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Are eco-sustainable dietary patterns associated with impulsiveness? An insight from Italy

Left running head: M. E. NAVARRA ET AL.

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ABSTRACT

Impulsivity is known to influence food choices. We explored possible differences in its expression between individuals with or without an eco-sustainable diet and its relationship with cognitions and behaviours about eco-sustainable foods.

Participants were categorised as having or not having an eco-sustainable diet. Impulsivity traits and cognitions and behaviours about sustainable food products were measured.

Among the 332 participants, 92.78% showed an eco-sustainable diet, whereas only 7.22% had an eco-sustainable diet. No difference between groups emerged about impulsive traits, whereas significant differences emerged in cognitions and behaviours about sustainable foods, with the only exceptions of subjective norms and past behaviour. Impulsive traits were linked to cognitions and behaviours differently within groups.

Impulsivity traits may be related to actions towards eco-sustainable foods, with the perception of their availability playing a crucial role. Increasing contextual opportunities may be fundamental for having eco-sustainable consumers.

KEYWORDS

Eating habits; eco-sustainability; impulsivity; food choice

Introduction

A dramatic deterioration of Earth's natural resources is ongoing. One of the reasons is the impact of food and its processing on the ecosystem (~~Food and Agriculture Organisation of the United Nations 2011~~ Burlingame B, Dernini S. 2010; Poore and Nemecek 2018; Forbes et al. 2021). Nowadays, experts in climate change demand all of us to adopt eco-sustainable dietary habits: eco-sustainable diets are recommended as an eating approach respectful of the environment, health, and biodiversity. Moreover, its effects include social equity and conservation of the local community's cultural heritage, not only for the present but also for future generations (Tilman and Clark 2014). Even though these knowledge and concepts are already known for a considerable amount of time, still very few individuals seem prone to take into account the environmental impact of food as motivation to buy or not buy it, whereas characteristics like freshness, genuineness, and price mostly guide food choices (Scalvedi et al. 2018).

Individual food choice is not exclusively related to taste, and it is not only driven by physiological or nutritional needs. Most of the time we choose food because of our habits and routines (Wood et al. 2002; Lin et al. 2016), which are influenced by the interaction of multiple individual and contextual factors. According to the Theory of Planned Behaviour (TPB; Ajzen 1991) explored in the context of eco-sustainable food (Vassallo et al. 2016), a specific behaviour (i.e. buying eco-sustainable foods) is linked to the individual intention towards it. Nevertheless, the intention to act is linked to two other components: the general feelings of favour or disfavour for that behaviour (i.e. attitude) determined by own beliefs and cognitions, and the perceived social pressure whether or not to engage in that specific behaviour (social norms). Thus, not only individual cognitions but also those of other people – and specifically the significant ones, such as relatives and friends – influence food choices (Ajzen 1991). Moreover, according to TPB (Ajzen 1991), we cannot neglect the environment in which individuals live, and specifically how much it supports the food supply. The (positive or negative) attempts to buy eco-sustainable food, which are linked to their availability in the market area, shape the individual perceptions about control over the behaviour ("I can/cannot buy eco-sustainable food"), influencing behavioural intention ("I think/don't think to buy it") and the actual behaviour ("I buy/don't buy it"). Overall, we daily make food choice decisions; however, they are mediated by multifaceted, situational, dynamic, and complex factors, that may be summarised in the questions of "*what, when, where, and with whom to eat*" (Bisogni et al. 2007; Sobal and Bisogni 2009). Within these factors, attributes like the individual's commitment to ethics and ecology are included (Scheibehenne et al. 2007): ultimately, our food choices have an ecological meaning. Finally, there is the psychological dimension: food choice is not only linked

to cognitions, beliefs, motivations, personal moral values, and opportunities, but it also strongly depends on the individual psychological components, such as temperament and emotional intelligence (Shepherd 1999; Köster 2009; Sobal and Bisogni 2009). From the psychopathological contexts, we well know that the manifestation of eating disorders symptoms is not specifically linked to the food and its characteristics, but it mirrors how people cope with their psychological distress through food (iper- or ipo-) consumption. Unfortunately, in the literature, we still have low evidence about the role of psychological components in the context of eco-sustainability dietary habits. One remarkable example was the research done by Vassallo and Saba (2015), in which they explored the role of temperament: those individuals characterised by a higher motivational dimension of self-transcendence (i.e. universalism and benevolence) are more inclined to buy eco-sustainable food.

If we agree to consider the food choice as the result of a process influenced by the individual's psychological functioning and, on the other hand, we are willing to encourage people to buy and consume more eco-sustainable food in their daily lives, we should be aware of how some psychological factors are involved in this process, and eventually how we may target them through *ad-hoc* education programs. Thus, to extend our knowledge about the role of psychological factors in sustaining eco-sustainable eating habits, in this research we focused on the specific psychological trait of impulsivity. It is a multifaceted psychological construct defined as "*a predisposition toward rapid, unplanned reactions to internal or external stimuli without regard to the negative consequences of these reactions*" (Moeller et al. 2001, p. 1784). Impulsivity is the result of a set of behaviours including rapid decision-making, inattention, lack of perseverance, acting without thinking, lack of planning, sensation seeking, and risk-taking (Moeller et al. 2001). Overall, food choices tend to be impulsive rather than deliberative (e.g. Fujita and Han 2009; Hofmann et al. 2009): people very hardly consider the long-term consequences on health when they select food for consumption (Wansink and Sobal 2007), preferring instead the immediate gratification in terms of economic and socialising needs (Garza et al. 2016). Unfortunately, the ecological impact of food choice is not an immediate result, rather it is a long-lasting one. In other words, we ask our consumers to change their food habits now (i.e. *hic et nunc*) in order to achieve ecological benefits in the future, and even the remote future, for the benefit of all the community and for the next generations. However, individuals with higher expressions of impulsive traits may have difficulties in pursuing long-lasting choices, because of the need for immediate rewards. In this context, they may be less prone to adopt an eco-sustainable diet.

Following this hypothesis, we investigated the expression of impulsivity in the context of eco-sustainable food choices in adult Italian consumers interviewed through an online survey in 2022. We categorised them as having or not an eco-sustainable diet through a food frequency questionnaire, and we compared the two groups about the level of expression of impulsive traits. Because of the multifactorial nature of impulsivity, we adopted three questionnaires, each measuring different psychological dimensions. We used the well-known Barratt Impulsiveness Scale (Patton et al. 1995), which describes *motor impulsiveness* (e.g. I do things without thinking), *attentional impulsiveness* (e.g. I do not pay attention), and *non-planning impulsiveness* (e.g. I do not plan tasks carefully). Moreover, we used the Dickman Impulsivity Inventory (DII, Dickman 1990), which describes two types of impulsivity, namely *functional* and *dysfunctional* impulsivity. This dichotomy regards that, in some circumstances requiring very simple or very rapid responses with little cost in errors, having an

impulsive decision is convenient (i.e. functional impulsivity). Nevertheless, in other situations, a quick and inaccurate response is a source of difficulty (i.e. dysfunctional impulsivity). Finally, we included in the survey the Three Factor Eating Questionnaire (TFEQ, Stunkard and Messick 1985) which measures three cognitive and behavioural impulsive components implied in human eating behaviour: i) *dietary restraint*, which is the tendency to conscious restriction of food intake to control body weight or to promote weight loss, instead of using physiological cues, (i.e. hunger and satiety) as regulators of food intake; ii) *disinhibition*, meaning the tendency to eat more than usual due to a loss of control over intake accompanied by subjective feelings of being out of control, and iii) *hunger*, meaning the tendency to eat in response to negative emotions. Thus, dietary restraint may be associated with a lower expression of impulsivity traits, whereas the other two components of disinhibition and hunger should be highly associated with impulsive behaviours. In this research, we also aimed to verify the relationship between impulsivity and cognitions and behaviours about eco-sustainable foods within the group of individuals with or not an eco-sustainable diet. Indeed, the perceptions and cognitions about the environment as more or less supportive of an eco-sustainable eating habit may be related to the individual expressions of impulsive traits. In other words, impulsivity may shape the individual experience: people with a higher expression of impulsive traits may perceive the environment as less supportive, whereas people with lower expressions may describe it as supportive. As mentioned, Vassallo and colleagues (2016) used the TPB questionnaires on Italian consumers in 2011, describing their habits about buying eco-sustainable foods at that time. Italy has been particularly affected by climate change events in the last decade (Bucchignani et al. 2016; Massazza et al. 2022). Notably, these events impacted dramatically on citizens' psychological well-being (Massazza et al. 2022). Because of these events and their media resonance, individuals may have changed perceptions and cognitions about eco-sustainability. Moreover, these events may enhance the individual levels of awareness about the impact of own choices, also in terms of food, on the ecosystem. Thus, including the TPB questionnaire in our survey, we offered a comparison between our data and those reported by Vassallo and colleagues (2016) in terms of cognitions and behaviours about eco-sustainable foods.

Materials and methods

Participants

Approval for this research was granted by the Ethical Committee of the University of Turin (Approval number Prot. N. 0169980). All the participants were informed about the aim of the study. They voluntarily signed the electronic consent form as part of the web survey, according to which they agreed to participate in the survey and they were informed about the confidentiality of their responses. Specifically, they were informed that all the collected data were de-identified and only reported in the aggregate form for statistical aims. Participants were free to withdraw (i.e. closing the browser) at any time without giving a reason. Participants were not remunerated for their participation. Only adult (age ≥ 18 years) individuals living in Italy at the time of the research and proficient in Italian language were enrolled through social media (i.e. Facebook, Instagram, and Twitter), electronic mail, and personal contacts by the authors.

The self-administered anonymous questionnaire survey was distributed cross-sectionally from 6 April 2022, to 6 May 2022 (one month) through the LimeSurvey platform. In the first part of the survey demographic (gender, age, education, marital status, family unit, income level, area of origin, and home area) information was collected. We also asked our participants to describe their involvement in food purchase (three possible answers: a) I don't do it; b) I do it together with another family member; c) I'm responsible for it) and preparation for their familiar needs (for both the questions, three possible answers: a) I don't do it; b) I do it together with another family's member; c) I' m responsible for it). Information about the body mass index (computed as the individual weight in kilograms divided by the square of height in meters), and the presence of food allergy or intolerance were also collected Also, participants completed the SCOFF questionnaire (Luck et al. 2002), which is a screening instrument for detecting possible eating disorders in research settings. It consists of five questions, with a dichotomic (yes = 1; no = 0) answer. The score is the sum of the answers, with a score of two indicating a likely diagnosis of eating disorders.

Food frequency questionnaire

As of our knowledge, no validated food frequency questionnaire to compute the level of eco-sustainability in an individual diet for Italians was available in the literature at the time of this study. Then, we created an *ad-hoc* food frequency questionnaire to assess the individual consumption of more or less eco-sustainable foods in order to categorise our participants in two groups: individuals with an eco-sustainable diet and individuals with a not eco-sustainable diet. In designing our questionnaire, we only asked about the frequencies of food consumption, avoiding questions about quantities and kilocalories, since people without specific expertise in dietetics and human nutrition may have difficulties in reporting accurately this information. For this questionnaire, we referred to foods assessed by Poore and Nemecek (2018): the authors estimated global variation in greenhouse gas emissions, land use, terrestrial acidification, eutrophication, and scarcity-weighted freshwater withdrawals, within and between 40 major food. From this pool, we extracted at least one item per food category typically consumed in the average Italian diet to be included in our questionnaire (i.e.; Ferro-Luzzi and Branca, 1995; Fidanza, 1991): whole grains, tubers/starchy vegetables, vegetables, fruits, milk, soft cheese, seasoned cheese, plant-based alternatives to cow's milk, red meat, processed meat, poultry, eggs, fish, seafood, legumes, oilseed and tree nuts. We asked our participants to rate of consumption per week each food on the list on a 5-point Likert scale (i.e. never, less than once a week, once/twice a week, three or more times a week, daily). To our knowledge – there are no specific guidelines about the consumption frequencies of the main food categories to define the level of eco-sustainability of a diet. According to the EAT-Lancet Commission (Willett et al. 2019), an eco-sustainable diet is characterised by a larger (almost a daily or one time a week or more) consumption of foods of plant origin and whole grains compared with a lower use (once/twice a week or less) of directly- or indirectly-derived animal products foods. This pattern was defined as *flexitarian* (Willett et al. 2019). According to this definition, we categorised each participant's diet as eco-sustainable when: milk, seasoned and fresh cheese, red and white (even processed) meat, eggs, fish and seafood, were consumed never, less than once a week, or once/twice a week, while legumes, whole grains, vegetables, seeds and nuts were consumed three or more times a week, or daily. Notably, vegetarian and vegan diets are

considered to have an eco-sustainable diet. When the pattern of food frequency was out of the previous constraints, the participant's eating diet was categorised as not eco-sustainable. The food frequency questionnaire is reported in Appendix I.

Cognitions and behaviours about eco-sustainable food

We used the questionnaire by Vassallo and colleagues (2016) which grounds on the TPB (Ajzen, 1991). Details about the statistical properties of this questionnaire and the items' order can be found in the seminal article (Vassallo et al. 2016). A definition of food produced according to sustainable approaches was provided in the introduction of the questionnaire for the benefit of the respondents. Specifically, we reported the definition by ~~FAO~~Burlingame and Dernini (2010): "*Sustainable diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations*". The questionnaire measures: the self-reported behaviour (one item; the response was coded through two unipolar scales, one with a 7-point Likert-type scale, the other with a 9-point Likert-type scale), the behavioural intention (two items on a 7-point Likert-type scale), the attitude towards behaviour (three items on a 7-point Likert-type scale), the subjective norms (four items on a 7-point Likert-type scale), the perceived behavioural control (i.e. perceived availability, two items on a 7-point Likert-type scale), and the past behaviour to purchase sustainable food products (one item on a 6-point Likert-type scale). For those components with more than one item, the score was computed as the sum of the answers provided by the participants. Higher scores suggested a higher manifestation of the component.

Knowledge about food sustainability

To assess the general level of knowledge about food sustainability, we presented a list of 28 foods extracted from Poore and Nemecek (2018). We designed this questionnaire considering that respondents as not experts about which factors may define the sustainability of foods: Moreover, we aimed to design a simple and quick questionnaire, in which people should select items in the absence of specific information. As previously reported, Poore and Nemecek (2018) assessed the level of eco-sustainability of foods according to five components (i.e. greenhouse gas emissions, land use, terrestrial acidification, eutrophication, and scarcity-weighted freshwater withdrawals). In our list, we choose items from each block of food reported in this seminal article (i.e. (A) Protein-rich products. (B) Milks. (C) Starch-rich products. (D) Oils. (E) Vegetables. (F) Fruits. (G) Sugars. (H) Alcoholic beverages, and (I) Stimulants), considering the level of greenhouse gas emission: notably, the Intergovernmental Panel on Climate Change (IPCC) stated that achieving net zero CO2 emission globally, around 2050, is crucial for limiting warming to 1.5 °C (Rogelj et al. 2022). Moreover, we selected items relative to foods which are typically produced and/or consumed in Italy. Then, our list consisted of the following items: the more *eco-sustainable food*s, including maize, potatoes, cassava, apples (cultivated), beer, dried lentils, dried peas, tofu, groundnuts, chicken, eggs, and mussels (farmed), and the more *not eco-sustainable foods*, including rice (flooded), berries (cultivated), milk, cheese, beef, pig meat, processed meat, crustaceans (farmed), tuna (fished), dark chocolate, tree nuts, palm oil, olive oil, sunflower oil, cane sugar, and wine. Among the list, participants were asked to choose three items relative to foods that they judged as the

most eco-sustainable, and three items as the least eco-sustainable, according to their knowledge. For each participant, we computed three scores: i) the *eco-sustainable food score*, from 0 to 3, assessing 1 point for each correct answer, meaning when participants correctly selected an eco-sustainable food from the list; ii) the *not eco-sustainable food score,* from 0 to 3, assessing 1 point for each correct answer, meaning when participants correctly selected a not eco-sustainable food from the list; and iii) the *total score*, from 0 to 6, corresponding to the sum of the eco-sustainable food score and the not eco-sustainable food score. The higher the score, the higher the level of knowledge. The questionnaire is reported in Appendix II.

Impulsivity traits

The Italian version (Fossati et al. 2001) of the Barratt Impulsiveness Scale – BIS-11 (Patton et al. 1995) is a self-rating questionnaire with 30 questions concerning control of thoughts and behaviour, according to a trifactor model of impulsivity: (a) ''motor impulsiveness'' measured by 11 items (e.g. I do things without thinking); (b) ''attentional impulsiveness'' measured by 8 items (e.g. I do not pay attention), and (c) ''non-planning impulsiveness'' measured by 11 items (e.g. I plan tasks carefully). Each item is measured on a 4-point Likert scale, ranging from rarely/never through to almost always, with no available neutral response. A score of 4 in each item indicates the most impulsive response. The final score is the sum of the answers to each item. The higher the subscale score, the higher the level of impulsiveness. The Italian version (Colledani 2018) of the Dickman Impulsivity Inventory (Dickman 1990) is a self-report questionnaire measuring functional (9 items) and dysfunctional (9 items) impulsivity in a true (1 point)/false (0 points) format. The final score is the sum of the answers to each item for both components; the higher the score, the higher the level of impulsiveness. Finally, the Italian version (furnished by the Società Italiana per lo Studio dei Disturbi del Comportamento Alimentare (SISDCA) available here http://sisdcadisturbialimentari.weebly.com/la-diagnostica-del-bed.html) of Three Factor Eating Questionnaire (TFEQ, Stunkard and Messick 1985) was used to measure eating habits in terms of: a) *dietary restraint*, which consists of 21 items and refers to an individual's concern about overweight control and strategies which are adopted to maintain body weight and restrict eating, as small portions, avoiding fattening foods, and stopping eating before reaching satiation, to limit food intake; b) *disinhibition*, which consists of 16 items and reflects a tendency towards overeating and eating opportunistically in an obesogenic environment, for example emotional eating, difficulties in resisting to food cues, and overeating in response to the palatability of food; and c) *hunger*, which consists of 14 items and is concerned with the extent to which hunger feelings are perceived and the extent to which such feelings then evoke food intake. For example, intense feelings of hunger resulting in consumption over three meals per day, feeling an absence of satiety or unpleasant gastric sensations.

Overall, the items of the TFEQ are split into two parts. In detail, Part I consists of 36 items and responses are in dichotomous (true (1 point)/false (0 point)) format. Part II comprises 15 items, 14 of which are assessed on a 4-point Likert scale and 1 item on a 6-point Likert scale; scores lower the medium point receive 0 points, and scores higher the medium point receive one point. For each component (i.e. *dietary restraint, disinhibition*, and hunger), the total score is computed as the sum of the corresponding items; higher scores indicate higher expressions of the behaviour.

Analyses

Data were initially analysed using descriptive statistics, including means, standard deviations, frequencies, and percentages. Scores about the questionnaires were computed according to the seminal articles. Chi-square test for categorical factors and independent *t*-test for continuous factors were used to verify any difference between the two groups (an eco-sustainable *vs* not eco-sustainable diet) in demographical characteristics. We verified any difference between our sample and the results reported by Vassallo and colleagues (2016), through an independent sample *t*-test. Differences between the two groups (an eco-sustainable *vs* not eco-sustainable diet) at all the collected measures relative to the TPB questionnaire, the task relative to the knowledge about food sustainability, and psychological questionnaires relative to the impulsivity were verified through an independent sample *t*-test. The relationship between the level of impulsivity and the different behavioural components assessed by Vassallo and colleagues' (2016) questionnaire was investigated independently for the two groups.

A-priori sample size computation

In 2021, the population ranged in years 15–66 living in Italy was 37.658.137 (ISTAT 2021). This information was used to assess the sample size of this study. Considering a *p value* of .05, and the Interval confidence of 95%, the sample should be of 256 individuals. This calculation was performed through the tool available at this link https://it.surveymonkey.com/mp/sample-size.

Results

Participants

Overall, 669 took part at the survey. However, only 332 individuals (161 females, 171 males; age in years M = 42.47; SD = 15.81; range = 18–78; education in years M = 15.65; SD = 2.52; range = 8–18) completed all the questionnaires and were included in the sample. Notably, 3.61% (N = 12) of our participants reported an age equal to or higher than 66 years, which represents the high value of the range of the data reported by ISTAT (2021) and used for the a-priori sample size computation. Since we did not set any constraints about the highest value of age in the inclusion criteria, we did not exclude these participants from our final sample.

According to the food frequency questionnaire, 92.78% (N = 308) of our sample showed a not eco-sustainable diet, whereas 7.22% (N = 24) an eco-sustainable diet. Details about the demographical information are reported in Table 1.

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Table 1. Demographical information about the sample.

		Overall *N* = 332	Not eco-sustainable diet *N* = 308	Eco-sustainable diet *N* = 24
Gender in %				
m = male;		*m* = 51.05 %	*m* = 51.94 %	*m* = 45.83 %
f = female;		*f* = 48.49 %	*f* = 48.05 %	*f* = 54.16 %
nb = not binary;		nb = 0 %	nb = 0 %	nb = 0 %
nd = prefer to not declare		nd = 0 %	nd = 0 %	nd = 0 %
Age in years		*M* = 42.47; SD = 15.81; range = 18-78	*M* = 42.97; SD = 15.79; range = 18-78	*M* = 36.04; SD = 14.93; range = 20-62
Education in years		*M* = 16.01; SD = 3.06; range = 8-22	*M* = 15.98; SD = 3.09; range = 8-22	*M* = 16.5; SD = 2.60; range = 13-22
Marital status in %	Unmarried	40.26%	54.17%	41.26%
	Married	46.10%	25.0%	44.58%
	Cohabiting	9.10%	12.5%	9.34%
	Divorced	3.57%	8.33%	3.92%
	Widower	0.97%	0%	0.9%
Family unit in %	Alone	13.96%	12.5%	13.85%
	With the family of origin	17.21%	20.83%	17.47%
	With the partner/cohabitee	24.67%	20.83%	24.40%
	With the partner/cohabitee and sons	32.46%	20.83%	31.63%
	With the sons	2.60%	0%	2.41%
	With roommates	9.10%	25%	10.24%
Income level in %	No income	12.66%	12.5%	12.65%
	Up to 15.000 euros	17.21%	37.5%	18.68%
	From 15.000 to 28.000 euros	29.22%	33.33%	29.52%
	From 28.000 to 50.000 euros	32.79%	8.33%	31.02%
	Over 50.000 euros	8.12%	8.33%	8.13%
Area of origin in %	North	31.92%	62.5%	34.14%
	Central	8.79%	4.17%	8.46%
	South	54.40%	25%	52.27%
	Islands	4.89%	8.33%	5.13%
Home area in %	North	47.40%	83.33%	50%

	Central	10.07%	4.17%	9.64%
	South	40.91%	12.5%	38.85%
	Islands	1.62%	0%	1.51%
Involvement in food purchase in %	I don't do it	12.34%	0%	11.45%
	I do it together with another family's member	50.32%	41.76%	49.70%
	I' m responsible for it	37.34%	58.33%	38.85%
Involvement in food preparation in %	I don't do it	27.92%	8.33%	26.51%
	I do it together with another family's member	33.12%	20.83%	32.23%
	I' m responsible for it	38.96%	70.83%	41.26%
Body Mass Index*		*M* = 24.21; SD = 3.91; range = 17.36–42.19	*M* = 23.42; SD = 4.97; range = 17.58–38.05	*M* = 24.15; SD = 4.00; range = 17.36–42.19
	Underweight	2.60%	12.5%	3.31%
	Normal-weight	61.04%	62.5%	61.15%
	Overweight	29.22%	16.67%	28.32%
	Obesity I	0.65%	4.17%	5.72%
	Obesity II	0.65%	4.17%	0.90%
	Obesity III	0.60%	0%	0.60%
Food allergy or intolerance in %		No = 84.64% Yes = 15.36%	No = 83.77% Yes = 16.23%	No = 95.83% Yes = 4.17%
SCOFF: % of participants with score ≥ 2		60.24%	60.39%	58.33%

*underweight BMI < 18.5; normal-weight BMI 18.5–24.9; overweight BMI 25–29.9; obesity I BMI 30–34.9; obesity II BMI 35–39.9; obesity III BMI > 40 according to WHO (2000).

No difference emerged between the two groups in terms of frequency of gender (only male and female included, since 0% for the other two tested categories) [χ^2= 0.33; p = 0.56]. Participants with a not eco-sustainable diet were significantly older than participants with an eco-sustainable diet [t(330)=2.07; p = 0.03], while they had comparable levels of education [t(330)=0.8; p = 0.42]. No significant difference emerged between the two groups about the marital status [χ^2= 6.56; p = 0.16], family unit composition [χ^2=7.41; p = 0.19], and income level [χ^2= 9.33; p = 0.053]. A significant difference emerged between the area of origin [χ^2= 10.85; p = 0.012] and the home area [χ^2= 11.52; p = 0.009]. No difference emerged in terms of involvement in food purchase [χ^2= 3.94, p = 0.13], whereas a significant difference emerged in food preparation [χ^2= 9.74, p = 0.007]. The two groups had comparable BMI [t(330)=0.56; p = 0.57], as well as they showed a similar pattern when the BMI classes were analysed [χ^2= 7.1, p = 0.21]. Finally, no difference in terms of food allergy [χ^2= 2.49, p = 0.11] and SCOFF score [χ^2= 0.03, p = 0.84] were observed.

Cognitions and behaviours about eco-sustainable food

In Table 2, we reported the scores obtained by all participants as well as by individuals with an eco-sustainable diet and those with a not eco-sustainable diet at the different components of the TPB questionnaire (Vassallo et al. 2016). When we compared these two sample, the scores reported by individuals with an eco-sustainable diet were always significantly higher than those with a not eco-sustainable diet, with two exceptions that were the subjective norms and past behaviour: for these components, respondents of the two groups reported similar scores.

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Table 2. For each component of the TPB questionnaire, mean, standard deviation and range are reported for the entire sample and for the data relative to the survey done by Vassallo and colleagues (2016) relative to the Italian population. We report the statistical comparisons between these two datasets. Moreover, the same information are reported for the group of participants with a not eco-sustainable diet and those with an eco-sustainable diet. Statistical results are showed. In bold, significant results [$p \leq .05$]; * indicates a significant difference after bonferroni's correction for multiple comparisons (critical p value $\leq .00714$).

	Present study *N* = 332	Vassallo et al. 2016 *N* = 2902	Statistical difference	Not eco-sustainable diet *N* = 308	Eco-sustainable diet *N* = 24	Statistical difference
Behavioural intention min–max = 2–14	10.64 (2.78) 2–14	9.30 (3.36) 2–14	t = 6.96; p < **.001***; d'=0.43	10.47 (2.79) 2–14	12.79 (1.53) 9–14	Levene's test p = .001; t = 6.61; **p < .001*;** d'=1.03
Attitude towards behaviours min–max = 3–21	18.45 (3.02) 5–21	16.68 (4.10) 3–21	t = 7.63; p < **.001***; d'=0.49	18.32 (3.07) 5–21	20,21 (1.28) 16–21	Levene's test p < .001; t = 5.99; **p < .001*;** d'=0.80
Perceived responsibility min–max = 1–7	5.67 (1.49) 1–7	5.21 (1.64) 1–7	t = 4.75; p < **.001*;** d'=0.28	5.60 (1.50) 1–7	6.58 (0.83) 4–7	Levene's test p < .001; t = 3.16; **p = .002*;** d'=0.80
Perceived availability min–max = 2–14	8.68 (2.67) 2–14	8.13 (3.14) 2–14	t = 3.07; p = **.002*;** d'=0.19	8.57 (2.65) 2–14	10.13 (2.57) 2–14	t = 2.71; **p = .006 *;** d'=0.59
Behaviour min–max = 1–7	4.02 (1.68) 1–7	2.54 (1.60) 1–7	t = 15.76; p < **.001*;** d'=0.89	3.92 (1.76) 1–7	5.38 (1.17) 2–7	Levene's Test p = .002; t = 5.66; **p < .001*;** d'=0.97

Past behaviour min–max = 1–7	3.47 (1.08) 1–7	2.60 (1.21) 1–6	t = 12.42; p < **.001*;** d'=0.75	3.38 (1.05) 1–7	4.54 (0.88) 2–7	t = 5.24; p = .35; d'=1.19
Subjective norms min–max = 4–28	18.91 (4.54) 5–27	19.32 (5.15) 4–28	t = 1.41; p = .15; d'=0.08	18.86 (4.49) 5–27	19.58 (5.18) 11–25	t = 0.75; p = .42; d'=0.4
df = 323 df = 330;.						

In Table 2, we also offered a comparison with the data reported by Vassallo and colleagues (2016): our sample reported significantly higher scores in all the components of the TPB questionnaire, with the exception of the subjective norms (p = 0.15) about which the two samples reported similar scores.

Impulsivity traits

In Table 3, we reported the scores for all the psychological questionnaires relative to impulsivity about the two groups (eco-sustainable vs not eco-sustainable diet). When we compared the scores, no significant difference emerged between groups.

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Table 3. For all the scores relative to three questionnaires investigating the impulsivity traits, we reported the mean and the standard deviation as well as the range for the total sample and for the two groups. The statistical results are shown.

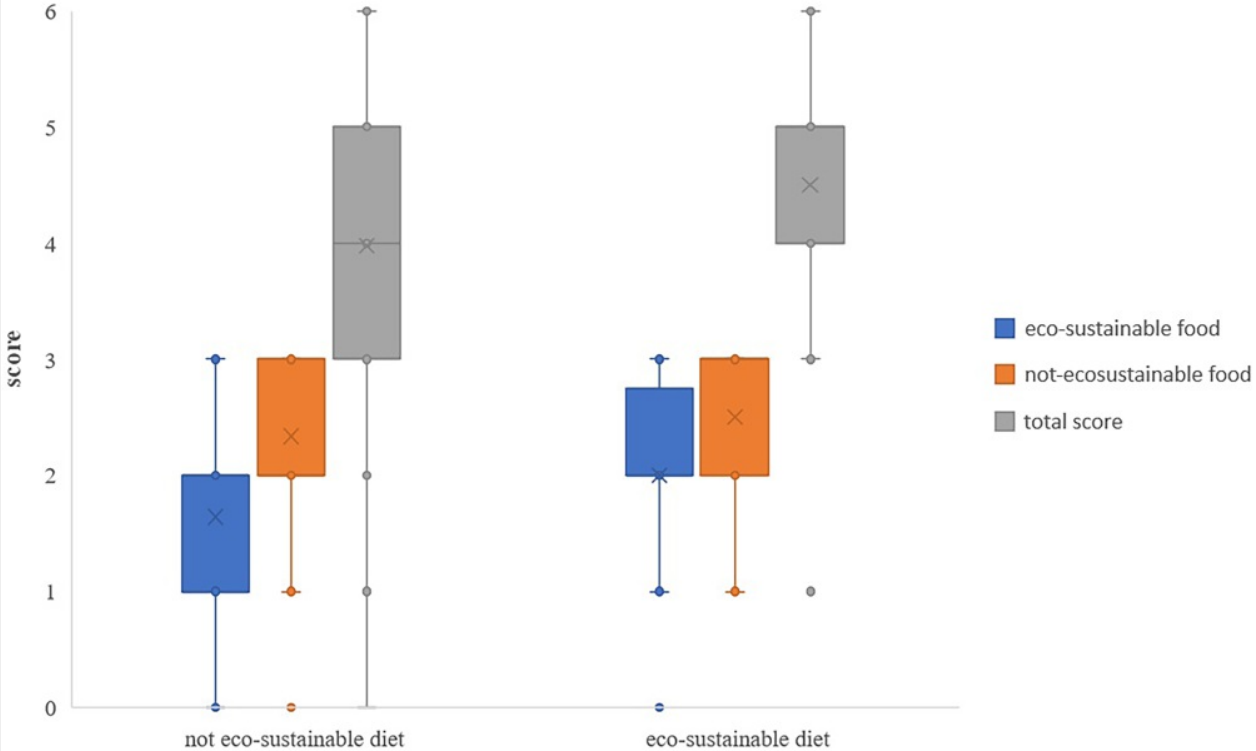
	Total sample *N* = 332	Not eco-sustainable diet *N* = 308	Eco-sustainable diet *N* = 24	Statistical difference
Barratt Impulsiveness Scale				
Attentional min–max = 8–32	14.97 (3.01) 8–24	14.98 (3.02) 8–24	14.83 (2.98) 11–22	t = 0.23; p = .81; d'=0.04
Motor min–max = 11–44	19.00 (3.54) 11–33	19.01 (3.57) 11–33	18.88 (3.27) 13–24	t = 0.18; p = .85; d'=0.03
Non-planning min–max = 11–44	23.87 (4.50) 12–38	23.84 (4.45) 12–38	24.29 (5.23) 12–37	t = 0.47; p = .63; d'=0.09
Dickman Impulsivity Inventory				

Functional min–max = 0–9	3.88 (2.61) 0–9	3.82 (2.57) 0–9	4.67 (3.03) 0–9	t = 1.53; p = .13; d'=0.30
Dysfunctional min–max = 0–9	1.58 (1.94) 0–8	1.59 (1.94) 0–8	1.54 (1.95) 0–7	t = 0.11; p = .88; d'=0.02
Three Factor Eating Questionnaire				
Dietary restraint min–max = 0–21	8.97 (4.72) 0–21	8.94 (4.59) 0–21	9.42 (6.26) 2–20	t = 0.47; p = .63; d'=0.08
Disinhibition min–max = 0–16	5.57 (3.53) 0–16	5.59 (3.55) 0–16	5.25 (3.19) 1–12	t = 0.45; p = .64; d'=0.10
Hunger min–max = 0–14	4.47 (3.24) 0–14	4.48 (3.22) 0–14	4.25 (3.66) 0–13	t = 0.33; p = .73; d'=0.06
df = 330.				

Knowledge about food sustainability

The scores reported by the two groups are shown in Figure 1.

Figure 1. About the knowledge about food sustainability, for the not eco-sustainable diet and the eco-sustainable diet groups (x-axis), the mean relative to the score (y-axis) reported about the eco-sustainable food score (in blue), the not eco-sustainable food score (in orange), and the total score (in grey), is depicted. The minimum, the lower quartile, the median, the upper quartile, the maximum, and the outliers are shown. About the eco-sustainable food and the not eco-sustainable food score, the range was from 0 to 3; about the total score, the range was from 0 to 6.



The two groups did not show any significant difference in terms of knowledge relative to eco-sustainable [t(330)=2.03; p = 0.043; d'=0.44] and not-eco sustainable foods [t(330)=1.12; p = 0.26; d'=0.25]. Moreover, also for the total score, we did not observe any significant difference between groups [t(330)=2.12; p = 0.034; d'=0.44]. Notably, the level of significant alpha was set at 0.016, since we applied the Bonferroni's correction for multiple comparisons (0.05/3).

The relationship between the TPB questionnaire and the impulsivity traits

Results are shown in Table 4.

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Table 4. Pairwise correlation matrix among the scores reported at three questionnaires relative to impulsivity trait (colums) and the scores reported at the different components of the TPB questionnaire (rows), for the group with an eco-sustainable diet (upper part) and with a not eco-sustainable diet (lower part). In bold, significant results [$p \leq .05$].

Eco-sustainable diet group (n = 24)

	Barratt Impulsiveness Scale			Dickman Impulsivity Inventory		Three Factor Eating Questionnaire		
	attentional	motor	non-planning	functional	dysfuctional	dietary restraint	disinhibition	hunger
behavioural intention	-0.28	-0.05	-0.15	0.07	0.14	0.17	-0.10	**-0.44**
attitude towards a behaviour	-0.17	-0.22	-0.21	-0.20	0.01	-0.32	-0.21	-0.22
perceveid responsability	**-0.54**	0.04	0.04	-0.02	0.15	-0.03	-0.21	**-0.41**
perceveid availability	-0.23	**-0.42**	-0.38	0.12	**-0.45**	0.33	-0.32	**-0.42**
behaviour	-0.17	-0.19	-0.11	0.04	0.02	0.20	0.02	-0.23
past behaviour	-0.15	**-0.49**	-0.35	0.10	-0.15	0.18	-0.16	-0.34
subjective norms	-0.27	0.05	0.05	0.16	0.08	0.29	-0.11	-0.10

Not eco-sustainable diet group (n = 332)

	Barratt Impulsiveness Scale			Dickman Impulsivity Inventory		Three Factor Eating Questionnaire		
	attentional	motor	non-planning	functional	dysfuctional	dietary restraint	disinhibition	hunger
behavioural intention	-0.05	-0.05	-0.10	-0.04	-0.05	**0.13**	0.02	-0.04
attitude towards a behaviour	0.01	-0.05	-0.07	-0.09	-0.07	**0.12**	0.06	0.03
perceveid responsability	-0.02	-0.03	-0.08	-0.04	-0.08	0.09	0.04	-0.03
perceveid availability	0.01	0.01	-0.04	<0.001	0.02	**0.11**	-0.02	-0.09
behaviour	-0.07	-0.06	**-0.13**	-0.02	0.06	**0.15**	**-0.15**	**-0.14**
past behaviour	-0.08	-0.07	-0.10	-0.04	0.01	**0.18**	**-0.15**	**-0.17**
subjective norms	-0.07	**-0.11**	-0.09	-0.05	0.01	**0.12**	-0.10	**-0.17**

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Considering the relationship with the components investigated in the TPB questionnaire (Vassallo et al. 2016), in the group with an eco-sustainable diet, a significant relationship emerged between the scores relative to the *perceived responsibilities* and the *attentional impulsiveness* from the Barratt Impulsiveness Scal (Patton et al. 1995; Fossati et al. 2001) e; moreover, the *perceived availability* as well as the *past behaviour* were both related to *the motor impulsiveness* (Barratt Impulsiveness Scale). The *perceived availability* was significantly related to the *dysfunctional impulsivity*, measured through the Dickman Impulsivity Inventory (Dickman 1990; Colledani 2018). Finally, the scores relative to the *behavioural intention*, *perceived responsibility* and *availability* were significantly related to the *hunger score* from Three Factor Eating Questionnaire (Stunkard and Messick 1985). Notably, all these relationships were negatively signed. When we

considered the results relative to the group with a not eco-sustainable diet, multiple significant relationships emerged between the components investigated with the TPB questionnaires (Vassallo et al. 2016) and the impulsive traits. Considering the Barratt Impulsiveness Scale (Patton et al. 1995; Fossati et al. 2001), the score relative to the *subjective norms* was significantly related with *motor impulsiveness*, whereas the current *behaviour* with the *non-planning impulsiveness*, all negatively signed. Considering the Three Factor Eating Questionnaire (Stunkard and Messick 1985), *behavioural intention*, *attitude towards a behaviour*, *perceived availability*, (current) *behaviour*, *past behaviour* Hand *subject norms* were all related to *dietary restraints*, positively signed. Moreover, current *behaviour* and *past behaviour* were related to both *disinhibition* and *hunger*, negatively signed, and *subjective norms* were negatively related to *hunger*.

Discussion

In psychology, the construct of impulsivity describes the individual tendency to behave rashly, with a lack of planning and with less forethought about the consequences of immediate actions (see Moeller et al. 2001 for a review). Notably, impulsivity traits influence individual food choices (e.g. (Fujita and Han 2009; Hofmann, Friese, and Strack 2009). As in our knowledge, no previous study investigated the role of impulsivity in the context of eco-sustainable food choices. In this research, we presented the results of a survey directed to an Italian sample, in which we assessed impulsivity traits, through self-report psychological questionnaires, and behaviours and cognition about eco-sustainable food (Vassallo et al. 2016). Notably, we categorised our participants into eco-sustainable and not eco-sustainable diets, according to the frequency of consumption of eco-sustainable food in their diet (Willett et al. 2019).

Differences between groups about impulsivity traits

Our participants with an eco-sustainable diet and those with a not eco-sustainable diet did not differ in the expression of impulsivity traits. This evidence seemed to contrast with our initial hypothesis, according to which individuals with a not eco-sustainable diet would show a higher expression of impulsive traits. However, this result – even unexpected – seemed in agreement with recent evidence provided by Migliavada and colleagues (2022) who investigated the effect of sustainability knowledge and impulsivity traits on the consumption of foods of animal and plant origin in Italy compared with Turkey. About the Italian participants, they observed that the levels of impulsivity, measured through the Barratt Impulsiveness Scale-11 (Patton et al. 1995; Fossati et al. 2001), were significantly associated with both the consumption of foods of animal and plant origin. Crucially, in both cases the coefficient was negatively signed, which is controversial: higher levels of impulsivity was associated with lower consumptions of plant origin, as well as higher impulsiveness was associated with lower (and not higher) consumption of food of animal origin. In reviewing the previous literature, we observed heterogeneous, even rare, evidence (Lumley et al. 2016; Bénard et al. 2019; Gómez-Martínez et al. 2022; Hanras et al. 2022). Bénard and colleagues (2019) observed lower levels of impulsivity associated not only with the consumption of fruit and vegetables, but also meat and poultry, processed meat, dairy products, milk-based desserts, and starchy foods in the context of eating disorders, in agreement with the

more recent evidence provided by Migliavada and colleagues (2022) about Italian consumers. Bénard and colleagues (2019) concluded that impulsivity was associated with energy intake and negatively associated with diet quality. In other words, they suggested to consider impulsivity as more linked to how much food people eat, rather than to what they eat. However, it may be argued that not only food quantity, but also food quality may be linked to the expressions of impulsivity. Lumley and colleagues (2016) reported that greater expressions of impulsive traits were associated with food consumption of a Western-style diet in both men and women, independent of body mass index. More recently, Gómez-Martínez and colleagues (2022) reported higher impulsive traits were associated with a higher adherence to the Western diet and to maintain it over time. However, this result was specifically observed in individuals with obesity and overweight, who are generally described as having the tendency to use unhealthy foods to cope with emotional distress (Barlow et al. 2016). Moreover, Hanras and colleagues (2022) observed that individuals with vegetarian/vegan dietary habits would be more cautious and then less impulsive. It should be noticed that in these previous researches, impulsivity traits were studied in relation to the traditional categorisation of diet in terms of Mediterranean, Western, Vegan and Vegetarian, with no information about the level of eco-sustainability, limiting the comparison with the present data. Since our results and the heterogeneity observed in the literature, we may suggest that the subjective level of impulsivity may be not crucial in disentangling individuals with a prevalent consumption of food of animal origin from those who largely or exclusively consumed plant-based products. Nevertheless, our hypothesis should be further explored, especially since we used only information about the frequency, and not the quantity, about eco-sustainable and not eco-sustainable foods to categorise our participants.

Differences between groups in cognitions and behaviours about eco-sustainable food

Interesting results emerged when we compared the two groups in the TPB components measured through the questionnaire designed by Vassallo and colleagues (2016). Indeed, we observed that participants with an eco-sustainable diet reported significantly higher scores than those categorised with a not eco-sustainable diet in almost all the factors. Not surprisingly, they purchased sustainable food products at the time of our survey, more than the other group. They expressed higher behavioural intention and attitude towards this behaviour, and they perceived eco-sustainable food as more available in the environment. Interestingly, we did not observe any difference between the two groups in the scores relative to the past behaviour and the social norm. About the first component, the result may suggest that we mainly interviewed people who had not recently changed their eating habits: from a psychological point of view, the eating style is a habit, meaning "*a phenomenon whereby behaviour is prompted automatically by situational cues, as a result of learned cue-behaviour associations*" (Wood and Neal 2009; for a review on the topic Gardner 2015); in other words, in the individual functioning, eating habit is something that tend to be the same over time. About the second one, the two groups declared to perceive the same level of social pressure in purchasing sustainable food products. However, they applied two very different behaviours. This result may point out the role of other (psychological and/or social) factors. What is a social norm? Reynolds and colleagues (2015) offered a review on this definition from a psychological/social perspective: overall, a norm is a formal or informal, individual or

collective, description of some behaviours that are done by the majority of people. Individuals may tend to conform to or to deviate from these behaviours according to personal motivations. Moreover, people tend to come together in groups, since they develop a perception of sharing features that distinguish them from other groups (i.e. ingroup norm). Thus, people may tend to aggregate with others with a similar eating style. Moreover, this tendency may be enhanced in those cultures, such as the Italian one, in which food consumption is a social practice. Since eating is a habit, and this habit would be similar to the other in-group individuals, the perception of responding to a social pressure may be reduced. This view may have crucial implications in terms of behaviour change interventions, especially if we would encourage people with a not eco-sustainable diet to increase their consumption of eco-sustainable foods: Reynolds and colleagues (2015) underlined that higher efforts are needed when we ask individuals to change something (i.e. in this case, eating habits) that is linked to own social identity and ingroup norms.

Relationships between impulsivity and cognitions and behaviours about eco-sustainable food within groups

Interesting findings emerged from our study when we linked impulsivity traits with cognitions and behaviours measured through the TPB questionnaire (Vassallo et al. 2016): overall, they suggested different patterns between individuals with or without an eco-sustainable diet.

In the group with an eco-sustainable diet, the perception of higher availability of sustainable food products was linked to a lower expression of motor impulsiveness (i.e. “as acting without thinking”, Stanford et al. 2009) at the Barratt Impulsiveness Questionnaires (Patton et al. 1995; Fossati et al. 2001). In other words, people who described themselves with a lower tendency to act rashly reported having lower difficulties in finding eco-sustainable foods in their environment. This result can be read together with another one from our survey: people with a lower tendency to express dysfunctional impulsivity (i.e. quick and inaccurate responses) perceived higher availability of sustainable food products. This is a very informative result: because impulsivity may be involved in the way people shape their experience about food choices in their context, it may be crucial to build environments in which buying eco-sustainable food is supported by food availability, that may be different across urban areas (De Magistris and Gracia 2008; Federbio 2012; Lunati and Zucconi 2012). For example, according to Vassallo and colleagues (2016), Italian consumers in the South and the Insular macro-regions perceived more potential barriers to the availability of sustainable food products on the market and in the neighbourhood than in the North and the Central regions. Optimally, eco-sustainable foods should be largely available and accessible to support consumers in buying them. Another interesting result emerged also when we focused on the Three Factor Eating Questionnaire (TFEQ, Stunkard and Messick 1985). This questionnaire is interesting since it measures the cognitive and behavioural components linking to eating behaviour. When we considered the group with an eco-sustainable diet, a lower tendency towards a dysfunctional emotional eating (i.e. eating in response to negative emotions, measured by the score of hunger) was linked to higher levels of behavioural intention, perceived responsibility, and perceived availability. More crucially, in the case of the group with a not eco-sustainable diet, the tendency to restrict food intake in order to control body weight (i.e. dietary restraint) was linked to multiple components of the TPB questionnaire.

Overall, when individuals perceived a favourable environment in terms of food product availability as well as having positive intentions and behaviour, they reported to choose their food more freely, without any agreement with a specific restrictive plan. This result mirrors what observed previously about the link between food availability and expressions of impulsive traits. Moreover, those individuals who bought less amount of eco-sustainable food, even in the past, reported a higher tendency to experience loss of control over intake as well as to eat in response to negative emotions: this result pointed out towards the link between altered eating habits and the consumption of unhealthy food. Overall, impulsivity, especially when measured in relation to eating patterns, seems to play a crucial role in the context of not eco-sustainable diet. Because of this evidence, one would design educational programs to help individuals in adopting more ecological food in their diet, as yet observed about the consumption of high-caloric or energy-dense foods (e.g. Metcalfe and Mischel 1999; Strack and Deutsch 2004; Hofmann, Friese, and Roefs 2009) and in increasing their level of awareness about sustainability. One example is described by Veling and colleagues (2017), who proposed to train individuals to be less impulsive in their food choices, improving the level of selective attention towards healthy and sustainable foods. In other words, through higher levels of self-control, individuals may enhance a deliberative and conscious, even if effortful, control of impulses (Fujita and Han 2009). Thus, even if we did not recognise specific differences in the expression of impulsivity traits between individuals with an eco-sustainable diet and those with a not eco-sustainable diet, on the other hand the expression of these traits seemed linked to different components of cognitions and behaviours within each group.

Knowledge about food sustainability

When we measured our participants' level of knowledge about food eco-sustainability, we did not observe any difference between the two groups, neither for the eco-sustainable food nor for the not eco-sustainable foods. This result may be crucial: most people may not be aware that some foods have a very negative effect on the environment. Thus, their level of knowledge may be not enough for deliberate eco-sustainable choices in terms of food. We are far away from having educated and knowledgeable consumers, even when people tend to adopt sustainable food habits. It should be considered that not only the knowledge, but also individual perceptions and cognitions play a significant role in food choices. An example is represented by those individuals who decide to avoid foods derived from genetic improvements and innovations in plant breeding (Borrello et al. 2021) or in the consumption of insects (van Huis and Rumpold 2023): they may be often conditioned by technophobia, negative public imaginaries, and cultural background. Borrello and colleagues (2021) underlined the importance of furnishing appropriate information for market acceptance of innovations to consumers. Another example is individuals who decide to avoid food of animal origin because of ethical reasons relative to the animals' wellbeing or because of healthy reasons (i.e. plant-based proteins may reduce risk of cancer, obesity, and cardiovascular disease, i.e. Key et al. 2006; Dinu et al. 2017), rather than because of ecological concerns.

Comparison with previous evidence about cognitions and behaviours about eco-sustainable food

According to the comparison between the results from this survey with those reported by Vassallo and colleagues (2016), it seems that the attention towards eco-sustainable foods has increased in Italian consumers. However, no changes were observed in terms of how people perceive social pressure in buying eco-sustainable food (i.e. subjective norms): this is a negative result, if we consider the importance to change now food habits to respond to the ecological issue. The adoption of an eco-sustainable diet may be still an individual – and not a community – choice. However, because of the fast deterioration of Earth's resources, this should be conceived also a social decision, done for the individual benefit as well as the communitarian well-being.

Limits and future directions

This study is subject to some caveats. The reduced number of participants in the eco-sustainable diet may result in reduced statistical power and reduced robustness to unequal variance. Here, we did not use any validated questionnaires to assess eating habits in our participants, since – as in our knowledge – the existing ones do not take into account the level of eco-sustainability. Because the Mediterranean diet seems to have main sustainability dimensions, such as health and nutrition benefits, low environmental impact and rich biodiversity, cultural heritage with high socio-cultural food values, and positive local economic (Dernini et al. 2017; Gülden Pekcan 2019), some previous studies (Gualtieri et al. 2022; Metin et al. 2023; Yassıbaş and Bölükbaşı 2023) inferred the level of eco-sustainability of some eating habits from the levels of adherence to Mediterranean diet measured through the Mediterranean Diet Adherence Screener (Martinez-Gonzalez et al. 2012). However, the Mediterranean diet score computes the dietary components, while the attributes of the Mediterranean diet are manifested also in the manner the food is produced, cooked and eaten (Dernini et al. 2017). Because of this consideration, Tepper and colleagues (2021) developed a questionnaire (i.e. Sustainable-HEalthy-Diet Index – SHED), which allows to recognised healthy and sustainable diets defined according to nutritional, environmental, and sociocultural factors. In future studies, this index may be adopted, providing also normative data for Italians. In this paper, we asked participants to fill out a questionnaire relative to the frequency of consumption of the list of foods assessed by Poore and Nemecek (2018) in terms of the variation of food's multiple impacts. For this reason, we were not able to apply the principal component analysis (PCA) and cluster analysis (CA), which are two commonly applied empirical dietary pattern methods (Newby and Tucker 2004). Since it was an online survey, a self-selection bias (Berk 1983) of the sample could have affected the outcomes of the study, in which over-represented individuals are generally more interested in eating habits and eco-sustainable foods. It also should be not noted that no a-priori *quota* was established about demographical characteristics, such as gender, anger, level of education, or geographical home area.

Finally, the evidence from this work is related to the Italian population. As reported by Vassallo and colleagues (2016), Italy is one of the most involved countries in organic farming, representing a European case in the Mediterranean area concerning the sustainable food market, mainly based on organic food. Notably, food availability as well as cultural factors shapes food decisions. This means that our results should not be extended to other countries; instead, we strongly suggest to replicate the same survey in different countries to increase cross-cultural research.

Conclusions

According to our results, the individual level of impulsivity traits seems to play a role in the way people perceive and act about eco-sustainable foods when they have or do not have an eco-sustainable diet. Other psychological factors, such as the tendency to adhere to social norms, may shape the individual tendency to buy and use eco-sustainable food. Crucially, to support people in being more eco-sustainable consumers, institutions should meet these purchase choices, increasing the opportunities to buy eco-sustainable foods. Indeed, easy access to eco-sustainable foods may represent a key factor in promoting their buying in those who do not generally use it. These people should be specifically targeted by the governments and institutions' social and educational actions for the promotion of eco-sustainable and healthy dietary behaviours, which may reduce ultimately environmental burdens caused by food. Adopting eco-sustainable diets may imply that individuals have to change, even profoundly, their eating habits. In this sense, it may be important to build environments, which promote and support long-lasting change as a deliberate action.

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Author contributions

Conceptualisation: M.E.N., am, and F.S.; Methodology: M.E.N, A.P., and F.S.; Software: M.E.N.; Formal analysis: F.S.; Data curation: M.E.N., F.B. and A.P.; Writing – Original Draft: F.S.; Writing – Review and Editing: M.E.N.: Supervision: am; Funding Acquisition: am and F.S.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Data availability statement

The dataset generated and analysed in this study is available in the Zenodo repository (10.5281/zenodo.8321659) on reasonable request.

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APPENDIX I. Abitudini alimentari: questionario di frequenza d'uso

Indichi la frequenza di consumo settimanale dei seguenti alimenti.

Note: The table layout displayed in 'Edit' view is not how it will appear in the printed/pdf version. This html display is to enable content corrections to the table. To preview the printed/pdf presentation of the table, please view the 'PDF' tab.

Alimento	Mai	Meno di una volta a settimana	1–2 volte a settimana	≥3 volte a settimana	Quotidianamente
Cereali integrali					
Tuberi o vegetali amidacei (es. patate)					
Verdura					
Frutta					
Latte					
Formaggi stagionati					
Formaggi freschi					
Alternative vegetali ai latticini					
Carne rossa					
Carni processate (es. affettati)					
Carne bianca					
Uova					
Pesce					
Frutti di mare					
Legumi					
Semi oleaginosi					
Frutta secca					

Place the cursor position on table column and click 'Add New' to add table footnote.

APPENDIX II Questionario sulla conoscenza degli alimenti ecosostenibili

Di seguito una lista di alimenti. Le chiediamo di scegliere tre alimenti che si considerano più ecosostenibili tra quelli proposti.

1. Mais
2. Riso (da risaia)
3. Patate
4. Cassava
5. Frutti di bosco (da coltivazione)
6. Mele (da coltivazione)
7. Latte
8. Formaggio
9. Manzo
10. Maiale
11. Carni processate
12. Pollo
13. Uova
14. Cozze (da allevamento)
15. Crostacei (da allevamento)
16. Tonno (pescato)
17. Lenticchie secche
18. Piselli secchi
19. Tofu
20. Arachidi
21. Frutta a guscio
22. Olio di palma
23. Oli di oliva
24. Olio di girasole
25. Zucchero di canna
26. Vino
27. Birra
28. Cioccolato fondente

Author Query

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