugar consumption and caries is much weaker in the modern age of fluoride exposure than it used to be. Additionally, sugar, particularly excessive fructose intake, induces an increase in uric acid which may be a

major mechanism that can cause cardio renal disease (Johnson et al., 2007). Finally, epidemiologic and experimental evidence indicates that a greater consumption of sugar is associated with weight gain and obesity (Malik et al., 2006). On the other hand, some researches find no relationship between sugars and body weight status in the New Zealand population (Parnell et al., 2007). Hess et al. (2012) stated that recommendations related to sugar are confusing. Ordinary advice suggests strict limits on intake of “added sugar”. The authors posit that to reduce the risk of overweight you should reduce the sugar intake regardless if they are “added” or “natural”.

Sugar is normally eaten by children in the form of candy bars or chocolate; biscuits, cakes, doughnuts or pies and finally sugared-sweetened beverages. We will review the literature concerning the link between children’s consumption of these items and BMI. Candy consumption did not adversely affect health risk markers in children and adolescents in the study performed by O’Neil et al. (2011). They found in their research that energy intake was higher in candy consumers, but surprisingly, the authors concluded that candy consumers were less likely to be overweight than non-consumers. Fogelholm and Tetens (2011) make a critical review of this study; we need to be careful with the interpretation and practical implications of their main finding due to methodological and philosophical reasons. A research in Germany found medium and high intakes of confectionery were associated with smaller BMI and decreased risk of being overweight (Pei et al., 2014). Ballali et al. (2013) review failed to show that confectionery consumption leads necessarily to a shift of energy intake and does not promote overweight.

A research conducted to discover whether obesity development is associated with dietary sugar intake in the US found that daily energy intake was positively predicted by carbohydrates and fat intakes but not with total and added sugar intake in the 1 to 18 years age group (Song et al., 2012). They stated that keeping energy balance is the primary strategy to avoid obesity. Furthermore, Barclay and Brand-Miller (2011) described the “Australian Paradox”, as a substantial decline in refined sugars intake over the same timeframe that obesity has increased. This implies that efforts to reduce sugar intake may reduce consumption but may not reduce the prevalence of obesity. Finally, Gibson et al. (2004) found that overweight young people were less likely to over consume sweet foods (biscuits cakes and confectionery) than other energy sources. Thus, Hornick et al. (2014) dare to quantify “candy in moderation”. They propose a range of up to 50 to 100 calories (i.e.15-30g) per day depending on energy needs. This amount falls within dietary guidance

from leading health authorities for calories from added sugars and fats. However, a field research performed in Japan found that in children aged 13 months to 9 years, long-term low sucrose intake is associated with better nutrient intake and growth than high sucrose intake (Ruottinen et al., 2008).

The reason for these surprising results in research originates from the sugar industry's interest in concealing the negative health consequences of sugar. Brownell and Warner (2009) found in a review, that there are significant similarities in the actions that the tobacco and food industry have taken in response to concerns that their products cause. Another reason for the incongruent results toward sugar may come from the fact that sucrose (sugar) can be eaten or drunk and the effects on health may be different. Wang et al. (2015) found that adiposity indicators were only positively associated with added sugars from liquid sources. Thus, it could be said that it is more harmful to drink sugared sweetened beverages than to eat candy. Additionally, they found that higher consumption of added sugars from liquid sources was associated with lower fruit and vegetable consumption and higher BMI. These findings have led us to review the findings related to sugared drinks.

Sugar-sweetened beverage consumption is associated with obesity in children (Ludwig et al., 2001). The authors found that for each additional serving of sugar-sweetened drinks consumed there was a significant increase in BMI adjusted for covariates. Later Malik et al. (2006) in a literature review confirmed that a greater consumption of sugar-sweetened beverages is associated with weight gain and obesity. Bell et al. (2005) found similar results in young children and that Australian children consume these beverages in excess.

A recent literature review (Torre et al., 2015) showed that the majority of studies with strong methodologies indicated a positive association between sugared drinks consumption and risk of overweight especially among children. Furthermore, Libuda et al. (2009) results showed a diluting effect of sugar-sweetened beverage consumption on micronutrient (e.g. folate and calcium) intake and diet quality. This effect was found to be more relevant in girls than in boys.

Of course, television ads increase this kind of beverage consumption. Exposure to 100 incremental TV ads for sugar-sweetened carbonated soft drinks during 2002–2004 was associated with a 9.4% rise in children's consumption of sugared soft drinks (Andreyeva et al., 2011)

On the other hand, Bachman (2006) research did not have conclusive findings. Four mechanisms were reviewed to explain the possible association between sweetened beverages and increased overweight or obesity: excess caloric intake, glycemic index and glycemic load, lack of effect of liquid calories on satiety, and displacement of milk. The findings were inconsistent across studies. The greatest support was for the excess caloric intake hypothesis, but the findings were not conclusive. Assigning possible links between sweetened beverage consumption and adiposity requires research that compares and contrasts specific mechanisms, especially in populations at risk of obesity, while controlling for likely confounding variables.

In review, it appears that high levels of fast-food and sugar consumption can increase the chances of children overweight. Research shows that living or having the school near a fast-food restaurant and drinking sugared-sweetened beverages increase the odds of children being overweight.

### ***Increase of low energy-dense food***

Energy density is defined as the number of calories divided by the weight in grams of food by the British Nutrition Foundation (BNF, 2015). Foods with a lower energy density provide fewer calories per gram than foods with a higher energy density. For the same amount of calories, a person can consume a larger portion of a food lower in energy density than a food higher in energy density. Low energy dense foods can be classified as healthy foods as they help with weight management by cutting calories while controlling hunger.

While they give no precise definition for "healthy food", the USA Food and Drug Administration, (FDA, 2013), has warned food manufacturers against labeling foods as being "healthy" when they have a high salt, fat t or sugar content. Scientific results suggest that focusing on increasing intake of healthy foods may be a useful approach for nutritional change in parents and children with a weight problem (Epstein and Gordy, 2001).

Research indicates that consumption of a low energy-dense diet (e.g. one that is rich in fruits, vegetables) helps people reduce their calorie intake (Swinburn et al., 2007; Shintani et al., 2001; Bell et al., 1998; Shintani et al., 1991; Duncan et al. 1983). At the same time, eating low-energy-dense foods helps people control their hunger and maintain feelings of satiety. Other studies indicate, that over the course of a few days, the weight of food a person consumes is fairly consistent and is more consistent than energy intake (Rolls et al., 1999; Bray and Popkin, 1998; Kendall et al., 1991; Lissner et al., 1987). Therefore,

encouraging people to eat more low energy-dense foods replacing high energy- dense meals help them decrease their caloric intake while eating satisfying portions of food and controlling hunger.

Water has zero calories and is essential for life (Popkin et al., 2010). The energy density of a food depends mainly on the amount of water it contains. The higher the water content the lower density the food has. Fruits and vegetables ( fruits and vegetables) have a high water content (Scherz and Senser, 1994) and therefore are low energy-dense foods and suitable for body weight management. We will do a literature review on fruits and vegetables consumption: health benefits, its role on overweight management, antecedents of consumption and finally we will name some interventions aimed at increasing consumption.

Fruits and vegetables consumption has been related to the prevention of several diseases. fruits and vegetables intake may be inversely associated with diabetes incidence particularly among women, (Ford and Mokdad, 2001). Carter et al. (2010) concluded that increasing daily intake of green leafy vegetables could significantly reduce the risk of type 2 diabetes. Cooper et al. (2012) conducted a European meta-analysis and were more specific pointing out that among fruits and vegetables subtypes, only green leafy vegetable (GLV) intake (relative risk: 0.84 (0.74–0.94)) was inversely associated with diabetes. Subtypes of vegetables, such as root vegetables or GLVs may be beneficial for the prevention of diabetes, while total fruits and vegetables may exert a weaker overall effect.

There is also a relationship between fruits and vegetables consumption and cancer (Riboli and Norat, 2003). Case-control studies, overall, support a significant reduction in the risk of cancers of the esophagus, lung, stomach, and colorectal associated with both fruits and vegetables; breast cancer is associated with vegetables but not with fruit; and bladder cancer is associated with fruit but not with vegetables. The overall relative risk estimated from cohort studies suggest a protective effect of both fruits and vegetables for most cancer sites considered, but the risk reduction is significant only for cancers of the lung and bladder and only for fruit (Riboli and Norat, 2003).

Coronary heart disease has also been related to fruits and vegetables consumption. A meta-analysis of cohort studies (He et al., 2007) found that consumption of fruits and vegetables has been shown to be associated with a reduced risk of coronary heart disease (CHD) in many epidemiological studies. The authors reviewed twelve studies, consisting of

13 independent cohorts. There were 278,459 individuals (9143 CHD events) with a median follow-up of 11 years. Compared with individuals who had less than 3 servings/day of fruits and vegetables, the pooled relative risk of CHD was 0.93 for those with 3–5 servings/day and 0.83 for those with more than 5 servings/day. Subgroup analysis showed that both fruits and vegetables had a significant protective effect on CHD. The meta-analysis demonstrates that increased consumption of fruits and vegetables is related to a reduction in CHD risk. The authors posit that results provide strong support for the recommendations to consume more than 5 servings/day of fruits and vegetables.

Boeing et al. (2012) performed a critical review to assess the role of fruits and vegetables in the prevention of chronic diseases. They found that for hypertension, CHD, and stroke, there is convincing evidence that increasing the consumption of fruits and vegetables reduces the risk of disease. There is probable evidence that the risk of cancer, in general, is inversely associated with the consumption of fruits and vegetables. In addition, there is possible evidence that an increased consumption of fruits and vegetables may prevent body weight gain. As overweight is the most important risk factor for type 2 diabetes mellitus, an increased consumption of fruits and vegetables therefore, may indirectly reduce the incidence of type 2 diabetes mellitus. Independent of overweight, there is probable evidence that there is no influence of increased consumption on the risk of type 2 diabetes mellitus. There is probable evidence that increasing the consumption of fruits and vegetables lowers the risk of certain eye diseases, dementia and the risk of osteoporosis. Likewise, current data on asthma, COPD, and RA indicate that an increase in fruits and vegetables consumption may contribute to the prevention of these diseases.

Recently, Wang et al. (2014) accomplished systematic review and dose-response meta-analysis of prospective cohort studies related to fruit and vegetable consumption and mortality from all causes, cardiovascular disease, and cancer. Sixteen prospective cohort studies were eligible in their meta-analysis. Their results showed that during follow-up periods ranging from 4.6 to 26 years there were 56,423 deaths (11,512 from cardiovascular disease and 16,817 from cancer) among 833,234 participants. Higher consumption of fruits and vegetables was significantly associated with a lower risk of all-cause mortality. Pooled hazard ratios of all-cause mortality were 0.94 for fruit, and 0.95 for vegetables. There was a threshold around five servings of fruits and vegetables a day, after which, the risk of all-cause mortality did not reduce further. A significant inverse association was observed for cardiovascular mortality while higher consumption of fruits

and vegetables was not appreciably associated with risk of cancer mortality. In conclusion, all researches agree in stating that the consumption of fruits and vegetables is a key condition to improve health and to avoid several diseases.

Fruit and vegetables (fruits and vegetables) can be useful for weight management as food groups, in general, with low energy density, have been proven to increase satiety with a lower calorie intake. This includes: eating foods like fruits and vegetables may help to control overweight (Rebello et al., 2013). In our study when we talk about fruits and vegetables we refer exclusively to solid fruit (i.e. not any kind of fruit juice) and not to starchy vegetables like potatoes. These differences are made due to the glycemic index (GI). The GI is a ranking of carbohydrates on a scale from 0 to 100 according to the extent to which they raise blood sugar levels after eating. Foods with a high GI are those which are rapidly digested and absorbed and result in marked fluctuations in blood sugar levels. Low-GI foods, by virtue of their slow digestion and absorption, produce gradual rises in blood sugar and insulin levels, and have proven benefits for health (Foster-Powell et al., 2002). GI increases with the maturity of fruits, the ratio carbohydrates/protein and lowers with the amount of fiber. This is why juices can have a higher GI than the solid fruit, due to a reduced amount of fiber (Foster-Powell et al., 2002). Low GI diets are beneficial for weight control because they help control appetite and delay hunger. Diets on low-GI foods can prevent the most common diseases of affluence, such as coronary heart disease, diabetes and obesity (Jenkins et al., 2002).

Faith et al. (2006) found juice intake was correlated with overweight increase in high-risk children, whereas, parental offerings of whole fruits were associated with reduced adiposity gain. On the other hand, O'Neil and Nicklas (2008) in a review, found that there is no systematic association between consumption of fruit juice and overweight in children, but only for 100% juice. Patrick and Nicklas (2005) found similar results.

Kahn et al. (1997) found in a longitudinal research that weight gain was inversely associated with high vegetable consumption. Serdula et al. (1996) reported that normal weight women ate more fruits and vegetables; Kahn et al. (1997) found that higher vegetable intake was associated with a decrease in BMI and waist circumference over a 10-year follow-up among men and women; and Trudeau et al. (1998) reported that fruit intake was lower for women in the highest BMI category than for women in the other BMI categories. Lin and Morrison (2002) reported that higher body weight was associated with lower fruit consumption, surprisingly, the authors did not find a consistent relationship

between vegetable consumption and body mass index. Tohill et al. (2004) in a literature review, revealed that not all the studies find a significant inverse relationship between fruits and vegetables consumption and BMI. They argue that these can be due to methodological problems. All the studies that took into account the confounders factors reported an association between higher fruit and vegetable intake and lower body weight. Rolls et al. (2005) found that changing the energy density replacing high energy-dense foods with fruits and vegetables can be a good strategy for weight management. Slavin (2005) found in a literature review that dietary fiber intake prevents obesity. The addition of dietary fiber generally decreases food intake and, hence, body weight. The author suggests that dietary fiber can promote satiation, decreasing absorption of macronutrients, and altering secretion of gut hormones. Ledoux et al. (2010), in a review, found that experimental studies discovered increased fruits and vegetables consumption contributed to reduced adiposity among overweight or obese adults, but no association was shown among children. Longitudinal studies among overweight adults found greater fruits and vegetables consumption was associated with slower weight gain but only half of children, longitudinal studies found a significant inverse association. Miller et al. (2011) found a significant positive mother-child association for fruits and vegetables intake. Overweight/obese children consumed fewer fruits and vegetables than normal-weight children. Finally, Vanhala et al. (2011) found that normal-weight children and parents ate fruits and vegetables more frequently than overweight children. Parents' consumption of fruits and vegetables and child's preference for eating vegetables were positively associated with the child's fruits and vegetables consumption.

To summarize, increasing the diet share of low energy-foods like fruits and vegetables can be a positive strategy for weight management. Children are more likely to eat fruits and vegetables if their parents do .

#### **2.4.4. Summary of causes**

Different meta-analysis in different regions have found that nutrition, TV watching, physical activity and sleeping are related at a higher or lower degree with children overweight (Musaiger, 2011; Wijnhoven et al., 2015; Bammann et al. 2013). The causes are similar in many countries. A systematic review of published papers between 1990 and 2011 was carried out by Musaiger (2011) to explore the prevalence of overweight and obesity in the



Eastern Mediterranean Region (EMR). The author found that factors determining obesity in the region include nutrition transition, inactivity, urbanization, marital status, a shorter duration of breastfeeding, frequent snacking, skipping breakfast, a high intake of sugary beverages, an increase in the incidence of eating outside the home, long periods of time spent viewing television, immense marketing promotion of high fat foods, stunting, perceived body image, cultural elements and food subsidize policy.

In Europe, and using data from the IDEFICS baseline survey, Bammann et al. (2013) investigate the association between socioeconomic status (SES) and overweight children. The authors found that in five of the eight investigated regions (Belgium, Estonia, Germany, Spain and Sweden), the prevalence of overweight children followed an inverse SES gradient. In the other three regions (Cyprus, Hungary and Italy), no association between SES and overweight children was found.

Also in Europe, Wijnhoven et al. (2015) recently conducted a cross-sectional design to assess to what extent eight behavioral health risks related to breakfast and food consumption and five behavioral health risks related to physical activity, screen time and sleep duration are present among schoolchildren, to examine whether health-risk behaviors are associated with obesity. Their results show, that not having breakfast daily and spending screen time  $\geq 2$  h/d were clearly positively associated with obesity. The same was true for eating 'foods like pizza, French fries, hamburgers, sausages or meat pies'  $>3$  d/week and playing outside  $<1$  h/d. Surprisingly, other individual unhealthy eating activities or less favorable physical activity behaviors', showed either no or significant negative associations with obesity.

In conclusion, a certain degree of children overweight can be prevented with healthy behaviors. On the energy input side of the equation, some factors should be promoted (breast-feeding, having breakfast regularly and eating sufficient fruits and vegetables and others should be reduced or avoided (sugared-sweetened food and beverages and energy-dense foods like regular fast-foods). On the energy output side of the equation, children should move as much as possible, doing physical activity and refrain from viewing TV for more than 2 h/day. Children should definitely go to bed earlier in order to sleep longer. This behavior plays a role on both sides of the equation; it helps them to eat less and allows them to have more energy to perform physical activities.

All these child behaviors are performed in two main settings, out of home and at home. Out of home settings are the nation and region in which children live, if they live in a rural or urban area, the neighborhood, and the school. Children eat in this environment and physically interact with it. Davison and Birch (2001) explain this situation in their contextual model of childhood overweight. Within the home setting, children have their main models for life, firstly parents and secondly siblings. Parents will behave according to their socio economic status, educational level and cultural background. From the very beginning, the prenatal period, parents will feed the fetus, they will or will not breastfeed, they will buy and cook healthy or unhealthy foods, they will set rules for where and what to eat, how much TV/screens and sports are allowed, they will set limits and they will chose the schools to which their child will go. The way the parents behave may differ depending on the region/country in which they live. All these decisions will have an influence on the children's behaviors and therefore on the children's BMI.

## **2.5. Interventions to improve children's weight**

Interventions to improve the children overweight pandemic can be done at the settings in which the childhood overweight is caused. Doak et al. (2006) state that childhood overweight and obesity can have different causes or factors: International factors (e.g. more convenience foods and sedentary entertainment); national factors (e.g. education on health, law on vending machines or promoting bike transportation); community (e.g. safety of children, educational level of the community), and the three causes which are closer to the child: school, home and the individual itself.

A review on school based interventions was done by Doak et al. (2006) relating to children's' behaviors concerning diet or activities. The author found 68% of the interventions were 'effective' based on a statistically significant reduction in body mass index (BMI) or skin-folds for the intervention group. Some of the successful interventions targeted reductions in television viewing. Five studies showed different results by gender. Another intervention found a trend of increasing BMI in African American children but no such trend for Caucasian or Hispanic children (Webber et al., 1996). Both facts indicate a need for further tailoring of these interventions by gender and ethnicity. As Doak et al. (2006) say, although evidence suggests that eating behaviors are shaped by care-givers, few broad-based interventions target parents or the home environment. Golan and Crow (2004a) propose that future interventions need to address the psychological and

environmental influences of the home environment through education and active involvement of parents, even in a school-based intervention. Treatment studies show that family-based interventions, combining education with behavior modification are most successful (Golan and Crow, 2004b).

Interventions to prevent overweight children can be accomplished in any of the above settings but are mainly achieved at school and rarely at home (Doak et al., 2006). Interventions at home can have different targets: parents and/or children. However, several studies suggest that it is better to target parents alone. For example Golan et al. (1998) found that the treatment of childhood obesity with parents as the exclusive agents of change was superior to the conventional approach with children. Results were revalidated some years later (Golan and Crow, 2004b); the authors found that, also, in the long term, treatment of childhood obesity with the parents as the exclusive agents of change was superior to the conventional approach. Two years later Golan et al. (2006) confirmed again that omitting the obese child from active participation in the health-centered program may be beneficial for weight loss and for the promotion of a healthy lifestyle among overweight children. Similar results were also supported by Janicke et al. (2008) who claimed that a parent-only intervention may be a viable and effective alternative to family-based treatment of childhood overweight.

As affirmed by Golan and Crow (2004a) parents play a critical role in helping children to become well-adjusted adults; this includes minimizing problem behaviors and maximizing self-efficacy and emotional, personal, and cognitive development (Birch and Davison, 2001; Maccoby, 1983). But, parents can also serve as role models to shape children's habits (Harper and Sanders, 1975; Bandura, 1972). Golan and Crow (2004a) review the obesogenic factors in the modern environment and the potential role parents play in modifying these factors in children's weight-related problems: increase in physical activity, reduction in sedentary behaviors and healthy eating.

Parents, apart from being healthy behavioral models for children and establishing a healthy environment at home, can educate their offspring in different styles. Baumrind (1967) focused her research on the classification of parenting styles. She found what she considered to be the four basic elements that could help shape successful parenting: responsiveness vs. unresponsiveness and demanding vs. undemanding (Baumrind, 1967). She identified three initial parenting styles: Authoritative parenting, authoritarian parenting and permissive parenting. expanded upon Baumrind's three original parenting

styles including the neglectful parenting depending on the responsive/unresponsive and demanding/undemanding characteristics of the parental style (See Table 3). Parenting style may influence the effectiveness of parental child-rearing practices (Golan and Crow, 2004a).

**Table 3. Parental style. Maccoby and Martin (1983)**

	Demanding	Undemanding
Responsive	Authoritative	Indulgent
Unresponsive	Authoritarian	Neglectful

Some studies have been published on the relationship between parenting style and children’s behavior. Schmitz et al. (2002) found that girls who report that their mothers are responsive to their needs and rights, while setting clear expectations for behaviors (authoritative parenting style), in general, reported more physical activity and lower levels of sedentary behavior. Furthermore Gustafson and Rhodes (2006) found that there were significant correlations found between parental support and child physical activity level.

Related to children watching TV, Saelens et al. (2002) found that parents have a great influence on the TV children watch as it depends highly on the home environment created by parents. TV watching increased with the number of in-home TVs, the frequency of meal eating while watching TV, and the percentage of children with TVs in their bedroom. Furthermore they found that watching TV more than 2 h/day was a risk factor for higher weight. Thus, parents can play an important role to promote reducing children's weight by modifying TV access, particularly by decreasing the frequency of meals eaten while watching TV.

Parental rules, norms and parenting style can also play a key role on the sleeping hours of children. A key factor to determine the number of hours slept is the time the child goes to bed. The bed time is usually determined by the parents or the child or both depending on the parent-child relationship. Children with less sleep are more likely to be part of a family with a low educational level and have a greater chance of being heavy TV watchers and not being engaged in physical activities (Padez and Mourao, 2009).

As Benton (2004) summarizes, the role of parental behavior in the development of food preferences is fundamental because although food preferences are genetically determined for example, to like sweet and salty flavors and to dislike bitter and sour tastes (Rosenstein and Oster, 1988) children can learn to like or dislike new foods. Parental style is a critical factor in the development of food preferences. Children are more likely to eat in emotionally positive atmospheres (Koivisto et al., 1994). However, this parental task is not always easy. Food aversions can be learnt in one trial if consumption is followed by discomfort (Koivisto and Sjödén, 1996). There is a predisposition to learn to like foods with high-energy density (Birch and Fisher, 1997; Maes et al., 1997) and towards the second year of life, there is a tendency to avoid novel foods (Neophobia) but siblings, peers and parents can act as role models to encourage the tasting of novel foods (Jansen and Tenney, 2001; Birch, 1980). Furthermore, repeated exposure to initially disliked foods can breakdown resistance (Sullivan and Birch, 1990; Pliner, 1982). The offering of low-energy-dense foods allows the child to balance energy intake but restricting access to particular foods increases rather than decreases preference and forcing a child to eat a food will decrease the liking for that food (Lee et al., 2001).

In review, interventions to improve the status of overweight children must change the behaviors of children. The changes can be related to eating patterns, sedentary and active behaviors and sleeping time. There are several arenas to implement interventions but the most commonly used has been schools. However, the home environment should be an interesting setting to implement interventions as parents are an important target as they are a key role player in forming children's behaviors. In the next section we explain the theory that supports why parental attitudes are antecedents of parents behaviors, which in turn are determinants for children behavior.



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**CHAPTER 2**  
**FROM HEALTHY PARENTAL ATTITUDES**  
**TO CHILDREN'S BMI: SLEEPING, SCREENS**  
**AND NUTRITION**

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## 1. INTRODUCTION

Over 2000 million people are currently overweight or obese. Worldwide, the proportion of adults with a high body-mass index (BMI > of 25 kg/m<sup>2</sup>) increased more than 25% between 1980 and 2013 reaching 37% in men and 38% in women (Ng et al. 2014). The pandemic is also taking place in developing countries (Popkin et al., 2011). Adult overweight and obesity has a quite negative effect on physical health, emotional well-being, and self-esteem (Prost and Ai, 2015). Overweight and obesity impacts not only individuals but also healthcare systems costs, employers expenses, and the economy as a whole (Lehnert et al., 2013)

Although the medical, psychological and sociological literature correctly analyzes factors causing overweight based on the behavior of parents and children (Potter et al., 2015), there has been almost no empirical research relating parental attitudes to overweight children. We posit that this relationship exists and is mediated by the parents' behavior and the child's behavior. Thus, so far, there is little guidance available on how this path is configured and the complex routes that contents. While, public policy actors must begin to understand how to account for and manage the message directed to parents in order to affect children's weight.

In this study, we analyze if parents' awareness and positive attitudes towards healthy habits are associated with normal-weight children. The term parenting refers to a complex set of parents' behaviors, duties, roles, expectations, cognitions and emotions related to caring, raising and educating their child (Sadeh et al., 2010). In order to build the path from parents attitudes to children's behavior, we based our research on The Theory of Planned Behavior (TPB) (Ajzen, 1985), which proposes that intention and perceived behavioral control (PBC) are the most proximal determinants of behavior.

The TPB explains how attitudes, beliefs and perceptions can shape behavior. The theory states that the aforementioned three points are the main antecedents to behavioral intention, the best predictor of actual behavior (Ajzen, 1991). Attitude refers to the individual's evaluation of a given behavior as favorable or unfavorable and formed based on the individual's beliefs about the outcomes of behavior and their evaluations of those outcomes (Ajzen, 1991). The subjective norms are the individual's perception of social pressures to perform or not such behavior. Finally, the perceived behavioral control is the individual's perceived ease or difficulty in performing the particular behavior.

In this study, we build a framework of parents' attitudes, parents' behavior and children's behavior to better understanding how children's weight is formed. Then, drawing on the TPB (Ajzen, 1991), a model of the antecedents of BMI is developed and tested. We believe that children will perform a particular healthy weight behavior, (e.g. sleeping enough, playing sports or eating vegetables) due to the influence of several factors. Firstly, their own attitude towards the behavior (i.e. if they like the activity). Secondly, the perceived pressure from the environment (i.e. if the child thinks his parents want him to do a certain behavior). Thirdly, the child behavior will also be based on his perception of how easy he will get away with doing what is, not necessarily correct, but in the short term tastier (e.g., eating junk food), easier (e.g. computer games) and more fun (e.g. going to bed late). As Ajzen (1991) proposed, all these situations are antecedents of behavioral intention which is the best predictor of actual behavior.

Although the predictive utility of the TPB (Ajzen, 1985) has been well established, there are relatively few studies that manipulate the cognitions specified in the model in order to assess whether changes in the supposed predictors of behavior do in fact lead to behavior change (Kothe et al., 2012). While a number of studies have successfully changed behavior using interventions modeled on the TPB (for a review see: Hardeman et al., 2002) – few studies have investigated the extent to which change in behavior occurs through theorized pathways (Hardeman et al., 2002; Armitage and Conner, 2001). Researchers have specifically called for studies that explore the mediation of behavioral change outcomes by specific cognition changes (Michie and Abraham, 2004).

Our core thesis is that parental attitudes have a direct influence on a child's BMI through their impact on the parents and children's behavior. More than this, there is a triple path: sleeping, the use of electronic devices and nutrition. Each of the paths has three stages: Parental attitudes towards the behavior, actual parental behavior and finally, children's behavior in each of the concepts. The behavior of children will ultimately define their BMI.

This study contributes to the academic literature testing an overall framework of the effect of parental attitudes toward child behavior using a structural equation model to contrast the hypotheses; we address this issue with a study based on a survey using a self-report questionnaire to 908 parents of children aged between 6-14 years old (primary school).

A positive parental attitude toward healthy behaviors can lead to parents' healthier behaviors. Parents through modeling (Bandura, 1972) can have a great influence on their children's healthy habits and therefore on their healthy weight. This study is of great importance because if the path way is significant it will mean that we might increase the rate of normal-weight children by increasing healthy parental attitudes.

In the following sections, we present a conceptual framework of antecedents of children's weight. We draw on extant research in medicine, psychology, consumer behavior and overweight literature to elaborate on the theory of planned behavior (Ajzen, 1985). We then, articulate our framework that offers propositions regarding the triple path: from sleeping, screen and nutrition to children's weight. Next, we present an empirical study where we test our model and conclude with a discussion of the theoretical and managerial implications of our findings.

## **2. LITERATURE REVIEW AND HYPOTHESES**

Modern societies need to fight this costly social scourge because it is better to prevent pandemics than to cure them. Research has shown that adult obesity usually starts by being overweight as a child (Reilly and Kelly, 2011; Dietz, 1998; Charney et al., 1976).

Overweight children not only have a higher risk of becoming overweight adults, they also face a number of health, social, and psychological problems at this young age. (Brixval et al., 2012; Erhart et al., 2012; Ottova et al., 2012; Dietz, 1998). Now, over 30% of American school-aged children are overweight or obese (Wang et al., 2013). Being aware of the problem, the WHO (WHO, 2015) has developed a Global Strategy on Diet, Physical Activity and Health and a plan to better inform and develop a comprehensive response to childhood obesity, establishing the High Commission on Ending Childhood Obesity (ECHO).

Most authors affirm that the overweight children rate is still growing. An exception to this opinion is the research of Olds et al. (2011). They infer, from their literature review, that the rise in the prevalence has slowed appreciably, or even stabilized. Even if this is true, it means that the overweight children rate is not decreasing, which is the final goal. Thus, significant health interventions are needed to solve this public health crisis. As Cameron (2009) states health interventions can be more efficient if they are theory based and address the right causes of the health problem. If the health problem is caused by the sufferer's behaviors, the researcher must understand the individual attitudes and intentions to modify those behaviors. However, as seen in the TPB, to change someone's behavior, changing the environment is also important. In the case

of children, parents will play a key role to change their behaviors (Golan and Crow, 2004).

### **2.1. BMI as a measure of children overweight**

Adult and child overweight can be measured by different means. We will use the BMI with the WHO (2015) cutoff points to classify adult individuals (over 18 years old) as overweight (BMI.>25) or obese (BMI.>30) regardless of their age, gender or ethnicity (Chan and Woo, 2010). BMI is simplistic compared to other body fat measuring methods (e.g. waist circumference, skin fold, bioelectrical impedance, etc.) and it is also practical, easy to perform, widely accepted in the literature and validated by the WHO.

The cutoff points in terms of BMI are not as simple in children as they are in adults. They have to be marked in a table depending on the age and gender of the child up to the age of 18 years old. There are several tables but the most commonly accepted are those developed by Cole et al. (2000) in an international survey across 6 different countries. Their results were only slightly revised in 2012 (Cole and Lobstein, 2012). The World Obesity Federation (former IOTF) which represents professional members of the scientific, medical and research communities from over 50 regional and national obesity associations accepts these tables. Their mission is to lead and drive global efforts to reduce, prevent and treat obesity. We will use these tables (Cole et al., 2000) in our study to calculate the overweight child rate in the Region of Murcia and later, on the model, we will use the BMI moderated by age.

### **2.2. From parental attitudes to overweight children**

As predicted by the TPB (Ajzen, 1985) parental behavior is anteceded by parental attitudes. Parents are a great influence for children when choosing healthy behaviors. When describing the child's behavior using the TPB parents would play a role on the subjective norms. Children would have normative beliefs about what their parents expect from them and would be motivated or not to comply with them. Children can behave according to what they see at home (modeling) to what they have (availability and accessibility) and what is expected from them to do; family rules. In this section, we will describe parental attitudes and behaviors leading to the children's behavior.

#### ***Parental attitudes***

The individual and social dimensions of overweight have received extensive attention in research literature analyzing the determinants (Monasta et al., 2010; McCrory et al.,

2000) and consequences (Prost and Ai, 2015; Wyatt et al., 2006; Carr and Friedman, 2005) of overweight in both adults and children. The term attitude is used to refer to a person's overall evaluation of people, objects, and issues (Fishbein and Raven, 1962). Thus, one's attitude refers to how favorably or unfavorably someone views some object of judgment such as "eating vegetables", "physical activity", or "sleeping long". These global evaluations can vary in a large number of ways in addition to their extremity such as whether they are based on emotions (e.g., "eating vegetables makes me sick"), beliefs (e.g., "playing sports promotes injuries"), or past experiences and behaviors (e.g., "I am exhausted of telling my kids to go to bed early"); (Albarracin et al., 2014; Zanna and Rempel, 1988; Breckler, 1984). They can also vary depending on whether they are internally consistent (e.g., being associated largely with positive feelings, attributes, and behaviors) or ambivalent (e.g., composed of a combination of positive and negative attributes)(Kaplan, 1972).

A large number of studies and reviews provide support for the utility of the TPB model in the prediction of behavior (Armitage and Conner, 2001; Godin and Kok, 1996). In their meta-analytic review of psychosocial predictors of fruit and vegetable intake, Guillaumie et al. (2010) argued that the TPB is the most strongly supported model of intention and behavior and therefore there is sound justification for the use of the model in interventions designed to increase intake of fruit and vegetables.

### ***Parental behavior***

Humans, as mammals, are born helpless, being unable to survive without the parental breast-feeding and subsequent education to survive in nature or society. A big part of human knowledge is not innate; it is learned from parents or from the environment. Parents feed, nurture, teach, socialize, model, control and give their children advice and tips to optimize their future chances of survival. This learning process can be shorter or longer depending on several sociocultural factors.

A parent taking care of children is not just human nature, in many countries parents are legally responsible for feeding, nurturing, taking care of and providing education to their children until their age of majority. During this period, all the choices that parents make can have a future influence on their child's health and habits. Choices such as parental age of conception (Gavrilov and Gavrilova, 1997), smoking while pregnant (Oken et al., 2008; Fingerhut et al., 1990), alcohol drinking while pregnant (Flak et al., 2014), breastfeeding or not (M'Rabet et al., 2008), if they prepare or not a healthy breakfast (Chitra and Reddy, 2007) or whether parents let their child eat lunch at school or at home (Briefel et al., 2009). Parents are responsible for buying foods, cooking them and

the availability of healthy foods at home. Parents can establish a set of family rules regarding several child behaviors like fussy eating; candy eating, fast-food frequency, TV viewing time, bedtime and setting the consequences (i.e. punishment) of not following the established rules.

All these behaviors can have an influence on their children's weight (Golan and Crow, 2004). Parenting practices, such as pressure, restriction, modeling and availability have an influence on child eating habits (Ventura and Birch, 2008). Parents should be responsible to implement feeding strategies that are responsive to children's hunger and satiety cues which help child to self-regulation (Savage et al., 2007). These strategies are not always obvious. For example, pressure can have a negative effect on children's affective responses to, and intake of healthy foods (Galloway et al., 2006). Additionally, parental agreement (mother and father) has been found to be related to effective parenting (Deal et al., 1989). Finally, when parents are divorced or separated and they cooperate to raise their children they perform co-parenting. It has been found that co-parenting is an important issue for the psychological adjustment of children (Teubert and Pinquart, 2010).

To summarize, parents are the great influencers for children (Davis-Kean, 2005). They breed their offspring by feeding, educating and entertaining them. Their degree of awareness and their level of concern and commitment towards healthy habits have a strong influence on their own behavior and, also, a positive influence through modeling on their children's healthy habits (Scaglioni, 2008; Brown and Ogden, 2004) .

### ***Parenting styles***

Parents can approach all these processes with different styles. Maccoby and Martin 1983 following the work of Baumrind (1967) defined four types of parenting: Authoritative, authoritarian, permissive and neglectful parenting depending on the responsive/unresponsive and demanding/undemanding. As Golan and Crow (2004a) state, parenting style may influence the effectiveness of parental child-rearing practices.

The beneficial effects of authoritative parenting (parents that are at the same time responsive and demanding) have been proven in many child-rearing fields from their own involvement with child issues to the child/adolescent school performance and to healthy behaviors (Arredondo et al., 2006; Darling and Steinberg, 1993; Dornbusch et al., 1987). Sleddens et al. (2011) analyze how these specific types of parental influences affect children's weight-related health outcomes. Results suggest that



children raised in authoritative homes ate more healthily, were more physically active and had lower BMI levels, compared to children who were raised with other styles (authoritarian, permissive/indulgent, uninvolved/ neglectful).

Peers are also important shaping other child attitudes, like those related to eating behaviors (Lowe et al., 2004; Oliver and Thelen, 1997). Finally, teachers can play a part increasing kids' awareness towards new healthy behaviors (Hendy and Raudenbush, 2000) but can have less influence than parents as they are rarely present at the crucial time of eating and playing. The influence of parents, peers and teachers is fundamental, as most children, regardless of their education, are not mature enough to determine how much junk food is enough or how many hours of TV per day they can watch. They are neither mature to know the importance of a healthy weight nor to fully realize the relationship between food, physical activity and weight. Children, rather than evaluate and decide behaviors they imitate adults (Bandura, 1972) and decide to follow or ignore rules (Laupa, 1990). Moreover, the parent-child relationship is hierarchical, normally the parent commands and the child chooses to obey, ignore or rebel the order, while some parents prefer to negotiate others prefer to impose instructions. According to TPB (Ajzen, 1985) we predict that children should perform a particular healthy weight behavior, (e.g. Eating vegetables, playing sports or sleeping enough) firstly, depending on their own attitude towards the behavior. Secondly, the child behavior will depend on the perceived pressure from the environment (e.g. parents, friends and teachers). The third determinant will be the child's perception of how easy it can be to get away with doing what is not correct but is short term tastier (e.g., eating junk food), easier (e.g. screen games) and more fun (e.g. going to bed late). A positive parental and child attitude towards healthy behavior can lead to healthier behavioral intention and subsequently to a healthier actual behavior, which can increase the percentage of normal-weight children.

### **2.3 Overweight children antecedents. Sleep, screens and feeding. Hypotheses**

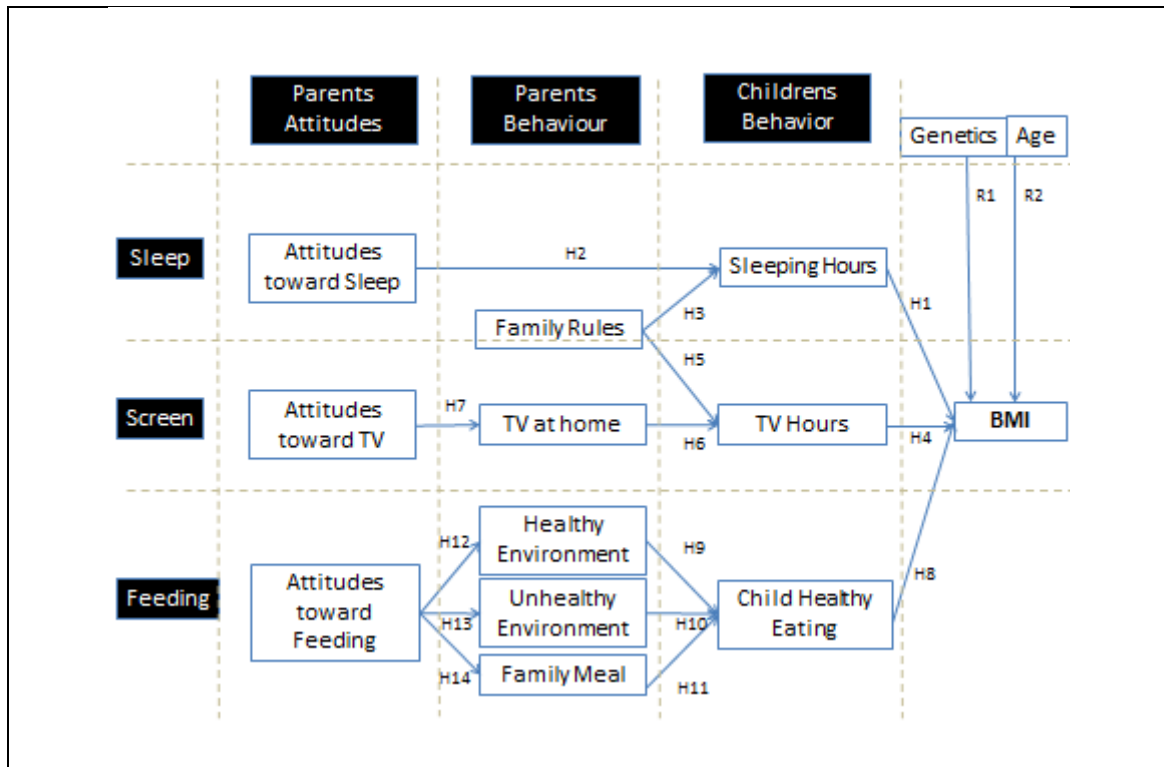
An area of emerging research focuses on the role of parents in the prevention of overweight inducing healthy behaviors to their children (Sleddens et al., 2011; Doak et al., 2006; Golan and Crow, 2004). Parents not only provide genes that have an influence on child BMI (Wardle et al., 2008; Stunkard et al., 1990) they also manage environments for children that may prevent the development of overweight (Rhee, 2008). A home healthy environment fosters a child's health and well-being with engaged and skillful parents that models, values, and encourages sensible eating habits and a physically active lifestyle. By promoting certain values and attitudes, by rewarding or reinforcing specific behaviors, and by serving as role models, parents can have a profound influence on their children being a normal weight (Koplan et al., 2005).

Many of the studies that address the overweight children problem focus on the influence of parental feeding styles (Clark et al., 2007; Birch and Fisher, 1998) and/or attitudes towards physical activity (Trost et al., 2003) and rules regarding TV viewing (Barradas et al., 2007) and bedtime (Golley et al., 2013). In our study, we build a framework of parents' attitudes, parents' behavior and children's behavior to better understand how the children's weight is formed. Then, drawing on the Theory of Planned Behavior (Ajzen, 1985) we develop and test a model of a child's weight antecedents (Figure 1).

Childhood overweight has many antecedents in several settings. In this study, we will not address the international, national, local or school factors as causes of overweight children. We will focus on all those child behaviors performed at home and influenced by parents. A parent has a great influence on children's behavior, but, obviously, it is at home where they can handle the greater degree of control over the child's behavior.

Most children sleep most of the time at home (unless they are in a boarding school). Much of the TV viewing is done also at home, and not so much for other electronic devices like cellular phones. Finally, most children eat breakfast and dinner at home and lunch can be eaten at home or at school depending on the school schedule, school distance from home, culture, etc. Snacking, especially during weekdays is also done at home but can be done at school and it depends on the school policies toward canteen menus and vending machines.

**Figure 1. Model proposed**



If the child takes food to school from home that is also a variable that can be controlled by parents. For all these behaviors, parents can have a high degree of control, especially for those that are performed at the home setting.

The complexity of each of these child behaviors, sleeping, screen watching and nutrition differs largely. While controlling sleeping time is fairly simple, controlling TV watching is less so, electronic devices like cellular phones are complicated and nutrition is extremely complex. On the other hand, any child could possibly live without electronic devices but not without sleeping or eating. In the following sections, we will describe each of the three chosen paths to child BMI (taking into account child age and parental genetics): Sleep path, screen path and the feeding path. Each path will have the same dependent variable; child BMI. Additionally each path has an independent variable; parental attitudes toward the behavior and two-mediator variables parental behavior and child behavior.

### **2.3.1. The sleep path**

Sleeping has two dimensions that affect child weight: quantity and quality. Long time sleeping and high quality sleep promote a healthy weight (Matricciani et al., 2012). Previous studies indicate that sleep deprivation results in changes in levels of several hormones including leptin, ghrelin, insulin, cortisol, and growth hormone (Spiegel et al., 2004; Taheri et al., 2004). These hormonal changes may contribute to energy imbalance and then lead to overweight or obesity (Chen et al., 2008). Recently, there has been an increase of research suggesting a link between shortage in sleep and overweight in children, adolescents and adults (Chen et al., 2008; Taheri et al., 2004). Several epidemiological studies have established the association between shortage in sleep and overweight in children and adolescents. However, according to a meta-analysis (Chen et al., 2008) just a few interventions have been done to increase sleep among children as a way to prevent childhood overweight. Even small changes in the energy balance are beneficial (Taheri, 2006).

Sleep problems in children are very common and can affect both children and parents. The common problems are bedtime resistance, delayed sleep onset and frequent night waking (Davis et al., 2004). Galland and Mitchell (2010) review summarizes practices and intervention options to improve sleep quality in healthy children. Children may benefit from good sleep hygiene practices, which include a consistent routine for bed and consistent bedtime, a quiet darkened and warm bedroom, a consistent wake time and daytime exercise. Light suppresses melatonin (hormone related to sleeping) secretion in humans (Lewy et al., 1980). Exposure to light from self-luminous displays, like tablets and cell phones, may be linked to increased risk for sleep disorders because these devices emit optical radiation at short wavelengths, close to the peak sensitivity of melatonin suppression (Wood et al., 2013). Summarizing, routines, silence and darkness help to improve sleep quality.

Sleep quantity is a problem that can be caused due to neglectful or unaware parents or to children's bedtime resistance. Sleeping hours is the difference between the waking up hour and the going to bed hour. The getting up time is set during weekdays due to the school starting time. Therefore, sleeping long hours depends mainly on the bedtime. Parents who want their children to sleep longer will have to make them go to bed earlier. For the sake of accomplishing this goal they have to come home as early as possible from work so that they can start doing all the routines established; homework, bathing, dinner, etc as soon as possible. If the environment is created, the early go to bed time goal can be accomplished. In order to create the environment

parents must have the possibility (e.g. being able to come early from work) and understand the need for the sleeping goal. Not all parents are aware of the importance of enough time allocated for children to sleep. Those parents who are aware of sleeping importance for their child will have positive attitudes towards their children sleeping long and will create the environment to accomplish this goal (Jenni and O'Connor, 2005).

Family rules are also important. In order to set a healthy sleeping environment, parents' positive attitudes towards sleeping are necessary but may not be enough. Both the mother and father need to reach an agreement on family rules that foster an early bedtime. Parents should explain to their children the importance of sleeping and try to enforce the early bedtime preferably with a parenting style that encourages children's social maturity. This style is linked to healthier sleep patterns (Spilsbury et al., 2005). Rules and nightly bedtime routines are important to reach sleep quality (wakefulness after sleep onset and sleep continuity) and quantity for infants and toddlers (Mindell et al., 2009). Nevertheless, Spilsbury et al. (2004) found that a sizeable proportion of elementary schoolchildren sleep less than the recommended 9 hours with cultural variables impacting sleep-related behavior in children. Race and socio-economic status (SES) have independent relationships with sleep behavior. Independent of SES, African-American children sleep less due to later bedtimes. (McLaughlin et al., 2005).

But, family systems are dynamic, with reciprocal interactions among family members, including interactions at night and during the day (Meltzer and Montgomery-Downs, 2011). When children have sleep problems, they often awaken a parent, affecting parent sleep and subsequent parent daytime functioning. Parent behaviors, which are shaped by parental cognitions and beliefs about sleep, as well as external stressors (e.g., work or marital problems), can also disrupt child sleep patterns. Thus, sleep among children cannot be understood in isolation, but rather it is important to view sleep from a family context.

Adam et al. (2007) found that stricter household rules fostered children and adolescents' good sleeping patterns. Furthermore, Buxton et al. (2015) stated that children generally have better sleeping habits in terms of quantity and quality in the presence of household rules and regular sleep-wake routines. Additionally they affirmed that, sufficient sleep quantity and adequate sleep quality are protected by well-established rules of sleep hygiene (limited caffeine and regular bedtime).

Following these arguments good sleeping practices could be part of the overweight prevention approach and we believe it should be contemplated into our integrative model and we suggest the following hypothesis:

*H1: There is a negative relationship between children sleeping hours and children BMI.*

*H2: There is a positive relationship between parents' attitudes toward sleep and child sleeping hours.*

*H3: There is a positive relationship between parental rules and child sleeping hours.*

### **2.3.2. The screen path.**

As we have seen in chapter 1, low physical activity or high sedentary behaviors (e.g. watching TV) produce low body energy consumption and therefore promote child overweight. (Gibson et al., 2004; Andersen et al., 1998). On the other hand, the time spent doing physical activities is negatively related to body fatness in children (Riddoch et al., 2004). However physical activity could be declining in many countries, especially in clearly defined contexts such as active transport, school physical education, and organized sports. Young people would like to be active but are often constrained by external factors such as school policy or curricula, parental rules in relation to safety and convenience, and physical environmental factors (Dollman et al., 2005). Several studies show that parents can promote children's physical activity by providing support and encouragement (Sallis et al., 1992). Furthermore, those parents who realize the importance of physical activity may offer even greater support. That support can take many forms: arranging access to after-school or community sports and activity programs, watching children's activities, or simply playing with their children (Lindsay et al., 2006). Despite the importance of being active, research shows that general American population spends the majority of their time in behaviors that consume very little energy. Overall, participants in a research performed by Matthews et al. (2008) spent 55% of their monitored time in sedentary behaviors. These results can be similar to those found in Spain by Laguna Nieto et al. (2011).

To make it worse, sedentary leisure options have raised in the last decades. We know for long that watching TV promotes children overweight (Danner, 2008; Hancox et al., 2005; Andersen et al., 1998; Dietz and Gortmaker, 1985), a TV in the child bedroom is an antecedent of child weight (Dennison et al., 2002). Viewing TV is harmful not only

for being a sedentary activity but also due to advertising of obesogenic food (Robinson, 1999; Francis et al., 2003). The relationship between physical activity and TV viewing and BMI starts as soon as of 3–4 years old. Physical activity (negatively associated) and TV viewing (positively associated) becoming stronger predictors as the children aged (Jago et al., 2005).

Availability of children TV shows has changed in the last decades. It has gone from TV broadcasting only in the afternoon, just some years ago, to the present countless 24h children channels. In addition to the TV offering increase, we have now a wide array of recreational screens: Nintendo, DS, PlayStation, PC, Smartphones, tablets, and a long etc. All these screens are at the hand of children. Common sense tells us that these artifact activities have at least three characteristics in common: they are very attractive to kids, they are convenient to parents as children are kept occupied and do not mess around, and finally they are usually sedentary activities and therefore promote overweight. Therefore, it is not surprising that sedentary behaviors and overweight tend to rise within families. Opportunities for spontaneous play may be the only requirement that young children need to increase their physical activity. Reducing the amount of time that children are allowed to watch television is one strategy that offers children opportunities for physical activity, and it is likely to reduce their requests for advertised foods as well (Francis et al., 2003). In our opinion these are not novel approaches; a generation ago, because there were few alternatives, these children active playing practices were the norm. In view of the rapid increase in the prevalence of overweight and its implications for chronic disease, a return to basics seems to be essential.

Although the evidence is not always consistent, especially concerning time with the computer, some authors have established that screen behaviors are risk potential behaviors, since they contribute to less participation in physical activities, such as active play (Brug et al., 2012; Marshall and Biddle, 2004). However, physical activity as well as TV and screen playing consumption at home are conditioned by the parents' attitudes towards healthy habits (Francis et al., 2003). Several studies found strong correlations between the prevalence of overweight and number of hours that youth spend watching TV (Biddle et al., 2009; Thomson et al., 2008; Francis et al., 2003).

Children who lived in a family with tight rules governing TV viewing time, or who never watched TV during dinner, or had only one TV in the household or had no TV in their bedroom had significantly less TV time than their counterparts (van Zutphen et al., 2007). Ramirez et al. (2011) found similar results for adolescents. Having clear rules, setting limits on screen time, and not having screen-based media in the bedroom were

associated with fewer hours of screen time. Springer et al. (2010) conclude that parental TV limits is an efficient strategy for reducing children's television watching. Sisson et al. (2011) agree on the importance of parental rules to control children TV viewing. So far, the majority of campaigns to increase physical activity have focused the communication emphasis on promoting physical activities but just a few interventions intend to reduce sedentary activities (Branscum and Sharma, 2012).

TV viewing time may be a robust marker of a sedentary lifestyle in women but not as much in men (Sugiyama et al., 2008). The total amount of time per day engaged in sedentary behavior is inevitably prohibitive of physical activity (Marshall et al., 2004). Furthermore research demonstrates that reducing sedentary behaviors in children increases physical activity (Epstein and Roemmich, 2001).

Other research focuses on the independent negative effects of low physical activity and high sedentary activity. Evidence in adults suggests that sitting time has deleterious cardiovascular and metabolic effects that are independent of whether adults meet physical activity guidelines (Hamilton et al., 2008). Thus, preventive action against metabolic risk in children may need to target TV viewing and physical activity separately. (Ekelund et al., 2006)

Therefore, drawing on the literature review, we can affirm that both behaviors, low physical activity and sedentary behaviors are deleterious in term of healthy weight. Both behaviors are substitutive; we cannot perform a sedentary and active behavior at the same time. Thus, the less time we watch TV, the more chances we have to develop an active behavior. In terms of contributions to health both are interesting behaviors independently, increasing physical activity and reducing sedentary behaviors like viewing TV.

Physical activity embraces a large number of activities that range from biking to school to playing in the school ground to more formal sport activities. In order to increase the parsimony of the model we have chosen to include sedentary behaviors but not physical activity. Among different sedentary behaviors, we have chosen TV watching which, despite the new screen devices appeared in the last years, keeps being the leader in time allocated for sedentary entertainment. TV watching, contrary to other devices like smartphones, occurs mainly at home and parents can easily estimate time allocated.

We can then infer that children BMI will be higher if the child spends long hours in front of the TV set. The amount of child TV watching hours will depend on the TV at home



environment. That is, on the number of TV sets at home and if the family watches TV while dining. TV set availability can increase consumption chances and certainly difficulties possibilities of parental control. Parental rules will play a key role. The stricter the parents are the lower amount of TV the child will see. Finally, we propose that the positive or negative parental attitudes towards TV will certainly determine the number of TV environment at home. Parents which have a positive attitude towards TV viewing will have more TV sets and home, will probably allow their children to have a TV set at their bedroom and will not have very strict rules concerning TV watching time. Therefore, we posit:

*H4: There is a positive relationship between children TV hours and children BMI.*

*H5: There is a negative relationship between family rules and TV hours.*

*H6: There is a positive relationship between TV environment at home and children TV hours.*

*H7: There is a positive relationship between parents' attitudes toward TV and TV environment at home*

### **2.3.3. The feeding path**

There is evidence concerning that at least part of the children overweight problem may lie in the need to increase body energy consumption through physical activity, although, on the other side of the energy equation, reducing excessive energy intake, is also very important to maintain a healthy weight (Riddoch et al., 2004).

As Lobstein and Davies (2008) propose healthy eating is about eating the right things (e.g. vegetables), at the right moment in (e.g. breakfast), the right amount (i.e. small amounts) and at the right speed (i.e. slow eating, Otsuka et al. 2006). Furthermore, breast feeding (Yang and Huffman, 2013) and breakfast eating (with ambiguous results) can help to avoid children overweight (Rampersaud et al., 2005). Therefore, healthy eating can be as important to children overweight prevention as sleeping well, having a physical active life and reducing sedentary behaviors. Healthy nutrition is the third path to adequate children BMI. Child healthy eating in our model is defined by the actual children behaviors related not to when they eat (breakfast) or how they eat, (slow or fast) but about what they eat and what quantity or frequency.

Controlling the energy density of foods is also important to weight manage. Reducing high energy-dense food is recommended to control weight. This can be done mainly by reducing the amount of sugared products (e.g. candy, biscuits, cakes and sugared sweetened beverages) and high fat products (e.g. traditional fast-food, French fries, hamburgers and sausages). The effect on overweight of sugars is higher from liquid sources than from solid sources (Wang et al., 2015). This might be the reason why while all researchers agree on the negative consequences of sugared-sweetened beverages (SSB) the results for candy, biscuits and cakes on children overweight are ambivalent. For this reason, we introduced the concept of SSB in our model as an unhealthy item. Additionally most of the studies in the literature review agree that fast-food increase overweight (Bowman et al., 2004), They also consent that children whose home and/or school is placed close to a fast-food restaurant have more chances of being overweight (Currie et al., 2009). As fast food in Spain is mainly consumed out of home, we have not considered this food in our model that is based only in at home behaviors.

Increasing low energy-dense food is also recommended to control weight. This can be done by increasing the percentage of eaten meals made with foods that are high in water content (zero calories). Several studies (Swinburn et al., 2004; Shintani et al., 2001; Bell et al., 1998; Shintani et al., 1991) indicate that a diet rich in fruits and vegetables, whole grains and low-fat products help people to maintain a healthy weight while satiety and hunger are under control.

If the child eats has a diet that promotes low over high energy-dense food (e.g. a lot of FV consumption and few sugared drinks consumptions) we can affirm that the child is performing healthy eating and therefore has more chances of having a healthy weight.

As we have seen in chapter 1, the child home diet depends on availability and accessibility of healthy and unhealthy foods at home. Furthermore, parental modeling though eating patterns, following the TPB (Ajzen, 1985) has an important influence on child eating behaviors. Foods that the child can and cannot find at home and parental eating behaviors (healthy or unhealthy) will define different levels of healthy and unhealthy environment at home. These two environments will condition child healthy eating. Hammons and Fiese (2011) found that sharing 3 or more family mealtimes per week had multiple healthy eating benefits. We anticipate that family meals will be a third determinant for children healthy eating.

Based on the literature review and in all the previous considerations we believe that if the child eats healthy food he will have a healthy weight. The child will eat healthy food

if the food environment is rather healthy (in terms of availability and parent modeling) and if family meals are frequent and the child has an opportunity to try all foods. Therefore we propose the following hypothesis:

*H8: There is a negative relationship between children healthy eating at home and children BMI*

*H9: There is a positive relationship between healthy home food environment and child healthy eating at home.*

*H10: There is a negative relationship between unhealthy home food environment and children healthy eating at home.*

*H11: There is a positive relationship between family meals and child healthy eating at home.*

Attitudes are a main antecedent of behavior (Ajzen, 1985). If parents have positive attitudes toward feeding their children, it means that this is an important behavior for them. Parents may subsequently try to provide their children with a healthy home environment in terms of food availability and modeling. Furthermore, if feeding is important to them they will probably promote family meals to assure their offspring is well fed. Therefore we posit the following hypothesis:

*H12: There is a positive relationship between parental attitudes toward feeding and healthy home food environment.*

*H13: There is a negative relationship between parental attitudes toward feeding and unhealthy home food environment.*

*H14: There is a positive relationship between parental attitudes toward feeding and family meals*

### **3. METHODOLOGY**

#### **3.1. Design and subjects**

We used a survey to parents with a cross-sectional design. Respondents were parents of children attending primary school in the Region of Murcia, Spain. They had to respond about their-own attitudes and behaviors towards healthy habits and about their older child attending primary school behaviors (in terms of eating, TV watching and sleeping hours). Both parental as well as children weight and height were reported by

parents to calculate both BMIs. Descriptive statistics and structural equations modeling were performed in order to test the hypothesis. The subjects of the study were both the primary school children and the parent (mother or father) who usually takes care of this child.

### **3.2. Questionnaire design and scales**

The questionnaire was composed of five groups of questions: child behavior, parental behavior, parental attitudes the dependent variable: child BMI and finally, control variables (Table 1)

We measured two kinds of concepts: specific concepts, like how many hours does your child sleep (15' intervals) or view TV (30' intervals) per day or how many days per week he eats fruits (0-7, 8 point scales), and abstract constructs, like how important are family rules at your home or which are your attitudes toward feeding your child. For the latter concepts, we used scales found in related literature. For all the construct scales we used a 1-5 point Likert scale in order to be able to compare results with other researches that use the same rating. For other abstract concepts like child healthy eating at home, we made scales ad-hoc (Table 1).

Children behaviors were assessed using a 5-days week or a 7 days week depending on the behavior. We are aware that family functioning is not the same during weekdays that during weekends. To facilitate parental response, we asked parents to describe children sleep and TV behaviors from Monday to Friday. The children sleeping hours were assessed asking for the waking up hour and the going to bed hour. We are aware that the child might not be sleeping right after he goes to bed, but we believe it the best proxy and that the bias must be normally distributed.

Child TV hours was measured asking the number of hours the child watched TV during weekdays, proposing intervals of 30 minutes. Referring to children healthy eating, we asked about the number of days/per week the child consumed fruits, vegetables or sugared-beverages (reverse) in a 8-point scale from 0 to 7.

**Table 1. Questionnaire structure**

<b>INDEPENDENT VARIABLES</b>	
Child Behaviors	Sleeping hours TV hours Healthy eating
Parental Behaviors	Family rules TV at home Healthy home food environment Unhealthy home food environment Family meals
Parental Attitudes	Sleep TV Feeding
<b>DEPENDENT VARIABLES</b>	
	Child height Child weight
<b>CONTROL VARIABLES</b>	
	Child age Child gender
	Parental height Parental weight Parental gender Parental education

In order to understand parents' behavior at home, we used a scale to measure family rules based on the work of Adam et al. (2007). To measure if the parents fostered TV watching at home, we asked how many TV sets they had at home and if the family watched TV while dinning together. Thereafter, we propose three parental behaviors that will be antecedents of child healthy eating: healthy home eating environment, and unhealthy home eating environment and family meals. Healthy home eating environment (HEn) in our model includes two dimensions. Firstly, how available are healthy foods for children (focusing on low energy-dense foods, namely fruits and vegetables). Secondly, how often the parent models healthy behaviors like eating fruits or vegetables. Unhealthy home eating environment (UEn) had only one dimension, and with different items measuring how often the parent misleads the child performing an unhealthy eating behavior (e.g. high energy-dense foods, namely sugared drinks). We constructed the scales focusing in two aspects. Firstly, parent modeling based on Brown and Ogden (2004) work that's states that a positive parental role model may be a better method for improving a child's diet than attempts at dietary control. Secondly,

focusing on the importance of availability and accessibility of fruits and vegetables found by Hearn et al. (1998).

The last parental behavior measured was family meal (FM). It had two dimensions, weekly frequency of parents and children dining together and frequency of parent and children eating the same food with no special food for children. We measured frequency of family meals using a scale based on Hendy et al. (2009) work.

Finally, to test parental attitudes towards the children act of sleeping and watching TV we based our scales on the Bagozzi and Yi (1988) research related to attitudes measurement. Furthermore to determine parental attitudes toward feeding their children, we based our scale on the Child Feeding Questionnaire (Birch et al., 2001). The dependent variable; child BMI, was calculated based on the parents' reports of the child weight in kilograms and the child height in meters.

As control variables, we introduced child age, child gender, genetics (i.e. parental BMI), parental education and parental gender. We know from literature that the most accurate way to assess overweight in individual under 18 years old is to use BMI tables modulated by age and gender. In order to keep the model parsimony, we used just the BMI and adjusted it with child age and gender and parental BMI that can be used a proxy variable for genetics (Danielzik et al., 2002). Therefore, parents self-reported their height in meters, weight in kilograms, gender and education. We adjusted the model controlling for these variables.

Preliminary versions of the questionnaire were administered to a convenience sample of 28 parents. They had an open field to describe which questions were not understandable or ambiguous, some of them did remarkable commentaries. These pretest results were used to improve measures, design and structure for the questionnaire. The final measures and items are used are provided in table 2.

**Table 2. Scales**

ITEM	Scale type	Source
<b>CHILDREN BEHAVIOR</b>		
<b>Sleeping Hours (SH)</b>		
Number of hours per day that the child sleeps	15' intervals	
<b>TV Hours (TV)</b>		
Number of hours per day the child watches TV	30' intervals	
<b>Child Healthy Eating at Home (HE)</b>		
Days a week your child eats fruit at home	8-point scale	
Days a week your child dinners with vegetables		
Days a week your child drinks sugared soda		
<b>PARENTAL BEHAVIOR</b>		
<b>Family Rules (FR)</b>		
You require your child to keep his room clean and tidy	5-point Likert scale	(Bradley et al. 2001)
You have rules regarding bedtime		
You set certain limits on TV watching		
You enforce the rules you establish		
<b>TV environment at Home (TVH)</b>		
Your child has dinner while watching TV.	8-point scale Open	
Number of TV you have at home		
<b>Healthy Home Food Environment (HEn)</b>		
Days you have fruit available at home	8-point scale	Cullen et al. (2001)
Days you serve peeled fruit for dinner		
Days you eat fruit		
Days you eat vegetables		
<b>Unhealthy Home Food Environment (UEn)</b>		
Days you drink sugared sodas	8-point scale	Hendy et al. (2009)
Days you eat candy, chocolate or sweets		
Days you eat salty snacks; chips, peanuts 0.. etc.		
<b>Family Meal (FM)</b>		
Days you have dinner with your child	8-point scale	Hendy et al. (2009)
Days you r prepare your child a different food for dinner		
Days you serve your child a bit of each of the meals		
<b>PARENTAL ATTITUDES</b>		
<b>Attitudes Toward Sleep (AS)</b>		
Is healthy for my child to sleep a lot	5-point Likert Scale	Bagozzi & Yi (1988)
I like my child to sleep long		
<b>Attitudes Toward TV (AT)</b>		
I like my child to watch TV	5-point Likert Scale	Bagozzi & Yi (1988)
Watching TV is a healthy entertainment for my son		
<b>Attitudes Towards Feeding (AF)</b>		
I like to be responsible to feeding my child	5-point Likert Scale	Birch et al. (2001)
I like to decide if my child has taken the right foods		
I like to decide the size of the portions you take my child		
<b>DEPENDENT VARIABLE</b>		
Child BMI		
<b>CONTROL VARIABLES</b>		
Child gender		
Parent BMI		
Parent gender		
Parent education		

### **3.3. Procedure**

In April 2014 we contacted the General Director of the Educational Council of the Region of Murcia, and ask her to contact the principals of 21 schools that we had previously chosen to have random sample. We were targeting primary school children from first grade to sixth grade, approximately from 6 to 12 years old. The General Director accepted our proposal. We included schools from the four largest cities in the region (Murcia, Cartagena, Lorca and Molina de Segura) but also many other small towns. There was also variability in the size of the school from 120 students to more than 150. There were both public and private schools.

At the beginning of September 2014, an email was sent to all the schools principals explaining them our project and requiring their cooperation. Some days later, all the schools principals were visited or telephoned to directly explain the objective of the research and the procedure. All the principals contacted accepted to participate in the research.

In total we sent approximately 11,000 paper questionnaires, as many as students had the participating schools. The school principals handed them to each teacher who, in turn, handed them to their students. Children were told to take the questionnaire home and give it to their parents to fill it and bring it back to the teacher. One week later, more than 1500 hand written questionnaires were collected from the schools. They were classified removing erroneous or incomplete copies. 908 questionnaires were found valid and were processed.

## **4. RESULTS**

### **4.1. Sample description**

The database includes data related to 908 dyads parent/child. All the information about the parents, the children and the home environment was self-reported by one parent. Mothers outnumbered (83.4%) fathers (16.6%) in the sample. In this sample 39.5% of the parents had some kind of university degree. See Tables 3 and 4. The rate of overweight parents on the sample (BMI>25) was 35.1%. We found significant differences between males 55.6% and females 31.0% ( $p<.001$ ). We also found significant differences in the rate of BMI>25 between parents with a university degree (25.6%) and parents with lower education (41.3%) ( $p<.001$ ).



**Table 3. Sample description: Parent gender**

Gender	N	%
Males	151	16.6%
Females	757	83.4%
Total	908	10.0%

**Table 4. Sample description: Parent education**

Education	N	%
No studies	14	1.5%
Primary	133	14.6%
Vocational Training	165	18.2%
Secondary	168	18.5%
University	359	39.5%
No data	69	7.6%
Total	908	10.0%

The sample was almost equally distributed in terms of gender: 51.3% of girls and 48.75% of boys (Table 5). Age ranged from 6 to 12 years old (Table 6). Using the tables from the international standard definition for overweight (Cole et al., 2000), we found that 28.7% of the children at the sample were overweight or obese. There was no significant difference between boys and girls. Children with overweight parents had a higher rate of overweight (33.5%), compared to children with normal weight parents (26.1%) being the result significant ( $p < .05$ ). We also found less overweight children when the parents had university education (25.1%) than when the parents had not (31.1%) ( $p < .05$ ).

**Table 5. Sample description: Children gender**

Gender	N	%
Boys	442	49%
Girls	466	51%
Total	908	100%

**Table 6. Sample description: Children ages**

Age	N	%
6	99	11%
7	135	15%
8	134	15%
9	143	16%
10	186	20%
11	190	21%
12	21	2%
Total	908	100%

Some other interesting descriptive result from the sample were that the majority of the children were the elder at home (56%), while the second sibling at home were the 34% and only 10% were the 3<sup>rd</sup> or more child of the family. Just 19.2% of the children ate lunch at school and more than 80% go home to eat the noon meal. Referring to the TV home environment, only 1 home had no TV. 21% had one TV set, 43% had two and as many as 36% of the families had 3 or more TV sets at home.

The questionnaires were distributed closely resembling the proportion of the real populations of the cities: Murcia 43% (388); Cartagena 25% (232); Lorca 16% (143) and Molina de Segura 16% (145). See Table 7 for the real population distribution in the Region of Murcia and table 8 for the school/town sample distribution.

**Table 7. Real population distribution. (I.N.E.)**

Town	Population	N/Total
Murcia City	441 000	54%
Cartagena	217 000	27%
Lorca	93.000	11%
Molina de Segura	67 000	8%
Total Population	818 000	100%
Region of Murcia	1 488 000	

**Table 8. Sample school/town distribution**

School	N	N/Total	Town
CATÓLICO SAN VICENTE DE PAÚL	43		
DE PRACTICAS MARIA MAROTO	46		
LA FLOTA	30		
LOS ALAMOS	44		
NICOLÁS DE LAS PEÑAS	39		
NTRA. SRA. DE LA FUENSANTA	44		
SAN BUENAVENTURA	83		
SANTA MARIA DE GRACIA	59		
Subtotal	388	43%	Murcia
ANTONIO DE ULLOA	41		
GABRIELA MISTRAL	44		
SAN ANTONIO ABAD	36		
SAN JUAN BOSCO	61		
VIRGEN DEL CARMEN	50		
Subtotal	232	26%	Cartagena
ANDRES GARCIA SOLER	24		
DE PURIAS	29		
JOSE ROBLES	26		
JUAN GONZALEZ	27		
VIRGEN DE LAS HUERTAS	37		
Subtotal	143	16%	Lorca
LOS OLIVOS	48		
NTRA. SRA. DE FATIMA	44		
SAN ANTONIO	53		
Subtotal	145	16%	Molina de Segura
<b>Total</b>	<b>908</b>	<b>100%</b>	

#### 4.2. Scales reliability and validity

The models CFA and SEM, (Confirmatory Factor Analysis and Structural Equation Modeling) described below were run using LISREL 8.54 (Jöreskog et al., 2001). The multi-item scales were further evaluated through confirmatory factor analysis (CFA) using the maximum likelihood procedure. The goodness-of-fit statistics for the model were as follows:  $\chi^2$  (288)=915.01,  $p \approx .00$ , RMSEA=.051, SRMR=.054, NNFI=.84, CFI=.87. The results were satisfactory taking into account the high number of variables used in the model and the fact that we are using a big sample (Hair Jr. et al., 1986). As posit Babakus et al. (1987) and Anderson and Gerbing (1988), the value of the CFI must be taken with caution when the model includes a large number of variables, and /or a high number of degrees of freedom (216), which is the case of our model.

Reliability of the measures was confirmed with composite reliability index higher than the recommended level of .6 (Bagozzi and Yi, 1988), as shown in Table 3. Following the procedures suggested by (Fornell and Larcker, 1981), the scales showed acceptable convergent and discriminant validity. Convergent validity was assessed by verifying the significance of the t-values associated with the parameter estimates. All t-values were positive and significant ( $p < .01$ ). See Table 9.

**Table 9. Scales reliability**

ITEM	Mean	sd	$\lambda_{c.e}$ (t)	Reliability
<b>CHILDREN BEHAVIOR</b>				
<b>Sleeping Hours (SH)</b>				
Number of hours per day that the child sleeps	9.703	.598		
<b>TV Hours (THS)</b>				
Number of hours per day the child watches TV	2.016	1.031		
<b>Healthy Eating (HE)</b>				
Days a week your child eats fruit at home	5.038	2.000	.71*	CF= 0,78 AVE= 0,62
Days a week your child dinners with vegetables	3.284	2.070	.54*	
Days a week your child drinks sugared soda	5.757	1.584	.07 <sup>ns</sup>	
<b>PARENT BEHAVIOR</b>				
<b>Family Rules (FR)</b>				
You require your child to keep his room clean and tidy	4.429	.815	.64*	CF= 0,98 AVE= 0,92
You have rules regarding bedtime	4.555	.809	.61*	
You set certain limits on TV watching	4.231	.950	.60*	
You enforce the rules you establish	4.272	.799	.66*	
<b>TV at Home (TVH)</b>				
Days your child has dinner while watching TV.	1.741	.438	.36*	CF= 0,67 AVE= 0,50
Number of TV sets you have at home	2.277	1.001	.49*	
<b>Healthy Home Food Environment (HEn)</b>				
Days you have fruit available at home	6.432	1.266	.55*	CF= 0,88 AVE= 0,66
Days you serve peeled fruit for dinner	3.367	2.543	.36*	
Days you eat fruit	5.394	1.959	.69*	
Days you eat vegetables	5.380	1.733	.56*	
<b>Unhealthy Home Food Environment (UEn)</b>				
Days you drink sugared sodas	2.215	2.272	.43*	CF= 0,88 AVE= 0,71
Days you eat candy, chocolate or sweets	1.813	1.657	.62*	
Days you eat salty snacks; chips, peanuts 0.. etc.	1.708	1.443	.67*	
<b>Family Meal (FM)</b>				
Days you have dinner with your child	5.007	2.459	.19*	CF= 0,88 AVE= 0,72
Days you prepare your child a different food for dinner	6.136	1.646	.19*	
Days you serve your child a bit of each of the meals on the table	4.697	2.587	.50*	
<b>PARENTAL ATTITUDES</b>				
<b>Attitudes Toward Sleep (AS)</b>				
Is healthy for my child to sleep a lot	3.533	1.211	.83*	CF= 0,90 AVE= 0,82
I like my child to sleep long	3.259	1.173	.94*	
<b>Attitudes Toward TV (AT)</b>				
I like my child to watch TV	1.928	1.016	.26*	CF= 0,93 AVE= 0,85
Watching TV is a healthy entertainment for my child	1.984	.894	.54*	
<b>Attitudes Towards Feeding (AF)</b>				
I like to be responsible to feeding my child	4.606	.723	.68*	CF= 0,93 AVE= 0,87
I like to decide if my child has taken the right foods	4.548	.706	.77*	
I like to decide the size of the portions you take my child	2.560	1.237	.03 <sup>ns</sup>	
<b>DEPENDENT VARIABLE</b>				
Child BMI	17.809	2.936		
<b>CONTROL VARIABLES</b>				
Parent BMI	24.326	4.147		
Children Age	9.115	1.748		

The  $\Phi$ -matrix (correlations between constructs) is provided in table 10. As a first test of discriminant validity, we checked whether the correlations among the latent constructs were significantly less than one. Since none of the confidence intervals of the  $\Phi$ -values ( $\pm$ two standard errors) included the value of one (Bagozzi and Yi, 1988), this test provides evidence of discriminant validity. Secondly, for each pair of factors, we compared the  $\chi^2$ -value for a measurement model constraining their correlation to equal one, to a baseline measurement model without this constraint. A  $\chi^2$ -difference test was performed for each pair of factors (a total of 10 tests in all), and in every case resulted in a significant difference, again suggesting that all of the measures of constructs in the measurement model achieve discriminant validity. In summary, internal consistency and discriminant validity results enabled us to proceed to estimation of the structural model.

**Table10. Correlation matrix of constructs**

	HE	FR	TVH	HEn	UEn	FM	AS	AT
HE	1							
FR	.82	1						
TVH	.02	.02	1					
HEn	.63	.41	-.09	1				
UEn	-.25	-.10	.32	-.34	1			
FM	.19	.25	-.13	.35	-.12	1		
AS	.22	.23	-.23	.47	.09	.37	1	
AT	-.11	-.08	.18	-.08	.42	-.05	-.05	1
AF	.13	.10	.02	.10	.06	-.08	.02	.09

Potential method bias was empirically assessed post-hoc using Lindell and Whitney's (2001) marker variable technique (for an application of this procedure see Walker et al. 2015), where the smallest correlation in the correlation matrix is used as a conservative estimate of bias. As shown in table 10, the lowest correlation exists between parental attitude towards feeding and TV at home, .02. After making the prescribed adjustments to the correlations between the latent constructs, the significance of the adjusted correlations was assessed. All significant correlations shown in table 10 remained significant (at the .05 level) after the adjustment, providing evidence that common method bias was not present in the data.

To address the possibility of common method bias, the following precautions were used, as recommended by Podsakoff et al. (2003). First, predictor and criterion

variables were distanced as much as possible in the survey instrument by other instrument items not included in this study. Second, protection of respondent anonymity was asserted, as was the fact that there was no right or wrong answer. Third, scale items were constructed by carefully adapting, where possible, extant items from sources that have established reliability and validity. Additionally, items were refined through information obtained from subject interviews and through pilot testing, as discussed previously.

### 4.3. Model testing

Structural equations modeling (Jöreskog et al., 2001) was used to test the theoretical model depicted in figure 1. Results show that the model in table 12 fits the data well as evidenced by the goodness-of-fit measures:  $\chi^2(438) = 1526.1$  ( $p = 0,00$ ), RMSEA = .053, NNFI = .81, and CFI = .83.

All determinants, Sleeping hours (H1;  $b = -.08$ ,  $t = 2.62$ ), TV Hours (H4;  $b = .16$ ,  $t = 5.09$ ); and Healthy Eating (H8;  $b = -.08$ ,  $t = 2.04$ ), have direct and significant effects on children BMI. There are some variables that have a significant and direct effect on BMI as genetics (parent BMI) and children age, as literature on children nutrition suggested.

The main proposal of this study is to prove that parental attitudes and behaviors have an influence on child's behavior, and this has been confirmed by the results. Child BMI is influenced by the child sleeping hours which increase with the Family Rules (FR) (H3,  $b = .20$ ,  $t = 5.14$ ) and with parents' positive attitudes toward sleep (AS) (H4  $b = .00$ ,  $t = 2.91$ ). The time the child spends viewing TV decreases when the family rules (FR) increase (H5,  $b = -.10$ ,  $t = 2.62$ ). Additionally child TV hours increase with the TV environment at home (H6,  $b = .32$ ,  $t = 4.20$ ). In turn, the TV environment at home depends on the parental attitude toward TV (H7,  $b = .40$   $t = 3.82$ ).

Finally, the child will have more chances of performing healthy eating when the healthy home food environment rates higher (H9,  $b = .76$ ,  $t = 1.73$ ) and when the construct family meal is also high (H11  $b = .31$ ,  $t = 2.95$ ). However, the unhealthy home food environment construct has a reverse effect on child healthy eating, but contrary to our expectations the effect is not significant (H10,  $b = -.05$ ,  $t = 1.10$ ) and H10 is not confirmed. The parents attitudes toward feeding have a direct effect on these three variables: a positive effect on healthy home food environment (H12  $b = .26$ ,  $t = 5.16$ ), a negative effect on unhealthy home food environment, (H13  $b = -.24$ ,  $t = 4.24$ ) and finally a positive effect on the family meals construct (H14  $b = .41$ ,  $t = 2.83$ ). See table 11.

**Table 11. Structural equation model results for hypothesis testing**

<b>Paths</b>	<b>Hyp.</b>	<b>Std. Coeff.</b>	<b>(t-value)</b>	<b>Sig.</b>
Sleeping Hours - BMI	H1	-.08	(2.62)	***
TV Hours - BMI	H4	.16	(5.09)	***
Healthy Eating – BMI	H8	-.08	(2.04)	**
Family Rules – Sleeping Hours	H3	.20	(5.14)	***
Attitudes Toward Sleep – Sleeping Hours	H2	.10	(2.91)	***
Family Rules – TV Hours	H5	-.10	(2.62)	***
TV at Home – TV Hours	H6	.32	(4.20)	***
Attitudes toward TV - TV at Home	H7	.40	(3.82)	***
Healthy Environment - Healthy Eating	H9	.76	(1.63)	***
Unhealthy Environment - Healthy Eating	H10	-.05	(1.10)	ns
Family Meal - Healthy Eating	H11	.31	(2.95)	***
Attitudes Toward Feeding - Healthy Environment	H12	.26	(5.16)	***
Attitudes Toward Feeding - Unhealthy Environment	H13	-.24	(4.34)	***
Attitudes Toward Feeding - Family Meal	H14	.41	(2.83)	***
Age		.31	(9.68)	***
Genetics		.14	(4.41)	***
$\chi^2$ (438) = 1526.1 (p=0,00), RMSEA = .053, NNFI = .81, and CFI = .83.				
*** (p.<.001); ** (p.<.010); n.s. Not significant.				

The introduction of these relationships in the model allows us to determine the existence of a scheme of parental attitudes that lead to parental behaviors that directly influence child behavior and consequently his BMI. The model specification supports the idea that the three paths (sleeping, screens and nutrition) contribute in some way to form the children BMI. In summary, the conceptual model developed was well supported. The model also explains much of the variance for the dependent variables, with R<sup>2</sup> value of .16 for BMI.

## 5. DISCUSSION

A child overweight has several antecedents. One of the most important is parents attitudes and behavior toward healthy weight behaviors. The present study aimed to examine the influence of parents' attitudes toward sleeping, TV use and feeding on parents' behavior. This parental behavior relates to family rules, TV environment at home, availability and accessibility of fruits and vegetables at home, parent eating modeling and child feeding strategies at family meals. As a consequence of those parental conducts child will perform different behaviors in terms of sleeping time, TV viewing and healthy eating. All those children behaviors will have an important influence on their BMI. As far as we know this is the first study to utilize a wide sample (908 parents) to check these hypotheses using Structural Equation Modeling. We found that, in general, there is a significant influence of parents' attitudes and behaviors on their children BMI. This influence is mediated through the children behaviors related to sleeping, TV viewing and healthy eating.

Our findings suggest that children are aware of some of their parents' eating attitudes and behaviors and parents should capitalize on this opportunity to role model healthful dietary intake for their children, their sleeping hours and the use of screen devices (TV in particular) as indicated H1, H4 and H8.

Results confirm that there is a direct and significant influence of family rules (H3) and parents' attitudes towards sleep (H2) on children sleeping hours. Considering just a few interventions have been done to increase sleep among children as a way to prevent childhood overweight (Chen et al., 2008), this study contributes to show that family rules and parents attitudes increase the hours that the children sleep. It is important to point out that good sleeping could be part of the overweight prevention approach and should be promoted in more interventions.

In addition to sleeping, the study may also provide parents with an ideal opportunity to role model the use of screen (in particular, TV) behaviors which may facilitate better children practices. We show that the hours of TV the children are exposed can be reduced with the existence of family rules (H5) and decreasing the number of TV at home (H6). The attitudes toward TV influence the number of TV at home, as the parents will decline to install TVs in the child bedroom, kitchen, etc. Once again, our research contributes to show that the parents' attitudes and behavior is very important to modulate children behavior. The advertising campaigns to increase physical activity have focused the communication emphasis on promoting physical activities but just a few interventions intend to reduce sedentary activities (Branscum and Sharma, 2012).



Interventions could be done to reduce sedentary children behaviors. As Sisson et al. (2011) research demonstrates TV watching is most detrimental sedentary behavior in terms of children overweight.

The third path from parents' attitudes to children BMI is defined through feeding. Our results show that there is an influence of healthy eating environment at home (H9), unhealthy eating environment at home (H10) and family meals (H11) on children healthy eating. These results are consistent with previous literature on nutrition and psychology (Draxten et al., 2014; McClain et al., 2009) that affirm that the parents behavior has a direct influence on children healthy eating. As De Bourdeaudhuij et al. (2008) points out, children that perceive a social environment supportive towards fruit and vegetable intake also reported the availability of fruit and vegetables at home. The healthy eating environment at home is ruled by the parents' behavior making healthy habits (e.g. to serve peeled fruit, to eat vegetables, etc.) and unhealthy habits (e.g. to drink sugared soda, sweets or snacks) on the children consumption of healthy or unhealthy foods. Contrary to our expectation, the relation between unhealthy eating environment at home and children healthy eating is not significant. Our explanation is that the consumption of soda and snacks is so extended and the perception of a bad habit can be misinterpreted by individuals. In brief, it is possible that an individual high consumption of soda can be auto evaluated as normal, and related with healthy eating. Since parents role modeling appears to be related to children's daily fruit and vegetable consumption, this study suggests that parents use family meals as an opportunity to role model healthful food intake.

Our study has important contributions to the literature. Our research stemmed from the idea that parents are responsible for creating a safe environment to raise healthy children. Children should not be blamed for being overweight. Parents should be responsible for their children and society should help them firstly informing them of which behaviors are better for their children and secondly educating them to be able to perform those behaviors.

While there is much literature on the correlations between parental behaviors and children weight, most of our research has focused on one stage earlier to parental behavior: Parental attitudes. Our research contributes to the literature by describing the process from parental attitudes to child BMI. This process has three stages; parental attitudes, parental behavior and children behavior to influence children BMI. Furthermore, we have integrated a three-path model with three variables, sleeping, TV watching and healthy eating.

While the present research focused on the antecedents of children overweight future research can examine in which part of the process (i.e. parental attitudes, parental behavior or children behavior) interventions could be more effective to reduce children overweight. We believe that parental attitudes must be the most efficient stage to target in order to change children overweight. Children behavior is highly conditioned by the home environment that is determined by parental behavior. A child can have very positive attitudes towards healthy habits, but if his parents make noise until late, have several TV sets at home, do not buy FV and there is plenty of junk food and sugared beverages at home, he will have difficulties to perform healthy behaviors. Likewise the parent will rarely perform healthy behaviors if he is not aware of the detrimental effects on his child health. It is important, in this sense, to be aware of the importance of children sleeping long, watching less than two hours of TV a day and eating healthy food; he has to have a positive attitude toward the behavior before performing it.

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**CHAPTER 3**  
**NUTRITION INTERVENTIONS.**  
**FRUIT AND VEGETABLES**

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## 1. INTRODUCTION

The children overweight problem is pandemic worldwide. Prevalence, health consequences and causes have been seen in the review of literature evident in Chapter 1. The Region of Murcia, Spain, is not an exception. In chapter 2, in a cross-sectional study we found that within this region overweight children almost reached one third of the child population.

Overweight children can be prevented by changing various behaviors: sleeping well, increasing energy expenditure and/or decrease sedentary behaviors and improving healthy eating. In order to help children to change those behaviors it is important to improve the obesogenic environment both out of home and at home. Interventions can be done in several fields; increasing time of sleeping or physical activity, decreasing sedentary behaviors like watching TV or reducing the consumption of unhealthy foods such as fast-food or increasing the consumption of healthy foods such as fruit and vegetables.

Although all the above behaviors deserve further research, we will center our attention on the nutrition side, based on the importance that the agricultural sector has in our region. Henceforth, this dissertation's main point will be to improve children's weight through healthy eating. Literature shows that it is easier to form a new healthy habit (e.g. eating more fruit and vegetables) than quitting an old harmful habit (e.g. drinking sugared beverages) (Bandura, 2004). For this reason, we will focus our literature review and research on how to increase the volume of fruit and vegetables eaten by children. Most fruit and vegetable interventions have been done at the school setting (French and Stables, 2003), but surprisingly there has been almost no research on the role of parental attitudes and intentions related to giving fruit and vegetables to children. As Fox et al. (2004) state, since parental food choices influence what foods are offered to children, family-based approaches to developing healthy eating habits must be helpful. This approach will be examined more thoroughly.

Surprisingly, we found that while many of these interventions are well intended and some of them have some impact; they do not entirely solve the problem. We posit that the lack is due to the interventions only partially addressing the problem. These interventions only focus on one setting; (e.g. school) or they only address independently parents and children to encourage them to eat more fruit and vegetables. Thus, there is little guidance available

on how parental attitudes incite children to consume fruit and vegetables and how these attitudes and intentions can be modified through communication.

In this chapter we justify the importance of fruit and vegetables in a healthy diet besides weight watching. We review the fruit and vegetable amounts that should be eaten and the organizations that recommend them. We describe the determinants of adults and children fruit and vegetable consumption. Then, theories that can help interventions to increase fruit and vegetables consumption will be explored. Finally, the degree of success of different interventions will be tested.

## **2. THE BENEFITS OF A BALANCED DIET WITH FRUITS AND VEGETABLES**

Dietary factors such as an inadequate intake of fruit and vegetables contribute directly or indirectly (via risk factors such as overweight and hypertension) to the total burden of disease (WHO, 2010). Low fruit and vegetable intake is among the 10 risk factors contributing to mortality and morbidity, according to the Global Action Plan for the prevention and control of non-communicable diseases 2013-2020 (WHO, 2013). The health benefits of fruit and vegetable consumption are significant and widely documented (Wang et al., 2014; Van Duyn and Pivonka, 2000; Block et al., 1992). According to our earlier results, fruit and vegetable consumption is a determinant that can prevent overweight children. In order to better understand the consequences of fruit and vegetable intake, in this section we will describe the health benefits of fruit and vegetable consumption.

The adequate intake of fruit and vegetables can influence the preservation of a healthy weight. Fruit and vegetables are an important component of a healthy diet, if consumed daily in sufficient amounts, they could help prevent overweight both in children and adults (Epstein et al., 2001). Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. These phenomena are measured by the Body Mass Index (BMI), and according to the World Health Organization (WHO), a BMI above than 25 kg/m<sup>2</sup> indicates overweight, and obesity if it exceeds a level of 30 kg/m<sup>2</sup>. A high BMI is associated with a higher prevalence of non-communicable diseases, including cardiovascular disease, type-2 diabetes, various cancers and osteoarthritis. The global prevalence of overweight and obesity has risen in all regions, and are also increasing in



nearly all countries. Non-communicable diseases, particularly cardiovascular diseases, cancer, obesity and type 2 diabetes mellitus, are currently the major cause of death in the world. Among the leading factors or determinants for these diseases are a poor diet and low physical activity (WHO, 2013). Additionally, the American Heart Association Childhood Obesity Report has emphasized that overweight children and adolescents, regularly suffer high levels of psychological distress, such as high rates of depression, low reported self-esteem, social marginalization, and negative body image (Daniels et al., 2009).

The prevention of childhood obesity is an urgent issue for public health, particularly in many industrialized countries. Consuming the recommended levels of fruit and vegetables is a relatively simple and effective way of helping reduce the impact of a wide range of serious health problems throughout the world. According to a WHO report, low fruit and vegetable intake is estimated to cause about 31% of ischemic heart disease and 11% of stroke worldwide (WHO, 2002). Additionally, several studies (Miller et al., 2015; Feldeisen and Tucker, 2007; He and Evans, 2007) have established that consuming a diet high in fruits and vegetables has a lot of benefits for health, such as prevention of chronic diseases and certain cancers.

Some of the health benefits of fruit and vegetable consumption are the reduction of the risk of cardiovascular disease and stroke (He et al., 2007), the treatment and prevention of metabolic syndrome (Feldeisen and Tucker, 2007), the reduction of risk for certain cancers (Nicolai et al., 2004; Riboli and Norat, 2003), the reduction of morbidity and mortality from heart disease (Feldeisen and Tucker, 2007), the enhancement of diabetes prevention (Carter et al., 2010; Ford and Mokdad, 2001) , among others. The adherence to Mediterranean diet, with a large amounts of fruit and vegetables, has shown a significant reduction of the risk of mortality from cardiovascular diseases (Sofi et al., 2008).

A recent meta-analysis (Wang et al., 2014) measured the relation between fruit and vegetable consumption and risk of cardiovascular and cancer mortality. Results of this study show that a higher consumption of fruit and vegetables is positively associated with a reduced risk of mortality from all causes including cardiovascular disease. Nonetheless, adults' intake of fruit and vegetables remains substantially below recommended levels (Ng et al., 2014).

As a consequence, the majority of public health organizations broadly agree in the promotion of fruit and vegetables to support good health. Population-based nutrition

messages almost universally encourage the consumption of fruit and vegetables (Giskes et al., 2009). In the last decades, there has been an extensive interest for increasing the fruit and vegetable intake among children, both because early intervention is likely to maximize health benefits (Perry et al., 1998), and because eating habits during childhood are strongly predictive of those behaviors in adulthood (Wardle et al., 2005). In addition, the clinical evidence shows that dietary patterns with high fruit and vegetable consumption can improve weight management since these types of foods are high in water and fiber and low in energy density (Yeh et al., 2008). Additionally, fruit and vegetable consumption is also associated with satiety, reduction of hunger, and lower energy intake (Rolls et al., 2004).

Nutrition and physical activity are the main focus of researchers in obesity prevention literature (Chen et al., 2008), and consequently, we focus on explaining the potential impact of fruit and vegetable consumption among children in relation to the prevention of overweight children. In the next section we explain the required consumption levels of fruit and vegetables established by several public and private organizations, such as the World Health Organization (WHO), Food and Agriculture Organization (FAO) or International Fruit and Vegetable Alliance (IFAVA), which main purposes are the establishment and promotion of dietary recommendations, and daily consumption levels of fruit and vegetables for healthy nutrition around the world.

### **3. DIETARY REFERENCES. FROM SCARCITY TO EXCESS**

A dietary reference is the healthy amount of a particular food or element that a human should eat in order to avoid nutritional deficiencies (WHO, 2013). Authorities started to recommend certain foods in a time where food was scarce to avoid deficiency diseases such as endemic colloid goiter due to lack of iodine or scurvy as a result of a lack of vitamin C. Currently, in many countries the problem has changed from scarcity of nutrients to an excess of food that can cause overweight and all its consequences. Several international organizations (e.g. WHO, FAO, IFAVA; PHB) summarize the scientific research in order to give recommendations about minimum and maximum quantities of different foods that can be eaten to be healthy. Fruit and vegetables are included within these recommendations.

### **3.1. International organizations that provide food recommendations**

Currently, there are some international organizations that promote, encourage and analyze fruit and vegetable consumption across the world. According to report from the WHO (2013) and the FAO (Food and Agriculture Organization) the minimum daily consumption of fruit and vegetables should be five servings, or a minimum of 400 grams. Both public and private institutions are currently working towards the same goals, which are improving fruit and vegetable consumption levels around the world, even when they respond to different interests. Following the main objective, emerged the most relevant nutritional campaign in the world - "5-a-Day"- which we further describe in the following sections. Local administrations and Public Health National Services share similar priorities in the promotion of fruit and vegetable intake. Therefore, we describe these main organizations, both public and private, that influence and promote fruit and vegetable consumption worldwide.

The World Health Organization (WHO) is a specialized agency of the United Nations Organization (UNO), specialized in international public health. Since its establishment in 1948, the WHO has played a leading role in the eradication of some communicable diseases, such as HIV/AIDS, Ebola, or tuberculosis. Among the WHO priorities is the mitigation of the effects of non-communicable diseases such as nutrition, food security and healthy eating, or substance abuse. According to the WHO, the non-communicable diseases are currently killing more people every year than any other cause of death, particularly cardiovascular disease, type-2 diabetes and various cancers.

The major determinants for these kinds of diseases are a poor diet, physical inactivity or tobacco and alcohol use. These behaviors are overwhelming to public health security systems (WHO, 2005). Additionally, the WHO develops the norms and standards that support member states in updating the health public programs. The WHO also supervises the implementation of the International Health Regulations, and published a series of medical classifications, such as the International Statistical Classification of Diseases (ICD), the International Classification of Functioning, Disability and Health (ICF) and the International Classification of Health Interventions (ICHI). It can be concluded that the WHO has a crucial international role (among others) in the creation of healthy eating recommendations relating to overweight and particularly promoting healthy eating such as fruit and vegetable consumption.

The Food and Agriculture Organization (FAO) is an agency of the United Nations which leads the international effort to defeat hunger around the world. Serving both developed and developing countries, FAO acts as a neutral forum where all countries meet as equals to negotiate agreements and to debate food and agricultural policies. Additionally, FAO is a source of knowledge and information which help countries to modernize and improve agriculture, forestry and fisheries practices, by ensuring good nutrition and food security (FAO, 2015). In addition, FAO and Department of Nutrition for Health and Development (WHO) are frequently collaborating in the review of new investigation results on human nutrient requirements. The majority of countries rely on both WHO and FAO to establish and disseminate their nutritional information.

The process of creating these nutritional requirements and clinical significance of intake levels – both deficiency and excess – are associated with disease patterns that need to be systematically reviewed. Therefore, every ten to fifteen years, enough research is completed and new evidence accumulated to warrant WHO and FAO undertaking the revision of at least the major nutrient requirements and recommended intakes (WHO, 2015).

The International Fruit and Vegetable Alliance (IFAVA) is the international private organization responsible for encouraging and fostering efforts to increase fruit and vegetable consumption globally to increase health. It was founded in 2004, during the 4th International Fruit and Vegetable Symposium held in Auckland, New Zealand. Their main objectives include; sharing scientific information about the benefits of fruit and vegetable consumption, and promoting campaigns which communicate those health benefits. IFAVA also aims to support all the efforts made to increase the consumption of fruit and vegetables by providing its members with up-to-date information and support resources. Their work tends to include the promotion of research evidence of dietary literature, the surveillance of science reviews related with the topic, the implementation of media relations and communications tools for the promotion of fruit and vegetables, and the execution of forums for transferring success stories and sharing resources. IFAVA also supports countries or public organizations to implement the “5-a-Day” campaign in collaboration with the World Health Organization (IFAVA 2015).

The Produce for Better Health Foundation (PBH) is a non-profit organization whose objectives are to increase the daily consumption of fruit and vegetables to improve health by leveraging private industry and public sector resources, and to promote fruit and

vegetables directly to the consumers, mostly in the USA market (PBH 2015). PHB proclaimed itself as a liaison between the industry and the public health organizations. Together with the Center for Disease Control and Prevention from the US Department of Health, PHB developed the “Fruit and Veggies” Campaign, as a second generation of the “5-a-Day” Campaign.

In addition, they have promoted the labeling movement which is a major accomplishment in nutrition label obligations in every country. The nutrition labels offer consumers’ easy access to Nutrition Facts Table provided on most packaged foods in a standard form listing calories and 13 key nutrients based on a specific amount of food. This label information allows people to compare products more easily, to assess the nutritional value of foods and to better manage special diets (Health Canada, 2015).

### **3.2. Consumption and dietary references for fruit and vegetables**

According to previous arguments, it is broadly established that fruit and vegetable consumption has several benefits for human health. As a result, proportions and dietary recommendations are established in several indexes measuring the diet quality and required intake. Although some authors question the use of dietary indexes (Waijers et al., 2007), some nutrition indexes were frequently used by both academics and practitioners (Kant, 2004; Kant, 1996)

#### **3.2.1. The Recommended Dietary Allowances**

The recommended dietary allowance (RDA) was developed during World War II by the United States National Academy of Sciences with the objective of providing standards to improve national nutrition. They created a committee renamed as the Food and Nutrition Board. This Nutrition Board started deliberating a set of recommendations for the standard daily allowance of each type of nutrient. In the early 1950s, United States Department of Agriculture nutritionists made a new set of guidelines that also included the number of servings of each food group in order to make it easier for people to receive their RDAs of each nutrient (Munro et al., 1964). These standards were used in nutrition recommendations for the army, civilians, and overseas population who might need a food relief. Since the rationing of food during the war, the food guides created by government agencies to direct citizens' nutritional intake also took food availability into account.

Since the war period, the RDAs have served as the basis for almost all federal food and nutrition programs and policies in USA. The Food and Nutrition Board have subsequently reviewed the RDAs every five to ten years, and have also expanded coverage from 8 original nutrients to 27 nutrients (National Research Council, 1989).

### **3.2.2. The Dietary Reference Intake**

The Dietary Reference Intake (DRI) is a system of nutrition recommendations, from the Institute of Medicine (IOM) of the National Academies in the United States, which provide several different types of reference values to meet the recognized nutrient needs of all healthy persons. The DRI was first introduced in 1997 in order to amplify the existing guidelines in RDAs. Dietary Reference Intakes (DRIs) are a comprehensive set of nutrient reference values that can be used for assessing and planning diets. There are DRIs in every country promoted by National Health Services (IOM, 2004). For instance, in Canada, the DRIs have been published and established by Canadian and American scientists through a review process overseen by the U.S. National Academies, which is an independent, nongovernmental body. The DRIs reflect the current state of scientific knowledge with respect to nutrient requirements and are published as a series of reports by the U.S. National Academies (Health Canada, 2015).

The main goal of the Dietary Reference Intake (DRI) is to serve as practical help to guide health professionals in their day-to-day task of assessing and planning nutrient needs of individuals, and also to provide educators with a tool for guiding students in the understanding of the reference values of an adequate diet. The DRI could be used to assess whether diets provide enough nutrients to meet requirements without being excessive, and for other dietary components to promote health and reduce the risk of chronic disease (Butte et al., 2010).

Based on the *Dietary Reference Intakes: Essential Guide to Nutrient Requirements* (Otten et al., 2006) by the Institute of Medicine (IOM), we describe the different types of references values included on DRI:

- The Estimated Average Requirement (EAR) is the regular daily nutrient intake level estimated to meet the nutrient needs of half of the healthy individuals in any life stage or gender group. The EAR represents an estimated median requirement, and is considered the primary reference point for assessing the adequacy of

estimated nutrient intakes and for planning groups' intakes. It is also the basis for calculating the RDA.

- The Tolerable Upper Intake Levels (UL) is the highest average daily nutrient intake level that is likely to pose no risk of adverse health effects to almost all individuals in the general population. When intake increases above the UL, the potential risk for adverse effects increases. The need for setting a UL grew out of two major trends: increased fortification of foods with nutrients and the use of dietary supplements by more people and in larger doses.

- Acceptable Macronutrient Distribution Ranges (AMDR) are the range of intakes of energy sources associated with a reduced risk of chronic disease, yet can provide adequate amounts of essential nutrients. The AMDR is expressed as a percentage of total energy intakes. According to Butte et al., (2014), intakes that fall above or below this range increase the potential for an elevated risk of chronic diseases.

- The Adequate Intake (AI) is the recommended average daily intake level based on observed or experimentally determined approximations or estimates of nutrient intake by a group (or groups) of apparently healthy people that are assumed to be adequate. This is mostly used when an RDA cannot be determined.

These guiding principles were recently suggested for revising the Daily Values (DVs) used for nutrition labels on foods and dietary supplements.

### **3.2.3. USDA Nutrition Guidance**

In response to the public's need for consistent guidance on diet and health, U.S. Department of Agriculture (USDA) and DHHS (Department of Health and Human Services) together issued seven principles for a healthy diet. The guidelines called for a variety of foods to provide essential nutrients while maintaining recommended body weight and moderating dietary constituent's fat, saturated fat, cholesterol, and sodium that might be risk factors in certain chronic diseases. Although the guidelines were directional, their release provoked some concern among consumer, commodity, and food industry groups as well as nutrition scientists who questioned the causal relationship between certain guidelines and health.

### **3.3. Fruit and vegetable recommended consumption**

Davis and Saltos (1999) did a review on USDA dietary recommendations and how they had changed over time. They found that the main change in recommendations was one of the slogans that went from “Avoid too much fat, saturated fat, and cholesterol” to “Choose a diet with plenty of grain products, vegetables, and fruits” making the message more understandable.

The World Health Organization (WHO) has evolved in the same tune recommending a daily intake of at least 400 grams of fruit and vegetables for the prevention of chronic diseases such as heart disease, cancer and diabetes, and for the prevention and alleviation of several micronutrient deficiencies. When world production of fruit and vegetables has experienced a remarkable increase (FAO, 2014), most people eat less than recommended amounts of fruit and vegetables (Kristjansdottir et al., 2009). Despite the broadly known health benefits of this consumption (Rolls et al., 2004) unfortunately neither adults nor children have adequate intake levels of fruit and vegetables (Krebs-Smith et al., 2010). As a result, people increase the risk of having diet related non-communicable diseases such as diabetes cancer or overweight, which has personal consequences for the sufferers and high costs for the private and public sanitary services.

Consequently, nutrition is a priority for the management of food-related chronic disease. Ball et al. (2013) in a systematic review established that general practitioners have the potential to provide nutritional care improving nutrition behavior and reducing risk factors in this kind of chronic disease. Additionally, there have been changes in childhood food consumption patterns that concern scholars as major cause of increasing overweight or obesity. An adequate intake of fruit and vegetables has a protective factor against the development of overweight (Alinia et al., 2009) or other diet-related diseases (Boeing et al., 2012). Nonetheless, the consumption of fruit and vegetables among children and adults is far from adequate (Krebs-Smith et al., 2010; Vereecken et al., 2007).



## **4. DETERMINANTS OF FRUITS AND VEGETABLES CONSUMPTION**

In order to more effectively analyze and promote fruit and vegetable intake among children and adults, scholars have established determinants of intake. Health professionals and food marketers are concerned about the understanding of all these determinants of food choice as groundwork for effective nutrition education and counseling (Roe et al., 2013). Moreover, as parents are strong referents for children, we address the determinants that influence adults and children' fruit and vegetable consumption.

### **4.1. Determinants for adults**

Higher-quality diets are, in general, consumed by better educated and more affluent people, while lower quality diets tend to be consumed by groups of lower socio- economic status and more limited economic resources (Darmon and Drewnowski, 2008). The same applies to fruit and vegetable consumption in the USA (Dubowitz et al., 2008) and in Europe (Prättälä et al., 2009; Irala-Estevez et al., 2000). Not surprisingly, Kamphuis et al. (2007) found that lower socioeconomic groups expressed more price concerns related to fruit and vegetable consumption.

Prättälä et al. (2009) revealed that a higher education level could mean a higher fruit and vegetable consumption in northern European countries but not in Mediterranean countries. A possible explanation is that in some Mediterranean countries the local production of vegetables is available throughout the year, thus the price is lower and therefore even the lower socio-economic groups can use fruit and vegetables as an essential part of everyday cooking. On the other hand, in Northern Europe, vegetables are available mainly during summer and therefore they import these products during the winter with a high market price (Prättälä et al., 2009). In the Netherlands for instance, there is gap in life expectancy between the highest educated groups and the lowest educated groups. This gap may be caused by different nutritional behaviors including low fruit and vegetable intake (Wang and Lobstein, 2015).

Furthermore, availability and accessibility are important determinants of fruit and vegetables consumption (Van Der Horst et al., 2007). The provision of a greater variety of foods leads to increased consumption (Roe et al., 2013). Likewise, Mathias et al. (2012) established that offering a variety of well-liked options with different sensory properties will lead to increased intake.

An increase in vegetable portion size can result in greater vegetable consumption, consequently serving more vegetables, either by adding more or substituting them for other foods. Thus, this is an effective strategy to increase vegetable intake during mealtimes (Rolls et al., 2010). As a result, several health organizations propose serving more vegetables at mealtimes. Liese et al. (2014) also found indirect effects of supermarket availability and suggest that food shopping frequency and perceptions of healthy food availability are two integral components of a network of influences on fruit and vegetable intake.

In addition, Glanz et al. (1998) recognize that a relevant determinant in food choice is taste. Consumers report that diet choices are often guided by foods taste. Sensory perceptions and preferences for the taste, aroma, and texture of foods affect not only food preferences but also eating habits. Foods with combinations of sugar and fat are universally preferred, whereas there is an extensive dislike of bitter tastes (Drewnowski, 1997).

Nonetheless, some impediments for fruit and vegetable consumption can appear such as high costs, obesogenic environments or low socioeconomic status. Yeh et al. (2008) found evidence of individual impediments such as the high costs of fruit and vegetables and perceived lack of time.

#### **4.2. Determinants for children**

According to Coulthard et al. (2010), early exposure (toddlers) to fruit and vegetables is associated with higher levels of fruit and vegetable consumption during childhood. Family, peers and other environmental factors are likely to influence children's dietary behavior (Cullen et al., 2001). Similarly, Butte et al. (2010) and Bowman (2008) demonstrated that food acceptance and food preferences are established early in life and may predict future eating habits. Accordingly, they emphasized the relevance for parents to introduce children to a wide variety of fruit and vegetables to encourage consumption in later life.

Research has analyzed a wide range of personal determinants for fruit and vegetable consumption among children such as; preferences, knowledge, attitudes, and personal characteristics, home availability/accessibility and family (Rasmussen et al., 2006). Other potential determinants are family rules, or the liking and taste (Kristjansdottir et al., 2009).

In this research, we classify determinants of children's fruit and vegetable consumption in three categories: personal, socio-demographic and parent-related factors.

#### **4.2.1. Personal factors**

Children's food preferences are the main personal factor and their preferences are known to be key determinants of their fruit and vegetable consumption. Taste preferences and liking are regarded as key determinants of food choice. People, and young people even more so, eat what they like, and disliked foods are avoided (De Bourdeaudhuij et al., 2008). Most children prefer to eat sweet and dislike bitter tastes, they also eat more of the foods they like best (Drewnowski, 1997). This might be one of the reasons why children accept fruits more easily than vegetables.

The acquisition of food preferences can be partly explained through the concept of food neophobia (literally, fear for trying new things). Although neophobia may have been an adaptive self-defense technique by protecting the organism from dangerous foods, there is evidence that it has a negative consequence: it introduces less dietary variety and therefore nutritional insufficiencies in children's diets (Falciglia et al., 2000). Several studies have found that child neophobia is a highly significant predictor of low fruit and vegetable intake (Cooke et al., 2004; Wardle et al., 2003). The neophobia appears to reach a peak between the ages of 2 and 6 years and rejection of vegetables in particular is common at this age in favor of rated fatty and sugary foods (Wardle et al., 2005). Furthermore, Jansen et al. (2010) demonstrated that visual appeal had a strong effect on the consumption of fruits.

Repeated taste exposures and modeling of healthy behaviors have been found to be effective in improving food preferences in children (Lakkakula et al., 2010). While children express higher preferences for fruits than for vegetables, results suggest that intakes of both fruits and vegetables can be promoted when larger portions of each food are served during the same meal (Mathias et al., 2012). Previous authors showed that increasing palatability of fruits and vegetables is an effective strategy for increasing intake. Furthermore, frequent experience with foods through sight, smell, and taste is critical to achieving acceptance from children.

Furthermore, children's preferences expanded and increased in complexity as they moved to a higher age range. The most important determinants for liking and disliking moved from appearance and texture attributes in 4–5-year-olds towards taste attributes in 11 year-old,

when children's knowledge of basic tastes increased, and also their understanding of health improved as they grew older (Zeinstra et al., 2009).

#### **4.2.1. Demographic and socio-economic factors**

Previous research found that socio-demographic factors might have an important impact. Gender or socioeconomic status can impact on children's fruit and vegetable intake. Researchers found evidence on gender with a positive association in fruit and vegetable intake and healthy eating for girls rather than boys (Cooke and Wardle, 2005; Wardle et al., 2003). There is a significant improvement in the knowledge levels of high socioeconomic status schoolchildren compared with the low socioeconomic status. Higher socioeconomic status is consistently related to fruit and vegetable intake in both children and adolescents (Giskes et al., 2006; Vijayapushpam et al., 2003; Milligan et al., 1998).

Several studies (Giskes et al., 2009; Giskes et al., 2006; Aranceta et al., 2003) showed that the socio-economic characteristics which played the most important role in shaping diet could be the area where children live. According to (Robinson-O'Brien et al., 2009) children from families with low socioeconomic status are more likely to consume the fewest daily servings of fruits and vegetables. Furthermore, children and adolescents most at risk for higher intakes of energy-dense food were generally boys and adolescents, at risk for being overweight or overweight and living in households below the poverty level (Lorson et al., 2009).

A growing body of research suggests that the food environment affects children's weight. Specifically, living in areas with higher-priced fast foods and soda is associated with lower weight and BMI, whereas higher fruit and vegetable prices demonstrated the opposite association (Morrissey et al., 2014). Previous authors also found that higher-priced fruits and vegetables are associated with higher child BMI in low- and middle-income households. Similar findings showed a significant relationship between higher-priced soft drinks and a lower likelihood of obesity among young children (Morrissey et al., 2014).

#### **4.2.2. Parent-related factors**

Increasing children's consumption of fruits and vegetables can be challenging for many parents. Previous research found evidence of a positive relation between the highest level of child fruit and vegetable intake and parental feeding style (Rodenburg et al., 2012; McClain et al., 2009; Zeinstra et al., 2009), home availability/accessibility (Bere and Klepp,

2005) and parental eating behavior (Ohly et al., 2013; Anzman et al., 2010). Parents can influence children's diets in many ways, such as food provision, child-feeding behaviors/strategies, role modeling or social eating environment (Anzman et al., 2010). Although most parents are not aware of their influence on their children's future health and food consumption behavior (Lorson et al., 2009).

Previous studies (Draxten et al., 2014; McClain et al., 2009) shown that parental role modeling of healthful eating behaviors is positively correlated to children's dietary intake and preferences for fruits and vegetables. Parental intake of fruit and vegetable consumption is positively related with children's intake (Ohly et al., 2013; Rodenburg et al., 2012; Pearson et al., 2009). Furthermore, children that perceived a social environment supportive towards fruit and vegetable intake, also reported the availability of fruit and vegetables at home (De Bourdeaudhuij et al., 2008).

Additionally, parents can create the adequate social eating environment by the use of parental child feeding strategies, such as rules, table food management and verbal instructions. According to Zeinstra et al. (2009), there is substantial evidence that child-feeding strategies can influence children's eating behavior, and although parents use these strategies with the best intentions, research has shown that the effects of these parental strategies on children's food intake are not always in the intended direction, forcing the consumption of fruit and vegetables can be counterproductive (Zeinstra et al., 2009). The strongest determinants for fruit and vegetable intake according to the children's reports were availability at home, modeling, demanding family rules and knowledge of recommendations (Kristjansdottir et al., 2009). Likewise, Ohly et al. (2013) revealed strong associations between parent and child diet quality, which clearly illustrates the powerful influence that parents have in these early developmental years. According to Pearson et al. (2009), parental modeling and parental intake are positively associated with children's fruit and vegetable consumption.

There is also a positive relationship between the parental role modeling of fruits and vegetables at dinner and children meeting daily fruit and vegetable recommendations (Draxten et al., 2014). Additionally, Christian et al. (2013) established that eating a family meal together at a table had a large effect on children's fruit and vegetable intake. These findings are consistent with our findings in study 1 about the fact that the "family meal" was an antecedent of children's healthy eating. Moreover, parental control and parental fruit and vegetable consumption are positively associated with children's fruit and vegetable

consumption (Johnson et al., 2011; Cooke et al., 2004). Johnson et al. (2011) also found that restricting the intake of unhealthy food and giving health information about a product appear to foster a healthy eating pattern.

Meal preparation at home is associated with diet quality among adolescents and adults with higher fruit and vegetable intakes (Larson et al., 2006).. Accordingly, involvement in food-related tasks could likely increase a child's perception of his/her ability to perform these behaviors (Larson et al., 2006; Hill, 1998), and greater participation in preparing home meals could foster increased self-efficacy for the selection of healthier food options (Chu et al., 2012). In addition, performing food-related activities can be an important opportunity to encourage children to try to enjoy a variety of foods, and children involved in such activities were generally more interested in nutrition and vegetables, and consumed healthier diets (Chu et al., 2012).

Regarding a healthy home food environment, Evans et al. (2011) confirmed that parents have an influence over the eating patterns of their children by setting rules, modeling and providing social support and encouragement. Draxten et al. (2014) established that children are aware of their parents' eating behaviors and report this behavior similarly to their parents. In addition, Sleddens et al. (2011) suggested that children raised in authoritative homes ate more healthily, were more physically active and had lower BMI levels, compared to children who were raised with other styles such as authoritarian, permissive or indulgent. These authors have defined authoritative parents as responsive and demanding, authoritarian as parents who are less responsive but highly demanding, and indulgent or permissive as parents that provide high levels of responsiveness but are less demanding.

In the same vein, Vollmer and Mobley (2013) revealed that authoritative parenting style, particularly in mothers, could be the most beneficial for child fruit and vegetable intake. On the contrary, Vereecken et al. (2009) found that general parenting style did not show any significant impact on dietary habits. However, food-related parenting practice such as encouragement through negotiation showed a significant positive impact, whereas pressure, catering on demand and permissiveness were practices with an unhealthy impact.

Home fruit and vegetable accessibility, parental encouragement, and family meal frequency can explain children fruit and vegetable intake (Robinson-O'Brien et al., 2009).

Also, parental food involvement – the level of importance of food in a person’s life – may be a determinant factor for consumption of fruits and vegetables for both parents and children (Ohly et al., 2013).

## **5. THEORIES APLIED ON FRUITS AND VEGETABLES CONSUMPTION**

Behavioral theories are broadly used for scholars to study eating behaviors, focusing on attitudes and motivations that can influence behavior related to food and consumption, and how intrapersonal, environmental, and behavioral factors can impact that behavior. Previous studies and reviews confirmed that intervention designs are more effective on changing behaviors whilst being supported with behavioral theories (Bogers, Brug, Van Assema, & Dagnelie, 2004). Several studies have theoretical basis (explicitly, or in the theoretical framework) as a basis to predict people’s behavior toward food and consumption decisions (Rasmussen et al., 2006).

A recent meta-analytic review in the uses of theories in interventions design, concluded that more extensive use of theory was associated with larger changes in health behavior (Webb, 2010). Although the prevalent relevance of the uses of theories, many studies within health behavior research are still no theoretical (Painter et al., 2008). The challenge for researchers working in the area of fruit and vegetable consumption is to develop interventions driven by theories to effectively influence behavior (Kothe et al., 2012).

Based on previous meta-analyses (Painter et al., 2008; Rasmussen et al., 2006) we review the most frequently applied theories to explain people's attitude and behavior toward food: Social Cognitive Theory, the Theory of Planned Behavior and The Trans-Theoretical Model.

### **5.1. Social Cognitive Theory**

The Social Cognitive Theory has been broadly used in health promotion and disease prevention (Bandura, 2004). It explains how intrapersonal, environmental, and behavioral factors influence behaviors (Lytle et al., 2003). This theory postulates that human behavior can be explained by a continuous interaction between behavior, personal factors, and environment (Branscum et al., 2013). In this theory, behavior refers to the health behavior which is being targeted or modified, and personal factors refer to cognitions, affects, and biological events, and environment refers to social and physical environments (Branscum

et al., 2013). SCT provides a reciprocal model in which behavior, personal factors, and environmental influences interact continuously.

Social Cognitive Theory has been particularly effective for developing nutrition programs for children and adolescents, and extensively used when children's fruit and vegetable intake is the behavioral outcome (Nielsen et al., 2003). Since children are often not completely in control of their behavior (e.g., if they intend to eat more fruit but fruit is not available, they cannot act on their intention), their environment needs to be taken into account as well.

## **5.2. Theory of Planned Behavior**

The Theory of Planned Behavior (Ajzen, 1991) provides an initial set of psychosocial factors that can influence fruit and vegetable consumption (Tremblay et al., 2011; Blanchard et al., 2009; Bogers et al., 2004; Lytle et al., 2003). In a recent meta-analysis of psychosocial predictors of fruit and vegetable intake (Guillaumie et al., 2010), the Theory of Planned Behavior was reported as the most strongly supported model for explaining people's intention and behavior of fruit and vegetable intake. Likewise, this theory is a relevant framework for explaining 5-A-Day intervention results (Blanchard et al., 2009).

According to Ajzen (1991), a central predictor of behavior is an individual's intention to perform the behavior; the intention is influenced by three factors: attitude, subjective norm, and perceived behavioral control. The TPB postulates that intention and perceived behavioral control are the most proximal determinants of behavior, and intentions are determined by attitude towards the behavior, subjective norm and perceived behavioral control. Attitude reflects a person's appraisal of the behavior to be performed, and subjective norm reflects the perceived social pressure to engage or not engage in a behavior.

Perceived behavioral control reflects the perceived ease or difficulty of engaging in a behavior, which can be influenced by both past successes and foreseen barriers with the selected behavior (Blanchard et al., 2009). The final predictor of intention reflects the extent to which an individual believes the performance of the behavior is within their control (Ajzen, 2011).



A meta-analysis including 185 independent studies on the predictive potential of the Theory of Planned Behavior for a variety of health-related behaviors (Armitage and Conner, 2001), have established that this theory explained 27% and 39% of the variance in behavior and intention. Furthermore, Chapman et al. (2009) revealed in a recent study that TPB successfully modeled fruit and vegetable consumption but not behavior change. The increase of fruit and vegetable consumption is a promising preliminary finding for those primarily interested in increasing fruit and vegetable consumption.

### **5.3 The Trans-Theoretical Model**

The Trans-Theoretical Model (TTM) developed by Prochaska and DiClemente (1982) is a behavior change theory used in health promotion to improve health outcomes in interventions (Johnson et al., 2008). This theory postulates that people move through a sequence of stages in their attempts to modify their problematic behaviors. As people change through different stages, they employ mediating processes such as self-efficacy and decisional balance, differentially making each stage unique (Lally et al., 2014).

The five stages of change have been identified as: pre-contemplation (no intention to change behavior in the predictable future, or denial of need to change), contemplation (intention to change within the next 6 months), preparation (serious intention to change in the next 30 days), action (initiation of overt behavioral change), and finally, the maintenance stage (which involved a sustaining behavioral change for 6 months or more) (Prochaska and Velicer, 1994).

According to TTM, performing an action for the first time requires planning, even if plans are formed only moments before the action is performed, as well as attention. Johnson et al. (2008) confirmed the ability of TTM-based tailored feedback to improve healthy eating, exercise, managing emotional distress, and weight on a population basis. Success of multiple behavior interventions based on the Trans-theoretical Model. In addition, Prochaska et al. (2005) suggested that TTM offers a promising framework for multiple risk weight management interventions. The complexity of dietary behavior probably also contributes to the fact that people tend to have an unrealistically optimistic view of their own intake levels. As behaviors are repeated in consistent settings they then begin to proceed more efficiently and with less thought as control of the behavior transfers to cues in the environment that activate an automatic response: a habit (Lally et al., 2014).

Before any personal behavior is carried out there must be several stages. First, a positive motivation is needed, the intention to do the behavior, and the opportunity to do it. The opportunity could be physical, availability or affordability of the fruit and vegetable market or real consumption.

Thus, to induce dietary changes it is necessary to change people's food choices. The studies on personal determinants of food choice have primarily made use of psychological theories to explain food choice and nutrition behaviors. However, since children may have less autonomy in making food choices, environmental rather than personal factors may be more important determinants of their nutritional behaviors (De Bourdeaudhuij et al., 2008).

All the three theories are important when designing healthy eating fruit and vegetable interventions. All of them; (SCT, TPB, and TTM) indicate that behaviors are preceded by behavioral intention. For that reason, our second study will be focused on parents as a key determinant on children's consumption.

## **6. INTERVENTIONS TO RAISE FRUITS AND VEGETABLES CONSUMPTION**

Rychetnik (2002) defines public health interventions as actions which are intended to promote or protect health or prevent diseases in communities or populations. These actions may include policy, regulatory initiatives, single strategy projects or multi-component programs. They are different from clinical interventions, which are intended to prevent or treat an illness in individuals. Public health interventions tend to be complex, programmatic and context dependent. The evidence for their effectiveness must be evaluated to improve future interventions (Rychetnik, 2002).

Health interventions to prevent overweight children are largely aimed to modify physical activity and/or sedentary behaviors, sleeping patterns and diet. Interventions to reduce the overweight children problem can be done in several domains; community-based initiatives (Bemelmans et al., 2011); school-based (Brown and Summerbell, 2009) or at home (Doak et al., 2006), among others.

When promoting healthy nutrition for children, interventions should focus on increasing the familiarity, availability and accessibility of healthy foods for children. Furthermore, interventions should be mindful of the need to target messages appropriately for age,

gender and socio-economic status (Lucy et al., 2005). For example, different messages for boys who have less healthful food preferences than girls at all ages.

Despite the positive health effects seen in the literature review, adult fruit and vegetable consumption is below the recommended (Krebs-Smith et al., 2010) and most children do not meet the recommended guidelines for fruit and vegetable intake (Springer et al., 2006). Intervention studies have shown that their fruit and vegetable consumption can be increased successfully (Lytle and Achterberg, 1995), especially integrating interventions in different settings. To have the greatest impact, public health interventions should occur in locations that service large and accessible segments of the target population (Branscum and Sharma, 2012). These interventions vary substantially depending on the setting; home based or school-based, community-base. (Wang et al., 2013).

There are interventions which are multi-health behavior (fruit and vegetables; water, low-fat dairy, TV, physical activity) and multi-channel (people teams, media coverage and web site) like the 5-4-3-2-1 Go! This Campaign was designed to alter parental behaviors within “obesogenic” environments in low-income communities in Chicago. It was addressed to parents in order to encourage them to change the home health environment, and talk to their children about health behaviors (Evans et al., 2007). Results showed that parents who received counseling consumed more fruits and vegetables at follow-up and served as models (W. D. Evans et al., 2011)(Evans et al., 2011). The strategy of treating parents as agents of change in childhood obesity is supported by recent studies.

Most interventions are school-based. Decision makers are best able to implement interventions in the settings over which they have control (e.g., schools) (Wang et al., 2013). For that reason, just few interventions are based on home environment.

### **6.1 Interventions at school**

Schools are a great place to influence the dietary intake, as well as cognitive and attitudinal variables relating to healthy eating and specifically fruit and vegetable intake. In a ten year review, Hoelscher et al. (2002) established that most nutritional interventions occurred in schools. However, they also found that a small number of interventions had included after-school programs, summer camps, community centers, libraries, or grocery stores. Not only nutritional interventions, fruit and vegetables also are school based

according to a recent systematic review (Thomson and Ravia, 2011) and the same fact was found nine years before (Hoelscher et al., 2002).

School-based interventions have shown some success in promoting appropriate dietary behaviors in children, notably with multi-strategy interventions (Lytle and Achterberg, 1995). The principle of the 'health-promoting school' offers an opportunity to incorporate curriculum approaches, food service settings, and parental and community networks for health benefits (Anderson et al., 2005). Schools are an important setting for health promotion in this age group, but school-based interventions mostly fail to target and involve the family environment (Brug et al., 2010).

Schools have substantial opportunities to address healthy eating because of their role in education and socialization and because they are a major source of food access, contributing up to 50% of many students' daily energy intake (McGuire, 2012). Several successful interventions (Bere and Klepp, 2004; Reynolds et al., 2000; Perry et al., 1998) included school food service components, in which food selections available to children at school were altered to include more healthful choices.

Lakkakula et al. (2010) have established the effectiveness of food tasting in settings where children make food choices such as school cafeterias. Repeated tastings of selected vegetables in school cafeterias increased children's likes of these items. Research on the impact of school garden programs showed that exposing children to a variety of fruits and vegetables is a viable strategy to encourage children to develop increased food preference and subsequently increased intake (Chu et al., 2012). Terry-McElrath et al. (2014) found that salad bar availability and accessibility were positively associated with middle school green vegetable consumption. Cooking can be also used in the school setting. In a school-based experiential nutrition education program, Cunningham-Sabo and Lohse (2014) found that cooking with children increased fruit and vegetable preferences, especially with vegetables.

Interventions at school should be simple and effective in order to be implemented by the school staff. The "Kids Choice" school lunch program used token reinforcement, food choice, and peer participation and accomplished a significant increase children's fruit and vegetable consumption and acceptance and significantly lowers BMI% (Hendy et al., 2011). The program requires relatively simple changes to the regular school procedures (e.g., adding fruits and vegetables to lunch, having children wear nametags, punching

holes in name tags when children show healthy behaviors, presenting a Reward Day so children can trade holes in their nametags for small prizes), which may enhance its acceptability to busy school staff (Hendy et al., 2007).

Different authors (Horne et al., 2004; Lowe et al., 2004) have found that school interventions using video watching of adventurous heroic peers who enjoy eating fruit and vegetables increased fruit and vegetable consumption. Researchers found significant increases of fruit and vegetable consumption at lunchtime (particularly large increases among those who initially ate very little) at snack time and even at home. Following this research it appears that technology, besides having some drawbacks like long TV watching, can be helpful if used well. In the same tune, some authors found (Delgado-Noguera et al., 2011), in a systematic review and meta-analysis that computer-based interventions were more effective than multicomponent interventions and free/subsidized fruit and vegetable interventions.

Not all the interventions have positive outcomes. Knai et al. (2006) in a systematic review of 15 studies found that none of the studies reviewed had a detrimental effect on fruit and vegetable consumption. Ten studies had a significant effect, ranging from +0.3 to +0.99 servings/day. The authors found again that evidence is strongest in favor of multi-component interventions to increase fruit and vegetable consumption in children. In the same line, Van Cauwenberghe et al. (2010), in a European review on the effectiveness of school-based interventions to promote a healthy diet in children aged 6–12 years old, found that multicomponent interventions on fruit and vegetable intakes were more efficient.

School intervention can be effective most of the time but they are more efficient in promoting fruits than vegetables. Evans et al. (2012) found in large school meta-analyses that interventions on average indicated an improvement of 0.24 portions and 0.07 portions respectively. They concluded that school-based interventions moderately improve fruit intake but have minimal impact on vegetable intake. This is consistent with other research that describes child food neophobia (Falciglia et al., 2000; Koivisto and Sjödén, 1996), and children's early dislikes for vegetables' bitter and sour tastes (Capaldi and Privitera, 2008). Apparently changing dietary behavior, particularly in relation to vegetables, is more complex and some other settings like home should be considered.

Interventions are not only done in the school setting. Branscum and Sharma (2012) performed a meta-analysis on these settings. They found that most interventions were

focused on short-term changes, and rarely did any perform a follow-up evaluation, probably due to this reason interventions resulted in modest changes in behaviors and behavioral antecedents.

Other interventions at school (Brotman et al., 2012; Fitzgibbon et al., 2011; Vandongen et al., 1995) have included a home component, in which educational lessons were extended to parents, as gatekeepers to foods. These programs that extend the interventional efforts to the family may be more effective than others (Lytle, 1994). However, Van Lippevelde et al. (2012) established that more studies are needed to compare school-based interventions with and without a parental component, and strategies and content of parental components of school-based interventions should be better reported in articles.

## **6.2 Interventions at home**

According to Lindsay et al. (2006), successful healthy weight interventions must involve and work directly with parents from the earliest stages of child development to support healthful practices both in and outside of the home. Developing interventions in nutrition programs early in a child's life could be more effective to increase healthy dietary patterns and to reduce some diet-related diseases in adulthood. Therefore, health promoting interventions implemented earlier in life, targeting modifiable risk factors such as diet and exercise, are more likely to have a positive contribution to the prevention of being overweight in adulthood (Baranowski et al., 1993).

This type of intervention takes place in the child's home to alter the foods purchased for home use, family cooking, family physical activities and parental modeling, among others. Parents and home environment have an important role in children's food consumption and healthy habits. Several child behaviors at home are clearly weight-related behaviors like television viewing, physical activity, sleeping time, family meals, food portion sizes, sugar-sweetened beverages, and parental modeling. Little research for obesity prevention has been conducted with families in the home environment, despite their well-documented influence on energy balance behaviors (Fitzgibbon et al., 2011).

Researchers identified that home environment is just as important as the school when encouraging healthy eating patterns since parents serve as both food providers and role modeling for children (Savage et al., 2007). French et al. (2011) evaluated the effects of a family-based intervention to prevent being overweight and found that a one year

intervention at home, could significantly reduce TV viewing, snacks and sweets intake, and dollars per person spent eating out, and increased (adults only) physical activity and self-weighing frequency. Two long-term follow-up studies of randomized trials showed that children who received family intervention at age 4 had lower BMI and improved health behaviors as they approached adolescence (Brotman et al., 2012). Therefore, efforts to promote effective parenting and prevent behavior problems early in life may contribute to the reduction of overweight and nutrition related diseases in adolescence and adulthood.

## **7. SOCIAL MARKETING TO RAISE FRUIT AND VEGETABLES CONSUMPTION**

Healthy weight actions and interventions can be international (e.g. The WHO or the E.U. campaigns, or the 5 a day campaign), national or local (Children Obesity Prevention in Molina de Segura). Interventions can embrace a wide array of healthy behaviors and agents (e.g. Estrategia para la Nutrición, Actividad Física y Prevención de la Obesidad, NAOS, from Ministerio de Sanidad y Consumo) or can focus on one single healthy behavior (e.g. 5 a day for fruits and vegetables). We will present here three interventions. Two actions are relevant to our research because they are performed in the same area where we apply our study (i.e. NAOS strategy and the Molina de Segura prevention project). The third intervention is the most international and well known fruit and vegetable promotional campaign: 5 a day.

In the year 2005, concerned about the obesity pandemic, the Spanish Ministry of Health and Consumer Affairs began implementing the NAOS. The goal was the promotion of healthy eating and the prevention of a sedentary lifestyle (Ballesteros et al., 2007). The NAOS Strategy extends far beyond the healthcare and educational areas, by combining actions in all those sectors of society by playing a role in preventing obesity. The NAOS strategy follows the health in all policies approach proposed by Franco et al. (2010).

The NAOS strategy is formed among others by the PERSEO program and PAOS code. PERSEO focuses interventions in the 67 Spanish schools in which nutritional and physical activities will be implemented to analyze how the overweight problem can be improved. The PAOS code is an out-regulations signed by the 36 biggest food industries in the country to guarantee that their advertising complies with a healthy code (Ministerio de Sanidad y Consumo, 2012). Furthermore, every year the NAOS strategy has a ceremony

where they give awards to the organizations and persons that have made a great contribution to the obesity prevention cause during the previous year.

In 2009, the city council of Molina de Segura, Region of Murcia was awarded with the prize for the best intervention for the promotion of healthy eating in the school setting. Finally, the city council of Molina de Segura has achieved important results since they started with their preventions program. In 2007 the overweight children +obesity ratio was 29.6%. In 2015 the same ratio had lowered to 21,4% (-5,5%) (Ayuntamiento de Molina de Segura, 2015).

In 2004, WHO adopted a new strategy diffusing the slogan “5 (fruits and vegetables) per day” around the globe. Fruits and vegetables are regarded as a single food group in the official dietary recommendations of many countries. The recommendation of eating at least five servings of fruits and vegetables each day (“5-a-Day”) was implemented first in the United States, and many countries have followed its implementation (Baranowski and Stables, 2000). Five servings of fruit and vegetables per day is considered the minimum recommended intake level, because higher intakes are considered to be more beneficial, and the Dietary Guidelines for Americans recommend 3–5 servings of vegetables and 2–4 servings of fruit (Rasmussen et al., 2006).

The ‘5 a Day’ has become the larger campaign promoting fruit and vegetable consumption around world. It has been implemented in many countries, although with small differences. For instance, in the USA it is called the “5 a Day for Better Health” Campaign, whereby it is a comprehensive and large scale intervention, which includes a large number of child focused projects (Wardle et al., 2005). In the case of California (USA), over the past 3 years, the campaign appears to have raised public awareness that fruits and vegetables reduce cancer risk, increased fruit and vegetable consumption in major population segments, and created an ongoing partnership between public health and agribusiness that has allowed extension of the campaign to other population segments, namely children and Hispanic adults (Foerster and Kizer, 1995).

In New Zealand, it is called “5+ A Day Charitable Trust”, and the main objective is to encourage children to eat and enjoy eating five or more servings of fresh fruit and vegetables every day for better health, taste and variety. The program since its launch in 1994 has become one of the most recognized food/health brands in New Zealand today (5aday, 2015). Awareness of 5+ A Day is high amongst their target audiences of



household shoppers at 90% and 93% for children which featured a simple, positive, behavior-specific message to eat 5 servings of fruits and vegetables daily as part of a low-fat, high-fiber diet. The campaign's use of mass media, partnership between the state health department and the produce and supermarket industries and extensive use of point-of-purchase messages were also examined.

In Spain the campaign has been implemented by the Association "5 a day", a non-profit organization, whose main purpose is to promote the daily consumption of fruits and vegetables and to appeal to families in order to promote a change in consumer habits to their children, since the rate of childhood obesity in Spain is among the highest in the European Union. Its strategy is to spread the message "Fruit and Vegetable: 5 a Day Good health!", and also to report on the health benefits of daily consumption of at least 5 servings of fruits and vegetables, and increase the fresh fruit and vegetable consumption per capita of the Spanish population to achieve the recommended intake level.

In Australia, the campaign was called "Go for 2&5", which is also a national media campaign first developed by the Western Australian Department of Health. The national campaign brings together government and private sector interests to encourage parents and children to increase their daily fruit and vegetable intake to the recommended two servings of fruit and five servings of vegetables (Gofor2and5, 2015).

Results from 5-a-Day Campaign in the USA suggested that the target group of the campaign saw little urgency in eating more fruits and vegetables and were not very involved with food planning (Balch et al., 1997). Besides, benefits that seemed likely to encourage more consumption of fruits and vegetables were some immediate benefits—such as feeling more energetic—rather than long-term benefits related to reducing health risks (Balch et al., 1997).

Additionally, Perry et al. (1998) suggested that 5-a-Day program provides evidence that multicomponent school-based behavioral programs can improve the health behaviors of children in schools and communities with considerable ethnic and socioeconomic diversity. Furthermore, the program has increased lunchtime fruit consumption and combined fruit and vegetable consumption among all children, lunchtime vegetable consumption among girls, and daily fruit consumption as well as the proportion of total daily calories attributable to fruits and vegetables (Perry et al., 1998).



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**CHAPTER 4**

**THE ROLE OF COMMUNICATION IN  
CHANGING PARENTAL ATTITUDES**

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## 1. INTRODUCTION

Normal-weight is based on energy balance where energy expenditure has to be equal to energy ingested. To reduce the rate of overweight children both sides of the equation can be examined.

Nonetheless, our interest in this research focuses on the decision to improve the overweight children epidemic on healthy eating. Specifically, we want to increase the share of low density foods consumed, namely fruit and vegetables. There are some reasons for this choice. It can be easier to break an old habit (e.g. eating sugared snacks) by creating a new habit (e.g. eating fruit and vegetables) (Verplanken and Wood, 2006), children eat less fruit and vegetables than they should (Guenther et al., 2006) and, finally, eating fruit and vegetables is associated with a lower BMI (Rolls et al., 2004; Lin and Morrison, 2002). As seen in chapter 3, several authorities and organizations are taking measures to improve children's fruit and vegetables consumption at schools. However, despite the importance of the home environment in creating healthy habits, children's fruit and vegetables consumption interventions at home are limited. Additionally, many communication campaigns are directed to increase adults fruit and vegetables consumption (e.g., "Eat 5 pieces of fruits and vegetables a day").

In order to change children's fruit and vegetables consumption at home the home environment has to be altered. To do so, parental attitudes, intentions and behavior towards fruit and vegetables must be changed. One method to attain this goal can be communication campaigns targeted to parents, stating the importance of giving fruit and vegetables to children. Nevertheless, despite the importance of this issue, there has been almost no research on how to design the most efficient communication campaign to improve parental intentions to give fruit and vegetables to their children. Thus, there is little guidance available on how the message should be designed in order to be the most efficient.

In this chapter a literature review is carried out of all theories of communication and persuasion that can be applied to health communication campaigns in order to change attitudes, intentions and behaviors. Furthermore, we review the elements of the communication process focusing on the message endorser and the message framing. All this research will help to build a supportive theoretical background for the hypotheses in chapter 5.

## **2. COMUNICATION THEORIES**

### **2.1. Communication and attitudes change**

Communication is the process of sending and receiving messages or transferring information from one part (sender) to another (receiver) (Craig, 1999). Models of communication are conceptual models used to explain the human communication process.

Frequently, the message does not effectively reach the receiver. This can happen not only when there is some kind of noise but also when the encoding process or channels chosen are not adequate. Lippmann's (1946) identified barriers to effective communication which include artificial censorship, gatekeepers in the media, shrinking news holes, limitation of social contact and insufficient time for paying attention. In response to Lippmann's barriers, Cutlip (1952) developed the seven Cs of Communication to help overcome barriers: 1.Clarity 2.Credibility 3.Content 4.Context 5.Continuity 6.Capability 7.Channels. The second study will focus on credibility and content which can help to achieve a better understanding of the message.

Dance and Larson (1985), Bochner (1984) and Jakobson (1960), among others, have developed different functions of communication. Organizations use communication to persuade clients or users to buy, use or adopt a certain product or idea. The first step is to change attitudes, the second behavioral intention, the third behavior and finally adoption as a habit (Leiss et al., 1990). Bourne (1959) states that each adopter goes through a five stage adoption process: 1. Awareness (Individual is conscious of the idea), 2. Interest, (Wants to learn more), 3. Evaluation, (Asks others for feedback), 4.Trial (Uses a sample), and 5. Adoption (Now he is a user/believer).

For the purpose of this research, the main function of the communication will be to change attitudes as this is an antecedent of behavioral intention and subsequently of behavior (Ajzen and Fishbein, 1980). Then, the attitudes will be examined and then we will talk about the theory persuasive communication.

To change attitudes about fruit and vegetables, persuasive communication must be used. But not all consumers accept the new ideas proposed at the same time, as we are creatures of habit. In general, human beings do not like change (Coch and French, 1948). In order to understand this process, we can use the Diffusion Theory. Diffusion of



innovations is a theory which seeks to explain how, why, and at what rate new ideas and technology spread through cultures (Rogers, 1962). Diffusion Theory helps us to understand why behavioral changes in general populations cannot be done quickly, why media use is not enough and why word-of-mouth is very important in diffusion. Targeted audiences are required in order to talk to peers about the product or behavior to generate trust (Rogers, 1962). Diffusion manifests differently depending on cultures and fields and is highly subjective to the type of adopters and the innovation-decision process (Rogers and Shoemaker, 1971).

In our study, we aim to test how to design the best possible message to be used in a communication campaign in order to change parental attitudes towards fruit and vegetables. To do so, we must understand how attitude change works. Attitude is how an individual evaluates a certain object or behavior, its simplest form would be positively or negatively (Fishbein and Raven, 1962; Katz, 1960). Attitude change simply means that a person's evaluation is modified from one value to another. Change is often assessed relative to the person's initial attitude. Polarization occurs when people move in the direction of their initial tendency (e.g., an initially favorable person becomes even more favorable) and depolarization occurs when they move in the opposite direction (McGuire, 1985).

Persuasion is the act of changing someone else's attitudes (O'Keefe, 1990), this is, convincing someone of something with good points. Petty and Cacioppo (1986), in their elaboration likelihood model, state that different factors can affect the persuasiveness of a message: source characteristics (expertise, trustworthiness, attractiveness and credibility), message characteristics (positive/negative, emotional/rational, etc.), receiver characteristics (the person who receives and processes a message), and cognitive routes (the amount of thinking in which the person engages to process the message).

## **2.2. Persuasion theories and health**

In health communication research, theory is used to explain and predict health attitudes, intentions, and behaviors of individuals and groups (Cameron, 2009). Although there are many definitions of persuasion, all have something in common which is that 'persuasion involves a conscious effort at influencing the thoughts or actions of a receiver

(Bettinghaus, 1994). Miller (1980) defines persuasion as any message that is intended to shape, reinforce, or change the responses of another, or others.

Response shaping relates to the creation of responses to a new product or an unfamiliar event. People know fruit and vegetables, but most people are not fully aware of the benefits of giving them to their children. Response reinforcing occurs when an individual already holds an attitude or is behaving in the way the persuader promotes. Support groups such as weight watchers exist to reinforce a decision (e.g. healthy eating) (O'Keefe, 2015; Stiff and Mongeau, 2003). This can be relevant in our case as many parents are already giving some fruit and vegetables to their children. Response changing is the most recognized aspect of persuasion. This would be the case if we wanted to reduce the number of sugary beverages given to children.

In what follows we review some theories relevant to health behavior related to persuasion following Cameron (2009). The mere use of a theoretical framework does not guarantee a desired or healthy outcome. However, an awareness of the theories can help in understanding parental attitude and behavior change, or lack thereof.

### ***2.2.1. Functional approaches***

Individuals can hold the same or similar attitudes for very different reasons. Understanding why these attitudes are held provides insight into how they can be reinforced or changed. The assumption of the Functional Theories of Attitudes is that an individual has reasons for the attitudes he holds (Kelman, 1961; Katz, 1960; Kelman, 1958; Bruner et al., 1956). Attitudinal functions related to seat belt use (Stasson and Fishbein, 1990), bicycle helmet use (Schneider, 1998) safer sexual practices (Morrison, 1995), and sexually transmitted diseases have been studied (Hullett, 2004). All these studies have been useful to understand the reasons behind specific behaviors.

### ***2.2.2. Inoculation Theory***

This theory postulates that people can be activated to build up resistance to future attacks on their attitudes by being exposed to weakened versions of the attack messages (McGuire, 1964). Inoculation Theory explains resistance to persuasive attempts. The procedure is as follows, the first step is to warn the receiver that an attack is possible, inducing a threat, which motivates the receiver to defend himself against the future attack. Then an attack message containing weak arguments is provided (Papageorgis and

McGuire, 1961). Finally, the receiver defends his original attitude actively generating one's own refutations.

### **2.2.3. Consistency Theory**

Consistency theories suggest that when our attitudes do not match our behaviors, we tend to change behavior to avoid an uncomfortable state of inconsistency. Two are the most relevant to our study consistency theories: Cognitive Dissonance Theory and Probabilistic Models.

#### *Cognitive Dissonance Theory*

The Theory of Cognitive Dissonance (Festinger, 1962) focuses on the relationships among cognitions: Beliefs, opinions, attitudes and knowledge. Cognitions may be consistent, inconsistent or irrelevant to each other. Cognitive inconsistency leads to psychological discomfort. People will attempt to reduce or eliminate the inconsistency choosing the easiest route to reduce dissonance (Stiff and Mongeau, 2003; Harmon-Jones, 2002; Festinger, 1962), seeking information consistent with their current attitudes, and avoiding exposure to contradictory information, a process called selective exposure (Cotton and Hieser, 1980). That is why, for instance, we buy the newspapers which are consistent with our ideology or we hear or watch the news on the radio stations or TV channels that represent the ideas that we stand for.

When attempting to change a patient's unhealthy behavior, dissonance is frequently used to encourage the patient to consider both pros and cons of behavior change (Britt et al., 2004). Normally he will find dissonance between knowledge and behaviors which can lead to behavior change.

#### *Probabilistic models*

Probabilistic models are based on the rules of formal logic and probability theory. (McGuire, 1981a; McGuire, 1960a; McGuire, 1960b). A syllogism is a set of three statements, including two premises that lead to a logical conclusion. For example: First premise: fruit and vegetables can cause diarrhea. Second premise: Diarrhea is dangerous. Conclusion: fruit and vegetables is dangerous. If one believes completely in the premises, then the expectation is that the identified conclusion will follow. Probabilistic models recognize that a person often does not hold a 100% belief in the premises of a syllogism. When a communication message causes a change in the attitude towards the premise, or

adds additional premises, corresponding changes to the conclusion are expected. A criticism is that the model is unable to explicitly account for other variables such as the source or the contextual factors (Eagly and Chaiken, 1993).

#### ***2.2.4. Cognitive processing theories and models***

Cognitive process models have changed from focusing on variable oriented approaches, to process-oriented approaches to persuasion (Booth-Butterfield and Welbourne, 2002), seeking to identify the variables leading to persuasion, and to specify the process by which such aspects of the message influence one's attitudes.

These models recognize that pre-existing attitudes may alter the reception of a message and provide a framework to predict and explain how a single message may be processed among multiple receivers.

##### *Elaboration Likelihood Model*

The Elaboration Likelihood Model (ELM) posits two processing routes leading to attitude change (Petty and Cacioppo, 1986). Central processing occurs when one is motivated and able to carefully evaluate the arguments and to evaluate the quality of messages; the message receiver engages in systematic thinking. In peripheral processing, elaboration is fairly low and the receiver employs a cognitive shortcut to evaluate the message (e.g., is the source of the message an expert?) (Petty and Cacioppo, 1986). Despite the critics the ELM is used in health communication research (e.g. Mammography messages (Susan and Kirby, 1998) and nutrition information (Bae, 2008).

##### *Heuristic-Systematic Model*

Chaiken (1980) describes the Heuristic-Systematic Model (HSM), which differs from the ELM, by explicitly recognizing simultaneous dual processing. The author proposes that systematic (central in ELM) and peripheral processing occur together, or in parallel (Chaiken and Eagly, 1989; Chaiken, 1987; Chaiken, 1980). Systematic processing evaluates the message and gives thoughtful consideration to all information before making a decision. Heuristic processing draws upon simple decision cues, often termed rules of thumb, and occurs when individuals lack motivation or cognitive resources to have deep thoughts. Motivation and ability are key predictors of message processing; the HSM's sufficiency principle states that active processing will occur up until the point where one

believes he has reached the necessary depth and level of understanding (Chaiken and Eagly, 1989)

There have been attempts to extend the HSM to determine predictors of the type of processing. Depending on the risk and level of understanding required to make a decision one person will use systematic or heuristic processing (Kahlor et al., 2003; Griffin and Neuwirth, 2002). Research findings indicate that the induction of fear resulted in systematic processing of information (Griffin and Neuwirth, 2002; Meijnders et al., 2001).

### *Social Judgment Theory*

One's attitude acts as an anchor, from which messages are judged. Social Judgment Theory (SJT) focuses on perceptions of how much a message agrees or disagrees with one's current attitude (Sherif and Hovland, 1961). Previous attitudes towards fruit and vegetables will condition how an individual analyses a message promoting an increase of fruit and vegetables consumption (Sherif, 1979). The messages are perceived and compared to one's attitudes by the receiver, who then classifies the messages in three latitudes that form a continuum: Acceptance, non-commitment and rejection. In the last case, persuasion will not occur. If attitudes change or are reinforced due to a message, then one's latitudes adjust accordingly, the new attitude becomes the anchor. One may perceive a message as not differing from her own attitudes, causing little need to change, this is called assimilation. When the perceived differences between one's attitude and the message are too big there is a reduction of the odds of persuasion called contrast. If the subject is very important then one's latitude of acceptance is usually narrow and one's latitude of rejection normally wide (Sherif, 1979; Sherif and Hovland, 1961).

### **2.2.5. Attitude-behavior approaches**

Attitudes affect behavior but are not the only antecedent of behavior. Three theories relate attitudes to behaviors: Theory of Reasoned Action, Theory of Planned Behavior and the Triandis Model of Interpersonal Behavior.

The Theory of Reasoned Action (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975) and the Theory of Planned Behavior (Ajzen, 1991; Ajzen, 1985) have enjoyed frequent use as organizing frameworks for numerous attitude and behavior change studies. The Theory of Reasoned Action explains voluntary behaviors and identifies one's behavioral intention as the mediator variable to behavior.

Behavioral intention is determined by one's attitudes toward the behavior and subjective norms. The evaluation of the belief one holds about the behavior and the strength with which each belief is held conditions attitudes (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975). Subjective norms refer to what is believed to be the expectation of what is important to others (e.g., family, teachers, peers, etc.), and one's motivation to satisfy the others expectations. Individuals compare their own attitudes with their perceptions of others attitudes. If these attitudes are in dissonance, they decide how to behave based upon costs and benefits of ascribing more weight to either one's own attitudes or those of others.

The Theory of Planned Behavior introduces a third element to Theory of Reasoned Action, adding perceived behavioral control as an antecedent of behavioral intention. Perceived behavioral control comes from Bandura's concept of self-efficacy, and refers to one's perceived ability to perform a given behavior (Bandura, 1986). The addition of perceived behavioral control (in Theory of Planned Behavior), significantly increased the amount of variance explained (Godin and Kok, 1996; Madden et al., 1992).

Triandis Model of Interpersonal Behavior proposes that attitudes and social normative considerations determine behavioral intentions (Eagly and Chaiken, 1993; Triandis, 1979). However, Triandis divided one's attitude into the affect toward the act, the expected consequences of the act, and, most importantly, included a habit construct, to represent those automatic actions that "occur without self-instruction" (Eagly and Chaiken, 1993; Triandis, 1979). The model proposes that the probability of a behavior depends on habits and behavioral intentions. Some model tests reported that it accounted for a greater

percentage of the variance behavior intentions than the Theory of Reasoned Action (Valois et al., 1988).

### **2.2.6. Message effectiveness theories**

These theories propose that individuals engage in cost-benefit analysis, taking into account the severity of a potential risk and selecting an action to maximize the expected outcome (Cleary, 1987).

The message learning approach states that four processes are needed to attain message persuasiveness. The message must get attention, be understood, reveal incentives for attitude change and finally being retained by the receiver (Hovland et al., 1953). The independent variables preceding these processes are the source, message, channel, and receiver. All these independent variables can be modified in order to attain a more persuasive communication, modifying how the receiver processes the information. Potential changes include belief, attitude, and behavior change (Petty and Cacioppo, 1996). This approach is relevant as the persuasive effects of source, message, channel, and receiver are identified in multiple theories. We will consider source and message in chapter 5 to investigate the potential persuasiveness of different ads.

Janis and Feshbach (1953) started using fear to promote behavioral change. Multiple theorists attempted to explain individuals' reactions to threatening messages. Their explanations are split into three categories: drive theories, parallel response models, and subjective expected utility models (Hale and Dillard, 1995; Witte, 1992). Different quantitative reviews reveal that the drive models are not significant (Mongeau, 1998). Subjective expected utility models, such as Protection Motivation Theory, suggest that individuals will choose behaviors that most likely lead to a reward and avoid a punishment (Dillard, 1994). Parallel response models such as that proposed by Leventhal (Leventhal, 1970), or Witte (1994) posits that both an emotional response and a desire to eliminate the danger are triggered upon exposure to a fear appeal.

Protection Motivation Theory explores the cognitive processes of threat evaluation and coping with them, which combine to form one's protection motivation (Rogers et al., 1983). This theory proposes that the perceptions of harm, susceptibility and efficacy of the behavioral response were the components of an effective fear appeal (Rogers et al., 1983). In other words, one evaluates a threat and one's ability and alternatives to cope with the threat and protect him/herself against the emergent risk. Despite its broad use,

criticisms remain, including critiques noting the concept of fear itself is not explicated in the model (Dillard, 1994) or is effectively excluded (Witte, 1992), and that it assumes rational information processing, not accounting for habitual behaviors or social and environmental factors.

Witte's Extended Parallel Process Model proposed that a fear appeal message initiates two evaluations (Leventhal, 1971). The first is the threat appraisal where one assesses both perceived susceptibility and perceived severity of the (health) threat (e.g., consequences of not giving fruit and vegetables to your children). If perceived susceptibility and severity are low, the subject ceases to process the message. Secondly, if perceived susceptibility and severity are high, the individual is expected to proceed to the efficacy appraisal, i.e., to assess his self-efficacy and the efficacy of the response being offered fruit and vegetables will protect his children from being overweight giving more fruit and vegetables to his kids. A high level of efficacy coupled with a high level of threat is predicted to lead to self-protective action. Meta-analysis of fear appeal research suggest that fear is generally correlated with attitude and behavior change (Nabi et al., 2002). Both Protection Motivation Theory and the Extended Parallel Process Model are widely used to evaluate health interventions, and to identify modifiable factors for interventions design.

To summarize, understanding the theories of persuasion may help to identify the drivers for attitudes and behaviors and, therefore, support the implementation of more efficient communication approaches when designing health campaigns aiming to change health behaviors.

### **2.3. Health communication campaigns**

Organizations and Public Institutions can change the dietary behaviors of a large number of people through communication campaigns. Communication campaigns are an organized communication activity, directed at a particular population for a particular period of time, to achieve a particular goal. The term health campaign includes organized, communication-based interventions aimed at large groups of people to promote a healthy behavior (Snyder, 2007). These can include: Seat belt use, medication use, dental care, drug use prevention and cessation, family planning, use of health services, testing for diseases, physical activity and dietary change,



Campaigns can use different communication activities, including posters, handouts, public service announcements, discussion groups, workplace or clinic-based counseling, in school presentations or other media. Media campaigns have been used in an attempt to impact various health behaviors in mass populations (Wakefield et al., 2010). Consumer exposure to such messages is generally passive. Mass media campaigns can propagate well defined messages to large audiences repeatedly and at a low cost per head. While campaigns do not always attain their goals due to different issues (insufficient funding, homogeneous messages sent to heterogeneous audiences, inappropriate sources or badly designed messages), in many cases mass media campaigns can produce positive changes in health-related behaviors across large populations. Health media campaigns work better when they apply multiple interventions (Kotler and Armstrong, 2009) and when we target an episodic behavior (e.g., vaccination) rather than habits (e.g., food choices). As expected, convincing someone to perform a certain behavior one time in their life is much easier than persuading an individual to adopt a new life lasting habit such as eating five fruit and vegetables a day. Product availability and accessibility are essential to persuade individuals motivated by media messages (Wallack and Dorfman, 1996).

Success of health campaigns that comes from three critical elements of campaign planning: goals; strategy; and feedback (Snyder, 2007). Campaigns goals specify what the campaign is designed to achieve within a period of time. The goals state the specific behavior that the campaign is promoting. The goals should be clear about the target population. Campaign objectives, which are more detailed versions of goals, should also specify the target level of change (e.g. 6-12 year old children will have increased their daily fruit and vegetable consumption by 100g per day after one year).

Campaign strategies may use a variety of communication tools to try and change the behavior of the target population. These include strategies that attempt to change the political and social context in which people are making decisions. For example, legislation about what sugared products can and cannot be sold at the school canteens, if sugared-beverages should have a higher tax or if fruit should be provided by the local authorities for free during the school break. Additional strategies are those aimed directly at the populations (e.g. addressing the children to promote fruit and vegetables), and those aimed at people who may influence the target population, (e.g. campaigns aimed at parents to give more fruit and vegetables to their kids) (Weinreich, 2010).

Selecting which strategy or strategies to use depends on careful analysis of the context surrounding individual decision making, including existing habits and barriers to behavior change. Pre-research conducted within the target population (e.g. children) and the decision makers (e.g. parents) can provide critical data to design the strategy (Weinreich, 2010). Inviting members of the target population to participate in the design of a campaign can increase the campaign's success (Kiwanuka-Tondo and Snyder, 2002). For example, if we want to increase fruit and vegetables consumption at school it might be very interesting to let the school boards, teachers and catering companies participate in the design of the intervention. A common strategy is to communicate directly with the target population in order to change their behavior. However, in our case, following the results of study 1, we believe it is essential to aim communications directed to parents in order to increase children's fruit and vegetable consumption. Fruit and vegetable availability at home is a necessary condition for children eating fruit and vegetables.

Campaign planners often establish a theoretical model of how behavior change might take place and use it to guide the setting of goals and design of messages (Noar, 2006). Furthermore, the theoretical model can uncover information relevant to change attitudes and behavior as well as barriers to persuasion and action (Manoff, 1985; McGuire, 1981b). The theories that can help to design health campaigns have been previously mentioned. All these theories help us to understand how consumer behavior may be changed and which tool should be used for each target, depending on the goal to be attained. Sometimes it is better to promote how and when to perform the behavior to support behavior change, as well as to find out about perceived barriers to behavior change (Manoff, 1985) (e.g. some children might not want to eat fruit because they do not like to peel it)

Campaign planners must analyze the target beliefs related to the advocated behavior. They need to know the target's perceived severity of the current behavior (e.g. perceived consequences of not giving fruit and vegetables to one's children). It is good to know the perceived benefits of compliance with the behavior (e.g. benefits from giving fruit and vegetables to children) also the peer and family behavior (e.g. do neighbors give fruit and vegetables to their kids?) as well as the degree of identification with people doing the behavior (e.g. are parents who give more fruit and vegetables to their kids cool? (Andreasen, 1995; Bandura, 1986; Maiman and Becker, 1974).

Analysis of the communication environment should reveal whether people are receiving strong messages to act in a manner opposite to that of the campaign goals. For example,

if the goal is that children consume more low energy-dense food (e.g. fruit and vegetables), it is important to understand commercial advertising for high energy-dense foods (e.g. candy bars). The campaign can fight competitors campaigns, such as the truth campaign aimed to boycott tobacco companies (Fortmann, 1986). Aside from the truth campaign, however, there is little information in the literature on the optimal persuasion strategies to effectively counter commercial advertising.

Campaigns use research at different stages in their development and implementation. Formative research serves to improve the design of the campaign. Monitoring research is critical during the early stages of implementing the campaign. Summative evaluation is critical to assessing campaign effects and disseminating the findings. It is important to monitor the implementation of the campaign to make sure that the plan is being followed and that the campaign has the ability to respond promptly when problems appear. Monitoring activities can include checking distribution of materials, and periodically soliciting feedback from all staff and participants (Weinreich, 2010).

Summative evaluation is designed to answer the following questions: “Is the campaign having the intended impact?” and “What can we do better next time?” One strong design for summative evaluation is to use both pretest and posttest measurement periods, and include a control group (Valente et al., 2001). Having a control group or a pretest help to detect change (Snyder and Hamilton, 1999). Valente et al. (2001) state that the pretest and posttest with control group design enables the researcher to compare the effects of the intervention over time within the intervention community to “naturally occurring” changes over time in the control community.

In summary, we have seen that understanding theories that explain the consumer process of changing attitudes and behaviors can be very important to design health communication campaigns. Additionally we have seen that we must set adequate campaign goals (what do we want to accomplish), specific communication strategies (how we are going to do it) and posterior research and evaluation to rate the degree of accomplishment. Hereafter, we will focus on the detailed elements of the communication process in order to get a further understanding on how the messages have to be designed to be more persuasive in the field of nutrition and, specifically, in fruit and vegetable consumption.

### **3. CHANGING PARENTAL ATTITUDES THROUGH COMMUNICATION**

In order to conduct a persuasive communication campaign, all the elements must fit correctly so that the desired goals can be attained. Persuasive communication has five elements; source, message, channel, receiver and destination (McGuire, 1981a; McGuire, 1978). The source must be credible to the audience, the channel should reach the target population, the receiver must be reached at a time when he is receptive and the message must be designed so that it is persuasive and tailor made to their specific characteristics. In this chapter we will focus on the first one of these 5 elements: the source and the message. The emphasis will be put on theoretical and practical research review concerning the source and the message framing. These two elements will be manipulated in study 2, chapter 5, to gain a further understanding of how a message has to be endorsed and framed to be more efficient in promoting parental intention to give more fruits and vegetables to their children.

#### **3.1. The source: credibility and attractiveness.**

The receiver of a communication accepts the message depending, among other causes, on his perception of the source credibility (the quality of being believed or trusted), which is a term commonly used to imply a communicator's positive characteristics that affect the receiver's acceptance of a message (Ohanian, 1990). Source credibility theory is an established theory that explains how communication's persuasiveness is affected by the perceived credibility of the source of the communication. The credibility of any communication, regardless of format, has been found to be heavily influenced by the perceived credibility of the source of that communication (Berlo et al., 1969; Hovland and Weiss, 1951).

Sources and their credibility are a key aspect of message presentation in order to be persuasive (Andreasen, 1995). To increase acceptance of the message, the campaign must select credible spokespeople and organizations that balance the two dimensions of credibility: trustworthiness and expertise (Kotler and Roberto, 1989; McGuire, 1981b).

Pornpitakpan (2004) finds, in an extensive critical review, that high-credibility sources have a higher effect on persuasion over low-credibility sources. Furthermore, the author justifies that the dimensions of source credibility are expertise and trustworthiness. The former refers to the extent to which a speaker is perceived to be skilled to be able to make the

right statements about a certain subject, and trustworthiness refers to the degree to which an audience perceives the assertions made by a communicator to be believable (Hovland et al., 1953). McGinnies and Ward (1980) found trust to be more persuasive than expertise.

Celebrities (a well-known person by the majority of the target population) or famous people are widely used as endorsers, as they can increase source credibility and therefore the persuasion of the message (Erdogan, 1999). Most of the findings related to source credibility and celebrity endorsement can be applied to the health communication process. This process can be active or passive from the receiver's point of view. An active process would be when, for instance, we face a health problem or query and, in a typical search for health information, we actively type a topic into internet search engine software looking for a source of health information. On the contrary, a passive process would be when the source reaches the receiver with information that had not been demanded (e.g. when we see on TV a fruit and vegetables promotion campaign). Source credibility can play a persuasive role in both cases.

An endorser can be used as a persuasive source of communication. Endorsers can be credible (trustworthiness /expertise) and/or attractive (Berlo et al., 1969). Many celebrities are both things and for that reason are widely used as endorsers. It is estimated that more than 25% of marketers in the USA use an endorsement strategy (Amos et al., 2008) to advertise their brand/product. This suggests that companies firmly believe that celebrity endorsers have a positive impact on consumer's intentions to purchase, their attitudes towards the products and brands.

Celebrity endorsers are important because they usually generate better results and also because they add value to a brand or an organization (Erdogan, 2005). A celebrity is a person who has gained general public recognition. This recognition is usually due to his/her profession mainly related to the world of entertainment (acting, modeling, sports, singing, music, comedy, etc.). The advertising potential of celebrities is primarily defined by the positive traits of their popular public images. This appealing factor is the power of celebrity endorsers, something which is hard to attain in the non-celebrity endorsed situation. Organizations invest millions of monies in endorsement in order to achieve brand loyalty and an increase in a brand's demand, sales and credibility (Agrawal and Kamakura, 1995).

Amos et al. (2008), states that consumers view celebrity endorsers as credible sources of information with regards to the product they endorse. Source credibility refers to communicators' positive traits that influence the receivers' acceptance of an advertising message. Freiden (1984) shows that celebrities are particularly effective endorsers because they are viewed as highly trustworthy, believable, persuasive, and likeable. However, other researchers suggest that celebrity endorsements may vary in effectiveness depending on other factors like the "fit" between the celebrity and the advertised product (Till and Shimp, 1998). In the same line, Erdogan et al. (2001) agree that the effectiveness of celebrity endorsed products depends upon the perceived reliability, expertise and credibility and also on how well the celebrity's qualities are congruent to the product advertised. Research aimed at examining the perceptions of endorsement suggested that engaging a celebrity as an endorser instead of an anonymous endorser could assist companies in improving the ratings of the advertisement, yet it doesn't guarantee a change in consumer purchase intentions and attitudes (Rashid et al., 2002). The reason behind this, as explained by Baker and Churchill (1977), is that celebrity endorsement works more to affect the cognitive aspects of consumer attitudes rather than the behavioral aspects.

Message endorsers can be classified according to their characteristics, age, gender, race, ethnicity, physical appearance, level of expertise and if they are ordinary people or celebrities. Freiden (1984) found no interactions between endorser type, gender of endorsers, and age of audience and the persuasion of the message. The impact of endorsers' characteristics (e.g., attractiveness and credibility) on consumers' reaction toward advertisements can be different depending on the target. Comiati and Plaias (2010) found that there are no universal recipes in the selection of the endorser of the advertisement regardless of the impact of endorsers' characteristics. Rather, each endorser may become the optimal solution depending on the circumstance under which it will be used.

Using celebrities is also risky because the advertiser has no control over the celebrity's future behavior. Till and Shimp (1998) showed that when the celebrity evaluations lowered the brand evaluations can also decrease. For instance, Pepsi had to face difficult consequences in terms of its public image when its endorser Michael Jackson was alleged for drug addiction and child molestation. The essence of celebrity marketing is using a personality's credibility, recognition, and trustworthiness for building brand image and, by

making him/her endorse a particular product the intent is to transfer a celebrity's unique likable qualities to the brand. However, the strategy can result in disaster if the choice of celebrity endorser is not made efficiently (Erdogan, 1999).

The impact of negative celebrity information is not always that serious for different reasons. As Till and Shimp (1998) points out; in the marketplace consumers often face communication confusion: celebrities (e.g. Fernando Alonso and Rafa Nadal) can endorse multiple brands, brands can employ multiple celebrities and sources of information about celebrities can vary widely in credibility. All of those factors may mitigate the impact of negative celebrity information. Secondly, we should not exaggerate the negative effect, celebrity endorsers are not judged very harshly by the population when negative information about them surfaces (Miciak and Shanklin, 1994).

Corporate credibility is also important in the role of persuasion (Goldsmith et al., 2000). This effect is crucial in consumers' reactions to brands, independent of the equally important role of endorser credibility. Corporate credibility depends on the organization that provides information to the receiver which can be of different quality depending on the expertise and professionalism of the organizational source. Examples of different corporate credibility in the health sector can be global institutions like the WHO, governments at different levels, universities, foundations, public companies, and private companies. Lafferty et al. (2002) conclude that source credibility must depend on both the organization that emits the message and the endorser that puts a face to the message.

Higher source credibility results in higher persuasion in terms of both attitude and behavior. The trustworthiness and expertise dimensions of source credibility might have differential importance in affecting attitude formation and change (Pornpitakpan, 2004).

There is, as well, an interaction effect between source credibility and other variables. Pornpitakpan (2004) focuses on the interaction effect with other communication elements like: other source variables (besides source credibility, for example attractiveness), message variables, channel variables, receiver variables and destination variables. The review did not find clear interaction for physical attractiveness (Horai et al., 1974), similarity of the source to the recipient, source gender and persuasion (Feldman, 1984). Referring to the message design, the author found that the use of evidence seems to increase the persuasiveness of a low, but not a high-credibility source (Hendrik and Borden, 1970; McCroskey, 1969). Another interaction effect was found with the quality of

the arguments. Herron (1996) found that the quality of the arguments affected persuasion only when the source had high expertise. The studies that deal with argument quality use the ELM (Petty and Cacioppo, 1986).

In the literature review there are many other interesting interaction effects between source credibility and other variables over communication persuasiveness (Pornpitakpan, 2004). For example, inclusion of threats seems to enhance the persuasiveness of a highly credible source while source credibility affects the weight that receivers give to the positive and negative information in the message (Hewgill and Miller, 1965). Wegner et al. (1985) found that negative messages are more persuasive when the source has high credibility. Yalch and Elmore-Yalch (1984) found that receivers tend to listen to source credibility cues when the message is quantitative, subjects appear to take the central route of processing. The channel can also affect the persuasiveness of source credibility. Attitudes formed by direct experience are resistant to a counter attitudinal message such that source credibility may have little effect on persuasion (Wu and Shaffer, 1987). Finally, Pornpitakpan (2004) states that some researches have studied receiver variables but the interactions between demographics of recipients and source credibility have not been widely reported, probably because the interactions were not significant.

In brief, we can assume that the organization that produces the message, and the endorser, the physical person that supports or backs the message, not only have differential effects on the attitudes of the receiver of the message in function of their own characteristics (e.g. attractiveness or expertise). Their effect on the consumer perception of the message might be moderated by source variables; message variables, channel variables and receiver variables, among others, which makes it even more difficult to disentangle which can be the ideal endorser to convey the right message for a certain target.

Source attractiveness can also be persuasive. Benoy (1982) found that attractive (vs. unattractive) communicators are consistently liked more, are perceived in more favorable terms, and have a positive impact on the products they endorse. Furthermore, Kahle and Homer (1985) state that if the product's characteristics match-up with the image conveyed by the attractive endorser the persuasion will increase. Furthermore, the research of Till and Busler (2000) showed a match-up effect. They found that the variable "fit" played an important role in persuasion independently of the endorser attractiveness and expertise. Tingchi et al. (2011) found that high attractiveness always works better than low



attractiveness except when both are in a product/endorser low match - up condition. Tucker et al. (2014) found that when the source is high in attractiveness or high in liking, persuasive messages had a stronger impact not only on explicit evaluations but also in implicit evaluations.

Attractiveness affects persuasion positively regardless of whether the presenter and receiver are of the same or the opposite sex, and regardless of whether receivers are characterized by low or high product involvement (Praxmarer, 2015). Petrosius and Newell's (2015) results indicated that the attractiveness of the spokesperson positively affects attitude toward the ad and purchase intentions for products that are attractiveness related. However, their analysis fails to support the notion that respondents are more favorably inclined toward ads that have an attractive member of the opposite sex. Yuan (2015) found that endorser attractiveness had a greater persuasive influence if the product was used to enhance the receiver's beauty while it was not significant if the message stressed the utilitarian functions of the same product. These findings are in line with the match-up message endorser findings.

Source attractiveness can also interact with other communication variables to increase persuasiveness. Kelman's functional theory (Kelman, 1961) states that an expert source's effect on persuasion is more dependent on supporting argumentation than is an attractive source's. However, Maddux and Rogers (1980) found that persuasion was greater when the source was expert and when supporting arguments were provided while physical attractiveness had no main or interactional effects on persuasion. These findings were in line with those of Hovland et al. (1953) who wrote about the reinforcement approach to persuasion.

Furthermore, persuasion can also depend on the receiver's personality. DeBono and Harnish (1988) found that high-self monitoring individuals systematically processed the attractive source's message and heuristically processed the expert source's message, whereas low self-monitoring individuals systematically processed the expert source's message and heuristically processed the attractive source's message.

### 3.2. Framing the message

Message is another important element of the communication process. Depending on its configuration, it will attract the receiver's attention and will be more or less persuasive. Messages need to capture the attention and be easily remembered by each member of the target population (Manoff, 1985). This goal can be accomplished by using multiple executions (different versions of the same underlying concept), being creative and novel, refreshing media messages often, representing people who are clearly members of the target population, keeping messages of high quality, using explicit, intense, emotional, or entertaining messages, and by creating logos, slogans, and jingles (Shimp, 1997; Lang, 1990). Messages should be kept simple, because complicated messages are more likely to be misunderstood and forgotten (Manoff, 1985). Campaign designers can think creatively about how to present complicated messages in order to increase the chance of people remembering the correct message. Messages usually contain a text or an image, the general impressions they give to the receiver is called message framing. The presentations of message framing usually come in pairs of opposite scenarios (e.g. loss-frame vs. gain-frame; emotional-frame vs. rational-frame).

Message framing is a controversial issue. According to Druckman (2004), one of the most contested questions in social sciences is whether people behave rationally. A large body of research assumes that individuals do only make rational economic, political, and social decisions. However research suggests that this is not the case (Lang, 1990). Framing effects constitute one of the most influential demonstrations of irrationality. A framing effect occurs when different, but logically equivalent, words or phrases cause individuals to alter their preferences. For example, people reject a policy program when told that it will result in 5% unemployment but prefer it when told that it will result in 95% employment. Druckman (2004) finds that framing effects are moderated by contextual forces (e.g. deliberation) and individual attributes (e.g., expertise). However the author believes that the framing effect is overrepresented due to different reasons: Scholars focus on experiments with statistically significant framing effects (Kühberger et al., 1999) and journals might have a publication bias toward positive findings.

Frames help people organize what they see in everyday life. The author calls frames the schemata of interpretation, a framework that helps in making an otherwise meaningless succession of events into something meaningful (Goffman, 1974). According to Entman

(1993), framing involves selection and salience. Framing could have significant connotations as frames highlight some aspects of reality and excludes others, which might lead individuals to interpret issues differently.

The framing can be said to have two broad foundations—sociological and psychological (Borah, 2011). Framing research that grew from sociological foundations refers to the “frames in communication” (Chong and Druckman, 2007). In general, this research tends to focus on the “words, images, phrases, and presentation styles” (Druckman, 2001) that are used to construct news stories and the processes that shape this construction.

Besides examining media frames, research has studied the processes involved in the formation of the audience frame. There is much research that demonstrates how news framing influences information processing and the subsequent decision-making processes. Kahneman and Tversky (1979) were the first to demonstrate how different presentations of essentially the same information can have an impact on people's choices. They found that individuals were inclined to take risks when “losses” are highlighted. But when the same information is presented in terms of “gains,” individuals shy away from risks.

According to Druckman (2001) social scientists have documented framing effects in a wide range of contexts, including surveys, experiments, and actual political campaigns. His research concludes that while the evidence to date suggests some isolated cases of incompetence, the more general message is that citizens use frames in a competent and well-reasoned manner.

As a general rule, the framing of the message makes a bias on the way the target audience understands that message. Message framing has an influence on the persuasiveness of the communication. Messages can be accepted or rejected depending on the message framing. Therefore we must gain further understanding on how framing, and particularly negative/positive and emotional/rational framing can modify consumer health behaviors.

### **3.2.1. *Negative vs. positive framing***

In many circumstances, messages that evoke positive emotions may have a greater impact with the target group than those evoking negative emotions like fear (Monahan, 1995). The emotional tone of the presentation should be carefully considered (Manoff, 1985).

As Gallagher and Updegraff (2012) affirm, health messages can be framed to highlight either the benefits of engaging in a particular behavior (a gain-frame or positive frame) or the consequences of failing to engage in a particular behavior (a loss-frame or negative frame). For example, a gain-framed message aimed at eating a healthy diet may be “Eating fruits and vegetables regularly can help you maintain weight.” On the other hand, a loss-framed message might be “Not eating fruits and vegetables regularly can make you lose your shape.” This simple variation in how health information can be framed is important because research has shown that although often conveying essentially identical information, one type of message frame may be more effective than another at promoting health behavior change (Rothman and Salovey, 1997).

The apparent phenomenon, whereby essentially identical information can have differential effects on people’s choices depending on how it is framed, was explained by Prospect Theory (Tversky and Kahneman, 1981). The framing postulate of Prospect Theory proposes that when faced with two choices—one posing little risk and one posing some higher degree of risk—a person’s preference for one option over the other will be influenced by how the choices are framed. If the choices include potential losses, individuals are often willing to choose a risky option to prevent those losses. However, if the choices include potential gains, risky options are less preferred to secure those gains. Rothman and Salovey (1997) applied this reasoning to how people might respond to framed health messages. And showed that gain-framed messages are more effective than loss-framed messages for promoting health behaviors while for health behaviors perceived to have some higher degree of risk associated with performing them, loss-framed messages should be more effective. To explain these two behaviors, Rothman and Salovey (1997) pointed out that behaviors that serve an illness prevention function (i.e., physical activity) often are viewed as involving very little risk, because the only thing risky about them is not engaging in them while behaviors that serve an illness detection function (i.e., mammography) are more likely to be viewed as involving a higher degree of risk because of the possibility that a serious illness could be discovered.

O’Keefe and Jensen (2009) found in their review a weak, but significant advantage of loss-framed messages’ persuasion on attitudes, intentions, and behaviors related to perform illness detection. Later, and in line with O’Keefe and Jensen (2007), Gallagher and Updegraff (2012) found a small advantage in their review for gain-framed messages over loss-framed messages on attitudes and intentions. In no case they found a significant loss-frame advantage within any specific domain of prevention behavior: Smoking cessation, skin cancer prevention, physical activity and eating fruit and vegetables.

The Elaboration Likelihood Model, seen before in this chapter, can also be used to explain how people respond to a framed message. Petty and Cacioppo (2012) explain that there are two alternative modes in which persuasive appeal are processed: systematically (attention to details in the message) and heuristically (attention to surface cues of the message). The manner in which a framed message is processed significantly affects its ultimate influence. The cognitive assimilation of the frame provided by a particular appeal is likely dependent on the systematic processing of that appeal. Systematic processing of a framed message must be a necessary precondition to observe the predicted advantage of gain framed message in prevention behavior and loss framed for detection behavior. But as we have seen before not all receivers process information systematically, some of them do it heuristically and this fact could be making the difference.

People’s intentions do not necessarily become a particular behavior (Webb and Sheeran, 2006). The most meaningful outcome for an intervention is a change in actual behavior. The findings of the Gallagher and Updegraff (2012) review provide evidence to show that how someone frames a health message is an important consideration in the design of messages promoting prevention behavior. Although the effect of message framing on prevention behavior might seem relatively small in magnitude, it is important to consider that health behaviors are complex, and health message framing is only one aspect of an intervention that can contribute to success (Williams et al., 2001).

### **3.2.2. Rational vs. emotional framing**

Persuasion is the goal of communication (Hovland, 1953). Organizations have a common goal when they create advertisements for magazines, newspapers, television or radio: to persuade consumers to perform a certain behavior. Messages addressed to convince consumers to perform a behavior can be rationally or emotionally framed.

With rational appeal, the advertiser attempts to prove the product's quality and usefulness to the consumer. That form of proof may include stating the behavior or product's benefits, performing a product demonstration or citing facts or statistics. According to Wood (2012), when the advertiser uses rational appeal, the message is addressed to the consumer's logic, to his systematic processing system. Although many advertisements use a combination of both types of appeal -- rational and emotional -- a distinct difference exists between an advertisement that is primarily rational and one that is primarily emotional (Sadeghi and Fakharyan, 2015). For example, several health organizations publicize anti-smoking commercials. They may picture a female sensual mouth, red painted lips and burning teeth instead of cigarettes and they ask: Sexy? In this case they are using primarily emotional advertising. When they list the carcinogenic components of a cigarette stating facts and statistics they are appealing to consumers' rational side. Examples of primarily rational advertisements are most infomercials. Although they use emotional advertising as well, many infomercials use product demonstrations, testimonials and money-back guarantees in efforts to prove to consumers that the products they are selling are rationally useful and effective. Empirical research shows that in some cases emotional message framing is more persuasive than a rational message and vice versa (Huertas and Campomar, 2009).

The type of organization that send the message plays some role in the type of marketing appeal it utilizes (Sadeghi and Fakharyan, 2015). For example, nonprofit organizations (NPOs) that seek consumer donations can use a more emotional appeal. An NPO presents facts and statistics to show that its cause is real and valid, but it must appeal to human emotion to gain a response (Cornelis et al., 2011).

Product, service, or behavior typology can also affect the persuasiveness of the emotional/rational framing. Sadeghi and Fakharyan (2015) found that rational appeals improved brand attitude, while the effect of emotional appeals on attitude toward the ad was not supported. Huertas and Campomar (2009) measured consumer attitude towards

slimming drug ads (one with predominantly rational appeal and another with predominantly emotional appeal) and behavioral intention, and found more favorable results for the rational ad. On the other hand, Zhang et al. (2014) found that an emotional advertising appeal led to a higher purchase intention in the experience service condition (e.g. restaurant, airline), while a rational message generated higher purchase intention in the credence service condition (e.g. dentist, hospital). Besides, individual traits may also need to be considered when matching the appeal to the service type. Albers-Miller and Stafford (1999) found that culture plays a role in the use of the appeals and that the product type and country interaction is strongly reflected in advertising.

Receiver age and gender can also have an influence on the importance of emotional/rational message framing for persuasion. Concerning age, Williams and Drolet (2005) found increased liking and recall of emotional ads among older consumers and that time horizon perspective moderates these age-related differences. Referring to gender differences, Lee (2009) found that women were more receptive to emotional appeals than males when faced with purchasing behavior. Mayer and Tormala (2010) found that men were more persuaded when the message was framed in “think” terms, while women were more persuaded when the message was framed in “feel” terms, although these effects were mediated by differences in emotional orientation.

Receiver personality might also mediate on the effect of emotional/rational framing persuasion. Higgins (1997) proposed that message frame effectiveness depends on consumers’ underlying motivational orientations. When the message frame is congruent to the viewer’s self-regulatory focus (prevention vs. promotion), the message is assumed to be more effective. Cornelis et al. (2011) found that in the case of a rational ad, regulatory congruence (versus incongruence) effects were found (though only for prevention focused people), whereas in the case of an emotional ad, regulatory incongruence (versus congruence) effects were found (though only for promotion focused people).

Dillard and Nabi (2006) found that emotional messages to promote cancer prevention could be helpful using fear, sadness, disgust or hope. The persuasion of each emotional message would have a different output depending on the receiver processing style. Nabi (1999) cognitive-functional model (CFM) claims that emotions exert their persuasive impact on the receiver by influencing message processing style.





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**CHAPTER 5**

**CHANGING PARENTAL ATTITUDES.**

**THE MESSAGE**

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## **1. PARENTAL ATTITUDES AND INTENTIONS TOWARDS GIVING MORE FRUITS AND VEGETABLES TO THEIR CHILDREN**

Parents are responsible to implement feeding strategies that are responsive to children's hunger and satiety cues which help children to self-regulate (Savage et al., 2007). They are also responsible for buying foods, cooking them and having availability of healthy foods at home. They usually establish a set of family rules regarding several child behaviors like fussy eating, candy eating, fast-food frequency, TV watching time, going to bed time and setting the consequences (punishment) of not following the established rules. All these behaviors can have an influence on their kids weight (Golan and Crow, 2004; Davis-Kean, 2005). They breed their offspring by feeding, educating and entertaining them. Parenting practices, such as pressure, restriction, modeling and availability have an influence on child eating (Ventura and Birch, 2008). Their degree of awareness and their level of concern and commitment towards healthy habits should have a strong influence on their own behavior and therefore have a positive influence through modeling on their children's healthy habits (Scaglioni, 2008).

Attitude change simply means that a person's evaluation is modified from one value to another. Change is often assessed relative to the person's initial attitude. Attitudes are an antecedent of behavioral intention, which is an antecedent of behavior itself (Ajzen, 1991). Therefore we need to change intentions before we see some results on actual behaviors. Our goal is to manipulate message endorser and framing, using theoretical bases to prove how these two factors contribute to increase parents' intention to give more fruits and vegetables to their children. Parents are, subsequently, the target group as they are the food providers. Our goal is to define a standard pattern to communicate to parents the importance of providing their children with a higher availability and convenience of fruits and vegetables which will ideally lead to an increase of child consumption of fruits and vegetables.

Parental intention to give more fruits and vegetables to their children (IGFV) will be the main dependent variable of this study. The actual behavior (giving more fruits and vegetables to children) is the real campaign goal, but due to experimental constraints we cannot measure directly this variable and we have to use the intention as a proxy. We know from literature (Webb and Sheeran, 2006) that intention does not always mean behavior. But we do also acknowledge that behavioral intention, not being a sufficient condition, is a necessary condition for actual behavior ((Ajzen 1991)Bandura, 2001; Ajzen, 1991).

## 2. LITERATURE AND HYPOTHESES

Communication campaigns are an organized communication activity, directed at a particular population for a particular period of time, to achieve a specific goal (Snyder, 2007). The term health campaign includes organized, communication-based interventions aimed at large groups of people to promote a healthy behavior. These can include seat belt use, medication use, dental care, drug use prevention and cessation, family planning, use of health services, testing for diseases, physical activity and dietary change.

Communication planners often establish a theoretical model of how changes in behavior change might take place and use it to guide the goal setting and message design (Noar, 2006). Furthermore, the theoretical model can uncover information relevant to change attitudes and behavior as well as barriers to persuasion and action (Manoff, 1985). The theories that can help to design health campaigns should emphasize information that is new to the target group and essential for behavior change (Snyder et al., 2004). If nearly all people are aware of a need for eating more fruits and vegetables but are uncertain on how to do it in an easy and amusing way, messages should tell them attractive and effortless recipes and tips to maximize the chances of consuming fruits and vegetables. Sometimes it is better to promote how and when to perform the behavior to support behavioral change.

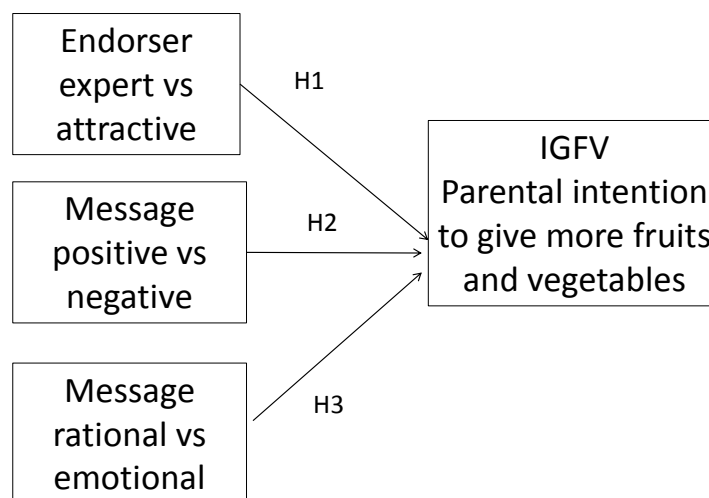
Campaign planners must analyze the target beliefs related to the advocated behavior. They need to know the target perceived severity of the current behavior (e.g. perceived consequences of not giving fruits and vegetables to their own children). It is good to know the perceived benefits of compliance with the behavior (e.g. benefits from giving fruits and vegetables to children) also the peer and family behavior (e.g. do neighbors give more fruits and vegetables to their kids?), and degree of identification with people doing the behavior (e.g. are parents who give more fruits and vegetables to their kids cool?) (Andreasen 1995). For example, if we want to increase vitamin intake through fruits and vegetables consumption among girls, previous research should have pointed strong motivations among girls to lose weight but lack of concern about healthy eating. Then, the campaign may decide to elaborate messages emphasizing the potential of fruits and vegetables eating for weight loss more than the importance of vitamin intake.

In many cases mass media campaigns can produce positive changes in health-related behaviors across large populations. As Wakefield et al. (2010) state in their review, health media campaigns work better when they apply multiple interventions and when they target an episodic behavior (e.g., vaccination) rather than habits (e.g., food

choices). As expected, convincing someone to perform a certain behavior once in life is much easier than persuading him/her to adopt a new habit that will last many years or a lifetime like eating five fruits and vegetables a day. Policies that support opportunities to change helps people to change while policy enforcement can discourage unhealthy or unsafe behaviors (Wallack and Dorfman, 1996). One of the main communication functions is changing attitudes, intention and behavior (Ajzen and Fishbein, 1980).

There has been almost no research on how to design the most efficient communication campaign to improve parental attitudes and intentions to give more fruits and vegetables to their children. Thus, there is little guidance available on how the message has to be designed to reach the highest efficiency. To address this issue, we propose a model (Figure 1) based on endorsement and message framing. Results can be of great help to implement successful campaigns to promote children's fruits and vegetables consumption through changing parents 'attitude and behaviors.

**Figure 1. Model**



## **2.1. Endorser: expert vs. attractive**

The recommendations about a healthy diet can be provided by a nutrition expert or a person, in general, with a supposed knowledge. We see in everyday life that companies use both types of endorser: the attractive one (e.g. Clooney and Nespresso) and the expert one (e.g. the technician that recommends a particular detergent for a certain washing machine). These are clearly two different kinds of products with a different degree of consumer involvement. But we have seen in the past similar industries using different endorsers like Citroen being promoted by the top model Claudia Schieffer (i.e. attractive endorser for high involvement product) and Formula 1 driver Fernando Alonso promoting Renault (i.e. expert endorser for high involvement product).

The main function that a message has to accomplish is to be accepted by the target group. To increase message acceptance, the campaign must select credible spokespeople and organizations that balance trustworthiness and expertise (McGuire 1981)(Kotler and Roberto, 1989; McGuire, 1981). Sources and their credibility are a key aspect of message presentation in order to be persuasive (Andreasen 1995).

Persuasive communication can include three processes: response shaping, response reinforcing, and response change. Increasing the parents' intention to give more fruits and vegetables to their children would be in the reinforcement change as most parents already have some intention to give more some fruits and vegetables to their children. The persuasion effectiveness of a message depends on the receiver similarity, familiarity and liking for an endorser (Erdogan, 1999). Likability refers to affection for the source as a result of the source's physical appearance and behavior (McGuire, 1985). Attractiveness does not simply mean physical attractiveness, but includes any number of virtuous characteristics that consumers might perceive in a celebrity endorser, for example intellectual skills, personality properties, lifestyles, or athletic prowess.

The receiver of a communication accepts the message depending, among other causes, on his perception of the source credibility (the quality of being believed or trusted), which is a term commonly used to imply a communicator's positive characteristics that affect the receiver's acceptance of a message (Ohanian, 1990). The person who transmits the message is the message endorser and can be perceived as more or less credible by the target consumer. Source Credibility Theory explains how communication's persuasiveness is affected by the perceived credibility of the source of the communication (Berlo et al., 1969; Hovland and Weiss, 1951).



Additionally, the trustworthiness and the expertise dimensions of source credibility might have differential importance in affecting attitude formation and change (Pornpitakpan, 2004).

Hovland et al. (1953) define expertise to the extent to which a speaker is perceived to be skilled to be able to make the right statements about a certain subject, while by trustworthiness they refer to the degree to which an audience perceives the assertions made by a communicator to be believable.

A celebrity is a person who has gained general public recognition. Celebrities or famous people (a well-known person by the majority of the target population) are widely used as endorsers as they can increase source credibility and, therefore, the message persuasion (Erdogan, 1999). Celebrity endorsers are important because they usually generate better results and also because they add value to a brand or an organization (Erdogan, 2005). This recognition usually is due to the profession performed by the person, usually related to the world of entertainment (acting, modeling, sports, singing, music, comedy, etc.). Celebrity endorsement is usually more expensive, for the communication campaign source, than ordinary people endorsement. The advertising potential of celebrities is primarily defined by the positive traits of their popular public images.

Many celebrities are both things and for that reason are widely used as endorsers. It is estimated that more than 25% of marketers in the USA use an endorsement strategy (Amos et al., 2008) to advertise their brand/product. Suggesting that companies firmly believe that celebrities' endorsement have a positive impact on consumer's intentions to purchase, their attitudes towards the products and brands. However, messages can also be endorsed by ordinary people, normally anonymous actors or models. Both cases can have advantages and disadvantages.

Although there is not a clear preference for an expert/attractive endorser in the literature nor the practice, we think that in the particular context of health and feeding the message sending by an expert would be more effective than an attractive or famous person. The reason is that an expert will be perceived as a credible source. All of this allows us to propose the following hypothesis:

*H1: Parental intention to increase the amount of fruits and vegetables given to their children will be higher when the message is backed by an expert endorser than by an attractive endorser.*

## **2.2. Message framing: negative vs. positive**

The framing postulate of Prospect Theory (Tversky and Kahneman, 1981) proposes that when faced with two choices (one posing little risk and one posing some higher degree of risk) a person's preference for one option over the other will be influenced by the manner in which the choices are framed. If the choices emphasize potential losses, individuals are often willing to choose a risky option to prevent those losses. However, if the choices emphasize potential gains, individuals are generally less willing to choose options involving risk to secure those gains. Rothman and Salovey (1997) applied this reasoning to how people might respond to framed health messages. They found that gain-framed messages are more effective than loss-framed messages for promoting health behaviors perceived to be only minimally risky to carry out. For health behaviors perceived to have some higher degree of risk associated with performing them, loss-framed messages are more effective.

Rothman and Salovey (1997) proposed that the function of a behavior can suggest how risky people are likely to view performing the behavior to be. Behaviors that serve an illness prevention function (i.e., physical activity) should often be viewed as involving very little risk, because, as the authors suggest, the only thing risky about them is not engaging in them. On the other hand, behaviors that serve an illness detection function (i.e., mammography) should be more likely to be viewed as involving a higher degree of risk because of the possibility that a serious illness could be discovered.

The concept of Elaboration Likelihood Model (Petty and Cacioppo, 2012) can also be used to explain how people respond to a positive or negative framed message. There are two alternative modes in which persuasive appeal are processed, systematically (attention in details to the message) and heuristically (attention to surface cues of the message). The manner in which a framed message is processed significantly affects its ultimate influence. The cognitive assimilation of the frame provided by a particular appeal is likely dependent on the systematic processing of that appeal. Systematic processing of messages is associated to high involvement contexts such as those related to health behaviors (gain framed message in behavior prevention and loss framed for behavior detection). The effect of message framing on prevention behavior is relatively high in magnitude and health message framing is one aspect of an intervention that can contribute to success (Williams et al., 2001).

Health messages can be framed to highlight either the benefits of engaging in a particular behavior (a gain-frame or positive-frame) or the consequences of failing to

engage in a particular behavior (a loss-frame or negative-frame) (Gallagher and Updegraff, 2012). For example, a gain-framed message aimed at increasing parents' intention to give more fruits and vegetables to their children might be "Giving a lot of fruits and vegetables to your children will help them to be healthier." On the other hand, a loss-framed message might be "Giving few fruits and vegetables to your children could make them sick" This simple variation in how health information can be framed is important because research has shown that although often conveying essentially identical information, one type of message frame may be more effective than another at promoting health behavior change (Rothman and Salovey, 1997). O'Keefe and Jensen (2007) as well as Gallagher and Updegraff (2012) found an advantage for gain-framed messages over loss-framed messages on attitudes and intentions.

Following Gallagher and Updegraff's (2012) meta-analysis, gain-framed messages were significantly more persuasive than loss-framed messages in promoting actual preventive health behavior (smoking cessation, skin cancer prevention, and physical activity). They found no case where there was a significant loss-frame advantage within any specific domain of behavior prevention. This conclusion is in line with the idea that in many circumstances, messages that evoke positive emotions may have a greater impact with the target group than those evoking negative emotions like fear (Monahan 1995).

As we have seen in chapter 3 fruits and vegetables consumption have several health advantages. They prevent cancer and cardiovascular disease (Serdula et al. 1996). They have a protective role of cataract formation, chronic obstructive pulmonary disease and diverticulosis (Van Duyn and Pivonka, 2000), and furthermore the majority of the evidence points towards a inverse association between fruits intake and overweight (Alinia et al. 2009).

Based on these findings we propose that positively framed messages will increase parental intention to give more fruits and vegetables to their children because this behavior is a prevention behavior, while negative framing is better for health problem detection behaviors. Therefore we posit the following hypothesis:

*H2: Parental intention to increase the amount of fruits and vegetables given to their children will be higher when the message is positively framed than when it is negatively framed.*

### **2.3. Message framing; emotional vs. rational**

Persuasion is the goal of communication (Hovland et al. 1953). Organizations have a common goal when they create advertisements for magazines, newspapers, television or radio, which is to persuade consumers to perform a certain behavior. Two common marketing techniques an organization may use to convince consumers to perform a behavior are rational and emotional message framings.

Emotional and rational framing can have different effects on persuasion. One framing can be more persuasive than the other depending on the product or behavior which is promoted and, also, on the receiver's characteristics. For example, the target's involvement towards the product and the type of processing (Petty and Cacioppo 2012) determines the message framing which is most influential.

With a rational appeal, the advertiser attempts to prove the product's quality and usefulness to the consumer. That form of proof may include stating the behavior or product's benefits, performing a product demonstration or citing facts or statistics. Following Wood (2012), when the advertiser uses rational appeal, it is also appealing to the consumer's logic, to his systematic processing system. On the other hand, by nature, human beings are emotional creatures. Organizations use a variety of techniques to appeal to consumer emotions and to a consumer heuristic way of thinking. Although many advertisements use a combination of both types of appeal (rational and emotional), a difference exists between an advertisement that is primarily rational and one that is primarily emotional (Leonidou and Leonidou 2009).

The type of organization, the good it sells or the service it provides play a role in the type of marketing appeal it uses (Sadeghi and Fakharyan, 2015). Nonprofit organizations (NPOs) that seek consumer donations can use a more emotional appeal. An NPO presents facts and statistics to show that its cause is real and valid, but it must appeal to human emotion to gain a response (Cornelis et al., 2011). Commercials in which an NPO will inform you of how many animals or people are suffering, show pictures and play music that pull on the heart strings and then ask for a donation, are examples of emotional appeals. Businesses that sell products that claim to work better than their competitors, such as carpet cleaners, laundry stain removers, paper towels and feminine hygiene products, generally use a more rational appeal. These advertisers show product demonstrations, testimonials and state facts in efforts to prove their product is superior to the competition.

Product, service, or behavior typology can affect the persuasiveness of the emotional/rational framing. Zhang et al. (2014) found that an emotional advertising appeal led to a higher purchase intention in the experience service condition (e.g. restaurant, airline), while a rational message generated higher purchase intention in the credence service condition (e.g. dentist, hospital). Furthermore their findings showed the moderating role of individual difference in affect intensity. High affect intensity individuals reported higher levels of brand favorability than their low affect intensity counterparts when exposed to ads using emotional appeal. Their results found a strong need to tailor ads to fit different service categories. An emotional appeal would be more effective for experience services, and a rational appeal would be more effective for credence services.

Dillard and Nabi (2006) found that emotional messages to promote cancer prevention could be helpful using fear, sadness, disgust or hope. On the other hand, Mayer and Tormala (2010) found that “think” or rational framing will be more persuasive when the target attitude or message recipient is cognitively oriented, whereas “feel” or emotional framing will be more persuasive when the target attitude or message recipient is affectively oriented.

If we want to transmit a scientific proved message: providing more fruits and vegetables to children they will be healthier the message framing can be rational or emotional. We might be aiming different targets (e.g. children, parents, teachers, etc.). In our case the pursued targets are parents and the relationship between parents and children is basically emotional rather than rational (Cox and Harter, 2003). We posit that the effect of the parent-child emotional relationship will be consistent with the message emotional framing.

For most parents, the wellbeing of their children is one their highest ambitions. This is an emotional feeling, not a rational one. When they receive an emotional message the contents of that message will be more consistent than when the message is rational and, therefore, the persuasion of the emotional message will be higher than for the rational one. Therefore we posit the following hypothesis:

*H3: Parental intention to increase the amount of fruits and vegetables given to their children will be higher when the message is emotionally framed than when it is rationally framed.*

## 2.4. Interaction effects

The Theory of Cognitive Dissonance (Festinger 1962) postulates that messages may be consonant (i.e., consistent), dissonant (inconsistent), or irrelevant to each other. If a cognitive inconsistency of sufficient magnitude is present, then an individual will perceive psychological discomfort, leading to an attempt to restore cognitive balance by reducing or eliminating the inconsistency (Stiff and Mongeau 2003; Harmon-Jones 2002).

Most people have a stereotype picture of scientific experts as more rational individuals and artists like actors, painters and musicians, as being more emotional people. We expect that receivers will perceive a high fit between the expert and the rational message as well as a high fit between the celebrity and the emotional message.

In general expertise makes for a stronger match-up factor than physical attractiveness and therefore is more persuasive except when the product promoted is to enhance ones attractiveness, in this case we say there is a “fit” between the endorser and de endorsed product (Till and Busler 1998). Furthermore Chiou et al. (2014) found that that the credibility of an objective message was higher when the message was communicated by a professional (expert) in the subject than when it was transmitted by a non-expert in the field.

Moreover, we have also justified previously that the emotional framing is more effective than the rational framing and that the expert endorser is more effective than the attractive one. Therefore, the only situation which will provide less effective results is when a rational framed message is presented by an attractive endorser. Thus, we propose:

*H4: There is an interaction effect between the expert/attractive characteristics of the endorser and the emotional/rational message framing on the parental intention to increase the amount of fruits and vegetables given to their children. The effect will be lower when the message is rationally framed and endorsed by an attractive person.*

## 2.5. Control variables

Control variables are those variables that we do not consider directly into the model but that can have an influence on the dependent variable, parents' intention to give more fruits and vegetables to their children. We have considered two types of control variables measured: those related to the parents and those related to the children.

The Theory of Planned behavior (Ajzen, 1991) suggests that attitudes are an antecedent of intention which is a determinant of behavior. Therefore, attitudes towards the product, fruits and vegetables, will be an antecedent of the parents' intention to give more fruits and vegetables to their children and we must to consider it.

The parental gender must be considered in the model. Several studies in different ambits of consumer behavior found that men and women do not necessarily follow the same process when acting as consumers or reacting to a communication campaign (Muñoz-Silva et al., 2007; Milligan et al., 1998; Freiden, 1984)(Muñoz-Silva et al. 2007)(Muñoz-Silva et al. 2007)(Muñoz-Silva et al. 2007)(Muñoz-Silva et al. 2007)(Muñoz-Silva et al. 2007)(Muñoz-Silva et al. 2007). Lee (2009) found that females were more receptive to emotional appeals than males when faced with purchasing behavior. Mayer and Tormala (2010) found that men were more persuaded when the message was framed in "think" terms, while women were more persuaded when the message was framed in "feel" terms. However these effects were mediated by differences in emotional orientation. Therefore, we must control this variable to take into account for gender differences on parents' intention to give more fruits and vegetables to their children.

Parental education can also have an influence on parents' intention to give more fruits and vegetables to their children. More educated parents normally have more information and are more aware of the advantages of giving fruits and vegetables to their children. Also parental education can be considered a proxy variable to parental income (Lin et al., 1981). Both parental education and income are frequently found to be antecedent of healthy behaviors (Musher-Eizenman and Holub, 2007).

Finally, as children grow older, they usually tend to accept more easily the consumption of fruits and vegetables (Rasmussen et al. 2006). Therefore, the age of a child should have a reverse effect on the parents' intention to give more fruits and vegetables to their children.

### 3. METHODOLOGY

The aim of this section is to present the methodology used in the empirical study to be able to test the predicted hypothesis. First, experimental design and subjects' selection will be discussed. Then, we explain how data were collected and describe the instructions given to participants to complete the questionnaire. Finally the latter and its scales are presented.

Experimental research is commonly used in sciences such as sociology, psychology, and marketing. In experimental-based research, the causal, independent variables or factors (e.g. ads) are manipulated in a relatively controlled environment (this means that other extraneous variables, like parent gender, that may also affect the dependent variable, are controlled and monitored as much as possible) to see how they affect the dependent variable (e.g. parental intention to give more fruits and vegetables). A specific combination of factor levels or independent variables is called treatment (e.g. an advertisement with an expert endorser with a positive and emotional message framing). The purpose of the experiment is to isolate the causal effect of different treatments on the dependent variable.

As Christ says (2007), the goal of empirical research is to initiate systematic manipulations that support conclusions regarding the cause–effect relationship between the independent variable and the dependent variable. Experimental control is demonstrated when a causal relationship has been established (Johnston and Pennypacker, (1993) which is only possible when all other potential influences can be ruled out. These influences must be ruled out because they represent a set of alternate hypotheses for the observed effects. Threats to internal validity are minimized considering the control variables.

The experimental design is a 2 (endorser: expert vs. attractive) x 2 (message: emotional vs rational) x 2 (message: positive vs negative) between subjects. Each group of parents was exposed to a different ad combining independent variables: attractive vs. expert endorser; negative vs. positive framing of the message and rational vs. emotional framing of the message. Additionally, we considered different control variables that could compete with the independent variables to explain the outcome of the study.

External validity examines whether or not an observed causal relationship should be generalized to and across different measures, persons, settings, and times, Campbell and Stanley (1963). As Bracht and Glass (1968) say, there are a lot of threats relating



to external validity in experiments, the main problem is presented when we try to generalize results to a population using a sample which is not representative of the population. We used a sample of real parents of primary school children, from different schools and town sizes, within the region of Murcia, who were randomly distributed over the eight conditions or treatments. This way, we overcame the problems associated with convenience samples.

### **3.1. Data collection**

Data collection was conducted by our own means. From study 1 we kept a database of parents belonging to different schools in the Region of Murcia. Then, a communication was sent to every School Principal advising that an email was going to be sent to the parents that had previously participated in the study 1 and had agreed to participate in further research. We also requested principals to send a note of support to motivate to parents fulfill the questionnaire. None of the school principals refused to collaborate in the second study.

The questionnaire was pretested with a marketing and nutritional expert panel. Before sending the final mailing, a trial run was carried out at the end of April 2015 to check that the parents understood everything. In this pre-test, we asked the recipients to state if any of the questions were not clear or confusing. We found several issues which had to be improved. Firstly, the opening ratio of the email was very low, which could be due to a generic email subject line: *"University Research on Children Healthy Habits"*. Secondly, we found that some statements of the survey were not clear to all parents. Some of them made adequate suggestions. We solved the subject line issue with some degree of personalization: we used the name of the school and the name of the School principal on the subject line. Then, we sent the personalized email to parents from 41 different schools (from 30 to 1800 students) from more than 20 towns. Additionally, we corrected the questionnaire sentences that were unclear in order to gain a better understanding.

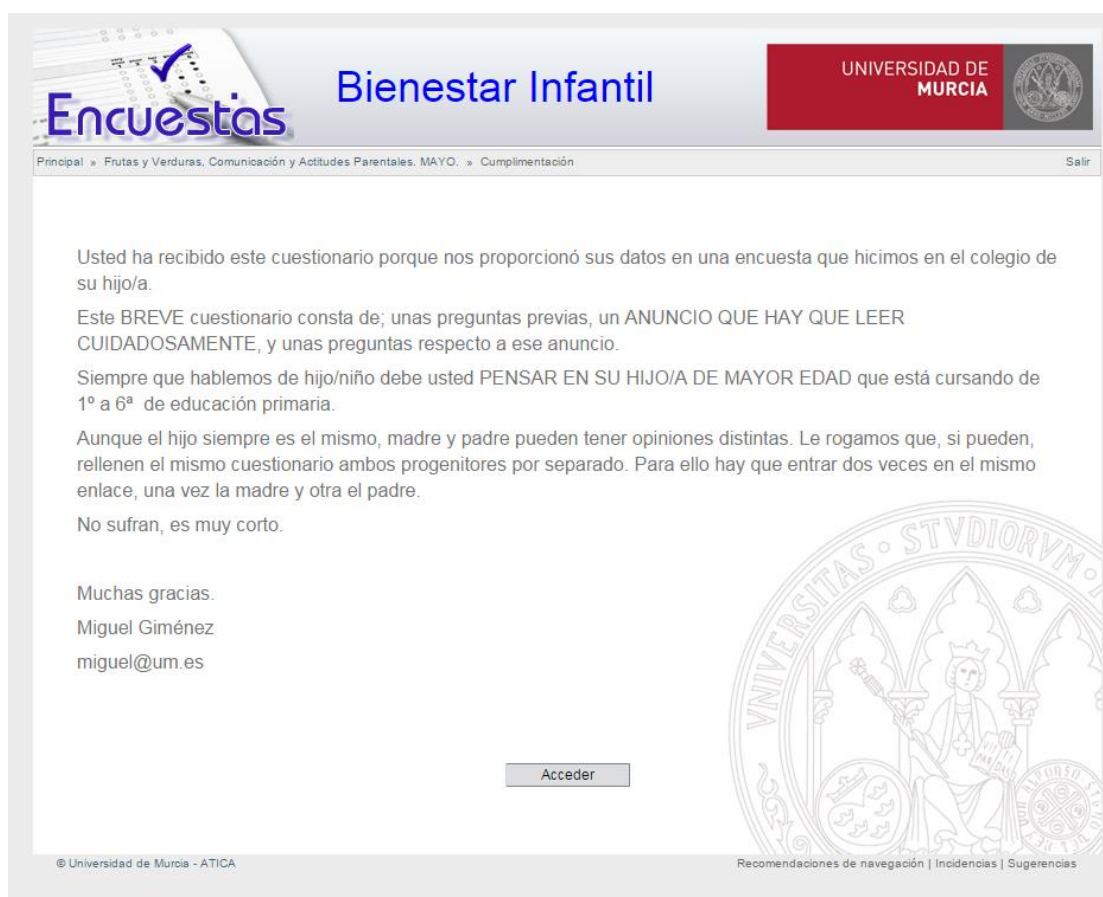
After the amendments and using the commercial email administrator MailChimp, the questionnaire and the invitation to participate was sent on May 6, 2015. A reminder was sent one week later, the 13<sup>th</sup> of May, pointing out the importance of participating in the survey. See appendix 1 and 2.

With the app MailChimp, we tracked email opening ratio for the reminder which went from a minimum of 10% to a maximum of 67% per school. The average was 46%. 679 emails were opened out of the 1.463 that were sent.

In the presentation email we explained to parents that we were researching children's eating habits. Additionally in the second email we offered an incentive to the parents who responded to the survey. We promised to send them a summary of our research.

Once the parent clicked the link, he/she were redirected to a landing page with a brief explanation about the survey. See figure 2.

**Figure 2. Landing page for the questionnaire**



In this landing page we reminded the parent that he/she had received the email because they had previously voluntarily given us (in the study1) their email for further research. We asked the respondent to think about their eldest child in primary school from 1<sup>st</sup> to 6<sup>th</sup> grade and answer a few questions after carefully reading the ad presented to them.

### **3.2. Questionnaire design and scales**

After reading the landing page, and once they clicked the button “access”, they were randomly exposed to one of the eight different conditions built through the manipulation

of the independent variables: attractive vs. expert endorser, negative vs. positive message framing and emotional vs. rational message. Every advertisement was sponsored by the Spanish Ministry of Health using an official logo. Additionally, it was backed alternatively, by a famous actor, Mr. George Clooney (Attractive endorser) and a supposed Harvard University professor specialized in pediatrics, Dr. Marshall (Expert endorser).

Regardless of presenting a different endorser and framing on each advertisement, all the ads were promoting the same message among parents, the importance, in terms of health and mood, of giving fruits and vegetables to their children.

We had eight versions of the ad in order to manipulate the addresses of the questionnaire:

- Attractive endorser, rational and positive framing.
- Attractive endorser, rational and negative framing.
- Attractive endorser, emotional and positive framing.
- Attractive endorser, emotional and negative framing.
- Expert endorser, rational and positive framing.
- Expert endorser, rational and negative framing.
- Expert endorser, emotional and positive framing.
- Expert endorser, emotional and negative framing.

Figures 3 and 4 show the eight actual treatments, followed by the English version of the four texts.

Right after the ad, the respondent was exposed to a self-administered questionnaire with an initial message that emphasized the guarantee anonymity. The questionnaire started with the instructions to carefully watch the ad and complete the questionnaire. Then, it included the dependent variables: parental intention to give more fruits to their children and parental intention to give more vegetables to their children. With those two variables we constructed a composite variable named parental intention to give more fruits and vegetables to their children. See table 1.

Figure 3. Ad endorsed by actor George Clooney.

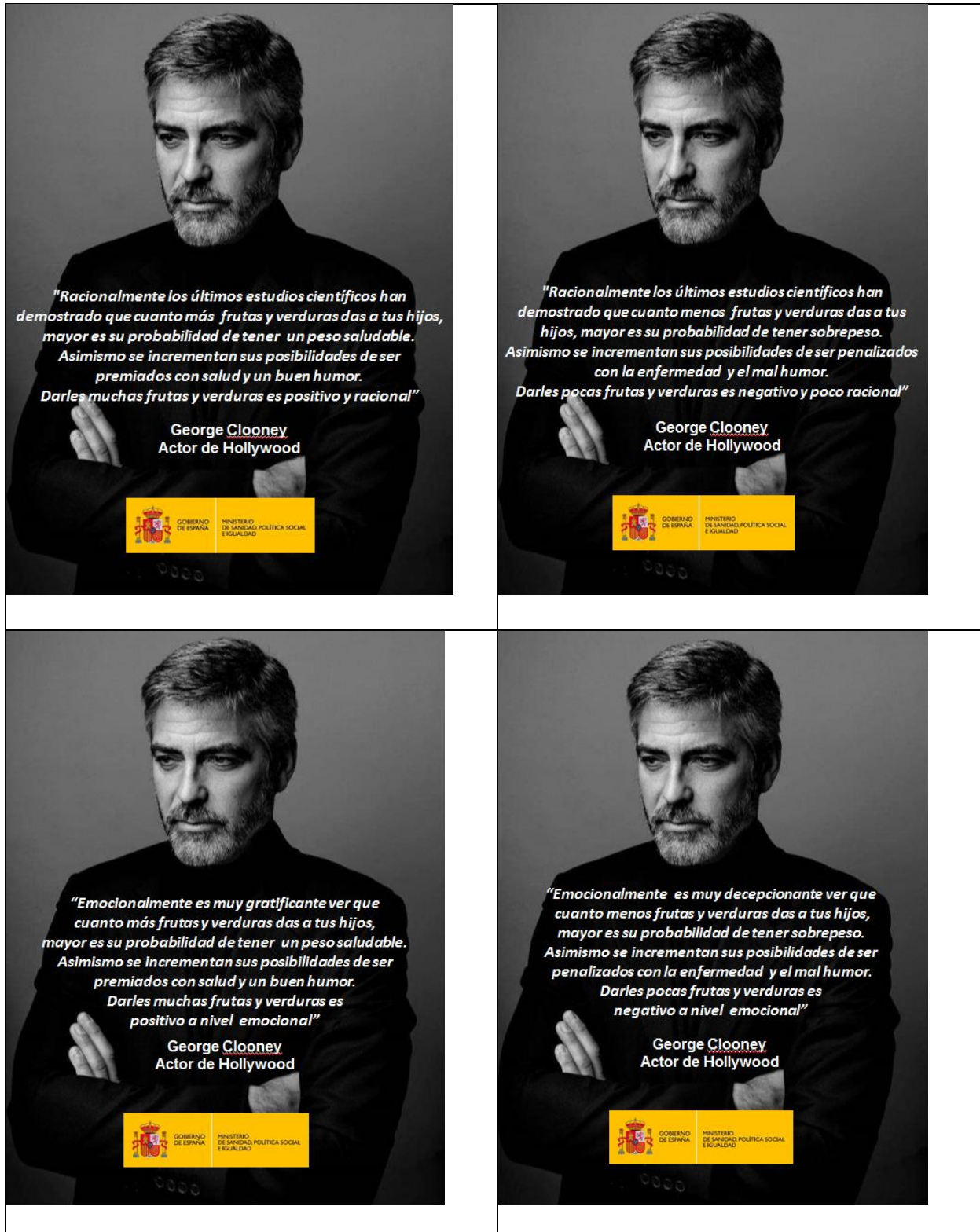


Figure 4. Ad endorsed by Harvard Pediatric Professor.

 <p><i>"Racionalmente los últimos estudios científicos han demostrado que cuanto más frutas y verduras das a tus hijos, mayor es su probabilidad de tener un peso saludable. Asimismo se incrementan sus posibilidades de ser premiados con salud y un buen humor. Darles muchas frutas y verduras es positivo y racional"</i></p> <p><b>Dr. Marshall. Catedrático Pediatría en Harvard.</b></p> 	 <p><i>"Racionalmente los últimos estudios científicos han demostrado que cuanto menos frutas y verduras das a tus hijos, mayor es su probabilidad de tener sobrepeso. Asimismo se incrementan sus posibilidades de ser penalizados con la enfermedad y el mal humor. Darles pocas frutas y verduras es negativo y poco racional"</i></p> <p><b>Dr. Marshall. Catedrático Pediatría en Harvard.</b></p> 
 <p><i>"Emocionalmente es muy gratificante ver que cuanto más frutas y verduras das a tus hijos, mayor es su probabilidad de tener un peso saludable. Asimismo se incrementan sus posibilidades de ser premiados con salud y un buen humor. Darles muchas frutas y verduras es positivo a nivel emocional"</i></p> <p><b>Dr. Marshall. Catedrático Pediatría en Harvard.</b></p> 	 <p><i>"Emocionalmente es muy decepcionante ver que cuanto menos frutas y verduras das a tus hijos, mayor es su probabilidad de tener sobrepeso. Asimismo se incrementan sus posibilidades de ser penalizados con la enfermedad y el mal humor. Darles pocas frutas y verduras es negativo a nivel emocional"</i></p> <p><b>Dr. Marshall. Catedrático Pediatría en Harvard.</b></p> 

The four versions of the text in the ad are:

*"Rationally, recent scientific studies have shown that the more fruits and vegetables you give your children, the greater their chances of having a healthy weight. Additionally their chances of being rewarded with health and good humor also increase. Giving them plenty of fruits and vegetables is positive and rational"*

*"Rationally, recent scientific studies have shown that the less fruits and vegetables you give your children, the greater is their likelihood of being overweight. Additionally their chances of being penalized by disease and moodiness also increase. Giving them few fruits and vegetables is negative and irrational"*

*"Emotionally it is very satisfying to see that the more fruits and vegetables you give your children, the greater their chances of having a healthy weight. Additionally their chances of being rewarded with health and good humor also increase. Giving them plenty of fruits and vegetables is emotionally positive"*

*"Emotionally it is very disappointing to see that the less fruits and vegetables you give your children, the greater is their likelihood of being overweight. Additionally the chances of being penalized by the disease and bad mood also increase. Giving the few fruits and vegetables is emotionally negative"*

We adapted the Machleit et al. (1993) scale to measure intention to give more fruits and more vegetables to their kids. Additionally, we measured the attitude toward this behavior and parental attitudes toward giving fruits and vegetables to their children. With those two variables, we built a composite variable named parental attitude towards giving fruits and vegetables to their children. We measured the dependent variables using scales previously tested in the literature. Detailed information about the scale items and sources is provided in table 2.

**Table 1. Questionnaire structure**

INDEPENDENT VARIABLES	
	Ad treatment
DEPENDENT VARIABLES	
	Parental attitudes to give more fruits to their children
	Parental attitudes to give vegetables to their children
	Parental intention to give more fruits to their children
	Parental intention to give more vegetables to their children
CONTROL VARIABLES	
	Manipulation check
	Parental perceived feeding responsibility
	Parental attitudes to fruits
	Parental attitudes to vegetables
	Parental educational level
	Parental gender
	Child weekly consumption of fruits
	Child weekly consumption of vegetables
	Child age
	Child gender.

After measuring the dependent variables, we included items to check the manipulation of the endorser's attractiveness through a scale adapted from Feick and Higie (1992) and Ohanian (1990). In addition, we checked the manipulation of the message and framing through the scales used by Maheswaran and Meyers-Levy (1990).

Finally, we also included other control variables such as parental perceived feeding responsibility, following the scale of Birch et al. (2001), and parental attitude toward fruits and vegetables, using one of the subscales of the Child Feeding Questionnaire. Finally, we measured parental educational level and gender. Related to the children, we measured weekly consumption of fruits and vegetables, age and gender.

**Table 2. Items and scales to measure the dependent variables**

Items	Scale type	Source
<b>Intention to give more fruits to my children</b>		
Improbable-probable	7-point semantic differential scale	Machleit et al, 1993
Uncertain-certain		
Unlikely-likely		
<b>Intention to give more vegetables to my children</b>		
Improbable-probable	7-point semantic differential scale	Machleit et al, 1993
Uncertain-certain		
Unlikely-likely		
<b>Attitude towards giving fruits to my children</b>		
Unpleasant-pleasant	7-point semantic differential scale	Ajzen and Fishbein 1980
Difficult-simple		
Foolish-wise		
Harmful-beneficial		
<b>Attitude towards giving vegetables to my children</b>		
Unpleasant-pleasant	7-point semantic differential scale	Ajze and Fishbein 1980
Difficult-simple		
Foolish-wise		
Harmful-beneficial		
<b>Manipulations check for expertise and attractiveness. The subject is a...</b>		
Non expert-expert in nutrition	7-point semantic differential scale	Feick and Higie 1992; Ohanian 1990
Non qualified-qualified in nutrition		
Non attractive-attractive		
Not sexy-sexy		
<b>Manipulation check for message framing. In your opinion the style of the ad is...</b>		
Negative-positive	7-point semantic differential scale	Maheswaran and Meyers-Levy, 1990
Punishes bad habits-Rewards good habits		
Emotional-rational		
About feeling-about thinking		



## 4. RESULTS

### 4.1. Sample description

A self-administered questionnaire was sent to 1463 email addresses gathered from study 1. Opening ratio was 46% (679 emails were opened), and 20% (290 parents) clicked through the link and completed the questionnaire.

The fully sample includes 226 mothers (77.9%) and 64 fathers (22.1%). Parents who responded to the questionnaire predominantly had a university degree (66.6%). See tables 3 and 4.

**Table 3. Adult respondent gender.**

Relative	N	%
Mother	226	77,9%
Father	64	22,1%
Total	290	100,0%

**Table 4. Adult respondent education.**

	N	%
Primary	14	4,8%
Secondary	83	28,6%
University	193	66,6%
Total	290	100,0%

Parents reported about 290 children, 143 girls (49.3%) and 147 boys (50.7%). Age varied between 6 and 15 years old, the more frequent interval being from 9 to 12 years old. See tables 5 and 6.

**Table 5. Child gender.**

	N	%
Girls	143	49,3%
Boys	147	50,7%
Total	290	100,0%

**Table 6. Child age**

Years	N	%
<7	37	12,8%
8	36	12,4%
9	41	14,1%
10	52	17,9%
11	64	22,1%
12	46	15,9%
<13	14	4,8%
Total	290	100,0%

Each of the parents was randomly assigned by the web to one of the eight different treatments. The sample distribution across the different treatments can be seen on table 7

**Table 7. Sample distribution of treatments**

	Attractive			Expert			Total		TOTAL
	Negative	Positive	T	Negative	Positive	T	Negative	Positive	
Emotional	30	36	66	37	48	85	67	84	151
Rational	29	43	72	36	31	87	65	74	139
	59	79	138	73	79	152	132	158	290

The minimum amount of individuals in one cell is 29 and the maximum is 48, which allows to run ANOVA tests with confidence. The mean size per cell is 36. The attractive endorsement scenario had 138 cases for 152 of the expert condition. The negative framing situation had 132 respondents for 158 of the positive one. The emotional framing had 151 cases while the rational one had 139.

### ***Scales reliability and validity***

The multi-item scales (dependent and control variables) were evaluated through confirmatory factor analysis (CFA) using the maximum likelihood procedure and the software LISREL 8.54 (Jöreskog et al. 2001). We analyzed the fruit (attitude toward fruits, attitude to give more fruits and intention to give more fruits) and vegetables (attitude toward vegetables, attitude to give more vegetables and intention to give more vegetables) scales

For fruits, the goodness-of-fit statistics for the model were as follows:  $\chi^2(41)=251.01$ ,  $p \approx 0.00$ , RMSEA=0.13, SRMR=0.061, NNFI=0.94, CFI=0.96. Reliability of the measures was confirmed with composite reliability (CR) index higher than the recommended level of 0.6 (Bagozzi and Yi 1988), as well as the Average Variance Extracted (AVE) as shown in table 8. Following the procedures suggested by (Fornell & Larcker (1981), the scales showed acceptable convergent and discriminant validity. Convergent validity was assessed by verifying the significance of the t-values associated with the parameter estimates (Table 8). All t-values were positive and significant ( $p < .01$ ). See table 8.

**Table 8. Scales and reliability for fruits**

VARIABLE	Lambda c.s.	C.R.	AVE	Alfa
<b>Attitude toward fruits (ATF)</b>		<b>0,95</b>	<b>0,82</b>	<b>0,95</b>
Unpleasant-pleasant	0,87***			
Difficult-simple	0,94***			
Foolish-wise	0,93***			
Harmful-beneficial	0,89***			
<b>Attitude to give more fruits (AGF)</b>		<b>0,88</b>	<b>0,66</b>	<b>0,88</b>
Unpleasant-pleasant	0,75***			
Difficult-simple	0,5***			
Foolish-wise	0,95***			
Harmful-beneficial	0,93***			
<b>Intention to give more fruits (IGF)</b>		<b>0,95</b>	<b>0,82</b>	<b>0,96</b>
Improbable- probable	0,93***			
Uncertain-certain	0,95***			
Unlikely-likely	0,93***			

The  $\Phi$ -matrix (correlations between constructs) is provided in table 9. As a first test of discriminant validity, we checked whether the correlations among the latent constructs were significantly less than one. Since none of the confidence intervals of the  $\Phi$ -values ( $\pm$ two standard errors) included the value of one (Bagozzi and Yi, 1988), this test provides evidence of discriminant validity. Secondly, for each pair of factors, we compared the  $\chi^2$ -value for a measurement model constraining their correlation to equal one, to a baseline measurement model without this constraint. A  $\chi^2$ -difference test was performed for each pair of factors (a total of 10 tests in all), and in every case resulted in a significant difference, again suggesting that all of the measures of constructs in the measurement model achieve discriminant validity. In summary, internal consistency and discriminant validity results enabled us to proceed to estimation of the structural model (Table 9).

**Table 9. Correlation matrix of constructs for fruits**

	ATF	AGF	IGF
AGF	0,73	1	
IGF	0,45	0,56	1

For vegetables, the goodness-of-fit statistics were:  $\chi^2(41)=340.08$ ,  $p \approx 0.00$ , RMSEA=0.16, SRMR=0.096, NNFI=0.92, CFI=0.94. Reliability of the measures and validity was confirmed using the same procedure (Table 10 and 11).

**Table 10. Scales and reliability for vegetables**

VARIABLE	Lambda c.s.	C.R.	AVE	Alfa
<b>Attitude toward vegetables (ATV)</b>		<b>0,94</b>	<b>0,82</b>	<b>0,96</b>
Unpleasant-pleasant	0,92***			
Difficult-simple	0,95***			
Foolish-wise	0,95***			
Harmful-beneficial	0,80***			
<b>Attitude to give more vegetables (AGV)</b>		<b>0,83</b>	<b>0,57</b>	<b>0,88</b>
Unpleasant-pleasant	0,64***			
Difficult-simple	0,38***			
Foolish-wise	0,95***			
Harmful-beneficial	0,92***			
<b>Intention to give more vegetables (IGV)</b>		<b>0,96</b>	<b>0,89</b>	<b>0,96</b>
Improbable- probable	0,92***			
Uncertain-certain	0,96***			
Unlikely-likely	0,95***			

**Table 11. Correlation matrix of constructs for vegetables**

	ATV	AGV	IGV
AGV	0,67	1	
IGV	0,47	0,58	1

Cronbach's alpha was used as well to check the scales' reliability. The minimum coefficient found is 0.88 (Tables 8 and 10).

### 4.3. Manipulation check

We used one way ANOVA in order to check that all the manipulations worked as expected. All manipulations showed significant differences between conditions. When we asked the interviewee if the person in the ad was attractive (1: “not attractive” and 7: “very attractive”), the respondents found Mr. Clooney to be more attractive than Dr. Marshall, as intended ( $M_{\text{Clooney}}=5.50$ ;  $M_{\text{Dr.Marshall}}=3.07$ ;  $F(1,289)=139.11$ ;  $p<.000$ ). We also asked the interviewee if he thought the subject in the ad was a nutritional expert (1: “not an expert” and 7: “very much an expert”). As expected, the respondents found Dr. Marshall to be more of a nutritional expert than Mr. Clooney ( $M_{\text{Clooney}}=2.82$ ;  $M_{\text{Dr.Marshall}}=5.66$ ;  $F(1,289)=156.20$ ;  $p<.000$ ). Parents were asked in a 7 point semantic differential scale (1: “very negative” and 7: “very positive”) if the ad message framing was more negative or positive. The subjects found the positive ad more positive than the negative one ( $M_{\text{negative}}=3.87$ ;  $M_{\text{positive}}=5.65$ ;  $F(1,289)=65.87$ ;  $p<.000$ ).

Finally respondents were asked in a 7 point semantic differential scale (1: “very emotional” and 7: “very rational”) if the message was more emotional or rational. The result were again significant ( $M_{\text{emotional}}=4.12$ ;  $M_{\text{rational}}=5.26$ ;  $F(1,289)=29.12$ ;  $p<.000$ ) and in the expected direction.

### 4.4. Hypotheses testing

ANCOVA was used to confirm the hypothesis. Most studies consider both the consumption of both products together; this is fruits and vegetables as a single product. We measured them separately but we built a composite variable called parents' intention to give more fruits and vegetables to his/her children. In order to be consistent with most of the literature, we started analyzing this composite dependent variable.

Control variables are included as covariates. Firstly, parents' characteristics like gender, education and parental attitudes towards fruits and vegetables. Secondly, children's features like daily amount of fruits and vegetables eaten by the child, gender and age.

Most of the control variables did not make a significant difference on parents' intentions to give more fruits and vegetables to their children. The only two covariates that increased the fitting of the proposed model were kids age and parent's attitude towards fruits and vegetables. And for that reason we ran the final ANCOVA with only these two covariates (See table 12). Table 13 shows the means for the parents' intention to give more fruits and vegetables to their children across conditions.

**Table 12. ANCOVA for dependent variable parents' intention to give more fruits and vegetables to their children**

ANCOVA for parents' intention to give...	F	p
Attitude toward fruits and vegetables	63.99	.00
Attractive / Expert endorser	6.14	.01
Negative / Positive message	5.85	.02
Emotional / Rational message	4.04	.05
Attractive / Expert * Negative / Positive	.12	.73
Attractive / Expert * Emotional / Rational	13.07	.00
Negative / Positive * Emotional / Rational	.57	.45
Attractive / Expert * Negative / Positive * Emotional / Rational	.01	.93

R<sub>adj</sub>=.252

**Table 13. Means of parent intention to give more fruits and vegetables to children, standard deviations are in parentheses**

	Attractive			Expert			Negative	Positive	TOTAL
	Negative	Positive	total	Negative	Positive	total			
Emotional	5.59 (1.66)	5.80 (1.59)	5.71 (1.61)	4.91 (2.35)	5.47 (1.76)	5.22 (2.05)	5.22 (2.08)	5.61 (1.69)	5.43 (1.88)
Rational	3.90 (1.67)	4.60 (1.94)	4.32 (1.86)	5.41 (1.84)	6.03 (1.44)	5.70 (1.68)	4.73 (1.91)	5.20 (1.88)	4.98 (1.90)
Total	4.76 (1.86)	5.15 (1.88)	4.98 (1.87)	5.16 (2.12)	5.69 (1.66)	5.43 (1.68)	4.98 (2.01)	5.42 (1.79)	5.22 (1.90)

Results showed that the covariate parental attitudes towards fruits and vegetables, exerts a significant effect on parents' intention to give more fruits and vegetables to their children ( $F(1,281)=63.99$ ;  $p<.00$ ). Correlation analysis ( $r=.45$ ;  $p<.00$ ) indicates that the higher the parental attitudes toward fruits and vegetables, the higher their intention to give more fruits and vegetables to their children.

We also found a significant main effect of the type of endorser. As predicted in the hypothesis H1, the parents' intention to give more fruits and vegetables to their children was higher when parents were exposed to the ad with the expert endorser than when they were exposed to the ad with the attractive endorser ( $M_{\text{Attractive}}=4.98$ ;  $M_{\text{Expert}}=5.43$ ;  $F(1,281)=6.14$ ;  $p<.05$ ).

Additionally, the valence of the message revealed a significant main effect of the parents' intention to give more fruits and vegetables to their children was higher for

parents exposed to the ad with a positive message than to those that were exposed to the ad with the negative framed message ( $M_{\text{negative}}=4.98$ ;  $M_{\text{positive}}=5.42$ ;  $F(1,281)=5.85$ ;  $p<.05$ ) as predicted in the hypothesis H2.

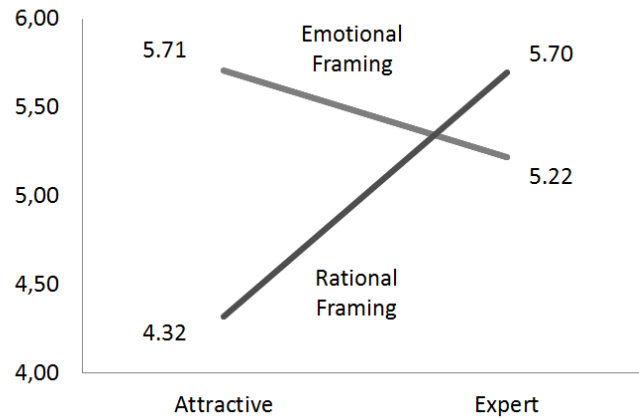
The emotional/rational message framing revealed, also, a significant main effect on the dependent variable parents' intention to give more fruits and vegetables to their children. This intention was higher for parents exposed to the rational ad than to those who were exposed to the emotional framed message ( $M_{\text{emotional}}=5.44$ ;  $M_{\text{rational}}=4.98$ ;  $F(1,281)=4.04$ ;  $p<.05$ ) also as predicted in hypothesis H3.

Additionally, we found a highly significant interaction effect between the type of endorser and the emotional/rational message framing ( $F(1,281)=13.07$ ;  $p<.00$ ). See figure 5. This means that if we use an expert endorser there is no difference in the parents' intention to give more fruits and vegetables to their children between using an emotional or rational message framing ( $M_{\text{emotional}}=5.22$ ;  $M_{\text{rational}}=5.70$ ;  $F(1,281)=1.43$ ;  $p>.24$ ) the tone of the framing is not relevant. On the other hand when the endorser is an attractive celebrity, a rational framing is associated to a much lower parental intention to give more fruits and vegetables to their children than when using and emotional message framing, ( $M_{\text{emotional}}=5.71$ ;  $M_{\text{rational}}=4.32$ ;  $F(1,281)=15.06$ ;  $p<.00$ ).

We can also see that if the message framing is emotional the message endorser is irrelevant ( $M_{\text{attractive}}=5.71$ ;  $M_{\text{expert}}=5.22$ ;  $F(1,281)=.73$ ;  $p>.40$ ), but, if the message framing is rational there is a significant difference between the attractive endorser and the expert endorser. ( $M_{\text{attractive}}=4.32$ ;  $M_{\text{expert}}=5.70$ ;  $F(1,281)=17.94$ ;  $p<.00$ ). Definitely, parents are finding the rational message more credible and therefore more persuasive in case of an expert doctor than in case of an actor.

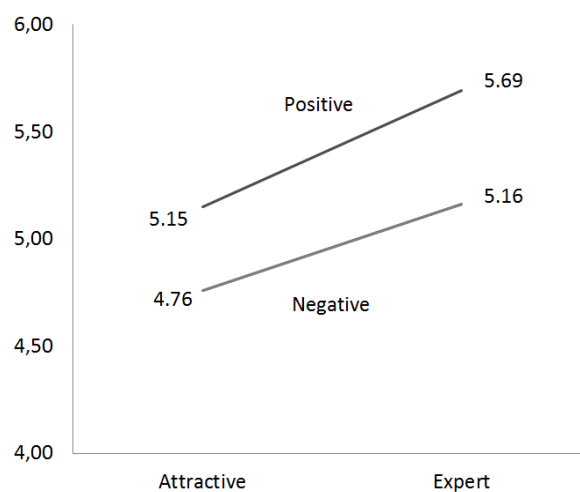
We can conclude that in general parents have the similar intention to give more fruits and vegetables when the message endorser is an expert, regardless if the message frame is emotional or rational. This two intentions are not very different from the parental intention is modified by an ad with and attractive endorser and an emotional message framing. Where we can see an important decrease in parental intention to give more fruits and vegetables to their children is when the message is presented by an attractive endorser with a rational message framing. Probably the attractive endorser, besides being liked, is not being perceived as having the expertise to give a particular rational message regarding the consumption of fruits and vegetables.

**Figure 5. Parents' intention to give more fruits and vegetables to their children with attractive/expert endorser and emotional/rational message framing**



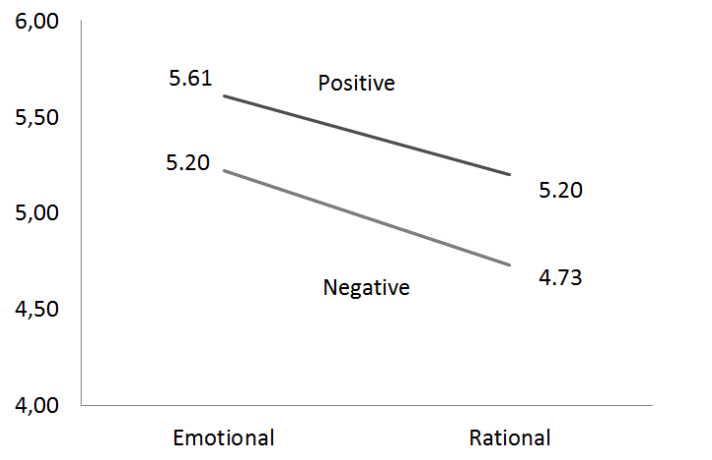
However, no interaction was found between the type of endorser and the negative/positive message framing ( $F(1,281)=.12$ ;  $p>.10$ ), as shown in figure 6, and neither between both message framings negative/positive and emotional/rational ( $F(1,281)=.57$ ;  $p>.10$ ) as shown in figure 7. The triple interaction was also no significant ( $F(1,289)=.02$ ;  $p>.10$ ). The adjusted R squared for the complete model was .252.

**Figure 6. Parents' intention to give more fruits and vegetables to their children with attractive/expert endorser and positive/negative message framing**





**Figure 7. Parents' intention to give more fruits and vegetables to their children with positive/negative and emotional/rational message framing**



In our study we also measured the parental attitudes towards giving fruits and vegetables to their children. We run an ANCOVA with this dependent variable and parental attitude toward fruits and vegetables and child age as covariates and the independent variables type of endorser and the two message framings (negative/positive and emotional/rational).

As expected, parental attitudes toward fruits and vegetables is also a determinant of parental attitudes toward giving fruits and vegetables to children ( $F(1,280)=249.25$ ;  $p<.000$ ). The Pearson correlation coefficient is positive and significant ( $r=.70$ ;  $p=.00$ ) which we anticipated, if parents are found of fruits and vegetables they must have a positive attitude towards giving fruits and vegetables to their children and therefore both variables are highly correlated. Additionally we found that the kids age, that was not significant for intention to give more fruits and vegetables, is now significant for attitude to give more fruits and vegetables ( $F(1,289)=4.46$ ;  $p<.05$ ), the Pearson correlation coefficient is negative and significant ( $r=-.13$ ;  $p<.05$ ). This means that parental attitude to give more fruits and vegetables to children decreases when the child grows older. See table 14.

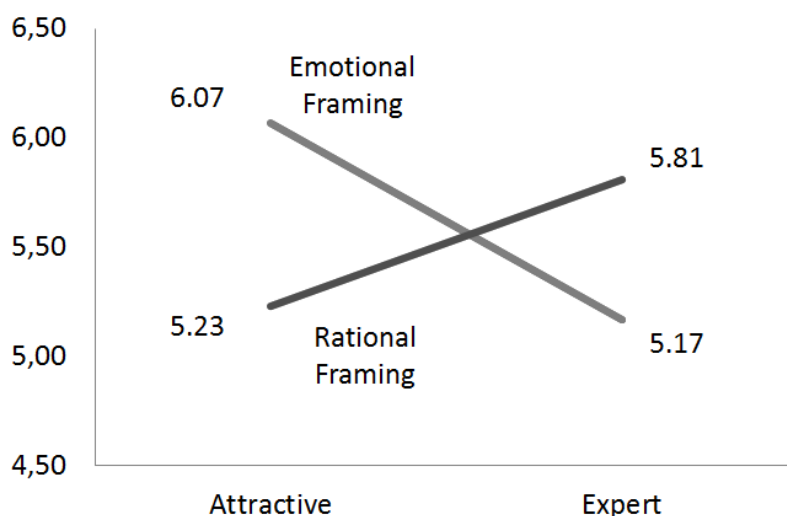
**Table 14. ANCOVA for dependent variable parents' attitude to give more fruits and vegetables to their children**

Effects	F	p
Attitude towards fruits and vegetables	249.25	.00
Child age	4.46	.04
Attractive / Expert endorser	1.26	.26
Negative / Positive message	.18	.67
Emotional / Rational message	.01	.91
Attractive / Expert * Negative / Positive	.80	.37
Attractive / Expert * Emotional / Rational	6.12	.01
Negative / Positive * Emotional / Rational	.00	.97
Attractive / Expert * Negative / Positive * Emotional / Rational	.00	.95
<hr/>		
$R_{adj}=.493$		

None of the message scenarios of endorsement and framing made a difference on the dependent variable. None of the main effect was significant. Parents' attitude to give more fruits and vegetables to their children is similar when parents were exposed to the ad with the attractive endorser (George Clooney) than when they were exposed to the ad with the expert endorser (Dr. Marshall) ( $M_{Attractive}=5.64$ ;  $M_{Expert}=5.46$ ;  $F(1,280)=1.26$ ;  $p>.10$ ). Additionally, the valence of the message revealed, no significant main effect of the parents' attitude to give more fruits and vegetables to their children ( $M_{negative}=4.50$ ;  $M_{positive}=4.58$ ;  $F(1,280)=.18$ ;  $p>.10$ ). Neither did the emotional/rational message framing. The dependent variable, parents' attitude to give more fruits and vegetables to their children was indifferent to being exposed to the rational ad or to the emotional ad ( $M_{emotional}=5.57$ ;  $M_{rational}=5.51$ ;  $F(1,280)=.01$ ;  $p>.10$ )

Furthermore, no interaction was found between the attractive/expert endorser and the negative/positive message framing ( $F(1,280)=.80$ ;  $p>.10$ ) and neither between both message framings negative/positive and emotional/rational ( $F(1,280)=.00$ ;  $p>.10$ ). But, the same interaction between independent variables (the message endorser and the emotional-rational message framing) that we had found before for intention to give more fruits and vegetables was also found for attitude to give more fruits and vegetables ( $F(1,280)=6.13$ ;  $p<.05$ ). See figure 8.

**Figure 8. Parents' attitude to give more fruits and vegetables to their children with attractive/expert endorser and emotional/rational message framing**



In the case of parents' attitude to give more fruits and vegetables to their children we can also see that if the message framing is emotional the attractive message endorser is much more efficient than the expert endorser ( $M_{\text{attractive}}=6.07$ ;  $M_{\text{expert}}=5.17$ ;  $F(1,280)=6.76$ ;  $p<.01$ ), but, if the message framing is rational there is no significant difference between the attractive endorser and the expert endorser. ( $M_{\text{attractive}}=5.23$ ;  $M_{\text{expert}}=5.81$ ;  $F(1,280)=.92$ ;  $p>.33$ ).

Finally, the triple interaction was neither significant ( $F(1,280)=.00$ ;  $p>.10$ ). The adjusted R squared for the complete model was .493.

#### **4.5. Additional results**

##### **4.5.1. Mediation effect**

Based on the Theory of Planned Behavior (Ajzen, 1991) and the consistent interaction effect of the type of endorser and emotional/rational message framing we checked for the mediation effect of attitude to give more fruits and vegetables between the independent variables (attractive/expert endorser and emotional/rational framing) and the main dependent variable parents' intention to give more fruits and vegetables to their children. We conducted a mediation analysis (Hayes 2012) estimating the two models and checking for the indirect effect (Table 15 and figure 9).

**Table 15. Mediation analysis**

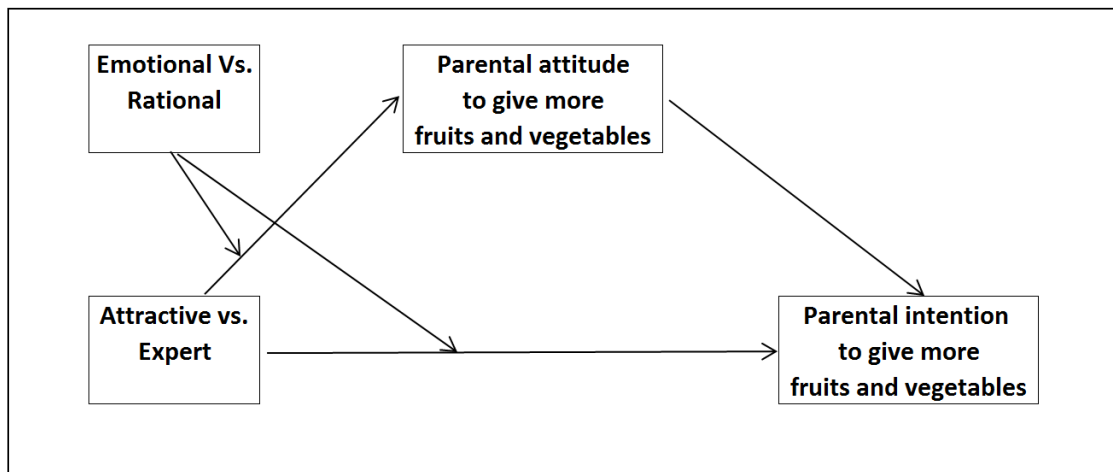
Attitude to give more fruits and vegetables to their children	B	p
Constant	3.77	.000
Child age	-.08	.037
Attitude toward fruits and vegetables	.53	.000
Attractive / Expert endorser	-.49	.011
Emotional / Rational message	-.37	.068
Attractive / Expert * Emotional / Rational	.69	.015

Intention to give more fruits and vegetables to their children	B	p
Constant	1.67	.009
Attitude toward fruits and vegetables	.59	.000
Attractive / Expert endorser	.09	.728
Emotional / Rational message	-.84	.001
Attractive / Expert * Emotional / Rational	.91	.013

Note. 10 000 bootstrap samples

**Figure 9. Attitude to give more fruits and vegetables mediation**



We introduced two covariates in the analysis, parents' attitude towards fruits and vegetables and the child's age. Both of them have a significant effect on the mediator. The first covariate ( $b = .53$ ,  $t = 15.93$ ,  $p < .00$ ) and the child's age ( $b = -.07$ ,  $t = -2.09$ ,  $p < .05$ ). But the same variables had a non-significant effect on the parents' intention to give more fruits and vegetables to their children ( $b = .06$ ,  $t = 1.10$ ,  $p > .10$ ) and the child's age ( $b = .01$ ,  $t = .18$ ,  $p > .10$ ).

The effect of the type of endorser on attitude to give more fruits and vegetables was negative and also significant ( $b = -.49$ ,  $t = -2.54$ ,  $p < .01$ ), but not significant on intention to give more fruits and vegetables ( $b = .09$ ,  $t = .35$ ,  $p > .10$ ). The emotional/rational framing exerts a negative influence on attitude to give more fruits and vegetables ( $b = -.37$ ,  $t = -1.83$ ,  $p < .10$ ). The effect of emotional/rational framing on intention to give more fruits and vegetables was negative and significant ( $b = -.84$ ,  $t = -3.22$ ,  $p < .00$ ).

The interaction effect of the type of endorser and emotional/rational framing was positive and significant for the attitude toward fruits and vegetables ( $b = .63$ ,  $t = 2.45$ ,  $p < .05$ ), as was for the Intention to give more fruits and vegetables ( $b = .91$ ,  $t = 2.49$ ,  $p < .01$ ). Finally, results also showed that the indirect effect of the interaction between the variables type of endorser and emotional/rational framing is also significant (indirect effect = .40, Bootstrap 95% confidence interval [.08;.82]). This mediation analysis confirmed that the interaction effect of attractive/expert endorser and emotional/rational framing over the parental intention to give more fruits and vegetables to their children is partially mediated by the effect of this interaction on the parental attitude to give more fruits and vegetables to their children.

#### **4.5.2. Differences between fruits and vegetables**

Literature has traditionally analyzed fruits and vegetables as a block (Slavin and Lloyd, 2012; Blanchard et al., 2009; Block et al., 1992). However, children consider differently these two food families as they have different visual and taste characteristics (Pennington and Fisher, 2009). Although there is not a general agreement on which foods are fruits and which are vegetables, fruits are sweeter and vegetables are sourer (Capaldi and Privitera, 2008). Vegetables are very often green and fruits are colorful. Food neophobic child behavior makes giving vegetables to them a more difficult task than giving them fruits (Birch, 1999). Therefore, in order to increase our understanding of how parents might behave differently to these two types of foods, we conducted two individual ANCOVAs, one for each type of food, parental intention to give more fruits to their children and parental intention to give more vegetables to their children. See tables 16 and 17.

**Table 16. ANCOVA for parents' intention to give more fruits to their children**

Effect	F	p
Attitude toward fruits	56.83	.000
Attractive / Expert endorser	5.35	.021
Negative / Positive message	5.29	.020
Emotional / Rational message	4.56	.034
Attractive / Expert * Negative / Positive	.02	.879
Attractive / Expert * Emotional / Rational	11.42	.001
Negative / Positive * Emotional / Rational	1.34	.247
Attractive / Expert * Negative / Positive * Emotional / Rational	.05	.818
$R_{adj}=.226$		

**Table 17. ANCOVA for parents' intention to give more vegetables to their children**

Effect	F	p
Attitude toward vegetables	62.93	.000
Attractive / Expert endorser	6.50	.011
Negative / Positive message	6.10	.014
Emotional / Rational message	3.31	.070
Attractive / Expert * Negative / Positive	.30	.586
Attractive / Expert * Emotional / Rational	14.63	.000
Negative / Positive * Emotional / Rational	.08	.773
Attractive / Expert * Negative / Positive * Emotional / Rational	.26	.637
$R_{adj}=.258$		

Covariates, main effects and interactions have the same effects for both parental intention to give more fruits and parental intention to give more vegetables when analyzed separately.

The covariate attitudes toward fruits are correlated with parental intention to give more fruits ( $F(1,281)=56.83$ ;  $p<.000$ ). The Pearson correlation coefficient is positive and significant for parental attitudes towards fruits and parental intention to give more fruits ( $r=.424$ ;  $p=.000$ ). The same significant relationship is found for parental attitudes towards vegetables and parental intention to give more vegetables to their children ( $F(1,281)=62.93$ ;  $p<.000$ ). Pearson correlation coefficient positive and significant ( $r=.452$ ;  $p=.000$ ).

We did not find differences between the independent variables and interactions that affect intention to give more fruits and intention to give more vegetables. The expert endorser is more effective increasing parental giving intention than the attractive endorser for both products considered separately; fruits ( $M_{\text{Attractive}}=5.00$  ;  $M_{\text{Expert}}=5.43$ ;  $F(1,281)=3.43$ ;  $p<.10$ ) and vegetables ( $M_{\text{Attractive}}=4.96$  ;  $M_{\text{Expert}}=5.43$ ;  $F(1,289)=4.64$ ;  $p<.05$ ). Also, the positive message framing is more effective than the negative message framing to increase parental intention to give more fruits to their children ( $M_{\text{Negative}}=4.88$  ;  $M_{\text{Positive}}=5.48$ ;  $F(1,281)=3.52$ ;  $p<.10$ ) as well as it is more efficient to increase parents' giving intention for vegetables ( $M_{\text{Negative}}=4.96$  ;  $M_{\text{Positive}}=5.41$ ;  $F(1,281)=4.07$ ;  $p<.05$ ). Furthermore, the effect of the emotional message framing is higher than the rational message framing and significant for both parental intention to give more fruits ( $M_{\text{Emotional}}=5.45$  ;  $M_{\text{Rational}}=4.98$ ;  $F(1,289)=4.19$ ;  $p<.050$ ) and for parental intention to give more vegetables to their children ( $M_{\text{Emotional}}=5.41$  ;  $M_{\text{Rational}}=4.98$ ;  $F(1,289)=3.91$ ;  $p<.050$ ).

Finally, the interaction effect of the type of endorser (attractive/expert) and the message framing (emotional/rational) is highly significant for both fruits ( $F(1,281)=11.42$ ;  $p<.001$ ) and vegetables ( $F(1,281)=14.63$ ;  $p<.000$ ). On the other hand the other two double interactions were not significant nor for fruits nor for vegetables. The interaction type of endorser and the message framing (negative/positive) was not significant for fruits ( $F(1,281)=.05$ ;  $p>.1$ ), nor for vegetables ( $F(1,281)=.30$ ;  $p>.1$ ). The interaction message framing (emotional vs. rational) and message framing (negative vs. positive) was neither significant for fruits ( $F(1,281)=1.34$ ;  $p>.1$ ), nor for vegetables ( $F(1,281)=.08$ ;  $p>.1$ ). The triple interaction was neither significant for fruits ( $F(1,281)=.05$ ;  $p>.1$ ) nor for vegetables ( $F(1,281)=.22$ ;  $p>.1$ ).

## 5. DISCUSSION

Our research stemmed from the idea that the change of the reduction in overweight children can be solved, at least partially, by changing the parents' attitudes toward giving fruits and vegetables to the children. Our intention is to define a standard pattern to communicate to parents the importance of providing to their kids a higher availability and convenience of fruits and vegetables. The first goal would be to determine the ideal message in terms of endorser and framing to increase parental intention to give more fruits and vegetables to their children. This intention will ideally lead to a parental behavior and subsequently to an increase of child consumption of fruits and vegetables (as seen in study 1 in chapter2). Parenting practices, such as pressure, restriction,

modelling and availability have an influence on child eating (Ventura and Birch, 2008). Parents are the great influencers for children (Davis-Kean 2005). They breed their offspring by feeding, educating and entertaining them. Their degree of awareness and their level of concern and commitment towards healthy habits should have a strong influence on their own behavior and therefore have a positive influence through modelling on their children healthy habits (Scaglioni, 2008).

Specifically, we addressed the question of the more effective communication to parents in order to change their attitudes toward giving more fruits and vegetables to their children. In this study we show that the parents' intention to give more fruits and vegetables to their children is influenced by the message endorser. The effect is higher for the expert endorser than for the attractive one. This result is consistent with the results of Pornpitakpan (2004), who found that higher source credibility results in more persuasion in terms of both attitude and behavioral measures. The trustworthiness and the expertise dimensions of source credibility contribute to this effect on parental intentions.

Our research contributes to the literature of communication of messages related to the prevention of disease and health maintenance by examining the effectiveness of the campaigns targeted to parents to change their intentions. Our research extends extant research on health communication to the domain of message framing, specifically concerning the valence of message in health communication campaigns. Results show that positive messages have a higher and significant main effect on the parental intention to give more fruits and vegetables to their children than the negative framing message. This idea is in line with that one that points out that messages that evoke positive emotions may have a greater impact with the target group than those evoking negative emotions like fear (Monahan 1995).

We also extend the research findings to the domain of emotional and rational message framing. Our findings show that the emotional message framing revealed a higher effect on Intention to give more fruits and vegetables than the rational message framing. This result is consistent with the idea that for most parents, the wellbeing of their children is one of their highest ambitions and is an emotional feeling, not a rational one. When the parents receive an emotional message the cognitions will be more consistent with their relationship with their children than when this message is rational and, therefore, the persuasion of the emotional message is higher than that of for the rational one.



The significant interaction effect between the attractive/expert endorser and the emotional/rational framing means that when we use an expert endorser the emotional or rational tune of the message is indifferent. The expert is always credible. On the other hand an attractive endorser must sound emotional to be equally persuasive and when the message is rational the attractive endorser loses credibility and persuasiveness.

In summary, increasing parents' intention to give more fruits and vegetables to their children has to be based on the joint consideration of these three variables: endorser, positive/negative valence and the emotional/cognitive dimension of the message.

Our research contributes to the literature on feeding by demonstrating a use of fruits and vegetables that has not been explored before. Based on previous literature, we did not distinguish between fruits and vegetables in our first analysis. But, we knew from the expert panel and the pre-test of the questionnaire that children accept more easily fruits than vegetables and, therefore, this task gives less hassle to parents. This is the reason why we measured attitudes, intentions and behaviors separately for fruits and for vegetables. However, we did not find any significant difference between parental attitudes towards fruits or towards vegetables, nor on the attitude towards the product or towards the act of giving the product. We neither find any significant difference on the mean of intention to give more fruits and the mean of the intention to give more vegetables. Therefore, as far as this research is concerned, fruits and vegetables can be considered together despite the slight behavior differences we might have suspected.



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## **CONCLUSIONS, LIMITATIONS AND FUTURE RESEARCH**

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## CONCLUSIONS

Our research stemmed from the idea that parents are responsible for creating a safe environment to raise healthy children. Parents are responsible for their children and society should help, firstly, by informing them of which behaviors are better for their children and, secondly, educating them to perform those behaviors.

Despite the existence of many studies on the correlations between parental behaviors and children weight (e.g. Birch et al. 2001; Lindsay et al. 2006; Ventura and Birch 2008; Sladdens et al. 2011) this dissertation has focused on one stage before parental behavior, this is, parental attitudes. Based on the first study, our research contributes to the literature by describing the process from parental attitudes to child BMI as a three stage process: parental attitudes, parental behavior and children's behavior, the latter directly linked with children's BMI. Furthermore, we have integrated this three stage model with three variables, sleeping, watching television and healthy eating, that show three complementary paths to change children's behavior and their BMI

As a third contribution, this research shows the influence of parents' attitudes toward sleeping, television use and feeding and their behavior in relation to these activities. This parental behavior relates to family rules, environment at home while watching television, availability and accessibility of fruit and vegetables at home, parent eating modeling and child feeding strategies at family meals.

Fourth, our results demonstrate that parental conducts have a significant influence on children's behavior relating to sleeping time, television viewing and healthy eating. Family rules and parental positive attitudes towards sleep increase the amount of hours that children sleep. Sleeping well contributes to the prevention of being overweight. Furthermore, the amount of time children are exposed to television can be reduced with family rules associated with this behavior. The parents' negative attitudes towards television usually reduce the number of TV sets at home. Moreover, a healthy eating environment at home influences healthy eating habits in children. This healthy eating environment is ruled by the parents' healthy habits (e.g. to serve peeled fruit, to eat vegetables, etc.) and avoiding unhealthy habits (e.g. to drink sugared soda).

In summary, children are aware of their parents' attitudes and behaviors. Therefore, parents should capitalize on this opportunity to set home rules and serve as role models for sleeping hours, the rational use of screen devices and a healthy diet for their children.

With the second study, our contribution is based on how the parents' intention to give fruit and vegetables to their children is influenced by the message endorser and the message framing. First, we demonstrate that the effect of communication is stronger when using an expert endorser than when using an attractive endorser. The trustworthiness and the expertise dimensions of source credibility show, therefore, a significant relevance in affecting attitude formation and change. Second, we contribute to the literature by showing that the positive message framing has a significant main effect on intention to give more fruit and vegetables. Messages that evoke positive emotions have a greater impact than those which evoke negative emotions. In addition, the emotional message framing revealed a higher and significant main effect on intention to give more fruit and vegetables than the rational message framing. For most parents, the wellbeing of their children is one of their highest ambitions to which they are emotionally attached. The persuasion of the emotional message is higher than that of the rational one.

Finally we found an interesting interaction effect between the type of endorser (expert/attractive) and the message framing (emotional/rational). Results show that the parental intention to give more fruits and vegetable to their children decreases when the rational message is presented by and attractive endorser. Probably parents perceive that the scientific, rational message does not fit with the attractive, but not expert, endorser.

Based on the sample sizes, how they were stratified and that they were composed of real consumers, our results show sufficient external validity.

## **IMPLICATIONS FOR PUBLIC POLICY**

In addition to the contributions to marketing theory, this research holds important implications for politicians and managers. Politicians in charge of public health face a huge responsibility. Health is one of the top priorities for most citizens and, therefore, for voters. Good health can be reached by two means, prevention and cure. As a general rule, prevention is less expensive than cure and in many western societies the budgets for the Public Health system are rising rapidly. Therefore, health politicians should focus on fighting causes of illness in an attempt to attain the maximum results with the minimum budget.

The public authorities have the responsibility to inform the population of all scientifically based facts that can improve or protect their health for the common good. In western countries we live in a society with an abundance of food, and sedentary leisure activities that prevent us from eating correctly, doing physical exercise and sleeping enough. People are born unaware of the fact that maintaining these three elements is fundamental to their present and future health. The public authorities invest valuable amounts in research to prevent illness. Therefore they should be responsible for promoting the awareness, concern and commitment toward healthy habits whilst trying to reach the maximum efficiency with the minimum budget.

Public policy should play an active role in promoting healthy behaviors in parents and children. That is, long sleeping, spending less time watching TV, practicing sports regularly and eating healthily. Promoting these habits may have a positive influence in some industries (e.g. sports facilities, bike factories, fruit and vegetable farms) and a negative influence on others (TV channels, sugar industry and fast food industry among others) willing to fight with important lobbies to avoid any restrictive policies, (Brownell and Warner 2009)

Furthermore we provide significant understanding on how a communication campaign should be design in order to promote parental intention to give more fruit and vegetables to their children. The endorser should be an expert and the message should be positive and emotional avoiding rational messages endorsed by attractive celebrities. Several campaigns promoting fruits and vegetables, based on the “five-a-day” slogan, have been implemented around the world, spending millions of monies, with different results in terms of efficacy (Ashfield-Watt et al. 2004; Balch et al. 1997), probably because they have used a wrong combinations of message elements such as an attractive endorser with a rational message. A clear example of the wrong doing is the “We care, you enjoy!” campaign to promote Spanish vegetables in Germany, using famous and attractive actress Esther Schweins, with rational arguments such as “they are healthy and safe”.

In summary, our contribution can make a significant difference in terms of increasing efficiency and reducing costs when designing campaigns that encourage children to eat more fruits and vegetables through targeting parents.

Marketing manager in the industry can also benefit from our conclusions as they can also design much more efficient campaigns when addressing parents, highly involved with their children health and weight.

## LIMITATIONS

Our research strengths are also accompanied by some limitations. For study 1, although our model focused only on the home determinants of children being overweight other aspects have not been included. Referring to the paths, we could have considered a fourth path relating to physical activity. We chose not to include it for two reasons. First, normally physical activity is not practiced at home and second, due to this fact, the time allocated by children to this activity is more difficult to be estimated by parents who fulfill the questionnaire.

Moreover, taking into account other behavioral influences on children's weight, we could have included other people's attitudes and behaviors, besides parents, from within the home environment, such as siblings or grandparents living at home or quite often feeding their grand-children.

Thirdly, in relation to children's behaviors, we could have taken into account not only sleeping time but also sleeping disturbances, not only television viewing but also other screen use and on healthy eating we could have used more items besides fruits, vegetables and sugared products.

Both studies, 1 and 2, could improve their external validity if different regions of Spain had been used or, even better, if we could have accessed an international sample.

Study 2 had also some limitations. A bigger sample could increase the strength of the results. In addition, the questionnaire was filled out through a website, and this system excludes those parents that do not have a pc or are not connected to the internet. Moreover, behavior is the variable that we aim to modify and it would be interesting if future research could work with this variable instead of using intention. Another source of bias within the results may be social acceptability. Although most parents know that eating fruit and vegetables is socially desirable, some of them may have answered concerning their intention to give more fruit and vegetables to accomplish what they think is socially desirable. Nevertheless, in-depth interviews carried out in the preparation phase showed that this was not a clear issue for parents. Furthermore, although we have been very careful to guarantee that the graphic designs were very similar in size, position of the endorser and text to real ads, the fact that one picture is mainly white and the other one is mainly black might have had an unknown effect on the intention.



## **FUTURE RESEARCH**

While study 1 focused on the antecedents of children being overweight, future research can examine in which part of the process (i.e. parental attitudes, parental behavior or children's behavior) interventions could be more effective to reduce overweight children. A child can have very positive attitudes towards healthy habits, but if his/her parents, prepare the dinner late, make noise at night, have several television sets at home, do not buy fruit and vegetables, and there is plenty of junk food and sugared beverages at home, the child will have difficulties trying to perform healthy behaviors like sleeping longer, spending less time watching TV and eating healthily. Likewise, the parents will rarely perform healthy behaviors if they are not aware of the detrimental effects they have on their child's health.

Concerning study 2, there are several questions to keep in mind for future research related to communication design when promoting the consumption of fruits and vegetables. First the same research can be replicated nationally and internationally. Second, the ad was created mixing fruit and vegetables in the same message. Therefore, research should be replicated making an exclusive ad for fruits and another for vegetables to check if results were the same.

Related to the endorser we used two males. Research should consider whether the endorser's gender may create a difference in results and if this difference depends on the receiver's gender too. The same applies for race. In our experiment the attractive endorser was a celebrity and the expert was anonymous. It would be very helpful to understand what the difference would be if both expert endorsers were equally anonymous or equally attractive.

Finally the positive message framing appeared to be more efficient in all cases but on the other hand we found that the emotional message framings could be more effective for mothers than for fathers. Future research should be further in-depth on this issue in order to draw definitive findings.



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**ANEXO**

**RESUMEN EN ESPAÑOL**

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## **INTRODUCCIÓN**

El sobrepeso adulto e infantil se han convertido en una pandemia en las últimas décadas, en particular en los países occidentales (Ng et al. 2014). Más de 2.000 millones de personas tienen sobrepeso u obesidad hoy en día. A nivel mundial, la proporción de adultos con un índice de masa corporal (IMC) superior a 25 kg / m<sup>2</sup> (que se asocia con el sobrepeso y la obesidad) aumentó más de un 25% entre 1980 y 2013, alcanzando el 37% de los varones y el 38% de la población femenina (Ng et al. 2014).

Esta tesis tiene dos objetivos principales: En primer lugar confirmar como las actitudes parentales influyen en sus comportamientos y estos en los de los hijos y como están relacionados con el sobrepeso. En segundo lugar averiguar que mensajes son más eficientes a la hora de convencer a los padres de la importancia de favorecer hábitos saludables para sus hijos. En concreto como incrementar el consumo de frutas y verduras. Vamos a realizar dos estudios para lograr estos objetivos.

### **ESTUDIO 1**

Proponemos un modelo en el que comprobar si las actitudes de los padres hacia el sueño, ver la televisión y la alimentación tienen una influencia sobre sus propios comportamientos. Estos comportamientos son: normas familiares, uso de la televisión en casa, tener comida sana en casa y comer en familia. Estimamos que estos comportamientos parentales condicionarán tres comportamientos infantiles. Las horas de que duerma el niño y alimentación saludable tendrán una relación inversa y las horas de TV una relación directa con el peso del niño.

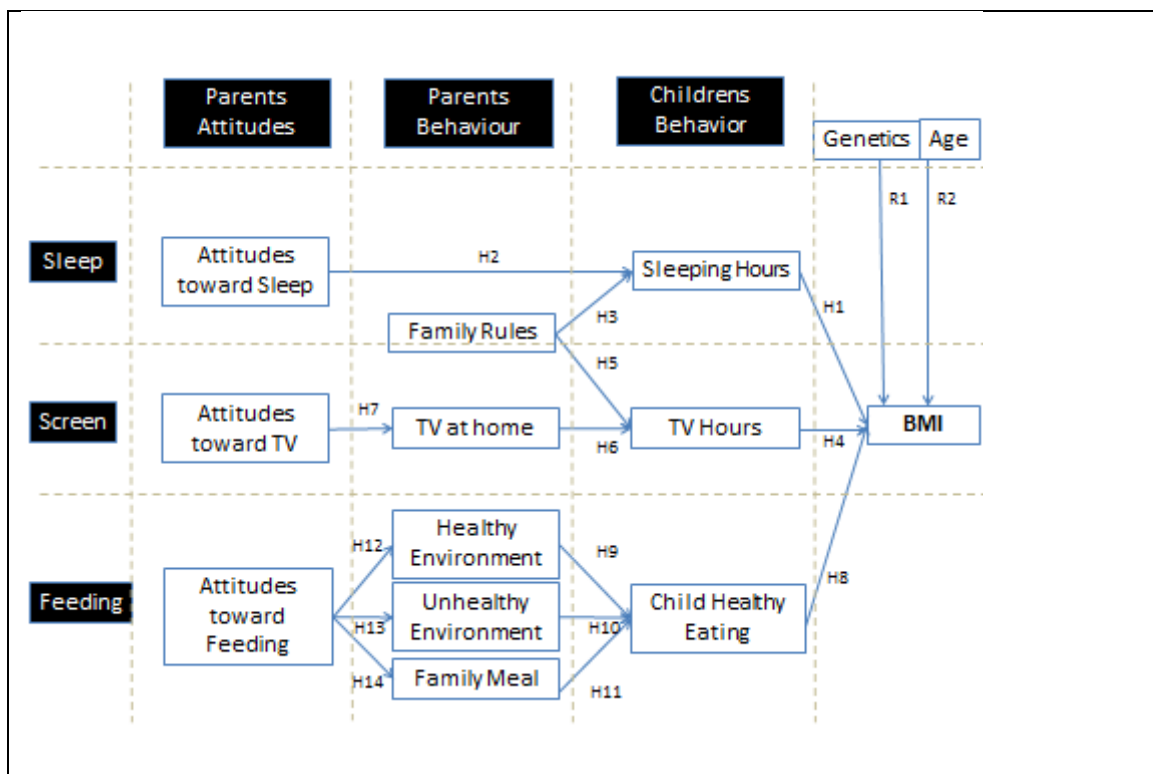
En el estudio 1 abordamos los antecedentes de sobrepeso infantil y se propone un modelo. En este estudio, no vamos a hacer frente a los factores internacionales, nacionales, locales o de la escuela como causas del sobrepeso infantil. Nos centraremos en todas aquellas conductas de niños realizadas en casa y con la influencia parental.

La mayoría de los niños duermen la mayor parte del tiempo en casa. Gran parte de la visión de la TV se hace también en casa. Por último, la mayoría de los niños toman el desayuno y la cena en casa y el almuerzo de mediodía se puede comer en casa o en la escuela en función del horario de la escuela, la distancia de la escuela desde su casa, la cultura, etc. Comer entre comidas, especialmente durante los días de semana también se hace en casa, pero se pueden hacer en la escuela y que depende de las políticas de la escuela hacia los menús de los comedores y hacia las máquinas

expendedoras. En el colegio el niño también lleva muchas veces un almuerzo o merienda que es preparado por los padres. Por todas estas conductas, los padres pueden tener un alto grado de control, especialmente para aquellos que se realizan en el entorno del hogar.

La complejidad de cada uno de estos comportamientos infantiles, dormir, ver televisión y la nutrición difiere en gran medida. Si bien el control de tiempo de sueño es bastante simple, el control de la televisión que se ve el niño es más difícil y que come el niño es extremadamente complejo. Por otro lado, cualquier niño podría vivir sin los dispositivos electrónicos, pero no sin dormir o comer. En nuestro modelo propuesto describiremos tres vías que tienen una influencia en el peso del niño (teniendo en cuenta la edad del niño y la genética de los padres): vía de sueño, vía televisiva y vía alimentaria. Cada camino tendrá la misma variable dependiente; el IMC del niño. Además, cada camino tiene una variable independiente; actitudes de los padres hacia el comportamiento y las variables de dos mediadores comportamiento de los padres y el comportamiento infantil. En base a la revisión de la literatura proponemos un modelo de antecedentes del sobrepeso infantil.

Figura 1. Modelo propuesto



En base a este modelo proponemos la siguientes hipótesis:

*H1: Existe una relación negativa entre las horas que duerme el niño y su sobrepeso*

*H2: Existe una relación positiva entre las actitudes de los padres hacia el acto de dormir y las horas que duerme el niño*

*H3: Existe una relación positiva entre las normas familiares y las horas que duerme el niño.*

*H4: Existe una relación positiva entre las horas de televisión y el sobrepeso del niño*

*H5: Existe una relación negativa entre las normas familiares y horas de televisión.*

*H6: Existe una relación positiva entre el entorno televisivo en casa y las horas de televisión que ve el niño*

*H7: Existe una relación positiva entre las actitudes de los padres hacia la televisión y el entorno televisivo en casa*

*H8: Existe una relación negativa entre una alimentación infantil saludable y el sobrepeso infantil*

*H9: Existe una relación positiva entre la disponibilidad de comida sana en casa y una alimentación saludable del niño*

*H10: Existe una relación negativa la disponibilidad de comida no sana en casa y una alimentación saludable del niño*

*H11: Existe una relación positiva entre la frecuencia de comidas familiares y la alimentación sana del niño*

*H12: Existe una relación positiva entre la actitud de los padres hacia la alimentación y la disponibilidad de comida sana en casa*

*H13: Existe una relación negativa entre la actitud de los padres hacia la alimentación poco saludable en casa*

## **METODOLOGÍA**

### **Diseño, sujetos, diseño de cuestionarios y escalas**

Se utilizó una encuesta a los padres con un diseño transversal. Los encuestados fueron los padres de los niños que asisten a la escuela primaria en la Región de Murcia, España. Tuvieron que responder acerca de sus actitudes y comportamientos hacia hábitos saludables y los de su hijo/a mayor (en términos de comer, ver televisión y horas de sueño). Se midió peso y altura de padre o madre y niño. El cuestionario se

compone de cinco grupos de preguntas: la conducta del niño, comportamiento de los padres, actitudes de los padres la variable dependiente: Niño IMC y por último, las variables de control Estadística descriptiva y modelos de ecuaciones estructurales se realizaron con el fin de probar la hipótesis. Los sujetos del estudio fueron tanto los niños de las escuelas primarias y el padre (madre o padre) que por lo general se hace cargo de este niño.

## RESULTADOS

Todos los factores determinantes, hora de dormir (H1;  $b = -0,08$ ,  $t = 2,62$ ), las horas de televisión (H4;  $b = 0,16$ ,  $t = 5,09$ ); y alimentación saludable (H8;  $b = -0,08$ ,  $t = 2,04$ ), tiene efectos directos y significativos sobre el IMC infantil. Hay algunas variables que tienen un efecto significativo y directo sobre el IMC como la genética (IMC) de los padres y los edad de los niños.

La propuesta principal de este estudio es demostrar que las actitudes y conductas de los padres tienen una influencia en el comportamiento del niño, y esto ha sido confirmado por los resultados. Existe una relación positiva entre las normas familiares y las horas que duerme el niño (H3,  $b = 0,20$ ,  $t = 5,14$ ) actitudes de los padres positivas hacia el sueño (H4  $b = 0,00$ ,  $t = 2,91$ ) incrementan el tiempo que duerme el niño. El tiempo que el niño pasa viendo la televisión disminuye cuando la reglas familiares aumentan (H5,  $b = 0,-0.10$ ,  $t = 2,62$ ). Las horas que ve el niño la tele aumentan cuanto más TVs hay en casa (H6,  $b = 0,32$ ,  $t = 4,20$ ). A su vez, el entorno televisivo en casa depende de la actitud de los padres hacia la TV (H7,  $b = 0,40$   $t = 3,82$ ).

Finalmente, el niño tendrá más posibilidades de alimentación saludable cuando más comida sana haya en casa (H9,  $b = 0,76$ ,  $t = 10,73$ ) y cuando más veces se coma en familia (H11  $b = 0,31$ ,  $t = 2,95$ ). Sin embargo la comida no saludable no tiene un efecto significativo (H10,  $b = -0,05$ ,  $t = 1,10$ ). Las actitudes positivas hacia alimentar a los hijos hacen que los padres tengan más comida sana en casa (H12  $b = 0,26$ ,  $t = 5,16$ ) menos comida insana (H13  $b = -0,24$ ,  $t = 4,24$ ) y hagan más comidas familiares con los hijos (H14  $b = 0,41$ ,  $t = 2,83$ ).

La introducción de estas relaciones en el modelo nos permite determinar la existencia de un esquema de comportamiento de los padres que influye directamente en el comportamiento del niño y por lo tanto su IMC. La especificación del modelo es



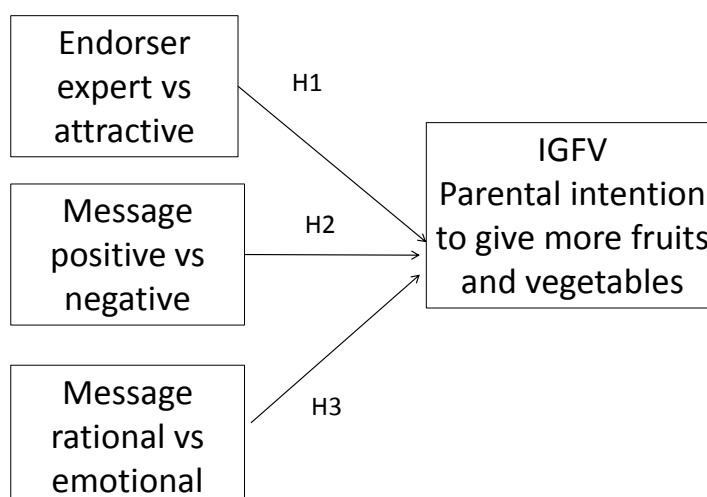
compatible con la idea de que los tres caminos (dormir, televisión y nutrición) contribuyen de alguna manera a formar un peso saludable de los niños. En resumen, el modelo conceptual desarrollado fue bien apoyado. El modelo también explica gran parte de la varianza para las variables dependientes, con el valor R<sup>2</sup> corregida de 0,16 para el IMC.

## ESTUDIO 2

Nuestro objetivo es encontrar un mensaje persuasivo que aumenta las intenciones de los padres para llevar a cabo hábitos saludables relacionados con sus hijos. En concreto, queremos aumentar la cuota de alimentos de baja densidad que se consumen en casa, en concreto, frutas y verduras.

Proponemos un modelo en cual la características de la persona que presenta el mensaje experto/attractivo y el tono del mensaje positivo/negativo y/o emocional/racional tendrán una influencia significativa en la intención parental de incrementar las frutas y verduras que los padres dan a sus hijos.

Figura 2. Modelo propuesto para un diseñar un anunció gráfico.



Este modelo está basado en la revisión de la literatura y en base a esta proponemos las siguientes hipótesis.

*H1: la intención de los padres de incrementar la cantidad de frutas y verduras que dan a sus hijos será mayor cuando el mensaje está respaldado por una persona experto que por una persona atractiva.*

*H2: la intención de los padres de incrementar la cantidad de frutas y verduras que dan a sus hijos será mayor cuando el mensaje está enmarcado positivamente que cuando se enmarca negativamente.*

*H3: la intención de los padres de incrementar la cantidad de frutas y verduras que dan a sus hijos será mayor cuando el mensaje está enmarcado emocionalmente que cuando se enmarca racionalmente.*

*H4: Existe un efecto de interacción entre el tipo de persona que respalda el anuncio y el tono emocional/ racional del mensaje. El efecto será menor cuando el mensaje está racionalmente enmarcado y lo respalda una persona atractiva.*

## **METODOLOGÍA**

Se realiza un diseño experimental 2 (experto vs. atractivo) x 2 (mensaje: emocional vs racional) x 2 (mensaje: positivo vs negativo) entre sujetos. Cada grupo de padres fue expuesto a un anuncio diferente combinando las variables independientes. En total teníamos 8 condiciones experimentales. Además, hemos considerado diferentes variables de control que podrían competir con las variables independientes para explicar el resultado del estudio.

## **RESULTADOS**

Un cuestionario auto administrado fue enviado a 1463 direcciones de correo recolectadas de estudio 1. Se abrieron 679 emails de los enviados y el 20% (290 padres) hace clic a través del enlace y completa el cuestionario.

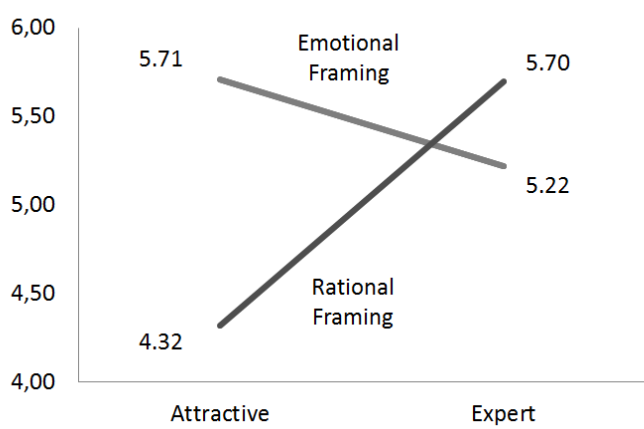
H1 se confirma el respaldo de una persona experta consigue incrementar en mayor medida que el respaldo de una persona atractiva la intención parental de dar más frutas y verduras a sus hijos ( $M_{\text{Attractive}} = 4,98$ ;  $M_{\text{Expert}} = 5,43$ ;  $F(1,281) = 6,14$ ;  $p < 0,05$ ).

H2 se confirma el tono positivo de un mensaje consigue incrementar en mayor medida que el tono negativo de un mensaje la intención parental de dar más frutas y verduras a sus hijos ( $M_{\text{negative}} = 4,98$ ;  $M_{\text{positive}} = 5,42$ ;  $F(1,281) = 5,85$ ;  $p < 0,05$ ).

H3 se confirma el tono emocional de un mensaje consigue incrementar en mayor medida que el tono racional de un mensaje la intención parental de dar más frutas y verduras a sus hijos ( $M_{\text{emotional}} = 5,44$ ;  $M_{\text{rational}} = 4,98$ ;  $F(1,281) = 4,04$ ;  $p < 0,05$ ).

Además, se encontró un efecto de interacción altamente significativa entre el tipo de persona que respalda el mensaje y el enfoque (emocional / racional) del mensaje ( $F(1,281) = 13,07$ ;  $p < 0,00$ ). Ver figura 1. Esto significa que cuando un mensaje racional es respaldado por una persona atractiva la intención parental de incrementar las frutas y verduras que dan a sus hijos es significativamente menor ( $M_{\text{emotional}} = 5,71$ ;  $M_{\text{rational}} = 4,32$ ;  $F(1,281) = 15,06$ ;  $p < 0,00$ ), esto es probablemente debido a que puede existir cierta incongruencia entre un patrocinador atractivo y un mensaje racional.

Figura 1. Intención de los padres para dar más frutas y verduras a sus hijos con distintos patrocinadores y un mensaje emocional / racional



## CONCLUSIONES

Nuestra investigación surgió de la idea de que los padres son responsables de criar hijos sanos. Asimismo la sociedad debe ayudarles, en primer lugar, informándoles de que comportamientos son más sanos para sus hijos y, en segundo lugar, de la manera más fácil de realizarlos. Hemos realizado un estudio para averiguar que actitudes parentales influyen en el sobrepeso infantil y otros estudio para mejorar eficazmente esas actitudes parentales.

El primer estudio demuestra un modelo de antecedentes del peso infantil. Las actitudes parentales influyen en sus comportamientos y estos en los de sus hijos. El comportamiento del niño determina si este tiene o no sobrepeso. Además, hemos integrado este modelo de tres etapas con tres caminos, en el ámbito familiar, para llegar a un peso saludable del niño. Estos son: dormir mucho, ver poco la televisión y llevar una alimentación saludable. Como tercera contribución esta investigación muestra la influencia de las actitudes de los padres hacia el dormir, el uso de la televisión y la alimentación y su propio comportamiento en relación con estas actividades influye indirectamente en el peso del niño. Este comportamiento de los padres se refiere a las normas familiares, la mayor o menor disponibilidad de televisión, la disponibilidad y la accesibilidad de las frutas y verduras en el hogar, los hábitos alimentarios de los padres y su influencia mediante modelado y la frecuencia y comportamientos en las comidas familiares. En cuarto lugar, nuestros resultados demuestran que las conductas de los padres tienen una influencia significativa en el comportamiento de los niños en relación con la cantidad de horas que duermen, que ven la televisión y la cantidad de frutas y verduras que comen.

Las horas que duerme el niño se ven influenciadas positivamente por las normas familiares y una actitud parental positiva hacia que el niño duerma lo suficiente. Cuanto más duerme el niño menos sobrepeso tiene. Las horas que el niño ve la televisión son más cuanto menos son las normas familiares y son más cuanto mayores son las actitudes parentales positivas respecto a la TV. Cuanta más televisión ve un niño más sobrepeso tiene. Los niños comen más comida sana (e.g. frutas y verduras) cuanto más disponibilidad y accesibilidad hay en casa y más lo hace el progenitor. No hemos encontrado una relación suficientemente significativa en el mismo sentido con la comida insana (e.g. bebidas azucaradas y aperitivos saldados).

Llegamos a la conclusión de que los niños son conscientes de las actitudes y comportamientos de sus padres. Por lo tanto, los padres deben aprovechar esta

oportunidad para establecer las reglas en casa y servir como modelos a seguir respecto a las horas de sueño, el uso racional de los dispositivos de pantalla y una dieta saludable.

En el segundo estudio nos centramos en las actitudes e intenciones parentales respecto a dar frutas y verduras a sus hijos. Con un experimento llegamos a la conclusión de que para mejorar la intención parental de incrementar las frutas y verduras que un padre da a sus hijos es mejor un determinado tipo de anuncio gráfico. Son más eficientes los anuncios que van respaldados por personas expertas que por personas atractivas, y que tienen un mensaje positivo y/o emocional que aquellos mensajes que enmarcados con un tono negativo y/o racional. Para la mayoría de los padres, el bienestar de sus hijos es una de sus ambiciones más altas a los que están unidos emocionalmente. La persuasión del mensaje emocional es superior a la de la del racional. En ningún caso debiéramos respaldar un anuncio con una persona atractiva y un mensaje racional ya que los efectos en la intención parental de incrementar las frutas y verduras que se dan a los hijos son menores.

## **IMPLICACIONES PARA LA GESTIÓN PÚBLICA**

La política pública debe desempeñar un papel activo en la promoción de comportamientos saludables en los padres e hijos. Se trata de dormir mucho, pasar menos tiempo viendo la televisión y comer de forma saludable. La promoción de estos hábitos puede tener una influencia positiva en algunas industrias (por ejemplo, instalaciones deportivas, fábricas de bicicletas, granjas de frutas y verduras) y una influencia negativa en algunas otras industrias (canales de televisión, la industria azucarera y la industria de la comida rápida, entre otros). Brownell y Warner (2009) analizaron la evidencia histórica de cómo la industria tabacalera usó su influencia para salvaguardar su negocio nocivo durante muchos años. Los autores encontraron que el guion de la industria alimentaria no es muy diferente del usado hace años por la industria del tabaco. En ambos sectores, los políticos se han enfrentado a las industrias grandes (por ejemplo, desde el sector del tabaco y el sector de bebidas azucaradas). Los políticos deben ser conscientes de que deben defender la salud de los ciudadanos por encima de los intereses de las grandes corporaciones y que debe favorecer a aquellas industrias que mejoran la salud de sus ciudadanos.

Además ofrecemos la comprensión significativa de cómo se debe hacer una campaña de promoción gráfica con el fin de promover la intención de los padres para dar más frutas y verduras para sus hijos. El mensaje debe ser avalado por un experto y el

mensaje debe ser positivo y emocional. Varias campañas de promoción de frutas y verduras, con base en el lema "cinco al día", se han implementado en todo el mundo, gastando millones de euros, con diferentes resultados en términos de eficacia (Ashfield-Watt et al 2004;. Balch et al . 1.997). Nuestra contribución puede hacer una diferencia significativa en términos de aumentar la eficiencia y reducir los costos en el diseño de campañas que animan a los niños a comer más frutas y verduras a través de mensajes dirigidos a los padres

## **LIMITACIONES**

Esta investigación tiene fortalezas y limitaciones. En el estudio 1 podríamos haber incluido la actividad física y el uso de otras pantallas aparte de la TV como, PC, tabletas, videojuegos y teléfonos móviles. No lo hemos hecho pues estudios previos indicaron que estimar el tiempo que el niño pasa en estas actividades es significativamente más difícil para los padres. Los resultados podrían haber sido menos fiables. En cuanto a la alimentación saludable y no saludable podríamos haber utilizado más elementos además de frutas, verduras y productos azucarados.

Estudio 2 una muestra más grande podría aumentar la fuerza de los resultados. Además, el cuestionario fue cumplimentado a través de un sitio web, y este sistema excluye a aquellos padres que no tienen un PC o no están conectados a internet. Por otra parte, el comportamiento es la variable que se pretende modificar y que sería interesante si la investigación futura podría trabajar con esta variable en lugar de utilizar la intención. Otra fuente de sesgo en los resultados puede ser la aceptabilidad social. Como la mayoría de los padres saben que el consumo de frutas y verduras es socialmente deseable, algunos de ellos podrían haber respondido en base a esto. Sin embargo, las entrevistas en profundidad realizadas en la fase de preparación mostraron que esto no era una cuestión clara para los padres.

## **INVESTIGACIONES FUTURAS**

La misma investigación debería ser replicada a nivel nacional e internacional. El anuncio fue creado mezclando frutas y verduras en el mismo mensaje. En relación con el personaje del anuncio se utilizaron dos varones. La investigación debe distinguir si el sexo del endosante puede crear una diferencia en los resultados. y si esta diferencia depende de sexo del receptor. Finalmente nos encontramos con que el tono de mensajes emocionales podría ser más eficaz para las madres que para los padres. Las investigaciones futuras deberían estar más a fondo sobre este tema con el fin de sacar conclusiones definitivas.

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