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Parents' trust in food safety and healthiness of children's diets: A TPB model explaining the role of retailers and government

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Abstract

This study started from the assumption that children's healthy diets are primarily determined by their parents and their intentions towards serving fruit and vegetables. Although it is widely known that a significant share in fruits and vegetables in children's diets has several advantages, there are some safety issues that can act as barriers in promoting fruit and vegetable consumption.
Therefore, we investigated parents' determinants in giving fruits and vegetables to their children taking into account that the trust in actors who minimize the presence of risks could be instrumental to understand the whole story. Due to the incidence of childhood obesity, Southern Italy is a suitable case study. An extended Theory of Planned Behavior (TPB) model including trust towards government and retailers has been set up. Results suggested that parental intention to give to their children fruits and vegetables in primarily determined by their perceived behavioral control, then by their attitude and by subjective norm. Trust has been proved to influence parents' intentions, but only related to retailers and not to government. Furthermore, the model positively explained childrens' behavior reported by parents.

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Introduction

According to WHO (2018), non-communicable diseases are the leading causes of death, disease and disability in Europe. The reason behind has been identified in an excessive intake of calories mainly due to increased consumption of processed food accompanied by an inadequate consumption of vegetables, fruits and whole grains (WHO, 2018).

In this context, children represent the most sensitive group of consumers, the WHO suggests, in future, this situation will get worse, with one in three children aged 6-9 years being overweight or obese. This tendency is higher in southern Europe countries, as: Italy Greece and Spain (WHO, 2014). Children tend to consume less than the recommended daily servings of fruits and vegetables, while consuming more sweetened beverages than recommended (Ogden *et al.*, 2002). A study on eating habits on infants and toddlers found that most of Italian children have a wrong nutrients intake through their everyday diet (Verduci *et al.*, 2019). One of the main causes of wrong diets is identified in a constant decline in the intake of vegetables-based food (Tognon *et al.*, 2014).

Given the scope of the problem, a large number of intervention efforts and campaigns have been implemented in Europe. Some campaigns were basically founded on the simplified message of suggesting five portions of fruits and vegetables per day (Hawkes, *et al.*, 2015), while others aimed at introducing fruit and vegetables among children in school (European Commission, 2016). Among the several experiences, it has been found that successful programs, mostly were based upon the role of family and parental involvement as instrumental in promoting healthy eating habits (Bere *et al.*, 2008; Rekhy & McConchie, 2014).

Despite the increased awareness of the health benefits that act as driver for fruit and vegetable consumption, the impact of these policy interventions remains at best, modest to low (Bere *et al.*, 2010; Methner *et al.*, 2017). Several barriers have been identified, including the consumer concerns related to food safety issues in fresh produce (Kahlor *et al.*, 2011; Rekhy & McConchie, 2014; Tallant *et al.*, 2018). In fact, the overall trend of fruits and vegetable consumption shows a decrease from 2006 to 2013 (Baselice *et al.*, 2017). A reason can be found in a growing consumer awareness concerning food safety (Alegbeleye *et al.*, 2018; Garcia & Teixeira, 2017). In the EU, in 2009 and 2010, respectively 4.4% and 10% of the foodborne verified outbreaks were linked with the consumption of vegetables and fruits, berries, juices (and products thereof) (EFSA, 2018).

Other food safety issues such as pesticide residues, antimicrobial resistance, wax coatings, nanomaterials and genetically modified organisms

are increasingly becoming a concern for the consumer (Magnuson *et al.*, 2011; Methner *et al.*, 2017; Tait & Bruce, 2001). There are evidences of diseases risk linked to pesticides exposure (Gold *et al.*, 2001; Sabarwal *et al.*, 2018). This can shapes preferences, for instance, García *et al.* (2005) reviewed the food habits of a Spanish population and found that about the 35% of respondents regularly avoided pesticide-treated fruits and vegetables to prevent cancer. Another study reported that organic food buyers estimated the risk of mortality from consuming conventionally grown food to be at a level nearly as great as the annual lung cancer risk for a smoker of one pack or more of cigarettes per day (Hammitt, 1990).

Furthermore, consumers highly concerned with the risks of food consumption tend frequently to share their worries with their peers and through social media, generating a negative word-of-mouth (Hilverda & Kuttschreuter, 2018). This is likely to lead, in extreme cases, to food scandals that are able to harm the performance of the entire sector (Cembalo *et al.*, 2019; Charlebois *et al.*, 2016). To the point that consumers' perceptions can outweigh the real risks and even privilege processed or animal foods. Actually, the real risks have been estimated in only 10 cancer cases per year from pesticide residues on fruits and vegetables consumed, versus 20.000 cases per year that can be actually prevented with an increased intake of fruit and vegetables (Reiss *et al.*, 2012).

Trust in the products' characteristics and in the entire supply chain appears to be crucial for consumers' choices (V. Carfora *et al.*, 2019; Hammitt, 1990). The safety of fruits and vegetables is a credence attribute (Darby & Karni, 1973; Del Giudice *et al.*, 2018), therefore it can lead directly to consumers' intention to purchase (Giampietri *et al.*, 2018; Pivato *et al.*, 2007). In fact, lacking real evidences, trust makes consumers convinced that the other party took all the measures needed to minimize the causes of risks (Hobbs & Goddard, 2015; Nuttavuthisit & Thøgersen, 2017; Wang & Tsai, 2019).

Therefore, this study aims to investigate the determinants of the parents' intention in inserting fruit and vegetables in their children's diets. The theoretical framework of Theory of Planned Behavior (TPB) will be used to explain the parents' role as health promoters for children. This theory will be extended to include trust, as it is believed to play a major role in this mechanism. Trust could remove the barrier of food safety concerns and act as driver of the parents' intention to provide fruit and vegetables. To the Authors' knowledge, in previous literature no study used an extended TPB framework to investigate the role of parents in determining the healthiness of their children's diets.

The theory of planned behavior for explaining fruit and vegetable intake

The role of parents in the development of healthy eating habits of their children occurs through mechanisms such as role modeling, availability and accessibility of foods at home and the development of attitudes, values and preferences (Patrick & Nicklas, 2005; Story *et al*., 2008; van der Horst *et al*., 2006). These mechanisms play a role interacting with the personal tendencies of children, that, in early age are particularly involved by the fluctuating levels of neophobia (Cavallo & Materia, 2018).

The current study proposed the Theory of Planned Behavior (Ajzen, 1991) as a theoretical framework to deepen the factors that predict parents' roles in facilitating fruit and vegetable consumption. It was chosen to identify the substantive elements that can drive a healthy eating behavior (Carfora *et al*., 2016a; Conner *et al*., 2016).

This theory indicates that intentions are proximal determinants of behaviors, which in turn are predicted by attitudes, subjective norms and perceived behavioral control (PBC). Attitude refers to beliefs towards the perceived likelihood that a specific behavior could determine a particular outcome. Subjective norm represents the individual's perceptions of whether the other references want that a certain behavior is performed or not and the individual motivation to comply their expectations. PBC is based on the perception that there are available resources and opportunities to perform the behavior successfully, where these facilitations are considerated on the basis of their perceived power to facilitate or inhibit the behavior performance.

In recent years several studies applied TPB model to predict different healthy eating behaviors (Armitage & Conner, 2001; McEachan *et al*., 2011) and specifically fruit and vegetable intake (Brookie *et al*., 2017; Kothe *et al*., 2012; Wilson *et al*., 2016). For example, Caso *et al.* (2016) showed that TPB predictors were useful factors for explaining fruit and vegetable consumption among teenagers. Moreover, a review reported that TPB predictors explained 30% to 57% of the variance in intentions and 6% to 32% of the variance in fruit and vegetable intake (Guillaumie *et al*., 2010).

Trust in food safety

Several food safety issues in fresh produce interrupted trust relationships between consumers and fruits and vegetables (Van Boxstael *et al*., 2013). Rebuilding trust is therefore one of the main challenges of modern marketing strategies, in fact, it appears to be more profitable than investing in consumer information (Wobker *et al*., 2015).

Shifting towards healthier and more sustainable diets will not be possible without sufficient levels of consumer's trust in the food chain actors, being food characteristics the outcome of all stages of supply chain from production to the consumption (Macready *et al.*, 2020). This implies that the consumer trusts the food characteristics if she feels trusts different institutions and market actors in the food system (de Jonge *et al.*, 2008; Meijboom *et al.*, 2006; Meyer *et al.*, 2012; Sapp *et al.*, 2010).

However, recent food scandals have contributed to a decline in the confidence of consumers towards regulatory agencies in their ability to deal with these food safety issues. In modern distribution channels, retailers are the first contact with consumers. Trust in retailers appears as the main strategy to reduce the uncertainty of consumers food choices (Khare & Pandey, 2017). By ensuring product quality dimensions as healthiness, sustainability, authenticity and safety, food retailers give consumers an indicator of the reliability and confidence (Khare & Pandey, 2017; Ladwein & Sánchez Romero, 2021). These credence characteristics need to be communicated by credible quality signals managed by reliable actors (Fernqvist & Ekelund, 2014).

In order to rebuild the interrupted trust between consumers and food system, several entities have developed private standards (Henson & Reardon, 2005). Their specific role is to ensure food quality in a sense that goes beyond what is assured by public standards. Retailers are the main instigators for private standards (Fearne *et al.*, 2001; Ganesan *et al.*, 2009; Kotsanopoulos & Arvanitoyannis, 2017). Furthermore, they are the actors with most interactions with the consumer and they leverage this closeness on a psychological level in order to reach satisfaction and loyalty, the reason why consumers feel this closeness it because retailers assess consumers' preferences and translate it into orders (Aschemann-Witzel *et al.*, 2016; Schultz *et al.*, 2016).

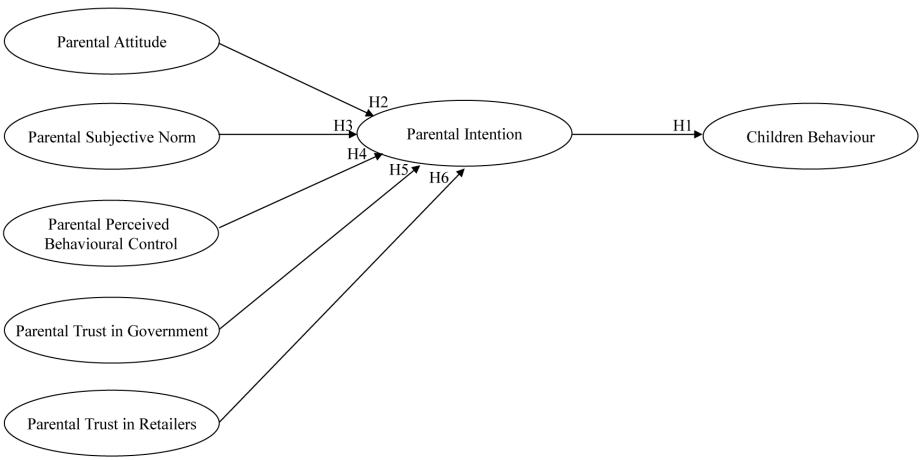
While the role of governments in food safety discloses in establishing policies and enforcing legislation about food safety, they also have the role of ensuring that producers follow the imposed rules through training and inspection. They also have the role of making sure that the imposed public standards are effective and sufficient to ensure the society safe food and avoid safety issues and scandals among the population (Kotsanopoulos & Arvanitoyannis, 2017; Reilly *et al.*, 2010).

Producers, obviously, have a role in determining desirable attributes of products as food safety, but in this case, they have been excluded from the model, as often in the majority of Italian grocery stores it is not possible to know who the producer is (Biénabe *et al.*, 2007).

Conceptual framework

The current study analyzed whether the TPB constructs (attitude, subjective norm and PBC) explain the parents' role as health promoters for children, predicting their intentions to feed children with fruit and vegetable. In line with previous researches, we proposed that parental intentions influence fruit and vegetables consumption of their children. Importantly, trust in food safety was added as additional factor because it could remove the barrier of food safety concerns and facilitate parents' roles in facilitating fruit and vegetable consumption. So, the aim is to verify if the inclusion of trust is able to increase the predictive validity of the TPB (Fig. 1).

Figure 1 - Conceptual model



Predicting children's fruit and vegetable consumption through parental intentions

Different findings suggested that parental practices to provide fruit and vegetable to children increase their actual consumption (Pearson *et al.*, 2009; Trofholz *et al.*, 2016). While, Melbye *et al.* (2012), supported the role of parents in monitoring, child control and modeling, for explaining children's consumption of fruit and vegetables. According to the TPB, these parental practices should be predicted by their intention to perform those actions (Ajzen, 1991).

Therefore, we hypothesized that:

H1: Parental intention to give their children fruit and vegetables is able to predict children's fruit and vegetables intake.

TPB predictors of parental intentions

Previous studies analyzed the role of parents in providing accessibility at home for fruit and vegetables and analyzed the impact of different domains of parental feeding practices (Bere & Klepp, 2004; Kratt *et al*., 2000; Melbye *et al*., 2012). However, they did not verify which cognitive factors could drive parents to adopt or not the intention. This consideration supports the need to provide further investigation to find which predictors could influence parental intentions.

Some studies applied the TPB model for understanding which factors are involved in the parental intentions to promote healthy behaviors in their children. In detail, it has been shown that TPB factors are able to explain caregivers' intentions for their child to walk to school (Schuster *et al*., 2016). Specifically, considering healthy eating behavior, Andrews *et al*. (2010) found that attitudes, subjective norms, and PBC are able to explain behavioral intentions, which in turn can predict parents' tracking behavior of their children's food intake. Besides, Riebl *et al*. (2016) tested the effectiveness of the TPB in predicting parents' and adolescents' sugar-sweetened beverages consumption, evaluating whether adolescents' beverage choices are influenced by parents' reactions to their beverage choices. Results indicated that adolescents' intention to limit sugar-sweetened beverages consumption moderated the relationship between parents' reactions encouraging sugar-sweetened beverages and adolescents' predicted consumption.

Therefore, stemming from the aforementioned literature we hypothesized that:

H2: Parental attitudes towards fruit and vegetables intake of their children could predict the intention to give them fruit and vegetables;

H3: Parental subjective norm in relation to fruit and vegetables intake of their children could predict intention to give them fruit and vegetables;

H4: Parental PBC towards fruit and vegetables intake of their children could predict intention to give them fruit and vegetables.

Additional factors: parental trust in government and in retailers

In this study we have chosen to analyze consumers' trust towards two actors that have a responsibility for guaranteeing food safety: government and retailers

(Carfora *et al*., 2019). We suppose it can depend upon their perception on the actor pro-active behavior in preventing food risks (Van Kleef *et al*., 2007). Among actors of supply chain, previous studies proved that the role of the government is instrumental in the perception that public welfare is granted, also for food safety (de Jonge *et al*., 2008). Then, the retailers too can be a target for trust because they are the leading part of the supply chain, having power over sourcing partners and being who handles the availability of foods and its visibility in the store environment (Bimbo *et al*., 2015; Fearne *et al*., 2001). In turn, trust can also foster loyalty towards the products, especially fresh products and the ones with private labels (Baselice *et al*., 2014; Calvo Porral & Levy-Mangin, 2016; Nandi *et al*., 2017). Their role has been framed as fundamental in re-establishing trust after food scares and food scandals (Jackson, 2010). Moreover, they are receiving increased attention as an "environment" that is strategic in order to prevent obesity (Bonanno *et al*., 2017).

Therefore, we hypothesized that:

H5: Parental trust in government could predict intentions to give children fruit and vegetables.

H6: Parental trust in retailers could predict intentions to give children fruit and vegetables.

1. Materials and Methods

1.1. *Participants and procedures*

The survey was carried out in 27 classes of 2 primary schools in Southern Italy. This area of Italy provides an interesting case study since the percentage of overweight or obese children is higher than in the rest of Italy (Gallus *et al*., 2013). The two schools were randomly chosen and are representative of sub urban schools in southern Italian cities.

School boards were approached by mail and telephone and invited to take part in the study. After receiving the consent of the school boards, the parents of young children between the ages of 6-11 were invited to participate in the study through an informative document that disclosed all the details and the purposes of the study. Questionnaires were distributed and collected by the teachers.

A total of 223 parents completed the questionnaire. The questionnaire was organized into three main sections: the first part collected children's eating habits and their anthropometric measures; the second part measured the TPB constructs plus trust; the last part collected sociodemographic information of parents.

2.2. *Measures*

The questionnaire included measures of TPB factors, and children behavior in relation to the consumption of fruit and vegetables, plus trust in government and retailers, and, in the end, the gender and age of the parents. The measurements of TPB predictors were adapted from previous studies (Carfora *et al.*, 2016b). All TPB items were ranked on 7-points Likert scale.

Self-reported behavior. Children's consumption of fruit and vegetables was measured with the following two items (scale from 0 = "never" to 5 = "everyday):

- How many times did your child had five portions of fruits a day in the last week (FRUIT);
- How many times did your child had five portions of vegetables a day in the last weeks (VEGETABLE).

The two-items scale (M = 1.51; SD = 0.58) yielded an α coefficient of .64.

Parental Intention. Behavioral intention was assessed through three items that asked parents if they intended to provide fruits and vegetables to their children. Respondents indicated their agreement (1 = "strongly disagree"; 7 = "strongly agree") answering to the following three items:

- I intend to give my child at least five servings of fruit and vegetables each day (INT1);
- I plan to give my child at least five servings of fruit and vegetables each day (INT2);
- I want to give my child at least five servings of fruit and vegetables each day (INT3).

The three-items scale (M = 5.11; SD = 1.48) yielded an α coefficient of 0.87.

Attitude. Attitude was assessed through six items that asked the parents' position on providing children fruit and vegetables:

- My giving my child five servings of fruit and vegetables each day to keep them healthy is very important (ATT1);
- My giving my child five servings of fruit and vegetables each day to keep them healthy is very good (ATT2);
- My giving my child five servings of fruit and vegetables each day to keep them healthy is very important positive (ATT3);
- My giving my child five servings of fruit and vegetables each day to keep them healthy is very wise (ATT4);
- My giving my child five servings of fruit and vegetables each day to keep them healthy is very favorable (ATT5);
- My giving my child five servings of fruits and vegetables each day to keep them healthy is very salutary (ATT6).

Participants were asked to indicate their agreement using a response scale from 1 = "strongly disagree" to 7 = "strongly agree". The six-items (M = 5.89; SD = 2.17) scale yielded an α coefficient of 0.79.

Subjective Norm. Subjective norm was assessed through three items that asked parents about the opinion of the people who were important to them about this issue. Specifically, participants were invited to indicate their agreement (1 = "strongly disagree"; 7 = "strongly agree") with the following three items:

- Most people who are important to me think that I should give my child five servings of fruit and vegetables each day (SN1);
- Most people who are important to me would approve if I give my child five servings of fruit and vegetables each day (SN2);
- Most people who are important to me want that I give my child five servings of fruit and vegetables each day (SN3).

The three-items scale (M = 4.63; SD = 1.33) yielded an α coefficient of 0.69.

PBC. PBC was assessed through three items that asked parents if they felt able to provide fruit and vegetables, indicating their agreement (1 = "strongly disagree"; 7 = "strongly agree") with the following three items:

- I am able to make my child eat 5 servings of fruit and vegetables each day (PBC1);
- If I give my child five portions of fruit and vegetables each day is entirely up to me (PBC2);
- I have the possibility to give my child five portions of fruit and vegetables each day (PBC3).

The three-item scale (M = 4.66; SD = 1.73) yielded an α coefficient of 0.71.

Trust in government. Trust in government scale was adapted by the research of de Jonge *et al.* (2008). The six items rated on 5-point Likert scales (1 = "strongly disagree"; 5 = "strongly agree") were:

- Government takes good care of the safety of our food (GOV1);
- Government gives special attention to the safety of food (GOV2);
- Government has the competence to control the safety of food (GOV3);
- Government has sufficient knowledge to guarantee the safety of food products (GOV4);
- Government is honest about the safety of food (GOV5);
- Government is sufficiently open regarding the safety of food (GOV6).

The six-items scale (M = 4.88; SD = 1.63) yielded an α coefficient of 0.99.

Trust in retailers. Trust in retailers scale was adapted by the research of de Jonge *et al.* (2008). Participants answered to the following six items rated on 5-point Likert scale (1 = "strongly disagree"; 5 = "strongly agree"):

- Retailers have the competence to control the safety of food (RET1);
- Retailers take good care of the safety of our food (RET2);
- Retailers give special attention to the safety of food (RET3);

- Retailers have sufficient knowledge to guarantee the safety of food products (RET4);
- Retailers are honest about the safety of food (RET5);
- Retailers are sufficiently open regarding the safety of food (RET6).

The six-items (M = 4.76; SD = 1.85) scale yielded an α coefficient of 0.99.

2.3. *Data analysis*

The means and correlations were performed using SPSS 23. The hypothesized models were tested using maximum likelihood method of structural equation modelling (SEM) by MPLUS7. SEM findings are based on the correlation of co-variance matrix and maximum likelihood estimator is performed to gain the best linear unbiased estimator. This guarantee to have a robust model even if we measured out variables using responses with different scales. The purpose was to test a nested comparison of a traditional TPB model and an extended TPB model, which included trust towards government and trust toward retailers as additional predictors of parents' intentions. For verifying the models goodness of fit, we controlled the values of the following fit indices: Chi-square test (non-significant value for confirming the goodness of the model (Browne & Cudeck, 1992; Iacobucci, 2010); RMSEA SRMR (Hu & Bentler, 1999), CFI and TLI (Bentler, 1990; Mcdonald, 1989).

The following statistical procedure was used to test the hierarchical models. To accept an extended TPB model it is necessary to compare it with the traditional TPB model. The traditional TPB model (Model 1) hypothesized that attitude, subjective norm and PBC predict behavioral intentions to give to children fruit and vegetables, in this case parental intention, which in turn determines behavior, in this case the children's intake of fruit and vegetables. In the Model 2, trust toward government and toward retailers were included as additional factors. In the Model 3, a not significant additional factor (trust in government) was excluded from the structural model. The comparison between the traditional TPB model (Model 1) and the extended models (Model 2 and 3) was tested by considering the first model as a nested model of the others. Thus, in Model 1 the regression weights of the paths between trust in government and trust in retailers were fixed to 0. To accept the final extended model, we tested the hypothesized significant differences using Chi-square value were run. If the Chi-square difference ($\Delta\chi 2$) is significant, the larger model with more parameters and less degrees of freedom (Model 3) could be accepted as a better model than the smaller model (Model 1). Moreover,

we compared the models using AIC indexes. Models with low AIC values will have a higher level of empirical support than models with high AIC values. The model with the lowest AIC is taken to be the best supported model.

2. Results

At first, we can analyze the composition of the sample of the study. The sample was composed of 148 females and 75 males. The mean age was 43.08 (SD = 5.68; min = 28; max = 58). Regarding the participants' level of education, 2,7% of the sample achieved a primary level, 33,5% of the sample achieved a secondary level, 46,2% obtained a high school diploma, and 17.6% obtained a university degree (Table 1).

To test the construct validity, the measurement factor analysis model including six latent factors indicating attitude, PBC, subjective norm, intention and trust in government and in retailers. Goodness-of-fit statistics for this measurement model were acceptable (χ_2 = 374.90, df = 278, $p < 0.001$; RMSEA = 0.05; CFI = 0.90; TLI = 0.88; SRMR = 0.04). The parameter estimates were all significant and presented high values (from 0.55 to 0.97). Means and standard deviations of all items are reported in Table 2.

Table 1 - Sociodemographic characteristics of respondents

Age	28-38	16.9%
	39-48	67.8%
	49-58	15.3%
Gender	Male	33.63%
	Female	66.37%
Education	Primary level	2.7%
	Secondary level	33.5%
	High school diploma	46.2%
	University degree	17.6%

Table 2 - Means and standard deviations of study items

	Mean	Standard Deviation
Children's consumption of fruit and Vegetable		
FRUIT	1.35	0.77
VEGETABLE	1.67	0.81
Parents' intentions to give their children fruit and vegetables		
INT1	5.05	1.69
INT2	5.15	1.61
INT3	5.13	1.60
Parental Attitude		
ATT1	6.26	5.47
ATT2	6.25	1.66
ATT3	6.22	1.39
ATT4	5.11	1.87
ATT5	4.98	2.16
ATT6	6.16	1.71
Parental subjective norm		
SN1	4.98	1.77
SN2	5.39	1.73
SN3	4.75	1.92
Parental perceived behavioural control		
PBC1	4.61	2.07
PBC2	4.74	2.10
PBC3	4.61	2.20
Parental trust in government		
GOV1	5.29	1.87
GOV2	5.22	1.85
GOV3	4.62	1.92
GOV4	4.49	1.76
GOV5	4.59	1.76
GOV6	4.69	1.79

Table 2 - continued

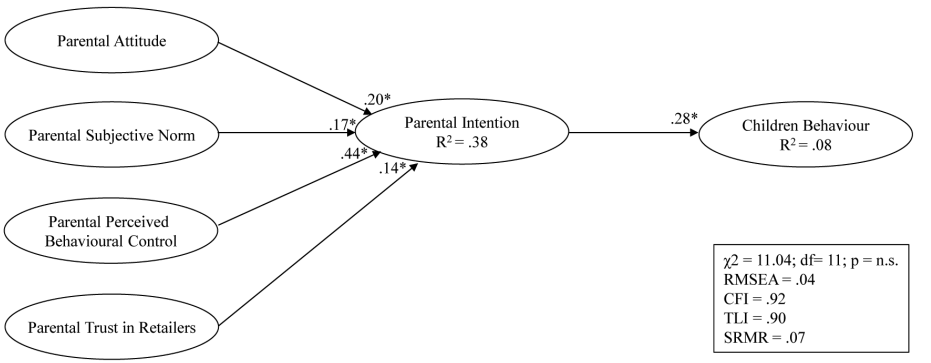
	Mean	Standard Deviation
Parental trust in retailers		
RET1	4.71	1.90
RET2	5.03	3.70
RET3	4.78	4.16
RET4	4.47	1.87
RET5	4.51	1.89
RET6	4.41	1.89

The Model 1 shows a good fit ($\chi 2 = 17.16$, df = 13, p = n.s.; RMSEA = 0.04; CFI = 0.96; TLI = 0.96; SRMR = 0.07). In this model, the parents' intentions to give their children fruit and vegetables are explained more strongly ($p < 0.001$) by PBC ($\beta = 0.48$), followed by the subjective norm ($\beta = 0.26$) and the attitude ($\beta = 0.18$). Children's consumption of fruit and vegetables reported by their parents was significantly ($p < .001$) predicted by the intention ($\beta = 0.22$). The Model 1 accounted for 45% of the variance of parents' intentions and 5% of children's behavior.

Moreover, the Model 2 has a good fit ($\chi^2 = 13.03$; df = 11, p = n.s.; RMSEA = 0.04; CFI = 0.96; TLI = 0.96; SRMR = 0.07), specifically the intention is explained ($p < 0.05$) by PBC ($\beta = 0.44$) and attitude ($\beta = 0.20$), followed by subjective norm ($\beta = 0.18$). Considering the additional factors, the trust in government is not a significant predictor of parents' intentions, while trust towards retailers significantly predicts parents' intentions ($\beta = 0.19$). Self-reported children's behaviors about their fruit and vegetables consumption is significantly ($p < 0.001$) explained by intention ($\beta = 0.28$). This model accounts for 38% of the variance of parents' intentions and 8% of children's behavior. Considering that trust in government is not a significant predictor of intentions, this path was excluded in a final extended TPB model (Figure 2).

The Model 3 (Figure 2) shows an acceptable fit ($\chi^2 = 11.04$, df = 7, p = n.s.; RMSEA = 0.04; CFI = 0.92; TLI = 0.90; SRMR = 0.07). Parents' intention is predicted ($p < .05$) by PBC ($\beta = .44$) and attitude ($\beta = .20$), followed by subjective norm ($\beta = .17$) and trust towards retailers ($\beta = .14$). Children's behavior about their fruit and vegetables consumption is significantly ($p < .001$) explained by intention ($\beta = .28$). This model accounts for 38% of the variance of parents' intentions and 8% of children's behavior.

Figure 2 - Extended TPB path model (Model 3) with standardized regression coefficients



Note: * $p < 0.05$; covariances and error variables not shown for ease of interpretation

Results show that the Chi-square difference value between Model 1 and Model 3 is significant ($\Delta\chi^2 = 6.02$; df = 6; $p < 0.05$), thus the Model 3 is significantly better than the Model 1. Table 3 reports the goodness of fit statistics for the confirmatory factor analyses and structural model of the estimated models. Table 4 shows standardized factor loadings of each tested models.

Table 3 – Goodness of fit statistics for the measurement and structural models

Model	Measurement Model – CFA	Structural Model 1	Structural Model 2	Structural Model 3
χ^2	$\chi^2 = 374.90$, $df = 278$, $p < 0.001$	$\chi^2 = 17.16$, $df = 13$, p = n.s.	$\chi^2 = 13.03$; $df = 11$, p = n.s.	$\chi^2 = 11.04$, $df = 7$, p = n.s.
RMSEA	0.05	0.04	0.04	
TLI	0.88	0.96	0.96	0.90
CFI	0.90	0.96	0.96	0.92
SRMR	0.04	0.07	0.07	0.07

Moreover, in these models the comparisons among the AIC indexes [73], which measures model parsimony, were respectively reduced to 6288.35 (Model 1) and 2285.85 (Model 3).

Table 4 - Standardized factor loadings of the estimated models

Model 1	**Model 2**	**Model 3**	**Parental attitude → Parents' intentions to give their children fruit and vegetables**	**0.18****	**0.20***	**0.22***
Parental subjective norm → Parents' intentions to give their children fruit and vegetables	0.26**	0.18*	0.17*			
Parental perceived behavioral control → Parents' intentions to give their children fruit and vegetables	0.48**	0.44**	0.44**			
Parents' intentions to give their children fruit and vegetables → Children's consumption of fruit and vegetables	0.22*	0.28*	0.28*			
Trust in government → Parents' intentions to give their children fruit and vegetables	/	–0.31	/			
Trust towards retailers → Parents' intentions to give their children fruit and vegetables	/	0.19**	–0.14*			
R^2 Parents' intentions to give their children fruit and vegetables	45%	38%	38%			
R^2 Children's consumption of fruit and vegetables	5%	8%	8%			

Note: * p = 0.05; ** p = 0.001

Results suggest that the use of an extended TPB model may be effective in explaining fruit and vegetables consumption in children. Firstly, their intake was significantly associated with parental intention to give them these foods (confirming our H1). In addition, H2, H3 and H4 were confirmed, since significant effects of attitude, subjective norm and PBC on parental intentions were found. This finding suggests that those parents who considered children fruit and vegetable consumption as an important healthy eating behavior were more likely to intend to provide their children with healthy food. Furthermore, the more other people approve this eating practice, the more parents were willing to intend to act it. Finally, parents, who perceived more control on possibilities to implement a promotion of fruit and vegetables consumption toward their children, were more likely to intend to perform it.

Considering the additional variables, the model confirms the decisive role of trust in determining parental intentions. Specifically, while H5 is not confirmed, H6 is accepted. In fact, trust in government do not influence parental intentions, while trust in retailers has a positive impact on parental intentions. These findings suggest that parents who trust retailers had higher levels of intention to provide fruit and vegetables to their children.

3. Discussion and conclusions

This study aims at understanding the determinants in parents in giving their children fruit and vegetables. This behavior is instrumental in determining the healthiness of children's diets to the extent that it is one of the most important strategies to prevent metabolic diseases and obesity. The incidence of such diseases in Southern Italy suggested this area as a suitable case study for the investigation. In detail, a TPB model has been used to explain the intentions of parents, but it has been extended to include trust towards government and retailers, the actors of the supply chain that can reassure parents about the safety of those foods. Our results confirmed the effectiveness of the TPB model to predict intention and behavior, as already showed in the several domains (Lombardi *et al.*, 2017; Riebl *et al.*, 2015).

Results yielded that PBC and attitude were the most important factors in determining the intention in parents of giving their children fruit and vegetables. The high predictive power of parental PBC in this context can be explained considering that parents are expected to control most of the food that children consume. Thus, the parental perception of being competent in controlling fruit and vegetable intake of their children may be a critical determinant in the development of healthy eating patterns in children. This confirms the need of providing parents with training sessions that can increase their perceived control (Hunsaker & Jensen, 2017).

Then, positive attitudes towards serving fruit and vegetables to children influenced the parents' intentions to offer them an adequate amount of these foods. This results is in line with prior evidences showing the important role of attitude to predict behavioral intentions for a range of eating protective behaviors (Carfora *et al*., 2018), including fruit and vegetable consumption (de Bruijn *et al*., 2014). Consistently, the present study confirmed that this is the case also for parental attitude towards the children' fruit and vegetable intake. Thus, future public campaign should try to improve parental positive attitude towards the children adherence to a diet rich in fruit and vegetables. To do so, health institution could use persuasive communication as strategy to induce attitude change, which in turn would lead to a change in their intention and behavior.

The model has been extended to trust, in order to consider that the intentions of parents in giving fruit and vegetables to children can be actually harmed by perceived risks about safety, due to the subsequent food scandals that affect the reputation of this food sector. Due to the long supply chain that brings food from the farm to fork, we considered that the role of actors of the supply chain could be multifold, according to consumers' perceptions.

Only trust towards retailers has been proved in being instrumental in influencing the parents' intentions while the role of government appeared to be negligible, according to our results. The reason why can rely in the closeness between retailers and consumers, that has also a psychological backlash that leads to the identification of the consumers with the retailers' values (Schultz *et al*., 2016). Furthermore, retailers appear to be concerned about the impact their business can have on society, so they are believed to convince consumers about the effectiveness of their risk prevention measures that they undertake (Tjärnemo & Södahl, 2015). In the end, the picture provided by this study, suggests that retailers play a pivotal role in shaping consumers' perceptions, also in a very sensitive case as risks connected to children's food.

Retailers' strategies to improve transparency to reduce the perception of food risk represent important tools in public and private interventions to foster healthier diets. Public policies and indications could encourage retailers' communication and information actions to inform consumers about their role in the children diet choices (Singh *et al*., 2020). These actions could be developed in a context of corporate social responsibility (CSR) approach (Ladwein & Sánchez Romero, 2021).

Policymakers and regulators need to improve trustworthiness in public certification and control measures to promote transparency and trust along supply chain. This strategy could compensate for weaknesses among individual partners and could limit the dangerous role of modern distribution

to represent the main trust maker. The actions of a single actor along supply chain remain insufficient to address the children dietary shifting challenge. However, consumer trust in retailers could be essential to reinforce the role of producers in this mechanism, also with the help of private standards and informative campaigns. The supply chain can give an image of openness with a larger number of products with credence characteristics like healthfulness and sustainability (Macready *et al*., 2020).

The digital technology has complicated the process of communicating the producers' message to customers. Modern and involved consumers search actively for information on their family diet, so web information or intelligent packaging technology (as QR code) can be leveraged to inform and build trust in consumers at the same time. This would have an effect on consumers' engagement at the point of sale, increase consumer trust and thereby influence their purchase decision.

Nevertheless, this study has some limitations. First, there are several elements that have been excluded from the study in order to have a clearer picture. For example, the role of children's perceptions has been neglected as other children's traits such as pickiness or food preferences. Second, the sample was limited to Italian families, limiting the generalizability of the findings. Third, the parental-reported assessment of children behavior is another limitation, although this is a common type of measurement in studies on parental influences on various children behaviors. Therefore, these elements may represent the challenges that may be addressed by future researches. They could also investigate what is the role of producers in truly working to improve people's diets and how their technological innovations can play a role.

In conclusion, the current study provides a useful contribution to the literature on the TPB and fruit and vegetable intake in children showing that parental beliefs – and importantly their trust in retailers – are relevant predictors of children healthy eating. The fact that parental attitude, PBC, subjective norms and trust in retailers influence parental intention, which in turn influences children behavior, suggests that these psychosocial factors might be a useful basis for attempting to promote an adequate intake of fruit and vegetable consumption in children, at least in Italian families.

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