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Promoting healthy eating habits among youth according to their preferences: Indications from a discrete choice experiment in Tuscany

Ilaria Corazza*, Francesca Pennucci, Sabina De Rosis

Health and Management Laboratory, Institute of Management, Sant'Anna School of Advanced Studies, Piazza Martiri della Libertà, 33, 56127 Pisa, PI, Italy

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ABSTRACT

Introduction: The incidence of overweight among youth in Western Countries requires the implementation of initiatives to promote healthy lifestyles. Although under particular conditions obesity is not preventable, drawing attention on factors affecting teenagers' preferences can ameliorate the efficacy of public interventions designed for health promotion.

Methods: This study aims at eliciting teenagers' food preferences through a discrete choice experiment, conducted in Tuscany using a webAPP survey, with the participation of more than 4,700 teenagers. Respondents expressed their preferences for breakfast food based on three attributes: food quality, packaging and claim. The survey also collected information on respondents' socio-demographic characteristics, social influence and media use for food information.

Results: Teenagers' preferences for healthy foods seem positively related with their own level of food literacy. The tendency of respondents to read labels and nutritional facts is positively associated with preferences for healthier foods. Peers' influence is not significant, while family influence has a positive impact on teenagers' healthy choices. Internet usage is associated with unhealthy choices with a healthy aspect.

Conclusion: The results can be useful in defining effective actions for the promotion of healthy behaviors among teenagers, either in communication and awareness campaigns or in education and activation initiatives, with respect to the reading and interpretation of nutritional facts and labels, the role of family and friends, and the use of media.

1. Introduction

The epidemic dimensions of obesity, as well as the overspread onset of chronic diseases and the consequent sustainability of social and health spending in Western Countries are very critical issues, confirmed by scientific evidence and widely discussed by the media [1–5]. According to the WHO, the diffusion of obesity worldwide is three times that of the 1970s. In 2016, already 13% of the global adult population were obese [6]. This phenomenon also affected younger populations, with more than 340 million overweight or obese children and adolescents (5–19 years) in 2016 [6].

The incidence of obesity and overweight, that is abnormal accumulation of fat presenting a risk to health with a body mass index (BMI) respectively over 30 or 25 [7], also in the Italian scenario urges to open a critical debate about eating education and correct lifestyles, especially in the younger population where the problem is becoming more pressing [8,9]. In fact, if on the one hand the diffusion of obesity is not so worrying among Italian adult population, on the other one overweight rates among youth are scary with 1 in 3 children that is overweight [10].

Even if it was demonstrated that obesity is not preventable when particular conditions hold [11], it is accepted that healthy lifestyles play a crucial role in terms of prevention [12]. Moreover, there is evidence that health promotion at a young age can positively affect the current and future sustainability of national health systems [13–15]. Under particular circumstances, such as the recent lockdown measures or other possible limitations to physical activity due to crises or epidemics, early establishing a good re-

* Corresponding author.
E-mail addresses: ilaria.corazza@santannapisa.it (I. Corazza), francesca.pennucci@santannapisa.it (F. Pennucci), sabina.derosis@santannapisa.it (S. De Rosis).

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lationship with food and positive food behaviors among teenagers results even more crucial [16,17].

Policies should focus on improving teenagers' skills and competences in taking food-related decisions [18]. Indeed, there is evidence that the greater the knowledge and awareness of food and nutrition, namely food literacy, the healthier the food consumption choices [18–20].

Food literacy is a broad and multidimensional concept [21]. It has been identified as a key component of the food-wellbeing [22], referring also to "the positive relationship built through social, cultural, and environmental experiences with food", which enable individuals to take decisions supporting their health [23,24]. To this respect, food literacy is much more than the sole food knowledge, intended as "the possession of food-related information", because it implies both "understanding and acting on knowledge" for taking food-related decisions [22,25,26]. According to Block and colleagues [22], food literacy presents a conceptual or declarative component related to reading and acquiring knowledge about food, food sources, and other food and nutrition knowledge. A second component is the procedural knowledge or functional literacy, which relates to understanding and applying such knowledge to food decision-making, such as when buying food products. In Azevedo Perry and colleagues [27], the nutrition literacy implies the ability to identify evidence-based or accurate knowledge and information (e.g. the ability to read labels or seek out reliable information). Krause and colleagues [28] included the ability to get and interpret front label packaging among the key aspects of the functional literacy, and the ability to get and process nutrition information [28–30]. Thus, food literacy is also about reading and understanding food labels [31,32], which is a key antecedent of taking healthy food decisions.

Nevertheless, there is evidence of the low propensity to read food labels among teenagers [33,34]. This is particularly important, considering that the acquisition of the food literacy is a life-long process [22], and it is important to establish healthy behaviours early in the lifespan [35]. Food literacy may play a role in shaping adolescents' food behaviours, although there is mixed evidence, for instance, on the association between food literacy and adolescents' dietary intake [20]. Despite this, scholars suggest to public health practitioners and policy makers to focus on policies increasing food literacy in adolescence [36].

In general terms, the literature offers examples of programs aimed at improving food literacy and dietary behaviors in different target populations [4,37], as well as using a food literacy framework for public health program planning, policy, and evaluation [38]. The focus of such interventions shifted from teaching adolescents to eat in a healthy way to improving their skills and food literacy to eat in a healthy way (e.g. how to read labels or cook properly) [39–42].

Nevertheless, it is necessary to conduct more research in order to analyze how food literacy and healthy eating relate [28,31]. This is especially true concerning teenagers [43], as adolescence is a period of great evolution, characterized by changes in behavior with respect to diet, physical activity and psychological health [35].

For the sake of this purpose, in this paper, the authors analyze how lower and higher food literacy are associated with adolescents' food preferences in the context of purchasing foods, by means of a discrete choice experiment (DCE), using as a main proxy teenagers' attitude to read labels and get food information [44–46]. The discrete choice experiment presented in this paper aims at eliciting teenagers' preferences with respect to explicit and implicit food characteristics, communication aspects, such as food quality, packaging and claims, as well as their own food literacy. The ultimate purpose of this contribution is, therefore, to support policy-makers in the refinement of public initiatives aimed at promoting correct eating habits among adolescents, by relying directly on their preferences for food and a number of factors potentially influencing their behavior.

2. Materials and methods

The study is based on data collected in 2017, by means of a survey administered under the beFood project. The beFood project was a public intervention aimed at promoting healthy lifestyles among youth; more particularly, it was conducted in collaboration with 49 adolescents, with the objective of early preventing obesity and overweight [47]. The reference population of this study consists of 16–17 year-old teenagers residing in Tuscany (Italy). In 2016, this group of the population consisted of 62,177 individuals [48]. By considering a significance level of $p = 0.05$, and tolerating a margin of error $d = 0.05$, the authors estimated a theoretical sample size of 3572 respondents, stratified in the 10 provinces of Tuscany [for further details, please see [49,50]]. The authors designed a theoretical convenience reference sample for each province, starting from ISTAT data as of 1 January 2016 [48]. Participants in the survey were not randomly selected, but joined the project via a snowball sampling procedure. The snowball sampling procedure took place starting from the abovementioned 49 students who invited their peers to fill in the questionnaire through a variety of methods. For example, they organized presentations about the beFood project in the schools of their province; they promoted the participation of their peers in the survey throughout their personal networks (such as sports, music and/or volunteering associations at local level); they used their own personal contact data and social media. The participants could access and fill-in the questionnaire either via smartphone, tablet or computer, using a webAPP [47,50]. A number of 5029 questionnaires were collected, of which 4749 were from 16 to 17 years old adolescents coming from the 10 Tuscan provinces. This study is actually based on a sample of 4669 respondents, who fully completed the questionnaire and were suitable for data analysis.

The questionnaire, consisting of two sections, was administered after a content and face validity check with the 49 adolescents participating in the beFood project. The first section of the questionnaire included questions about the lifestyle and sociodemographic characteristics of the respondents. In particular, data on the quality and frequency of foods consumed by adolescents were used to compute an individual index of adherence to the food pyramid developed by the Tuscany Region and the official WHO recommendation on fruits/vegetables consumption 5 times a day [50–52]. For more details, see Appendix A in [53]. Such score ranges from a minimum of −6 to a maximum of 27.5. The minimum value indicates the lowest adherence to the recommendations in terms of both quality and quantity of food consumed by adolescents. Three levels of adherence were defined: low adherence from −9 to 3 total scored points; medium adherence from 4 to 15 total scored points; high adherence from 16 to 30 total scored points.

In the first section of the questionnaire, several questions were asked to teenagers about their attitudes towards food consumption, as proxies of food literacy. In further details, Table 1 illustrates what questions respondents were asked, pertaining to four different aspects related to their food-related knowledge, skills and sources of information. All expected answers to such questions were dichotomous, namely either yes or no.

The second section contained a DCE [54], one of the most popular techniques used to elicit respondents' preferences, starting from their stated preferences in hypothetical scenarios [55–57]. More particularly, this study aimed at extrapolating the preferences of respondents in terms of nutrition, proposing as a scenario the purchase of breakfast foods. In the experimental design phase, the at-

Table 1
Questions building on each investigated dimension of teenagers' food consumption.

Dimension	Questions
'reading labels and nutritional facts on breakfast food packages'	In the last week, have you read nutritional values (e.g. carbohydrates) on the packages of foods you have eaten? In the last week, have you read other labels on the packages of foods you have eaten?
'receiving suggestions from friends and family'	Would you accept advice on food from your family? Would you accept advice on food from your friends?
'being influenced by friends and family'	In the last week, has your family had an influence on your food choices? In the last week, have your friends had an influence on your food choices?
'selecting specific channels to get informed on nutrition'	If you liked to know more about nutrition, would you look for information on the Internet? If you liked to know more about nutrition, would you look for information on books or magazines? If you liked to know more about nutrition, would you look for information on APPs? If you liked to know more about nutrition, would you look for information on social networks? If you liked to know more about nutrition, would you look for information on TV?

tributes and levels characterizing the object of choice were identified on the basis of a literature review [58]. Particularly, the attributes and respective levels adopted were 1) 'quality of food' [59] declined in 'low-fat yoghurt', 'chocolate cornflakes' and 'sweet snacks'; 2) 'packaging' [60] declined in 'natural' and 'bright and colorful', and 3) 'claim' [61] declined in 'healthy', 'multivit' and 'tasty'.

The full factorial experimental design produced $3^2 \times 2$ (18) combinations, randomized to form 18 pairs (or choice sets), collected in 6 blocks of 3 pairs of alternatives [62]. The choice of articulating the experimental design into six blocks was made considering the number of answers needed to test the model as well as the acceptable cognitive burden on respondents [63].

Each respondent was presented with only one block, randomly selected, according to the block randomization strategy adopted by Seghieri et al. in 2014 [64]. Each block contextualized the choice between alternatives within the same scenario common to all blocks and respondents:

> "If you were in the supermarket to buy something to eat for breakfast, you would choose …"

The scenario, related to the concept of procedural or functional food literacy, was chosen because related to a potential real-life situation where teenagers might act on their food knowledge for taking purchasing decisions.

Each alternative was constructed using the same attributes and, from one alternative to the other one, only the levels varied. The levels were respectively assigned to the various alternatives according to systematic changes [65] in order to guarantee orthogonality, balance and minimum overlap between the various levels [66]. The full factorial experimental design was performed using the STATA 14 software, by means of the "`dcreate`" function that applies the modified Fedorov algorithm to maximize the D-efficiency of the design, "based on the covariance matrix of the conditional logit model" [67].

The data were coded according to a dummy variable coding process, and analyzed using a conditional logit model with both main and interaction effects [68]. Respondent preferences were first identified with respect to the different levels characterizing the attributes (main effects). Then, the interactions between preferences and characteristics of the respondents (i.e. sex, body mass index, higher level of education in the family and level of adherence of the diet of the respondent to the Tuscan food pyramid) were identified. Finally, the researchers observed the interactions between the preferences of the respondents and their propensity to reading nutritional facts and labels on food packages, receiving suggestions on food from friends and families, being influenced on food by friends and families and searching for information on nutrition through different sources. The statistical analysis of data were also performed using STATA 14. Throughout the analyses, the p-value cut-off considered for statistical significance was $p<0.05$. Nevertheless, when considered especially relevant for the research, also the results with a p-value below 0.10 were reported and commented in the article.

3. Results

The main characteristics of the 4669 adolescents who participated in the DCE are reported in Table 2. The females are 56.6% of the group of respondents. Most of the adolescents are not fully adherent to the recommendations on food intake, as shown by the food score, but their BMI indicates that on average they are normal weight. Moreover, they mainly come from families with almost a member having a medium/high level of education.

As shown in Table 3, the analysis of the main effects from the collected data showed that teenagers prefer medium-healthy foods, such as chocolate cornflakes ($p<0.001$), compared to healthy foods, such as low-fat yoghurt, and unhealthy foods, such as sweet snacks ($p<0.001$). Moreover, they declare to prefer a natural-looking packaging rather than a bright and colorful one ($p<0.001$) and a healthy claim rather than a tasty claim ($p<0.001$). In order to interpret the results provided in the tables correctly, the readers should consider 'low-fat yoghurt', 'natural packaging' and 'healthy claim' as reference levels in the DCE. Therefore, the results in the tables, associated with a positive or negative sign, are respectively more or less preferred than such reference levels.

As far as it concerns the analysis of interaction effects, it emerges that in general the 'quality of food' is the leading attribute in determining the preferences of adolescents for breakfast foods, except for being influenced by family, and using social networks and watching TV as information sources where the claim is the leading attribute [68]. More in detail, females seem to prefer healthier foods as compared with males ($p<0.001$). Additionally, compared to their female peers, males seem also more sensitive to a bright and colorful packaging ($p<0.05$), and to advertising claims containing a promise of taste rather than health ($p<0.001$).

It has also emerged that, where the level of family education is lower (primary and lower secondary school), adolescents tend to prefer the consumption of unhealthy foods ($p<0.05$).

Moreover, adolescents with a low or medium profile of adherence to the Tuscan food pyramid prefer less healthy foods, a packaging that does not look natural and a claim containing a promise of taste rather than health ($p<0.10$). On the other hand, with increasing individual BMI, adolescents report preferring the consumption of healthier foods ($p<0.01$).

Table 2
Descriptive statistics of the sample participating in the DCE.

Variables	Categories	%	Nr.
Sex	Female	56.6	2641
	Male	43.4	2028
Level of education of the family of origin	Low	11.11	519
	Medium	39.09	1825
	High	49.79	2325
Level of diet adherence to the Tuscan food pyramid (food score)	Low	9.04	422
	Medium	80.98	3781
	High	9.98	466
BMI (continuous variable): Min 8.31 Max 41.16 Mean 21.11 Std. Dev. 3.12			

Table 3
Analysis of main effects driving teenagers' preferences.

Choice	Coef.	Std. Err.	$P > \|z\|$	[95% Conf. Interval]	
Chocolate cornflakes	.406	.030	**< 0.001**	.346	.465
Sweet snacks	−0.239	.026	**< 0.001**	−0.291	−0.188
Bright and colourful	−0.196	.023	**< 0.001**	−0.242	−0.152
Multivit	.044	.035	0.215	−0.025	.113
Tasty	−0.268	.035	**< 0.001**	−0.337	−0.199

The respondents who prefer the healthier food alternative in terms of quality, packaging and claim, are those who pay more attention to reading nutritional facts ($p<0.05$), as well as other labels on the packaging of the products, such as ingredients, "organic" or "gluten-free" brands and "0 Km products", a label that indicates all those foods, such as fresh fruit and vegetables, that are either grown or produced locally ($p<0.10$).

Teenagers, who report they would accept suggestions by their families as well as those influenced by their friends on food consumption, tend to prefer unhealthy foods with a bright and colorful packaging. On the contrary, teenagers who feel to be influenced by their families regarding their eating behavior, tend to prefer healthier foods with a healthier claim. It is worth pointing out that friends' suggestions have always negative but not significant effect on healthy food choice.

Finally, with regards to the preferred sources of information on nutrition, teenagers who seek more information on the Internet as compared to other information sources tend to prefer unhealthy foods ($p<0.001$) as well as a natural-looking packaging ($p<0.05$) and a healthy claim ($p<0.10$). On the other hand, teenagers who get informed by means of books or magazines tend to prefer healthy foods ($p<0.01$), while those who watch television opt for a claim containing a promise of good food taste ($p<0.10$). For full results on interaction effects, see tables in the Appendix.

4. Discussion

This paper investigates whether and how different levels of food literacy, combined with specific characteristics of respondents, can drive teenagers' preferences for food choice, using a DCE on breakfast foods purchasing. From the literature, it emerged the need to attain a greater understanding of the influence of food literacy on adolescents' food choices [36]. Moreover, the available evidence is mainly related to the impact of food literacy on adolescents' behaviors and not preferences [69]. Given these premises, this research provides novel evidence on the association between the elicited preferences of adolescents on food and their food literacy, also considering the role of family, friends and new media, such as the Internet. The results of this study may have important implications on different expected roles that the context, family, peers and media may play on adolescents' food choice. Given the importance of successful initiatives for the adolescents' development as adults also with respect to their relation with food [70], these results can also inform public policies specifically targeted to adolescents and aimed at building their choice architecture based on what moves their preferences.

In accordance with the literature, as compared to males, females prefer healthier alternatives in terms of food quality [71,72], package and claim [73]. As similarly found by Folkvord [74], teenagers with a higher BMI seem to prefer healthier food. On the one hand, such a result may actually depend on the onset of a social desirability bias effect [75]. On the other hand, Larson and colleagues showed that the overweight teenagers are more likely to be involved in food tasks, such as food cooking and grocery shopping [76]. Therefore, this group of adolescents may benefit from interventions aimed at suggesting strategies for making healthful consumer decisions, for instance during shopping, rather than focusing only on their food knowledge and healthy eating [39–41].

Again in line with previous research, the results show that teenagers coming from less deprived family contexts tend to show healthier preferences [77,78]. Such a result possibly relates also to the distinct features of conceptual and functional literacy [22], since adolescents raised in more deprived family contexts can even acquire full knowledge on food, but eventually lack the necessary resources to put their knowledge into practice due to less affordable prices of healthier foods. Moreover, Pearson and colleagues showed that indicators of family circumstances, such as parental education, are key for defining policies promoting healthy lifestyles in adolescence, because they influence teenagers' food behaviors [79]. Social context is key in terms of food socialization [22], and can be used for segmenting and effectively targeting policies of healthy lifestyle promotion [43]. However, results are more jeopardized when considering the tendency of respondents to accept suggestions and being influenced by their family and friends. Indeed, it emerges that teenagers who would accept suggestions by the family tend to prefer quite unhealthy foods, as counter posed to teenagers that reported to be actually influenced by their families in choices regarding nutrition [80]. These results can be explained by the different impact of parents giving concrete examples, which can therefore influence teenagers, as compared to suggestions that could remain theoretical or distant from practice. It could be argued that practical and concrete examples may be related to functional food literacy, while suggestions to declarative food knowledge [22,25,26]. This implies that parents can have a key role as positive examples, by creating a supporting home environment, and a source of positive influence and rules to manage eating behaviors of teenagers. More research should be done on the role of families, considering previous evidence on the positive association between parental encouragement and children's fruit and vegetable consumption [79]. In contrast with other studies, this research does not support evidence on teenagers being influenced by their friends on food choices, by preferring less healthy breakfast foods [81–84]. Given the mixed evidence, careful studies

should be done on the real potential of peer-to-peer approaches for the health promotion initiatives targeted to teenagers [43].

According to previous studies [85], higher online engaged teenagers are more likely to consume unhealthy foods. This research showed that teenagers searching for information mostly on the Internet tend to prefer unhealthy food, but also a natural-looking packaging and a healthy claim. Visual impact tends to be stronger than a reading, deepening and reasoned process [86]. As such, also when it comes to food choices, it has been demonstrated that appearance of food has a greater impact on choice than information provided [87]. Presumably, this evidence may drive important policy implications, as visual impact could turn into a particularly effective method to address teenagers' attitudes. This can be a key aspect to consider also in choosing media channels of communication. For instance, 'visually intensive' social networks, such as Instagram, are widely used by teenagers and can be considered in designing health promotion campaigns [88], by carefully considered the proper engagement and communication strategies [89–91]. Moreover, since there is evidence in the literature that tastiness of food is a better predictor of purchase intentions as compared with expected healthiness of food, it is also ascertained that increasing health consciousness in order to drive healthy food choices is not enough. Consequently, when dealing with the promotion of healthy foods, it becomes fundamental to boost food health-unrelated features so to increase its degree of attractiveness (such as food composition, attractiveness of the packaging and price), beyond trying to optimize the interrelation between healthiness and tastiness [92]. Such an aspect is especially important to try to positively affect the food choices of adolescents making a wider use of the Internet and social networks, in general and more in particular to catch information on food, as well as of those belonging to more deprived family contexts and overall less health conscious.

The main findings of the present study are in line with the evidence on the positive association between food literacy and teenagers' dietary habits [36,93]. This study showed that teenagers' attitude to reading nutritional facts and labels on food packages positively affects their preferences for food. Such findings imply that health promotion and prevention policies should not merely focus on the features of foods and health outcomes themselves, but rather be addressed towards the triggering causes of healthy choices by teenagers, such as food knowledge and skills [92,94,95]. The presented results could be of interest in other contexts since there is little evidence on the relationship between food literacy and preferences, not habits, of adolescents. In particular, the findings of this study can be relevant in a context of strong family relationships, and with a strong food culture, as Italy and the Southern and Mediterranean European countries are. In this respect, the presented study design can be reproduced considering different food cultures of other countries and applied to a broader age range of adolescents. The literature offers examples of successful experiments and initiatives worldwide, aimed at improving general people's dietary habits by fostering their own level of food literacy and skills [37,38,96,97]. Therefore, specifically tailored measures could be designed and implemented to make also teenagers more aware and capable of making the best choices to protect and improve their own health, by strengthening the direct relationship between literacy and well-being [98].

This study is based on a large sample that gives robustness to the discrete choice experiment. As in any other self-reported survey, some biases may have influenced the survey responses. However, the DCE is based on realistic scenarios that were investigated considering multiple factors potentially affecting teenagers' preferences. Thus, the presented evidence can be applied in designing specific health policies that are tailored according to the specific factors that influence adolescents' preferences.

5. Conclusions

The results of this study confirm that, in order to support teenagers in making healthy eating choices, it is necessary to boost their level of food literacy. In this way, they would be more capable of interpreting correctly nutritional facts and labels, thus potentially of making healthier food choices. Key findings emerged in relation to the association between the teenagers' food preferences and their family and friends' influence, as well as the sources of information on food they used. Each result has been discussed and policy implications presented, in order to support policy makers and practitioners in designing health policies aimed at effectively empowering young people in making healthy food choices.

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Declarations of Competing Interest

None.

CRediT authorship contribution statement

Ilaria Corazza: Conceptualization, Methodology, Formal analysis, Investigation, Data curtion, Writing – original draft, Visualization. **Francesca Pennucci:** Conceptualization, Methodology, Investigation, Data curtion, Writing – review & editing. **Sabina De Rosis:** Conceptualization, Methodology, Investigation, Data curtion, Writing – review & editing, Project administration.

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Appendix

The following tables illustrate the full results of the interaction analysis performed between the attributes of breakfast foods determining teenagers' preferences (i.e. type of food, packaging and claim) and other investigated characteristics of the participants in the experiment, namely 1) socio-demographic characteristics, 2) attitude to reading food nutritional facts and labels, and 3) attitude to accept suggestions and being influenced by family and friends, as well as selection of information sources.

In order to read the tables below, it should be considered that the reference level adopted during the coding process of answers was the healthiest one, which therefore is not shown in the results. Thus, a positive coefficient is associated with options actually preferred to the healthiest one, while a negative coefficient is associated with options less preferred as compared with the healthiest one.

1) Socio-demographic characteristics

Choice	Coef.	Std. Err.	$P > \|z\|$	[95% Conf. Interval]	
Interaction effects driving teenagers' preferences, sex					
Female * Chocolate cornflakes	.442	.063	0.001	.317	.567
Female * Sweet snacks	.578	.055	0.001	.469	.686
Female * Bright and colourful	.100	.048	0.037	.006	.194
Female * Multivit	.097	.073	0.189	−0.047	.241
Female * Tasty	.306	.073	0.001	.162	.450
Interaction effects driving teenagers' preferences, Body Mass Index (BMI)					
BMI * Chocolate cornflakes	−0.014	.010	0.156	−0.034	.005
BMI * Sweet snacks	−0.025	.008	0.005	−0.042	−0.007
BMI * Bright and colourful	.007	.007	0.302	−0.007	.022
BMI * Multivit	.013	.011	0.257	−0.009	.036
BMI * Tasty	.009	.011	0.412	−0.013	.032
Interaction effects driving teenagers' preferences, level of family education					
Low education level * Chocolate cornflakes	−0.165	.101	0.103	−0.364	.033
Low education level * Sweet snacks	.178	.090	0.048	.001	.354
Low education level * Bright and colourful	.024	.077	0.754	−0.127	.175
Low education level * Multivit	−0.042	.117	0.720	−0.271	.187
Low education level * Tasty	−0.104	.114	0.361	−0.330	.120
Medium education level * Chocolate cornflakes	.060	.066	0.365	−0.070	.191
Medium education level * Sweet snacks	.049	.057	0.397	−0.064	.162
Medium education level * Bright and colourful	.039	.050	0.432	−0.059	.138
Medium education level * Multivit	.126	.077	0.103	−0.025	.278
Medium education level * Tasty	.046	.077	0.545	−0.104	.198
Interaction effects driving teenagers' preferences, adherence to the Tuscan food pyramid					
Low adherence profile * Chocolate cornflakes	1.036	.150	0.001	.740	1.331
Low adherence profile * Sweet snacks	1.837	.140	0.001	1.561	2.112
Low adherence profile * Bright and colourful	.312	.116	0.007	.084	.539
Low adherence profile * Multivit	−0.461	.174	0.008	−0.804	−0.118
Low adherence profile * Tasty	.571	.169	0.001	.240	.903
Medium adherence profile * Chocolate cornflakes	.659	.113	0.001	.436	.882
Medium adherence profile * Sweet snacks	1.211	.111	0.001	.994	1.429
Medium adherence profile * Bright and colourful	.257	.090	0.004	.079	.434
Medium adherence profile * Multivit	−0.319	.135	0.019	−0.585	−0.053
Medium adherence profile * Tasty	.242	.131	0.065	−0.014	.499

1) Reading of food nutritional facts and labels

Choice	Coef.	Std. Err.	$P > \|z\|$	[95% Conf. Interval]	
Interaction effects driving teenagers' preferences, reading of nutritional facts					
Reading nutritional facts * Chocolate cornflakes	−0.597	.067	0.001	−0.730	−0.465
Reading nutritional facts * Sweet snacks	−0.804	.058	0.001	−0.918	−0.689
Reading nutritional facts * Bright and colourful	−0.119	.050	0.018	−0.218	−0.020
Reading nutritional facts * Multivit	.110	.078	0.157	−0.042	.263
Reading nutritional facts * Tasty	−0.316	.077	0.001	−0.468	−0.164
Interaction effects driving teenagers' preferences, reading of food labels					
Reading labels * Chocolate cornflakes	−0.227	.122	0.063	−0.467	.012
Reading labels * Sweet snacks	−0.400	.109	0.001	−0.613	−0.186
Reading labels * Bright and colourful	−0.191	.093	0.041	−0.374	−0.008
Reading labels * Multivit	.238	.143	0.096	−0.041	.518
Reading labels * Tasty	−0.096	.140	0.492	−0.371	.178

1) Suggestions and influence by family and friends, and selection of information sources

Choice	Coef.	Std. Err.	$P > \|z\|$	[95% Conf. Interval]	
Interaction effects driving teenagers' preferences, accepting suggestions by family and friends					
Suggestions by friends * Chocolate cornflakes	−0.143	.101	0.157	−0.341	.055
Suggestions by friends * Sweet snacks	−0.052	.088	0.553	−0.226	.121
Suggestions by friends * Bright and colourful	−0.005	.076	0.940	−0.155	.143
Suggestions by friends * Multivit	−0.054	.117	0.641	−0.284	.174
Suggestions by friends * Tasty	−0.088	.115	0.443	−0.313	.137
Suggestions by family * Chocolate cornflakes	.067	.068	0.323	−0.066	.201
Suggestions by family * Sweet snacks	.128	.059	0.032	.010	.245
Suggestions by family * Bright and colourful	.095	.050	0.061	−0.004	.195
Suggestions by family * Multivit	−0.017	.079	0.826	−0.172	.137
Suggestions by family * Tasty	.033	.078	0.666	−0.119	.187
Interaction effects driving teenagers' preferences, being influenced by family and friends					
Influence from friends * Chocolate cornflakes	−0.045	.096	0.640	−0.234	.143
Influence from friends * Sweet snacks	.156	.083	0.063	−0.008	.320
Influence from friends * Bright and colourful	.126	.071	0.076	−0.013	.265
Influence from friends * Multivit	.016	.111	0.882	−0.202	.235
Influence from friends * Tasty	−0.077	.110	0.483	−0.295	.139
Influence from family * Chocolate cornflakes	.118	.068	0.085	−0.016	.253
Influence from family * Sweet snacks	.033	.060	0.581	−0.085	.151
Influence from family * Bright and colourful	−0.073	.051	0.156	−0.174	.027
Influence from family * Multivit	.133	.080	0.095	−0.023	.290
Influence from family * Tasty	.021	.078	0.786	−0.133	.176
Interaction effects driving teenagers' preferences, surfing the Internet					
Internet * Chocolate cornflakes	.280	.071	0.001	.138	.421
Internet * Sweet snacks	.290	.063	0.001	.165	.415
Internet * Bright and colourful	−0.113	.054	0.036	−0.220	−0.007
Internet * Multivit	−0.150	.083	0.073	−0.315	.014
Internet * Tasty	−0.109	.082	0.186	−0.270	.052
Interaction effects driving teenagers' preferences, using social networks					
Social networks * Chocolate cornflakes	−0.100	.129	0.436	−0.354	.152
Social networks * Sweet snacks	.153	.112	0.172	−0.067	.374
Social networks * Bright and colourful	.121	.095	0.204	−0.066	.309
Social networks * Multivit	−0.156	.150	0.300	−0.452	.139
Social networks * Tasty	−0.138	.148	0.352	−0.430	.153
Interaction effects driving teenagers' preferences, using mobile applications (mobAPP)					
MobAPP * Chocolate cornflakes	.166	.112	0.140	−0.054	.386
MobAPP * Sweet snacks	.116	.099	0.241	−0.078	.311
MobAPP * Bright and colourful	−0.078	.085	0.360	−0.245	.089
MobAPP * Multivit	−0.113	.128	0.375	−0.365	.137
MobAPP * Tasty	−0.077	.126	0.542	−0.325	.171
Interaction effects driving teenagers' preferences, reading books and/or magazines					
Books * Chocolate cornflakes	−0.124	.078	0.111	−0.277	.028
Books * Sweet snacks	−0.220	.069	0.002	−0.357	−0.084
Books * Bright and colourful	.008	.059	0.880	−0.107	.125
Books * Multivit	.065	.090	0.472	−0.112	.243
Books * Tasty	−0.076	.089	0.395	−0.251	.099
Interaction effects driving teenagers' preferences, watching TV					
TV * Chocolate cornflakes	.143	.099	0.151	−0.052	.339
TV * Sweet snacks	.108	.087	0.218	−0.063	.280
TV * Bright and colourful	.010	.074	0.888	−0.136	.157
TV * Multivit	.113	.115	0.328	−0.113	.340
TV * Tasty	.199	.114	0.081	−0.024	.423

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