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The Relationship Between Connectedness with Nature and Organic Food: An Explicit and Implicit Attitudes Approach

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The views stated in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics or Erasmus University Rotterdam.

Abstract

In recent years, demand for organic food has substantially increased and previous research has found that motivations of organic food consumers include the concern for the environmental damages that conventional production processes have and the impact that consuming organic food has on one's health. At the same time, connectedness with nature has been associated with pro-environmental behaviors and healthier and more sustainable food choices. Since consuming organic food has been referred to as a pro-environmental behavior, and organic food products are perceived as healthy and environmentally safe by most products, this paper aims to study the relationship between the level of connectedness with nature and some aspects of organic food consumption, namely consumer attitudes towards organic food (environmental and health attitudes), perceived benefits of consuming organic food (warm glow and egoistic motive) and buying frequency of organic food. The level of connectedness with nature was measured through explicit attitudes, using the 7-item Connectedness with Nature (CNS) scale, and implicit attitudes, by applying a version of the Implicit Association test (IAT) – the nature IAT. Findings show a positive correlation between explicit attitudes of connectedness with nature and all the constructs associated with organic food consumption, while results from using the implicit methods remained inconclusive, suggesting no evident association. Future research should focus on developing the use of implicit measures of connectedness with nature, further evaluating the relationship with different aspects related with organic food consumption, such as consumers' values and ethics.

Keywords: connectedness with nature, organic food consumption, explicit attitudes, implicit attitudes

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Introduction

Ethical consumption behavior has been studied for several years to analyze how individuals are increasingly changing their purchasing decisions towards more ethical goods (Long & Murray, 2012). Ethical concerns can include sustainability and environmental matters, fair trade, labor rights, and animal welfare (Carrington et al., 2010). Ethically minded consumers usually express their interests in the food and agriculture sector, in which several movements have risen such as the organic movement (Guthman, 2014), also referred to as organic farming movement.

The demand for organically produced food has increased substantially in the past two decades, even in periods of crisis (Massey et al., 2018). A reflection of this is the increase in organic retail sales in the recent years both in the European Union and Europe (see Appendix A). A couple of reasons can explain this steady growth, such as the public's concern for the environmental damages that conventional production processes have and food safety motivations (Lockeretz, 2007). Another important factor for the rise in demand of organic food is health preservation or improvement. The results of a study by Schifferstein & Oude Ophuis (1998) proved that organic food consumers feel responsible for their own health and believe their health is affected by their food intake. In fact, food choice is an extremely complex process that is influenced by the product characteristics (both intrinsic and extrinsic properties), the consumer's knowledge, beliefs and attitudes, and the context of the purchase (Kaya, 2016).

A new concept that is starting to be discussed in terms of consumption choices and behaviors is the concept of connectedness with nature i.e., “an individual's belief about the extent to which they are part of the natural environment” (Bruni et al., 2021). Connectedness with nature has been previously linked to positive pro-environmental behaviors in several studies (Nisbet et al., 2008; Chochola, 2009; Gosling & Williams, 2010; Mackay & Schmitt, 2019; Ibáñez-Rueda et al., 2020). The study conducted by Ibáñez-Rueda et al. (2020) found this positive association between connectedness with nature and pro-environmental behaviors, considering purchasing organic food as one of the items to measure the pro-environmental behaviors, using a sustainable consumption index. An unprecedented study conducted by Bruno et al. (2021) concluded that higher levels of connectedness with nature may lead to healthier and more sustainable food choices, with positive associations between nature connectedness and the following factors: health, natural content, and ethical concern. These aspects are related with some

of the motivations to consume organic food, along with the perception that organic food production process does not harm the natural environment (Grzybowska-Brzezińska et al., 2017). In general, consumer's buying behavior towards organic food has been a topic heavily researched in the past (Kapuge, 2016; Lee, 2016; Krishnakumare & Niranjana, 2017; Paul & Rana, 2017; Darsono et al., 2019; Canova et al., 2020; Ali et al., 2021; Gundala & Singh, 2021).

The purpose of the present paper is to measure the level of connectedness with nature and analyze its correlation with several aspects related with organic food consumption – a specific pro-environmental behavior. Understanding the relationship between the level of connectedness with nature and organic food consumption appears relevant for both consumer and environmental psychology, and consumer behavior literature, given the importance that studies related with the environment and sustainable consumption can have in diminishing the impacts of the current climate crisis we live in (Trudel, 2018). Additionally, studying the relationship between nature and organic food seems interesting, since Verhoog et al. (2003) found a positive attitude towards nature when asking participants about the naturalness of organic farming, concluding that organic agriculture is closer to nature. This is supported by Richter & Hunecke (2020) who proposes that connectedness with nature and its associations with the natural environment and pro-environmental behaviors, specifically food consumption, should be further investigated. However, as far as I am concerned, there are no papers studying only the specific relationship between connectedness with nature and organic food consumption. Hence, to address this literature gap, this paper is interested in assessing the following research question “How is the level of connectedness with nature correlated with consumer attitudes towards organic food, perceived benefits of consuming organic food and buying frequency of organic food?”. These specific aspects related with organic food consumption were chosen having in mind the previous literature that studied organic consumers' behavior. A wide range of studies have studied the consumer attitudes towards organic food (Beharrell & MacFie, 1991; Vlahović et al., 2011; Sangkumchaliang & Huang, 2012; Basha et al., 2015; Cheung et al., 2015; Oroian et al., 2017; Peric et al., 2017). In this study, I decided to focus on environmental and health attitudes, since researchers invoke the benefits towards protecting the environment and public health as the main drivers for consuming organic food (Sangkumchaliang & Huang, 2012; Oroian et al., 2017; Laureti & Benedetti, 2018; Yuan & Xiao, 2021).

Furthermore, organic food consumption has proven to provide consumers with ecological, social, and individual benefits (Cerjak et al., 2010). Example of these can be the psychological benefits that arise from consuming organic food, namely the perceived psychological benefit of pro-environmental behavior (i.e., warm glow) and the perceived health benefits (i.e., egoistic motive) that motivate consumers to purchase more organic food products (Cahyasita et al., 2021). Therefore, warm glow and egoistic motive were included in the current study. Lastly, previous studies have distinguished between regular and occasional consumers of organic food (Jensen et al., 2011; Pino et al., 2012) or only focusing on one type of organic consumers (Stolz et al., 2011). Thus, in this study there is also a measure of the buying frequency level of organic food.

Focusing on the level of connectedness with nature, it is measured through explicit and implicit attitudes, based on the dual attitude model proposed by Wilson et al. (2000), that distinguish between two types of attitudes: explicit attitudes, which are expressed at a conscious level, and implicit attitudes, that often occur outside individual's awareness (Fabrigar et al., 2005). While explicit attitudes have been extensively studied in the past, research on implicit attitudes is quite recent and has seen a dramatic increase since the nineties (Bassili & Brown, 2014). Niemand & Mai (2013) found that behavior is jointly affected by explicit attitudes, related to the reflective process – cold state – and by implicit attitudes, corresponding to the impulsive, effortless, and uncontrolled process – hot state. As an extension of this distinction, some researchers say explicit attitudes predict deliberate behavior and implicit attitudes are a good predictor for spontaneous behavior (Spence & Townsend, 2007). This paper focus on both types of attitudes since the results of only studying explicit attitudes could be biased by social desirability, where people may show they are more pro-environmental than they are (Bruni et al., 2015). Moreover, although explicit measures provide a useful tool for measuring connectedness with nature, they also assume that individuals explicitly know and can express their beliefs (Schultz et al., 2004). But, according to Dunlap et al. (2000) these beliefs can be “primitive” and not available to convey through self-report questionnaires, such as explicit attitudes measures. So, implicit attitudes were also measured, given that they do not rely on self-reports, thus not likely to be subject to social desirability bias (Fazio & Olson, 2003), being considered a useful alternative and improved technique to measure the strength of the association between nature and the self (Schultz et al., 2004). This allows to explore

the differences in results between both types of attitudes, providing the opportunity to deliver a more comprehensive analysis of the level of connectedness with nature.

The explicit attitudes towards connectedness with nature were measured through the Connectedness to Nature Scale (CNS), initially introduced by Mayer & Frantz (2004) and later reviewed by Pasca et al. (2017). To measure the implicit attitudes towards connectedness with nature, the Implicit Association Test (IAT; Greenwald et al., 1998) was used. The current paper uses the nature IAT variation with the following categories 'Nature/Built' and 'Me/Not-Me' and measures the degree of connectedness with nature, allowing to differentiate participants between those who feel a part of the natural world and the ones who feel disconnected from nature. This paper aims to provide a great contribution to the research of implicit connections with nature, since this topic remains underexplored among researchers, with very few literature using the nature IAT to measure the association between the self and nature. The uniqueness of this paper lies on benefit from explicit attitude measures and the referred IAT modification to study an individual's degree of connectedness with nature and relate it with several aspects related with the consumption of organic food, a recognized pro-environmental behavior.

Literature Review

Organic Food

Organic food can be generally defined as the food produced and processed without the use of any chemicals such as pesticides or mineral fertilizers (Singh & Verma, 2017), not including genetically modified organisms and its process is free from irradiation, industrial solvents, and other chemical food additives (Paul & Rana, 2012). In terms of animal production practices, it is mandatory that livestock producers do not use growth hormones, including antibiotics or any other growth stimulants for the farm to be certified as an organic farm (Organic Foods Production Act, 1990). Based on these production characteristics, organic food products are considered healthy (Paul & Rana, 2017) and environmentally safe (Gundala & Singh, 2021) by most consumers.

There are some definitions of the organic production system provided by international recognized organizations that are helpful to understand the concept of 'organic food'. The Committee on Agriculture of the Food and Agriculture Organization (FAO) of the United Nations states that the holistic production management system of organic agriculture (OA) enhances agro-ecosystem health, where the biological cycles

and the soil activity are respected, having in mind the need for local systems within each region (FAO, 1999). According to the European Parliament and the Council of the European Union (EU), organic production is a system that combines food production and farm management that is focused on preserving natural resources and maintaining high levels of biodiversity and animal welfare standards (EU, 848/2018).

Since the organic food production process addresses a variety of topics, there are a few dimensions to consider when discussing organic food products. First, organic food is usually perceived as sustainable and environmentally friendly, so people believe they are promoting sustainability and protecting the environment by consuming this type of food (Tandon et al., 2020). This belief is supported by some studies where OA was the best method based on several environmental impact measures (De-Magistris & Gracia, 2016). According to Van der Werf et al. (2007), OA had the smallest ecological footprint and can be characterized as a “low input-low output” method when compared to other farming methods. Additionally, Abeliotis et al. (2013) found that in terms of global abiotic resources and freshwater aquatic toxicity, OA was the preferable method.

There is another dimension related to organic food that is important to mention since it is considered one of the determinants of organic food consumption. To distinguish OA from traditional agriculture, naturalness is often mentioned as a characteristic of organic farming and it is used in advertisements to convey the idea that the product is produced in a natural way (Verhoog et al., 2003). However, this is a broad term that might have several connotations, thus it requires further clarification. Binnering (2015) provides a definition for the concept of naturalness as “the quality or state of being natural”. This term has a positive correlation with the attractiveness, quality, credibility, and purchase intention of food products, in the context of product packaging and its influence on product evaluation (Binnering, 2015). Regarding food naturalness, the author differentiates between two elements cited in the literature. On one hand, the respect for the environment, which is considered the most important, and then the healthiness of the product. Later in the paper, this distinction will be important for the hypothesis’s formulation, since it can be linked to either altruistic or egoistic aspects (Hemmerling et al., 2016).

Verhoog et al. (2003) conducted a study on the role of naturalness in organic farming and concluded that this concept can only be used to characterize OA if three dimensions are considered. The most evident one is referring that OA is free from

chemicals, but it is necessary to include two other aspects. According to the same paper, naturalness also refers to ecological principles and the respect for the integrity of living nature as a whole. This is supported by their results that showed that respondents considered organic farming to be focused on achieving a balance between human and nature's interests, meaning attaining a level of integration where nature and OA are in harmony. Therefore, I argue that organic food and agriculture, the environment and nature are intimately related, a concept that will be further discussed in this paper.

Connectedness with Nature

Many authors have contributed to the extensive psychology literature by studying the notion of being connected with nature. This concept has a philosophical dimension saying that nature should be loved and respected by humans and as soon as we start to feel part of the natural environment, our behavior towards nature will change (Leopold, 1949). Schultz (2002) refers three components of inclusion with nature. There is connectedness with nature which is the cognitive component that leads to caring for nature, the affective dimension. Both these core structural components will lead to a commitment to protect nature, a behavioral approach referring to pro-environmental actions. In this section, a detailed description of the cognitive dimension will be provided, bearing in mind that it is closely linked to the other two concepts.

It is important to define the term connectedness, which has been previously used to describe part of a person's self-concept (Bruni et al., 2021). The same authors define connectedness with nature as the "individual's belief about the extent to which they are part of the natural environment". A similar definition that includes its core psychological component (cognitive) is referred by Schultz (2002) which states that connectedness is "the extent to which an individual includes nature within his/her cognitive representation of self". It is possible to distinguish between two different types of people, based on their degree of nature connectedness. On one side there are individuals who believe they are just as much part of nature as are other animals, and on the opposite side are those people who believe that laws of nature do not apply to them and consider themselves superior to plants and animals (Schultz et al., 2004).

Earlier studies have used a variety of measures to assess connectedness with nature, including the New Environmental Paradigm (NEP) scale, the Inclusion of Nature in Self scale (INS), the Connectedness to Nature Scale (CNS), among many others. Next,

I will further discuss the mentioned methods, analyzing their unique contribution to the literature but also why they might not be ideal to measure connectedness with nature.

The NEP was originally designed by Dunlap & Van Liere (1978), having its roots in the US environmental movement of the sixties and seventies and it is used to measure environmental concern through the means of a survey (Anderson, 2012), challenging important ideas about the relationship between individuals and nature. Later in 2000, it was revised due to criticisms related with the internal consistency, language and correlation between the scale and behavior (Dunlap et al., 2000). However, according to a short overview done by Anderson (2012), this NEP scale still has its own drawbacks. It is often seen as an incomplete method that is missing elements of a pro-ecological world view, while its validity and reliability are still issues that need to be addressed.

Schultz (2001) created the INS scale to measure the perceived relationship between self and nature, by adapting the Inclusion of Other in Self (IOS) scale (Aron et al., 1992). This measure consists in asking participants to select several overlapping circles labeled 'self' and nature', which poses two issues. Being only a single item comes with the problem of internal reliability and it is a self-report measure which, as it will be explained in the next section, requires the existence of explicit beliefs and there might be cases who do not comply with this condition.

Another commonly used method is the CNS scale developed by Mayer & Frantz (2004) and focused on measuring the individual's "experiential connection to nature", therefore being an affective measure. Based on Pasca et al. (2017) analysis of the CNS scale, some disadvantages are worth mentioning. For example, some items do not represent a good fit to measure connectedness and others were considered redundant, leading the authors to conclude that a few items from the original scale are not relevant and add noise to the method. Thus, a revised scale with only seven items was created, including the items with the higher discrimination indices. This shortened scale proved to be a good solution to tackle the disadvantages of the original scale, since it has the power to discriminate between individuals who feel connected with nature and those who sense a disconnection with the natural world.

Several authors have put together a practitioner guide that contains a review of numerous tools used to assess connectedness or connection with nature (Salazar et al., 2020). However, most of these measures have other uses that are not entirely related with

the aim of this paper. For example, the Biophilia Interview (Rice & Torquati, 2013), the Children's Environmental Perceptions Scale (Larson et al., 2010) and the Connection to Nature Index (Cheng & Monroe, 2010) were designed to measure children's dimensions, perceptions, and feelings about nature, while this paper is focused on understanding adult's connectedness with nature.

Explicit and Implicit Attitudes

Defining the concept of attitude appears important to understand the theory behind the dual attitudes model. Eagly & Chaiken (1993) define attitude as a “psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor”. The authors state that the “evaluating” process refers to three components – cognitive, affective, or behavioral – and individuals can store in memory mental representations of attitudes, which can be subsequently activated by showing the attitude object or cues associated with the attitude. This activation appears to be automatic and spontaneous, being dependent of the strength of association between the attitude object and its evaluation (Fazio et al., 1986). The evaluation that occurs during the attitude formation can be referred as the attribution of meaning to entities in the environment (Eagly & Chaiken, 1993), commonly described as attitude objects, which can include social issues, categories of situations and people, and physical objects (Fazio et al., 1986). Examples of traditional models of attitudes are the Theory of Reasoned Action (TRA, Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980) and its extension, the Theory of Planned Behavior (TPB, Ajzen, 1991). These models focus on explicit beliefs and attitudes being the basis for how individual's intentions lead to behavior (Ajzen, 1991; Ajzen & Dasgupta, 2015).

More recently Wilson et al. (2000) proposed the dual attitudes model where people can hold both an explicit attitude and an automatic evaluation of the same attitude object – implicit attitude. The authors argue that both attitudes can coexist, meaning older attitudes can be preserved together with the new attitude, calling it a dual attitude. According to them, acquiring explicit and implicit attitudes simultaneously or an implicit attitude after the explicit counterpart are both examples of dual attitudes. In a nutshell, one attitude appears at a conscious level, i.e., explicit, while the other occurs without people's awareness, i.e., implicit (Fabrigar et al., 2005).

When using explicit methods, Echabe (2013) states that the conditions to have controlled and deliberate processes are present, such as the meaning of behavior being

obvious and clear to the participants, and the fact that there is time to reflect before having to express opinions. It is undeniable that most of the social psychology and marketing literature have been focused on explicit measures, which include self-report surveys and interviews (Lee & Kim, 2013). One of the strongest limitations of explicit measures happens when the attitude object is controversial (Echabe, 2013). The author explains that participants face the risk of being categorized as belonging to a group with a socially undesirable position. This social constraint can be strong enough to affect the way individuals express attitudes, either by artificially increasing the mean scores or decreasing the range and flexibility of responses (Bruni & Schultz, 2010). This phenomenon is called social desirability and it is present in the explicit measurements of connectedness with nature, since people may report higher levels of connection between the self and the natural world to be considered more pro-environmental than they are (Bruni et al., 2015). Schultz et al. (2004) mention that measuring connectedness with nature with explicit measures may not be ideal since they rely on self-report, which assumes that participants already have an explicit belief about their relationship with nature. However, according to Dunlap et al. (2000) this may not be true due to the primitive nature of individual's beliefs regarding connectedness with nature. Then, it is possible that a person's sense of connectedness may not be conscious, not occur regularly and/or not be available to retrieve through explicit methods.

More recently, implicit measures started to become popular throughout the social psychology literature, mainly because they were less likely to be susceptible to the issue of social desirability, since they did not require the participant to provide a verbal report (Fazio & Olson, 2003). Banaji (2001) explained that implicit attitude measures may unlock unique elements of attitudes that are under conscious awareness, intention, and control. The IAT, first introduced by Greenwald et al. (1998), is the most frequent method to assess implicit attitudes (Richetin et al., 2007) and has the characteristic of possibly reveal implicit attitudes and automatic associations from subjects who would rather prefer not to express those attitudes (Greenwald et al., 1998). The IAT is used to measure the strength of association between a pair of target concepts (e.g., flowers vs insects) and a pair of attributes (e.g., pleasant vs unpleasant) through a classification task (Greenwald et al., 1998). Participants are shown a sequence of randomly presented stimuli in the center of the computer screen, either words or images, and are asked to classify them into one of the four categories that appear at the top of the screen, as fast as possible

(Czyzewska et al., 2011). The underlying assumption in the IAT is that people will categorize faster the stimuli when two concepts that are regarded as compatible (e.g., flowers and pleasant) share the same response key than when they require opposite response keys (Richetin et al., 2007). This is considered an easier classification task than when the target-attribute are judged as incompatible (e.g., insects and pleasant). The IAT score, also referred to as the IAT effect, is based on the difference in reaction times (mean latencies) between the incompatible and compatible task combinations (Greenwald et al., 1998). This new method to measure implicit attitudes without needing participants to be consciously aware of the association is mostly used in psychology research with contributions in a variety of areas such as prejudice, preference, politics, morality, and personality (Carpenter et al., 2019). For example, Greenwald & Farnham (2000) showed how the IAT is a stable and valid technique to measure self-esteem and self-concept, using a different concept pair (e.g., self vs other), elements that will be used in the current paper.

The IAT is said to overcome some of the limitations of explicit measures, thus being a good alternative to assess individual's degree of connectedness with nature (Schultz et al., 2004). This research area prompted a few IAT modifications including a game interface (Bruni & Schultz, 2010) and the adaptation created by Schultz et al. (2004) that intends to measure connectedness with nature, analyzing the extent to which individuals associate 'self' with 'nature'. The latter showed that participants tend to implicitly associate themselves more easily with nature than with built environments, and implicit connections with nature were correlated with explicit measures of environmental attitudes. Schultz & Tabanico (2007) further developed this IAT procedure by conducting additional research where they changed the environment where participants completed the test or analyzed the influence of experiences with the natural and built environments in the implicit measures of connection with nature. Their findings provide evidence that the IAT is a useful tool to measure and test hypotheses about an individual's level of connectedness with nature. Therefore, I argue that using both explicit and implicit measures provide a more comprehensive analysis of individuals' attitudes, in contrast to the methods mentioned in the previous section which relied only on explicit methods.

Hypotheses

A meta-analysis conducted by Mackay & Schmitt (2019) found there is a strong association between explicit measures of connectedness with nature and pro-

environmental behaviors in the correlational literature. Consuming organic food is identified as one example of a pro-environmental behavior (Ibáñez-Rueda et al., 2020). Additionally, it was previously discussed that concern for both the environment (Moser, 2016) and for one's health (Paul & Rana, 2017) are considered two of the main drivers for consuming organic food. Therefore, a positive association between the explicit attitudes of connectedness with nature and both consumer attitudes towards organic food (environmental and health attitudes) is expected, given the importance that environmental and health attitudes have in organic food consumption (Sangkumchaliang & Huang, 2012; Oroian et al., 2017; Laureti & Benedetti, 2018; Yuan & Xiao, 2021). The following two hypotheses were then created:

H1a: A higher explicit level of connectedness with nature is associated with a higher level of environmental attitudes towards organic food.

H2a: A higher explicit level of connectedness with nature is associated with a higher level of health attitudes towards organic food.

However, Schultz et al. (2004) found that implicit connections with nature were positively correlated with biospheric environmental concerns (including elements from the environment such as plants, animals, etc.) and negatively correlated with egoistic environmental concerns, which include the individual's concern for their own health (Schultz et al., 2004). Based on the work by Kareklas et al. (2014), environmental concerns and personal-health concerns drive consumers' attitudes towards organic food. Yet, the former is considered altruistic purchase considerations, since consumers choose organic food because it denotes a pro-social and pro-environmental behavior (Kareklas et al., 2014), while the latter represents egoistic purchase considerations, given consumers opt for organic food to personally benefit from it, given their perception that organic food is healthier (Kareklas et al., 2014). Thus, it is possible to infer that implicit attitudes of connectedness with nature are likely to be positively associated with environmental attitudes and negatively associated with health attitudes towards organic food. Based on these preliminary expectations, the following two hypotheses were formulated:

H1b: A higher implicit level of connectedness with nature is associated with a higher level of environmental attitudes towards organic food.

H2b: A higher implicit level of connectedness with nature is associated with a lower level of health attitudes towards organic food.

Moreover, Cahyasita et al. (2021) found that the perceived benefits of consuming organic food (warm glow and egoistic motive) were positively associated with consumer attitudes (environmental and health attitudes) towards organic food. It is important to remember the concepts of warm glow, meaning the reward obtained from engaging in pro-social and/or pro-environmental actions, usually having an altruistic value, and egoistic motive, i.e., the concern that consumers have for their own health and food safety. So, given this positive association with consumer attitudes it should be expected that both warm glow and egoistic motive behave similarly to environmental and health attitudes, respectively. Considering the strong association between explicit measures of connectedness with nature and pro-environmental behaviors (Mackay & Schmitt, 2019), that organic food is a pro-environmental behavior (Ibáñez-Rueda et al., 2020) and how organic food consumption is driven by environmental and health attitudes (Sangkumchaliang & Huang, 2012; Oroian et al., 2017; Laureti & Benedetti, 2018; Yuan & Xiao, 2021), the same line of thought used for the previous hypotheses (H1a and H2a) was applied here. These additional constructs were incorporated into the study by including the next two hypotheses, where explicit attitudes of connectedness with nature are expected to be positively correlated with both warm glow and egoistic motive:

H3a: A higher explicit level of connectedness with nature is associated with a higher level of warm glow.

H4a: A higher explicit level of connectedness with nature is associated with a higher level of egoistic motive.

Once again, the expectations for implicit attitudes of connectedness with nature are slightly different. Schultz et al. (2004) proved the positive association between implicit connections with nature and biospheric environmental concerns (including elements from the environment such as plants, animals, etc.) and the negative association between implicit connections with nature and egoistic environmental concerns (including the personal concerns for one's health). Kareklas et al. (2014) showed that environmental concerns are altruistic motivations and health concerns are egoistic motivations, yet both drive organic food consumption. Given the connection between warm glow and the environment with an altruistic value, a positive association between the implicit attitudes of connectedness with nature and warm glow should be expected. By contrast, having in mind the connection between egoistic motive and health with an egoistic value, a negative association could be expected. Additional two hypotheses were included in the study:

H3b: A higher implicit level of connectedness with nature is associated with a higher level of warm glow.

H4b: A higher implicit level of connectedness with nature is associated with a lower level of egoistic motive.

But, analyzing the effect between the level of connectedness with nature and consumer attitudes towards organic food (environmental: H1a & H1b and health attitudes: H2a & H2b) and the perceived benefits of consuming organic food (warm glow: H3a & H3b and egoistic motive: H4a & H4b) only answers part of the research question. The last part focus specifically on how frequently consumers' purchase organic food. Balundé et al., (2019) mention the environmental identity theory developed by (Clayton & Opatow, 2003) to explain that being in contact with nature can lead people to feel they belong to the natural world, which can deepen the relationship between a person and nature, and further impacting behavior related with that relationship. Given the indirect connection between consuming organic food and its consequences to the environment, it could be inferred that organic food consumption is likely linked to connectedness with nature. Furthermore, a study by Dong et al. (2020) has proved that connectedness with nature has a positive influence on green purchasing, as an element of sustainable consumption behavior. A similar paper found that connectedness with nature also positively influence green purchase behavior (Jaiswal & Bihari, 2020). In both papers, buying organic food was one of the items to measure green consumption. Moreover, the buying frequency of organic consumers has been discussed throughout several papers, in which the authors study the purchase motives and distinguish the results according to the level of purchase frequency (Zanoli & Naspetti, 2002; Padel & Foster, 2005; Barrena & Sánchez, 2010; Pino et al., 2012). So, I decided to study the connection between the level of connectedness with nature and the buying frequency of organic food, for which the following two hypotheses were developed. No previous evidence of similar studies was found but assuming the link between explicit measures of connectedness with nature and green purchasing, including purchasing organic food (Dong et al., 2020), a positive association can be expected between the explicit level of connectedness with nature and buying frequency of organic food. Since Schultz et al. (2004) found that results from explicit measures of connectedness with nature and the nature IAT scores were positively correlated, a positive association between the implicit attitudes of connectedness with nature and buying frequency of organic food is to be expected as well.

H5a: A higher explicit level of connectedness with nature is associated with a higher buying frequency level of organic food.

H5b: A higher implicit level of connectedness with nature is associated with a higher buying frequency level of organic food.

Methodology

The aspects of the research methodology were first discussed with the supervisor and the ethical questionnaire required by the university was filled out. The following subsections will provide a detailed explanation about the other elements of the methodology.

Experimental design

This paper is a correlational study, attempting to examine the correlation between an individual's level of connectedness with nature and some aspects of organic food consumption, namely consumer attitudes towards organic food (environmental and health attitudes), the perceived benefits of consuming organic food (warm glow and egoistic motive), and buying frequency of organic food. Correlational or associational research investigates the relationship between two or more variables without any variable manipulation, contrary to experimental research (Fraenkel et al., 2012), where finding causation is the ultimate goal. Indeed, correlation does not imply causation and by using a correlational coefficient, correlational research can analyze the degree to which two variables are related to each other. In this study, the variables tested are almost always measured using ordinal data, which, by definition, should be included in the categorical variables.

An online questionnaire was conducted between May and June 2022 using Qualtrics, an online platform that allows to build and distribute surveys. Using online surveys has many advantages, but also some drawbacks as any other method. Indeed, creating an online survey and making it available to collect responses from participants is a rapid, automated, and straightforward process, with almost no costs involved (Ball, 2019). This increases data quality and participants' satisfaction when answering the survey (Callegaro et al., 2015). However, this widely used method to collect data also raises some questions related to the online format and sample bias, further discussed in the limitations of this research. This was a one-time survey, meaning the information was collected only at one point in time, since the main purpose of the paper is to get a baseline

understanding of individual's connectedness with nature (Salazar et al., 2020) and relate it with some insights about organic food.

Sample

Fraenkel et al. (2012) states that data from a sample smaller than 30 subjects carries the risk of giving inaccurate estimates of the degree of correlation between the tested variables, while samples with more than 30 respondents are more likely to deliver significant results. Based only on this, it could seem reasonable to consider 30 as the minimal sample size for the paper. However, this is just a general recommendation for all correlational research, and the optimal sample size might differ according to the goals of the researcher. As such, a more statistically detailed power analysis is required, as described next.

A sample size calculation was performed using the G*Power software, latest version 3.1.9.7 (Faul et al., 2007; Faul et al., 2009) which is recommended due to its user-friendly interface and the possibility to use it without any monetary costs (Kang, 2021). Since this paper uses Spearman rank correlation coefficient, considered the non-parametric version of the Pearson product-moment coefficient (McCrum-Gardner, 2008), and at the moment of sample size estimation one cannot know if the assumptions for Pearson correlation hold or not (Bujang & Baharum, 2016), the sample size analysis was conducted to estimate the power of Pearson's correlation. According to Faul et al. (2007), conducting *a priori* power analysis is efficient to monitor statistical power before running the study. By using this method, several parameters have to be defined including effect size, the significance level (α) and the power ($1-\beta$). Assuming a one-tailed or one-sided test, suitable when the direction of the relationship between the variables is specified in advance (Cohen, 1988), a medium effect size equal to 0.3 (see recommended q values for differences in correlation by Cohen (1988)), α equal to 0.05 (McCrum-Gardner, 2008), and $1-\beta=0.8$ (Bhandari, 2021), it was determined that the minimal sample size should consist of 64 participants.

The sample was selected by a mix of convenience and snowball sampling, both being non-probability sampling methods. This type of methods indicates that the participants are chosen based on non-random criteria (McCombes, 2019). The survey link was distributed through different online platforms (e.g., WhatsApp, LinkedIn, and Facebook), either by individually messaging contacts or by posting in groups. These first

participants were asked to send the survey to their contacts, with the purpose of gather as many participants as possible, resembling a snowball technique.

There were no specific eligibility criteria for participation, apart from the need for all participants to be 18 years or older since there are ethical concerns regarding testing minors. I argue that the common criteria used (gender, nationality, certain life experiences, etc.) are not particularly useful for my research goals. In general, almost everyone has had at least some contact with nature and/or built environments at some point in their lives. Also, with the increase in popularity of organic food in recent years, it is unlikely that there is someone who has never heard of this type of product. Even in that case, a short definition of organic food was provided in the survey to give context to those respondents. Hence, no additional eligibility criteria were chosen since the main goal of the paper is to provide a broad overview of the relationship between the main variables, having no particular restrictions.

The survey stopped collecting respondents in June 2022, reaching a total of 455 participants, being this the initial sample composition. However, some responses were incomplete, in other words, the response was not submitted since the participant did not reach the end point of the survey, either because it was closed manually, or the session expired. There were 55 responses that corresponded to this description, leaving 400 complete responses. Another important aspect to check is the speed to which participants completed the survey, since extremely fast responses are usually thoughtless or chosen at random. So, it was considered that the minimum duration to complete the survey was five minutes since only the IAT section takes approximately five minutes min on average (Carpenter et al., 2019), which implies that every complete response with a duration under five minutes would be unreliable. By applying this condition, additional 127 respondents were eliminated, which correspond to the same subjects that would have been excluded from the sample by following the steps necessary to compute the IAT D-score according to Lane et al. (2007). Next, it was necessary to address the missing values on critical variables such as the ones measuring the explicit and implicit level of connectedness with nature, the environmental and health attitudes, warm glow, egoistic motive. For 59 participants, the responses to some of these questions were not recorded so they were additionally discarded from the dataset. Then, the presence of outliers in the critical variables was checked and 6 responses were eliminated. This happened either because the values fell outside of the range of possible values (e.g., in the variables measuring

environmental attitudes, the range of values should be between -2 and 2 and every response with values outside this range was deleted) or in the case of the variable with the IAT D-scores, there was an extreme positive value that was considered an outlier and thus also deleted.

Finally, there was the need to check for odd responses from participants that might undermine the data analysis. An example of this is called survey straight lining, meaning when the respondent has selected the same response for every question, regardless of the question (Vannette, 2018). Therefore, a small data analysis was conducted to see if there were potential straight liners in the dataset, considering the sections measuring explicit attitudes and the frequency of organic food consumption, since these were the ones with more questions in a row. There was no response where the same option was chosen for all questions in both sections, hence no apparent survey straight lining was found in the sample. There are other types of survey straight lining, where participants try to form a pattern with their answers on the rating scale that are extremely hard to detect in the data (Vannette, 2018). Thus, to prevent these from happening in the first place, the number of matrix questions presented on the same page was reduced, so that participants were not able to form any patterns. Considering the data cleaning steps referred above, the final sample consisted of 208 subjects.

Participants' ages ranged from 18 and 70 years old (mean = 29.4, standard deviation = 8.8) where the majority identified as female (53.9%), following by male (45.2%) and less than 1% described themselves in another way. Most respondents have completed a bachelor's degree as their highest level of education (55.3%) and are currently employed full-time (55.8%). More detailed information about sample demographics can be found on Appendix B.

Materials

Participation in the survey was supposed to take approximately between eight and ten minutes and required the use of a PC/laptop since some functionalities did not work on mobile phones or other devices, more specifically the IAT game interface. At the beginning of the survey, there was a short welcome to the study, information about the university and degree of the researcher and a brief preview of the top topics covered in the survey (e.g., relationship with nature and organic food). Then, information about the incentives of the study and the survey characteristics (anonymity, data confidentiality, participation requirements, voluntary participation, and estimated duration). The exact

information shown to subjects is on Appendix C. The first item of the survey was the consent question, in which to move forward with the survey, an affirmative answer was required. Participants were requested to read all the conditions explained before and agree to participate, indicating their consent by choosing the response option “Yes, I consent to participate in this experiment.”, as shown on Appendix C. If respondents answered “No, I do not consent to participate in this experiment.”, then they would be sent to the end of the survey.

The survey consisted of completing five blocks of questions in total, three of which covering the research topics (explicit and implicit attitudes towards connectedness with nature and organic food consumption), which will be first discussed. These three blocks were randomized to make sure there was no order effect impacting the results, and could either correspond to the first, second or third blocks. Randomization was arranged in a way to make sure that participants saw the explicit attitudes block, one of the four possible versions of the IAT and the organic food consumption block, in a random order.

Random Block: Explicit Attitudes Towards Connectedness with Nature

The explicit attitudes towards connectedness with nature were measured using the revised CNS scale with only seven items (Pasca et al., 2017), initially created with 14 items by Mayer & Frantz (2004). Pasca et al. (2017) conducted an overall analysis to this new 7-item CNS scale, using Item Response Theory (IRT) models. More specifically, the authors used the Graded Response Model (GRM), first proposed by Samejima (1969). They concluded that this new version of the scale had high reliability, even higher than that achieved by Mayer & Frantz (2004). Pasca et al. (2017) removed several items from the original scale due to various reasons: in particular, items 4 and 13 were not a suitable fit to the model; items 3 and 8 were eliminated because of their low discrimination index score; items 1 and 2 were found to be redundant so item 1 had to be excluded since it had the lowest discrimination index, thus providing worse psychometric properties, as well as item 12 which was also removed because items 7 and 12 appeared to be redundant in the scale. Therefore, the seven items in the scale used in the survey were 2, 5, 6, 7, 9, 10 and 11.

Participants were asked to rate these seven statements on a five-item likert scale ranging from “Strongly Disagree” to “Strongly Agree” (see Table D1 in Appendix D). These statements refer to the perception that each individual has in relation to their belonging to the natural world and how they perceived this natural world. Examples of

some of the statements used in this study are “I think of the natural world as a community to which I belong.”, “I feel as though I belong to the Earth as equally as it belongs to me.” and “Like a tree can be part of a forest, I feel embedded within the broader natural world.”. A new variable was created as the sum of the scores of all seven variables from each statement of the CNS scale. This new variable provides the score that represents the explicit attitudes towards connectedness with nature, the same as referring to the explicit level of connectedness with nature.

Additional Questions: Explicit IAT Counterpart

There were two additional questions belonging to the explicit attitudes block representing the explicit IAT counterpart questions, according to the paper by Nosek et al. (2007). These two explicit items tried to parallel the relative nature of the IAT method, since the IAT is used to measure implicit attitudes towards one attitude object in relation to another. The questions asked specifically about everyone’s association of the natural and built environments to themselves or others, based on the example of the “Gender-Career” topic with “Male-Female” target concepts from Nosek et al. (2007). The exact questions used in the survey were “How strongly do you associate the natural environment with yourself or others?” and “How strongly do you associate the built environment with yourself or others?”. The answers ranged from “Strongly Others” to “Strongly Myself” (see Table D2 in Appendix D). A positive score on both questions indicates that the individual tends to associate the natural and built environments to themselves, while a negative score shows the participant tends to associate the natural and built environments to others. An exact score of zero indicates that respondents do not associate natural and/or built environments to neither themselves or others (when participants choose the response option “Neither others nor myself”).

Random Block: Implicit Attitudes Towards Connectedness with Nature

Another block contained the IAT, seeking to measure the implicit attitudes towards connectedness with nature. The IAT used in the survey was inspired by one of the many IAT extensions built upon the original version, in this case the so-called self-esteem or esteem IAT. It appears in studies that aim to measure of evaluative associations related with self-esteem, using “Me” versus “Not Me” representing the self and other, respectively (Greenwald et al., 1998; Karpinski, 2004). However, in the present study instead of associating them with the traditional categories “Pleasant” and “Unpleasant”, two other target pairs were used, one related with the natural environment (“Nature”) and by contrast, one related with built environments (“Built”). Therefore, there were four-

word categories used in the IAT: “Nature”, “Built”, “Me” and “Not Me”. Each of them had five words used as stimuli that represented each category, selected based on the previous study conducted by Schultz et al. (2004). Table E1 in Appendix E shows the complete set of words and categories, including their correct category association. Thanks to Carpenter et al. (2019), it was possible to implement a functional IAT in Qualtrics which was interactive and appealing to the participants, by which the authors refer to as the “survey-software IAT”, created using the *iatgen* tool. Next, the structure of the IAT and what participants were required to do will be described.

The IAT in the current survey consisted of seven blocks summarized on Table E2 in Appendix E, where Blocks 1 and 2 were only to practice targets (“Nature” and “Built”) and categories (“Me” and “Not Me”), each block with 20 trials. Following these practice rounds, participants were shown two combined blocks with both targets and categories (e.g., compatible block: “Nature” + “Me”, “Built” + “Not Me”) in which the hand pairings (left/right commands) are chosen based on the previous blocks which were initially randomized. Thus, there were 20 practice trials (Block 3) for the subjects to familiarize with the pairs and 40 critical trials (Block 4), although both blocks are accounted for scoring. Next, Block 5 was another practice block where the sides of the categories are reversed (e.g., “Built” and “Nature”), consisting of 40 trials based on the work of Nosek et al. (2005) that concluded that using 40 trials in this block instead of just 20 reduced the overall impact of task order. The goal of this block is to get rid of left-right associations that respondents might have previously acquired. Finally, the combined blocks were repeated but this time the categories were in their reversed positions (e.g., compatible block: “Nature” + “Not Me”, “Built” + “Me”), where once again there were 20 practice trials (Block 6) and 40 critical trials (Block 7). The idea behind the IAT is that when the target pairs are compatible with associations (named a “compatible block”), the individuals will sort stimuli faster than when pairings are reversed (known as “incompatible block”).

After reading the introduction to perform the IAT, participants were randomly assigned to one of the four seven-block versions of the IAT, which counterbalance left/right positions of targets and categories. By placing hands on the keyboard, respondents complete the seven blocks of stimuli sorting trials (Carpenter et al., 2019). In each trial, there is a word appearing on the screen which represents a category or target. Each participant sorts the stimuli by pressing the corresponding key with the designated

hand (e.g., in the case of a compatible block – left hand for “Nature” or “Me” and right hand for “Built” and “Not Me”). The stimuli shown to participants on the screen will alternate between target trials (“Nature” and “Built” words) and category trials (“Me” and “Not Me” words).

The IAT D-scores were computed according to the *iatgen* default procedure (Carpenter et al., 2018), which are very similar to the steps mentioned by Lane et al. (2007). Based on the last two papers mentioned, a summary of the steps of IAT scoring procedures is described next. First, it is necessary to guarantee to only use data from blocks 3, 4, 6 and 7. Then, to clean the data, one should delete trials greater than 10,000ms and responses in which more than 10% of trials have latency less than 300ms. Following this, two mean differences should be computed ($\text{Mean}_{\text{block 6}} - \text{Mean}_{\text{block 3}}$) and ($\text{Mean}_{\text{block 7}} - \text{Mean}_{\text{block 4}}$), as well as a pooled standard deviation for all trials in blocks 3 and 6 and likewise for blocks 4 and 7. Next, one should divide each mean difference by its corresponding pooled standard deviation, which provides two “D-score” type measures. Finally, the D-score is the equal-weight average of the ratios calculated in the previous step. A positive D-score indicates the participant was faster in the compatible block, whereas a negative D-score shows the participant was faster in the incompatible block (Carpenter et al., 2018). Lastly, a D-score of zero reveals there was no difference in speeds (Carpenter et al., 2018).

Random Block: Organic Food Consumption

The organic food consumption block contained several sub-blocks of questions, corresponding to different topics that needed to be measured to test the hypotheses. The order of the sub-blocks shown to participants in the survey corresponds to the order in which they will be described below.

Sub-Block: Buying Frequency of Organic Food

First, there was a sub-block with the following question measuring the buying frequency of organic food: “How often do you buy the following products in organic quality?”, which was designed based on the paper by Richter & Hunecke (2020). Padel & Foster (2005) states that more regular consumers usually take more issues into consideration in organic food consumption, and that it varies according to which product category is purchased. For example, in the case of organic vegetables and fruits where consumers eat the skin, considerations about nature and the natural environment appear more relevant, especially among the more frequent consumers. So, I decided to measure

the buying frequency of organic food per product category. Participants were asked to report their buying frequency on different product categories using a 5-item likert scale ranging from “Never” to “Always” (see Table F1 in Appendix F). The different types of food products included “Vegetables”, “Fruits”, “Dairy products”, “Meat”, “Fish”, “Staple foods”, where examples of rice and potatoes were given to account for any unfamiliarity with this term, and “Sweets”. The measurement scale and range of products were extracted from Richter & Hunecke (2020), based on the question to measure organic food consumption in their paper. An additional response option was included for individuals who were not sure about their consumption habits or had no information regarding a specific product (“I don’t know/Not applicable”), based on Forster & Pereira (2015). A condition was added for the participants who answered “Never” or “I don’t know/Not applicable” to the majority of the items. These subjects were sent to the end of the survey immediately, since I considered that having basic previous experience with organic food consumption was essential for this study. A new variable was created as the sum of the scores of all variables measuring the buying frequency of organic food, namely the seven variables with the corresponding food product categories. This new variable provides the score that represents the overall buying frequency level of organic food, including all product categories.

Sub-Block: Consumer Attitudes Towards Organic Food - Environmental and Health Attitudes

Then, another sub-block with four statements was used to measure the consumer attitudes towards organic food, namely environmental and health attitudes. Within this sub-block, two questions were related to the environmental factors of consuming organic food (e.g., “I like organic food because it is processed without the use of chemicals.” and “I like organic food because it is environmentally friendly.”) and two questions included health aspects of organic food consumption (e.g., “I like organic food because it is more nutritious.” and “I like organic food because it is healthier to consume.”). These exact statements used in the study were extracted from the paper by Cahyasita et al. (2021), since they had already been used in that paper to measure consumer attitudes towards organic food. Participants were asked to report their level of agreement to the statements in a 5-item likert scale that ranged from “Strongly Disagree” to “Strongly Agree”. This information can also be found in Table F2 in Appendix F. Two new variables were created as the sum of the scores of all variables measuring the consumer attitudes towards organic food, in particular the two variables measuring environmental attitudes and the two

variables measuring health attitudes, respectively. These new variables provide separate scores that represent the level of environmental attitudes and the level of health attitudes towards organic food.

Sub-Block: Perceived Benefits of Consuming Organic Food – Warm Glow and Egoistic Motive

Finally, there were two sub-blocks with three questions each, measuring the perceived benefits of consuming organic food, more specifically warm glow and egoistic motive (see Table F3 in Appendix F). It is important to remember that warm glow is related with the idea that people feel good about consuming organic food because it is considered a pro-environmental action, having an altruistic value (Cahyasita et al., 2021). Therefore, in this study three questions were extracted from Cahyasita et al. (2021), given they were used in that paper to measure warm glow. Examples of statements used in the survey are “Every time I consume organic food, I feel good about myself because I have protected the environment.” and “I am satisfied because I have contributed to the efficiency of natural resources by consuming organic food.”. The three specific questions were chosen because they best represent the pro-environmental action aspect that is associated to consuming organic food, necessary for people to feel the warm glow. Similarly, egoistic motive in this survey is associated with health reasons to consume organic food, since these are considered personal interests that affect consumption motives (Cahyasita et al., 2021). Thus, additional three questions were extracted from Cahyasita et al. (2021), given they were used in that paper to measure egoistic motive. Examples of statements used in this study are “I eat organic food to better maintain my health.” and “I eat organic food to provide my body with more nutrition.”. The three specific questions were chosen since they seem the best representation of the healthy aspect related with organic food consumption that generated an egoistic consumption motivation in individuals (egoistic motive). Two new variables were created as the sum of the scores of all variables measuring the perceived benefits of consuming organic food, in particular the three variables measuring warm glow and the three variables measuring egoistic motive, respectively. These new variables provide separate scores that represent the level of warm glow and the level of egoistic motive.

Fourth Block: Demographics

Then there was the block covering demographic questions, which was mainly included to provide a better understanding of the background characteristics of the sample. Hansen et al. (2018) refers that past research has already found some insights

regarding the characteristics of individuals who are more likely to be interested in organic and sustainable food products. It usually includes more females, younger groups, highly educated people, and higher income households (Paul & Rana, 2012). Therefore, “Gender”, “Age”, “Education” and “Income” were included as demographic variables. Additionally, to provide geographical background about the participants, the variable “Country” was created as well as “Employment Status” to have an idea of participants’ occupation, implicitly related with the “Income” variable.

Fifth Block: Monetary Incentive

The last block was related with the monetary incentive to participate in the survey. By completing the full survey participants had the chance to win a 20€ gift card to spend on specific stores or supermarket chains, ideally to spend on groceries since this study addresses organic food consumption. Hence, it was decided that it would be interesting to see whether respondents would choose an organic food store or a conventional supermarket chain to buy their food products, when given the same monetary incentive for both types of stores. This aspect appears relevant because past literature has focused on studying the price influence on the decision to whether consume organic food compared to conventional foods (Zepeda & Li, 2007; Aschemann-Witzel & Zielke, 2015; Bryła, 2016). They were only asked to leave their email in case they wanted to participate in the gift card lottery. From the 400 complete responses, 337 participated in the gift card lottery. In this block, there was a version with examples from Portuguese stores and a more international version of the gift card question, with examples from more general brands (e.g., Dutch stores).

The end of the survey consisted first of a message to show participants they had completed their participation. The researcher’s email was made available, and respondents were invited to send an email if they had any further questions after their contribution. Lastly, information about the gift card lottery was provided as well as the SurveySwap and SurveyCircle codes. A copy of this debriefing section is available on Appendix C.

Analysis

The measurement scale for data of all variables is ordinal, with exception to the IAT D-scores which can be considered a continuous variable. According to Khamis (2008), when one variable is ordinal and the other is continuous or when both variables are ordinal, the general appropriate measure would be the Kendall’s coefficient rank

correlation tau-sub-b (τ_b). However, in the case that the ordinal variable has many levels (e.g., five or more), Khamis (2008) recommends the Spearman's rank correlation coefficient. Since the ordinal variables in this survey have at least five or more response options, the latter was used for data analysis. First introduced by Spearman (1904), Spearman's rank correlation coefficient is a non-parametric test used to measure the level of association between two variables when these are measured, at least, on an ordinal scale (Correlation (Pearson, Kendall, Spearman), 2022). It is computed based on the formula shown on Figure 1, where ρ = Spearman rank correlation coefficient; d_i = the difference between the two ranks of corresponding variables and n = number of observations (Gupta, 2021).

Figure 1

Formula of Spearman's rank correlation coefficient

$$\rho = 1 - \frac{6\sum d_i^2}{n(n^2 - 1)}$$

This test does not have any assumptions regarding the data distribution, only that data must be at least ordinal. Additionally, this coefficient establishes the strength and direction of a monotonic relationship between two variables, unlike Pearson's correlation coefficient which determines the strength and direction of a linear relationship instead (Laerd Statistics, 2018). However, this is not strictly an assumption of Spearman's correlation, since it is possible to conduct the test on a non-monotonic relationship to verify if there is a monotonic component to the association (Laerd Statistics, 2018).

The Spearman correlation coefficient ranges from -1 to +1, which indicate a perfect negative and positive monotonic relationship, respectively, while a Spearman coefficient equal to zero indicates no association (Schober et al., 2018). The general null hypothesis for a Spearman correlation is the following:

H0: There is no association between the two variables tested.

Moreover, the level of statistical significance does not signal the strength of the relationship. Instead, the p-value indicates the probability that the strength of the correlation might occur by chance (Akoglu, 2018). Based on the summary of the

correlation coefficient interpretations created by Akoglu (2018) and considering this study is related to the psychology research area, the most used interpretations of the strength of the Spearman correlation coefficient are: 0 – Zero; ± 0.1 to ± 0.3 – Weak; ± 0.4 to ± 0.6 – Moderate; ± 0.7 to ± 0.9 – Strong; ± 1 – Perfect.

Results

Descriptive Statistics

The most frequent rating of statements measuring explicit attitudes of connectedness with nature was “Somewhat Agree”, followed by “Strongly Agree” (see Table G1 and Graph G1 in Appendix G). Additionally, in the 5-item likert scale ranging from “Strongly Disagree” to “Strongly Agree” the range of variability of responses in these variables was zero or one for 54.33% of participants, showing almost no variation in responses.

The option indicating the strongest level of agreement “Strongly Agree” was the most frequent among participants’ responses in the questions measuring environmental (see Table G2 and Graph G2 in Appendix G) and health attitudes (see Table G3 and Graph G3 in Appendix G) towards organic food. The vast majority of respondents had no variability in their level of agreement to the statements measuring environmental (64.42%) and health attitudes (60.58%).

By analyzing the responses to the questions that evaluated the perceived benefits of consuming organic food, most participants split their answers between “Somewhat Agree” and “Strongly Agree” (see Table G4 and Graph G4 in Appendix G for warm glow and Table G5 and Graph G5 in Appendix G for egoistic motive). 53.85% of respondents revealed no variability in their responses to warm glow statements, while 47.12% had a range of variability of responses to egoistic motive statements equal to zero.

Most respondents answered they buy organic food products “Most of the Time” (see Table G6 and Graph G6 in Appendix G). In particular, this was the most frequent option for vegetables, fruits, meat, and fish categories. The range of variability in responses to the items measuring the buying frequency of organic food was between zero and two for 70.19% of participants, which represents an overall low variation in most subjects’ answers.

The majority of participants chose the response option “Neither Others nor Myself” to answer to the explicit IAT counterpart questions, which measured the associations to the natural and built environments (see Table G7 and Graph G7 in Appendix G). Moreover, in the 7-item likert scale ranging from “Strongly Others” to “Strongly Myself”, most respondents showed almost no variation in their answers, with 65.38% revealing a range of variability equal to zero or one.

IAT D-scores were mostly positive, since 165 participants had a D-score greater than zero, while 43 respondents revealed a negative D-score (see Table G8 in Appendix G). This shows that most subjects were faster in the compatible blocks, so tend to implicitly associate the natural environment with themselves and the built environment with others.

The option “Organic food store” was chosen by 153 participants, while 53 opted for the conventional supermarket chain when reporting their type of store preference in the incentive question (see Table G9 in Appendix G). This means most respondents would prefer to have a monetary gift card to use in an organic food store if they were the winner, in comparison to have the same amount to spend in a conventional store.

Hypotheses Testing

The main correlational analysis of all hypotheses was based on both the explicit attitudes towards connectedness with nature, measured with the CNS scale with seven items, and implicit attitudes towards connectedness with nature, represented by the IAT D-scores. The results are summarized on Table 1.

Table 1

Hypotheses Testing - Correlation Matrix

	Environmental Attitudes Score	Health Attitudes Score	Warm Glow Score	Egoistic Motive Score	Buying Frequency Score
Explicit Attitudes	0.4575***	0.3603***	0.4778***	0.5378***	0.3799***
Implicit Attitudes	-0.0602	0.0582	0.0909	0.0393	0.0358

* p = .05, ** p = .01, *** p = .001

Explicit Attitudes

With the goal of testing Hypothesis 1a to discover if a higher explicit level of connectedness with nature is correlated with a higher level of environmental attitudes

towards organic food, the Spearman correlation coefficient was computed between the variable with explicit attitudes scores and the variable with the environmental attitudes score. There was a positive monotonic relationship between the variables, in what can be described as a moderate correlation ($r_s = 0.4575$). This result was statistically significant at the 0.1% significance level so there is evidence supporting H1a.

Similarly, to test Hypothesis 2a, a Spearman correlation analysis was computed between the variable with explicit attitudes score and the variable with the score representing the level of health attitudes towards organic food. There was a positive monotonic relationship between the variables, meaning that a higher explicit level of connectedness with nature is associated with a higher level of health attitudes towards organic food. The Spearman correlation coefficient was equal to 0.3603, signaling a weak but close to being considered a moderate correlation, and was considered statistically significant at the 0.1% significance level, therefore supporting H2a.

To test Hypothesis 3a, a Spearman correlation coefficient was computed between the variable with the score representing the explicit attitudes towards connectedness with nature and the variable with the warm glow score. There was a positive moderate correlation between the variables ($r_s = 0.4778$), being statistically significant at the 0.1% significance level, showing enough evidence to support H3a.

By analyzing the Spearman correlations computed between the variable with the score corresponding to the explicit level of connectedness with nature and the variable of egoistic motive score to test Hypothesis 4a, the result shows a positive moderate correlation coefficient ($r_s = 0.5378$), meaning there is a positive monotonic relationship between both variables. This value was statistically significant at the 0.1% significance level, therefore supporting H4a.

To test Hypothesis 5a, a Spearman correlation analysis was performed between the variable with the score representing the explicit attitudes towards connectedness with nature and the variable indicating the score of buying frequency of organic food including all product categories. There was a positive monotonic relationship between the variables, with the correlation coefficient showing a weak but close to moderate correlation ($r_s = 0.3799$), being statistically significant at the 0.1% significance level, thus H5a is supported.

Implicit Attitudes

To test Hypothesis 1b, a Spearman correlation analysis was performed between the variable with the IAT D-scores representing the implicit level of connectedness with nature and the variable with the environmental attitudes score. The Spearman correlation coefficient was negative, which could suggest a negative correlation between the variables. However, the value was very close to zero ($r_s = -0.0602$) and not statistically significant at the 5% significance level, indicating there is no evidence of an association between the level of connectedness with nature measured with implicit attitudes and the level of environmental attitudes towards organic food, not supporting H1b.

Then, the analysis was replicated for Hypothesis 2b using the variable with the IAT D-scores and the variable representing the health attitudes score. Although the correlation coefficient was positive, the value was close to zero ($r_s = 0.0582$) and not statistically significant at the 5% significance level. This indicates a zero correlation, meaning that no evidence was found proving an association between the implicit level of connectedness with nature and health attitudes towards organic food, so H2b is not supported.

The analysis using the IAT D-scores to test Hypothesis 3b proved there is no evidence of a correlation between implicit attitudes towards connectedness with nature and warm glow, since the correlation coefficient was close to zero ($r_s = 0.0909$) and was not statistically significant at the 5% significance level. Therefore, H3b is not supported.

The result using the implicit attitudes score variable and the variable with the egoistic motive score variable to test Hypothesis 4b was in line what was found in the previous hypotheses. The correlation coefficient was very close to zero ($r_s = 0.0393$) and not statistically significant at the 5% significance level, meaning we cannot prove that a correlation exists between both variables, so H4b cannot be supported.

The exact same analysis was performed to assess Hypothesis 5b using the variable with the IAT D-scores, which measure the implicit level of connectedness with nature, and the variable with the score measuring the buying frequency of organic food of all product categories. The correlation coefficient found was very close to zero ($r_s = 0.0358$), suggesting there is no evidence of an association between the variables. Additionally, the result was not statistically significant at the 5% significance level, not supporting H5b.

Additional Analysis

Explicit IAT Counterpart

An additional analysis was conducted with the explicit IAT counterpart variables, with the goal of comparing with the results found using the IAT to measure implicit attitudes of connectedness with nature, given the explicit IAT counterpart variables tried to mimic the relative nature of the IAT to measure implicit attitudes towards one attitude object in relation to another. Therefore, hypotheses H1b, H2b, H3b, H4b, and H5b were re-tested but this time using both explicit IAT counterpart variables – one measuring the association with the natural environment (“Explicit IAT Counterpart - Natural Environment”) and another measuring the association with the built environment (“Explicit IAT Counterpart - Built Environment”). The results can be found on Table 2.

Table 2

Explicit IAT Counterpart - Correlation Matrix

	Environmental Attitudes Score	Health Attitudes Score	Warm Glow Score	Egoistic Motive Score	Buying Frequency Score
Explicit IAT Counterpart - Natural Environment	0.1518*	0.0688	0.0558	0.1025	-0.0367
Explicit IAT Counterpart - Built Environment	0.0673	-0.0507	0.0268	0.0074	0.0220

* p = .05, ** p = .01, *** p = .001

Using the explicit IAT counterpart variable that measured the association with the natural environment and the variable with the environmental attitudes score, the Spearman’s correlation coefficient was positive ($r_s = 0.1518$) and statistically significant at the 5% significance level, suggesting a weak correlation between both variables. A similar result was found between the explicit IAT counterpart variable evaluating the association with the natural environment and the egoistic motive score variable, since the Spearman correlation coefficient was slightly above 0.1 ($r_s = 0.1025$). However, this value was not statistically significant at the 5% significance level. Although it could be indicative of some degree of association, both values are still weak correlations so no strong conclusion can be drawn from only these two values. All the other Spearman correlation coefficients using the variable of the explicit IAT counterpart indicating the association with the natural environment were very close to zero and not statistically significant, more specifically the correlation with the health attitudes score variable ($r_s =$

0.0688), warm glow score variable ($r_s = 0.0558$) and buying frequency of organic food score variable ($r_s = -0.0367$).

No evidence was found of a correlation between the explicit IAT counterpart variable assessing the association with the built environment and each of the other score variables related with organic food consumption, namely environmental and health attitudes, warm glow, egoistic motive and buying frequency of organic food. All correlation coefficients were very close to zero and not statistically significant at the 5% significance level (see Table 2).

Store Choice

Next, an additional analysis was conducted between the variable representing participants store choice and the score variables measuring the level of connectedness with nature (explicit and implicit attitudes) and the score variables related with organic food consumption (environmental and health attitudes, warm glow, egoistic motive and buying frequency of organic food). The correlation matrix is summarized on Table 3.

Table 3

Store Choice – Correlation Matrix

	Explicit Attitudes	Implicit Attitudes	Environmental Attitudes Score	Health Attitudes Score	Warm Glow Score	Egoistic Motive Score	Buying Frequency Score
Store Choice	0.2635***	-0.0950	0.1818**	0.3017***	0.2626***	0.4059***	0.3889***

* p = .05, ** p = .01, *** p = .001

By analyzing the results related with level of connectedness with nature, there is evidence of a positive correlation between store choice and the explicit attitudes towards connectedness with nature, since the Spearman correlation coefficient was positive ($r_s = 0.2635$), showing an overall weak correlation, being statistically significant at the 0.1% level. This can be interpreted as individuals who feel explicitly more connected with nature were more likely to choose organic food stores. However, the correlation coefficient between store choice and implicit attitudes score variable was very close to zero ($r_s = -0.0950$) and not statistically significant at the 5% significance level, which suggests there is no evidence of a correlation between the type of store participants prefer to spend the gift card and their implicit level of connectedness with nature.

The Spearman correlation analysis using the variables connected to organic food consumption showed an overall weak correlation between these variables and the store choice variable. More specifically, there was evidence of a positive association between

store choice and each of the following variables: environmental attitudes score ($r_s = 0.1818$), health attitudes score ($r_s = 0.3017$), warm glow score ($r_s = 0.2626$), egoistic motive score ($r_s = 0.4059$) and the buying frequency of organic food score ($r_s = 0.3889$). The referred correlation coefficients were all statistically significant at least at the 1% significance level. These results imply that participants who prefer the organic food store show higher levels of environmental and health attitudes towards organic food, higher levels of the perceived benefits of consuming organic food (i.e., warm glow and egoistic motive) and consume more regularly organic food.

Demographics

The last additional analysis was performed including the demographic categorical variables, namely age, education, and income. Table 4 presents the correlation matrix between the demographic variables and the variables measuring the level of connectedness with nature (explicit and implicit attitudes) and the score variables related with organic food consumption (environmental and health attitudes, warm glow, egoistic motive and buying frequency of organic food).

Table 4

Demographics – Correlation Matrix

	Explicit Attitudes	Implicit Attitudes	Environmental Attitudes Score	Health Attitudes Score	Warm Glow Score	Egoistic Motive Score	Buying Frequency Score
Age	0.3390***	-0.0437	0.0966	0.1402*	0.1493*	0.2836***	0.3645***
Education	0.0256	0.0400	0.0594	0.0174	-0.0739	-0.0274	-0.0580
Income	0.2858***	0.0924	0.0318	0.0994	0.1021	0.3359***	0.4541***

* $p = .05$, ** $p = .01$, *** $p = .001$

There was evidence of a positive weak correlation between age and explicit attitudes towards connectedness with nature ($r_s = 0.3390$), health attitudes ($r_s = 0.1402$), warm glow ($r_s = 0.1493$), egoistic motive ($r_s = 0.2836$), and buying frequency of organic food ($r_s = 0.3645$). These correlation coefficients were statistically significant at least at the 5% significance level. Therefore, it can be concluded that older subjects are more explicitly connected to nature and show a higher level of health attitudes towards organic food, a higher level of both warm glow and egoistic motive and consume organic food products more frequently. In contrast, there was no evidence of an association between age and both implicit attitudes towards connectedness with nature ($r_s = -0.0437$) and environmental attitudes towards organic food ($r_s = 0.0966$), with these correlation coefficients not being statistically significant at the 5% significance level.

Additionally, no evidence was found of correlation between the education demographic variable and the remaining variables, meaning that participants' level of education seems to not be associated with the level of connectedness with nature (both explicit and implicit), the consumer attitudes towards organic food (environmental and health attitudes), perceived benefits of consuming organic food (warm glow and egoistic motive) and the buying frequency of organic food.

The analysis using the variable income suggests a positive weak correlation between income and explicit attitudes towards connectedness with nature ($r_s = 0.2858$), egoistic motive ($r_s = 0.3359$), and buying frequency of organic food ($r_s = 0.4541$). These correlation coefficients were statistically significant at least at the 0.1% significance level, meaning that there is evidence of an association between a higher income level and a higher explicit level of connectedness with nature, higher level of egoistic motive, and higher buying frequency level of organic food. However, there was no evidence of a correlation between income and the following variables: implicit attitudes towards connectedness with nature ($r_s = 0.0924$), environmental attitudes score ($r_s = 0.0318$), health attitudes score ($r_s = 0.0994$) since these correlation coefficients are all close to zero and not statistically significant at the 5% significance level. The correlation coefficient between the income variable and warm glow score ($r_s = 0.1021$) could be considered a very weak correlation given it is slightly above 0.1 but it was also not statistically significant at the 5% significance level.

Correlation Between Connectedness with Nature Variables

Table 5 presents the correlation matrix between all variables measuring the level of connectedness with nature, in particular the explicit attitudes (score variable derived from the 7-item CNS scale), the implicit attitudes (variable with IAT D-scores), and the explicit IAT counterpart variables measuring the association with the natural and built environments. There was evidence of a weak correlation between the explicit attitudes score variable and the explicit IAT counterpart variable evaluating the association with the natural environment ($r_s = 0.2170$), being this correlation coefficient statistically significant at the 1% significance level. Additionally, both explicit IAT counterpart variables were positively correlated, showing a weak correlation with its Spearman correlation coefficient equal to 0.2542 and statistically significant at the 0.1% significance level. It is worth to mention the positive correlation between implicit attitudes and explicit IAT counterpart measuring the association with the natural

environment ($r_s = 0.1049$), although it reveals a very weak correlation slightly above 0.1. All the remaining correlation coefficients were very close to zero and not statistically significant at the 5% significance level, namely between explicit and implicit attitudes ($r_s = 0.0483$) and between the explicit IAT counterpart variable measuring the association with the built environment and both explicit attitudes ($r_s = -0.0397$) and implicit attitudes ($r_s = -0.0482$).

Table 5

Connectedness with Nature Variables – Correlation Matrix

	Explicit Attitudes	Implicit Attitudes	Explicit IAT Counterpart - Natural Environment	Explicit IAT Counterpart - Built Environment
Explicit Attitudes	1			
Implicit Attitudes	0.0483	1		
Explicit IAT Counterpart - Natural Environment	0.2170**	0.1049	1	
Explicit IAT Counterpart - Built Environment	-0.0397	-0.0482	0.2542***	1

* $p = .05$, ** $p = .01$, *** $p = .001$

Discussion

The main goal of this paper is to provide an overview of the relationship between an individual's level of connectedness with nature and both their consumer attitudes and buying frequency of organic food. It is important to distinguish the findings using the two different types of methods to measure connectedness with nature (explicit and implicit methods). In general, results using the explicit attitudes measures were in line with what was previously expected, while remaining inconclusive when using the IAT D-scores. Indeed, a higher explicit level of connectedness with nature was positively correlated with a higher level of environmental and health attitudes, a higher level of warm glow and egoistic motive and a higher buying frequency level of organic food. By contrast, no correlation was found between these same variables and a higher implicit level of connectedness with nature.

Examining first the results of explicit attitudes of connectedness with nature, the correlation coefficient with environmental attitudes (H1a) was higher than the one using the health attitudes of organic food (H2a), while being both positive. This can be

explained by the close relationship between connectedness with nature and pro-environmental attitudes and behaviors (Mayer & Frantz, 2004; Forster & Pereira, 2015; Barbaro & Pickett, 2016; Mackay & Schmitt, 2019; Ibáñez-Rueda et al., 2020). Individuals who feel connected with nature might feel a responsibility to protect the natural environment (Schultz, 2002), thus are more likely to show a higher level of environmental attitudes towards organic food since organic food consumption is considered an example of pro-environmental behavior by several researchers (Ibáñez-Rueda et al., 2020; Cahyasita et al., 2021; Yuan & Xiao, 2021). An interesting finding of this study is the positive association found between explicit attitudes of connectedness with nature and both warm glow (H3a) and egoistic motive (H4a). This confirms the strong influence of warm glow and egoistic motive on the consumer attitudes towards organic food previously found by (Cahyasita et al., 2021). Furthermore, this paper builds on the work by Cahyasita et al. (2021), by proving a positive relationship between the explicit level of connectedness with nature and both the perceived psychological benefits (warm glow) and the perceived health benefits (egoistic motive) of consuming organic food as a pro-environmental behavior. The last result related with the explicit attitudes was an overall positive correlation between this type of attitudes towards connectedness with nature and the buying frequency level of organic food. This means that individuals who feel more connected with nature, also tend to consume organic food products regularly. Krömker & Matthies (2014) found that regular organic consumers care more about the environmental consequences than occasional organic consumers. This suggests that those who consume organic food on a regular basis are more concerned with the natural environment, given the relationship between pro-environmental behaviors and environmental concern (Vining & Ebreo, 1992; Poortinga et al., 2004). Thus, being more likely to report a higher level of connectedness with nature (Forster & Pereira, 2015; Mackay & Schmitt, 2019).

Moving on to the results of implicit attitudes of connectedness with nature, there was no evidence of correlation between the IAT D-scores and all the other variables, in particular environmental and health attitudes towards organic food, warm glow and egoistic motive and the buying frequency level of organic food. Although surprising, these generally inconclusive results are not completely unexpected. Previous research has found smaller relationships between the nature IAT and pro-environmental behaviors (where organic food consumption can be included), compared to explicit measures

(Mackay & Schmitt, 2019). Nevertheless, there are other explanations related with the use of implicit measures and particularly, the nature IAT. One reason might be related with measurement issues of the IAT method. Indeed, previous studies have found the IAT test-retest reliability to be relatively low, especially among first-time users (Rezaei, 2011) since it was found that reliability of the IAT improved with the familiarity with the test. The origin of this vulnerability can be the use of reaction time in the IAT, as proposed by Rezaei (2011), so the reliability of the IAT may be more affected by the stability of participants in their reaction time than the stability in their implicit attitudes (Rezaei, 2011). An alternative explanation refers to the study conducted by Geng et al. (2015) which concluded that implicit connectedness with nature was positively associated with spontaneous but not with deliberate environmental behaviors. The authors used the College Students' Environmental Behaviors Questionnaire (CSEBQ; Kaiser et al., 2007), an explicit measure of environmental behaviors, where organic food purchasing is including as an item. Mateen et al. (2022) considers pro-environmental behaviors to be a reflection of individual's conscious efforts and attitudes towards protecting the environment, suggesting a deliberate way of acting, rather than an act of spontaneity. Therefore, I argue that consuming organic food is a deliberate environmental behavior, assuming it is part of the pro-environmental behaviors. So, according to Geng et al. (2015) only explicit and not implicit connections with nature predict deliberate environmental behaviors, thus providing evidence to explain the zero correlations found using implicit attitudes in this study. More researchers have proven this so-called double dissociation effect in other areas, meaning that explicit measures can only predict controlled behavior, while the IAT uniquely predicts spontaneous behavior (Asendorpf et al., 2002). However, one should be aware that in both referred studies (Asendorpf et al., 2002; Geng et al., 2015) they observed actual behavior, contrary to the current paper that measures organic food consumption through self-report measures, so the above explanation should be looked at with caution.

It is worth recalling the intrinsic nature of explicit and implicit attitudes to better understand the findings of the current paper. Greenwald & Banaji (1995) refers a possible disagreement between results from explicit attitudes methods and implicit attitudes measures, given the possible disparity between using a direct explicit measure of attitude and the evaluative content provided by an implicit measure. Moreover, one should remember that there was almost zero correlation between the explicit and implicit

attitudes towards connectedness with nature (see Table 5), so the 7-item CNS scale and the IAT D-score might have been not exactly capturing the same concept of connectedness with nature. The initial authors of the CNS scale refer that it is an affective measure, meaning that it was designed to assess an individual's affective experiential connectedness with nature (Mayer & Frantz, 2004). By contrast, the nature IAT used in the current study to measure implicit attitudes towards connectedness with nature can be understood as measuring a cognitive association. This is because it is derived from the self-esteem IAT, thus measuring the extent to which an individual associates the self with the natural environment (Schultz et al., 2004). And according to Schultz et al. (2004), if an individual has a cognitive association between the self and nature, it should be easier to complete the compatible trials (i.e., "Nature" + "Me", "Built" + "Not Me") in comparison to the incompatible blocks.

The additional analysis conducted using the explicit IAT counterpart variables proved to be overall inconclusive, which is in line with the almost zero or very weak correlations found between these variables and the implicit attitudes variable (IAT D-scores). There is the chance that explicit IAT counterpart questions and the IAT may not be measuring similar concepts given they are barely correlated, so the results found are not surprising. This is because the primary goal of including these questions in the study was to try to parallel the relative nature of the IAT method, which apparently was not effective. Furthermore, Nosek et al. (2007) included this measure in their paper to analyze social group attitudes (e.g., race, sexuality, disability), social group stereotypes (e.g., gender-career/family) and political attitudes. All these issues are highly controversial, in contrast to the topics addressed in the present study (e.g., connectedness with nature and organic food consumption) which do not trigger an immediate need to have a formed opinion, thus providing a reason as to why there was no relationship between the explicit IAT counterpart questions and the other variables. Lastly, the other two additional analyses using the store choice question and demographic variables led to some interesting findings. It was found that participants who feel more connected with nature are more likely to choose organic food stores as their preferred store to spend their monetary incentive. Moreover, individuals who prefer the organic food stores also show higher levels of environmental and health attitudes towards organic food, higher levels of the perceived benefits of consuming organic food (warm glow and egoistic motive) and consume more regularly organic food. The analysis of the demographic variables

concluded that older and higher-income subjects are more explicitly connected to nature, show a higher level of egoistic motive, and consume more organic food products.

Limitations

Addressing the limitations of the current paper, the use of an online survey as the method to collect data involves some disadvantages. It is not possible to describe the population to which the survey was distributed, since distribution through online channels does not allow us to know how many people in total had access to the questionnaire (Andrade, 2020). Additionally, participants may self-select into the sample, leading to an over-representation of a particular point of view, creating sampling bias (Ball, 2019; Andrade, 2020). The choice of non-probability sampling methods (e.g., convenience and snowball sampling) is also associated with increased the risk of sampling bias, meaning the conclusions made about the results are more limited (McCombes, 2019). Therefore, all these issues can limit the ability to generalize the findings, influencing the external validity of this study. Moreover, while the sample was adequate for power analysis, a greater sample size could have delivered more accurate results.

One could argue that the fact that the statistical analysis was all based on the same correlation technique – Spearman’s rank correlation coefficient (r_s) – might be a drawback. Although there has been some criticism related to the use of this method (Roberts & Kunst, 1990), r_s was found to behave approximately the same as Pearson’s product moment correlation coefficient, and even performed better in terms of variability and robustness to outliers (de Winter et al., 2016).

Recommendations for future research

Given the positive results found in this study regarding the explicit level of connectedness with nature and both warm glow and egoistic motive (both H3a and H4a were supported) and their altruistic and egoistic nature, respectively, further research should focus on the specific relationship between connectedness with nature and altruistic/egoistic consumption motives of organic food.

Additionally, it is evident that more research is required to study how implicit measures of connectedness with nature are associated with apparent related topics such as pro-environmental behaviors, in this case organic food consumption since the results of this study were not conclusive (H1b, H2b, H3b, H4b and H5b were not supported). It can be useful to see the outcome differences between a variety of field contexts (see

Schultz & Tabanico, 2007) or to examine more carefully the roots of the implicit connections with nature, given it is considered a primitive belief (Dunlap et al., 2000). Additionally, future researchers can study the correlation between the level of connectedness with nature and organic food consumption by evaluating the results of the nature IAT with other concepts associated with organic food consumption, such as values or ethics of consuming organic food. This seems promising given the association between the self-concept and consumers' values and moral ethics (Kavak et al., 2009), which could provide helpful insights to the existing literature.

Lastly, while the present study focused generally on the positive implications that a higher level of connectedness with nature has on individuals' attitudes and behaviors, Ibáñez-Rueda et al. (2020) claims that the loss of connectedness with nature might explain part of the degradation of the environment. Klanięcki et al. (2018) already proposed a framework to integrate nature as a 'treatment' intervention and future research could focus on seeing how reconnecting people to nature can help to reduce the impact of the environmental crisis we are living in, which can be of utmost importance to policy interventions.

Conclusion

This paper aimed to study the relationship between connectedness with nature and organic food consumption, which represents a novel contribution to the existing literature. The research question focused on how an individual's level of connectedness with nature is correlated with consumer attitudes towards organic food, perceived benefits of consuming organic food and buying frequency of organic food. Connectedness with nature was measured both through explicit and implicit methods, namely the CNS scale and the nature IAT, respectively.

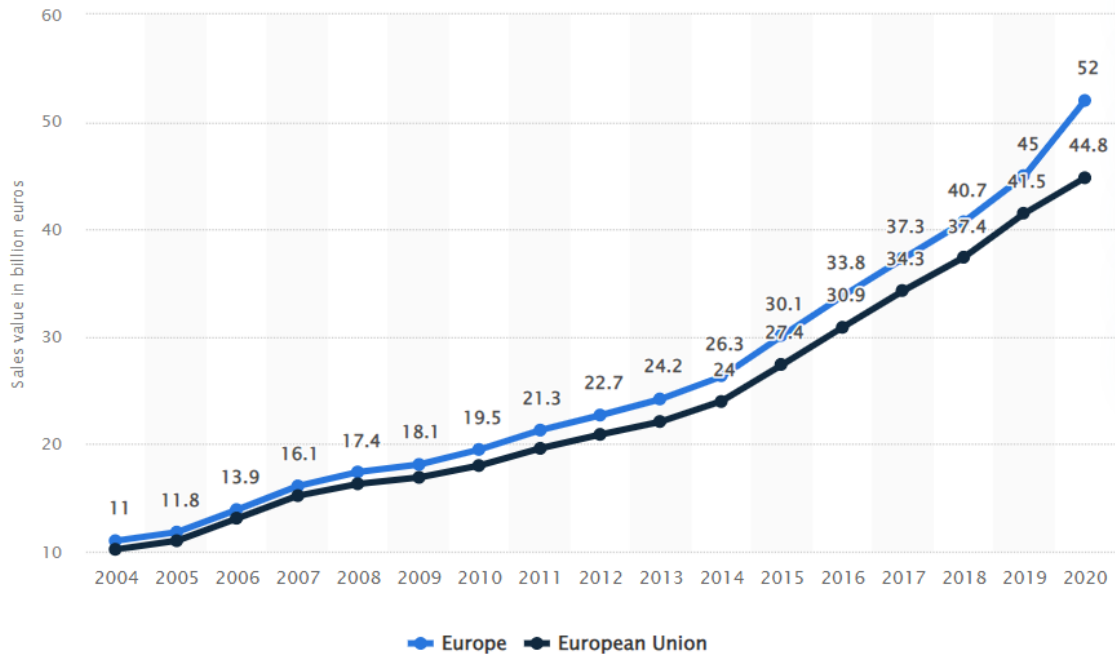
There was evidence of a positive correlation between explicit attitudes of connectedness with nature and all the constructs associated with organic food consumption. Indeed, a higher explicit level of connectedness with nature revealed to be positively associated with a higher level of environmental and health attitudes, a higher level of warm glow and egoistic motive, and a higher buying frequency level of organic food. Nonetheless, results of implicit attitudes of connectedness with nature were inconclusive, suggesting no association between a higher implicit level of connectedness

with nature and higher levels of consumer attitudes towards organic food, perceived benefits of consuming organic food and buying frequency of organic food. Thus, more research is required to evaluate if this discrepancy between results from explicit and implicit measures holds within other research contexts or with different measures of explicit and implicit attitudes towards connectedness with nature.

Overall, these findings confirm the previously studied existent relationship between connectedness with nature and pro-environmental behaviors but extend these results to a particular pro-environmental behavior – organic food consumption – providing a new avenue for research in this area. Both organic and non-organic food consumers may find this paper interesting since some might have never thought of how their level of connectedness with nature influences their shopping behavior. Additionally, results from this study can influence the work of organic food manufacturers, marketers of brands that sell organic food products, and government leaders that intend to promote pro-environmental behaviors as an approach to protect the environment.

Appendix A

Organic Retail Sales Value in the European Union and Europe from 2004 to 2020 (in billion euros)



Note. Since 2004, organic retail sales have been annually increasing and account for approximately 52 billion euros in Europe and 44.8 billion euros in the European Union in 2020. There was a gradual increase until 2013 and in the most recent years, there has been a steep acceleration growth in both regions. From *Organic retail sales value in the European Union and Europe from 2004 to 2020* [Graph], by Shahbandeh, M., 2022, Statista (<https://www.statista.com/statistics/541536/organic-retail-sales-value-european-union-europe-statistic/>).

Appendix B

Demographic Characteristics

Demographic Variable	N	%	
Age (Years Old)	18-25	82	39.42
	26-35	97	46.63
	36-45	15	7.21
	46-55	8	3.85
	>55	6	2.89
Gender	Female	112	53.85
	Male	94	45.19
	Other	2	0.96
Country	Germany	13	6.25
	Netherlands	30	14.42
	Portugal	39	18.75
	United States of America	81	38.94
	Other	45	21.64
Education	Some High School	1	0.48
	High School or equivalent	8	3.85
	Some college, but no degree	36	17.31
	Bachelor's Degree or equivalent	115	55.29
	Master's Degree or equivalent	46	22.12
Employment Status	PhD or higher	2	0.96
	Student	41	19.71
	Working Student (part-time or full-time)	23	11.06
	Employed part-time	17	8.17
	Employed full-time	116	55.77
	Self-employed	8	3.85
	Unemployed looking for work	2	0.96
Income	Retired	1	0.48
	Less or equal to €9 999	46	22.12
	€10 000 to €24 999	43	20.67
	€25 000 to €49 999	45	21.63
	€50 000 to €74 999	47	22.60
	€75 000 to €99 999	21	10.10
€100 000 or greater	6	2.88	

Appendix C

Information Sheet and Debriefing Sections

Information Sheet shown in the beginning of the survey

Dear participant,

Welcome to this experiment!

Thank you for taking the time to help me in the last step of my MSc in Behavioural Economics at the Erasmus University of Rotterdam. This is part of my final thesis and you will be asked about your relationship with nature and organic food.

There is a chance to win a 20€ gift card to spend on groceries from specific stores or supermarket chains, if you complete the full experiment.

Make sure you are in a PC/laptop, since some functionalities do not work on mobile phones.

Be aware that any information given here is completely anonymous and will be treated with confidentiality. Participants should be 18 years or older.

Your participation is voluntary and you may withdraw from the experiment at any point in time. It should take approximately between 8-10 minutes.

This experiment also contains SurveySwap and SurveyCircle codes.

Consent Question

If you have read the experiment conditions and agree to participate in this experiment, please indicate your consent below.

Option1: Yes, I consent to participate in this experiment.

Option 2: No, I do not consent to participate in this experiment.

Debriefing Section

You reach the end of the survey, well done!

I hope you found this experiment interesting. If you have any further questions let me know by sending an email to: 616370cp@student.eur.nl

I will announce the winner of the gift card lottery at the beginning of July.

The following codes give you credits that can be used to get free research participants at SurveySwap.io and SurveyCircle.

Go to: <https://surveyswap.io/sr/NZ8E-PHOW-FQI2>

Or, alternatively, enter the code manually: NZ8E-PHOW-FQI2

For SurveyCircle users (www.surveycircle.com): 7VNH-9S1V-72B3-BVM9

Have a nice day!

Constança Costa

Appendix D

Survey Blocks – Explicit Attitudes of Connectedness with Nature (CNS Scale) and Explicit IAT Counterpart

Short Introduction to the Explicit Attitudes Block

The next questions are about your relationship with nature, in contrast to built environments. To distinguish between the 2 environments consider the following elements:

Natural environment: Animals, Birds, Plants, Whales, Trees and Water.

Built environment: Building, Car, City, Factory, Street and Computer.

Each element is a mere example of something that is associated to each environment.

Be aware that some questions are more abstract than others. Please answer as truthfully as you can.

Instructions to the Connectedness to Nature Scale (CNS)

Please answer each of these questions in terms of the way you generally feel.

There are no right or wrong answers.

Table D1

7-item CNS scale

Statements	Strongly Disagree	Somewhat Disagree	Neither Agree or Disagree	Somewhat Agree	Strongly Agree
I think of the natural world as a community to which I belong.					
When I think of my life, I imagine myself to be part of a larger cyclical process of living.					
I often feel a kinship with animals and plants. (note: kinship = relationship)					
I feel as though I belong to the Earth as equally as it belongs to me.					
I often feel part of the web of life.					
I feel that all inhabitants of Earth, human and non-human, share a common "life force."					
Like a tree can be part of a forest, I feel embedded within the broader natural world.					

Table D2

Explicit IAT Counterpart Questions

Questions	Strongly Others	Moderately Others	Slightly Others	Neither Others nor Myself	Slightly Myself	Moderately Myself	Strongly Myself
How strongly do you associate the natural environment with yourself or others?							
How strongly do you associate the built environment with yourself or others?							

Appendix E

Survey Blocks – Implicit Association Test (IAT)

Short Introduction to the Implicit Attitudes Block (IAT)

This part of the experiment is an association task. You will be asked to associate some words and pronouns to 4 different categories: Nature, Built, Me and Not Me.

Please familiarize yourself with the following elements before starting the task:

Nature: Animals, Birds, Plants, Whales, Trees and Water.

Built: Building, Car, City, Factory, Street and Computer.

Me: I, Me, Mine, Myself, Self, My.

Not Me: It, Other, Their, Them, They, Theirs.

The task consists of 7 rounds. The categories will change between some rounds. The objective is to be as fast as you can with the smallest amount of mistakes. It should take up to 5 minutes.

Good luck!

Table E1

Categories and words used in the IAT

Categories			
Nature	Built	Me	Not Me
Animals	Building	I	It
Birds	Car	Me	Other
Plants	City	Mine	Their
Whales	Factory	Myself	Them
Trees	Street	Self	They
Water	Computer	My	Theirs

Table E2

Categories of each IAT Block

Blocks	Categories
Block 1	Nature–Built
Block 2	Me–Not me
Block 3	Nature/Me–Built/Not me
Block 4	Nature/Me–Built/Not me
Block 5	Built–Nature & Not me–M
Block 6	Built/Me–Nature/Not me
Block 7	Built/Me–Nature/Not me

Appendix F

Survey Blocks – Organic Food Consumption

Short Introduction including Organic Food Definition

The next questions are about your consumption habits and your beliefs about organic food.

Organic food products include the food produced and processed without the use of any chemicals such as pesticides or mineral fertilizers, not including genetically modified organisms and its process is free from irradiation, industrial solvents and other chemical food additives. In terms of animal production practices, it is mandatory that livestock producers do not use growth hormones, including antibiotics or any other growth stimulants.

Please consider the definition above when answering the next questions.

Table F1

Buying Frequency of Organic Food Question

How often do you buy the following products in organic quality?						
	I don't know / Not applicable (NA)	Never	Sometimes	About Half the Time	Most of the Time	Always
Vegetables						
Fruits						
Dairy products						
Meat						
Fish						
Staple foods (e.g. rice, potatoes)						
Sweets						

Short Introduction to the Environmental and Health Attitudes, Warm Glow, and Egoistic Motive Questions

Please answer each of these questions according to your motivations.

There are no right or wrong answers.

Table F2

Environmental and Health Attitudes Statements

Type of Attitudes	Statements	Strongly Disagree	Somewhat Disagree	Neither Agree or Disagree	Somewhat Agree	Strongly Agree
Environmental	I like organic food because it is processed without the use of chemicals.					
Environmental	I like organic food because it is environmentally friendly.					
Health	I like organic food because it is more nutritious.					
Health	I like organic food because it is healthier to consume.					

Table F3

Warm Glow and Egoistic Motive Statements

Type of Perceived Benefits	Statements	Strongly Disagree	Somewhat Disagree	Neither Agree or Disagree	Somewhat Agree	Strongly Agree
Warm Glow	Every time I consume organic food, I feel good about myself because I have protected the environment.					
Warm Glow	I am satisfied because I have contributed to the efficiency of natural resources by consuming organic food.					
Warm Glow	Consuming organic food makes me feel good because it contributes to the preservation of the quality of the Earth (soil, water, etc.).					
Egoistic Motive	I eat organic food to better maintain my health.					
Egoistic Motive	I eat organic food to provide my body with more nutrition.					
Egoistic Motive	I choose organic foods to obtain products that are safer to consume.					

Appendix G

Descriptive Statistics

Table G1

Frequency Distribution of Explicit Attitudes Statements

	I think of the natural world as a community to which I belong.	When I think of my life, I imagine myself to be part of a larger cyclical process of living.	I often feel a kinship with animals and plants. (note: kinship = relationship)	I feel as though I belong to the Earth as equally as it belongs to me.	I often feel part of the web of life.	I feel that all inhabitants of Earth, human and non-human, share a common "life force."	Like a tree can be part of a forest, I feel embedded within the broader natural world.
Strongly Disagree	1	2	3	4	2	0	1
Somewhat Disagree	15	7	11	11	6	12	11
Neither Agree or Disagree	25	31	34	46	45	41	27
Somewhat Agree	99	80	91	72	103	76	89
Strongly Agree	68	88	69	75	52	79	80

Graph G1

Bar Graph of Explicit Attitudes Statements

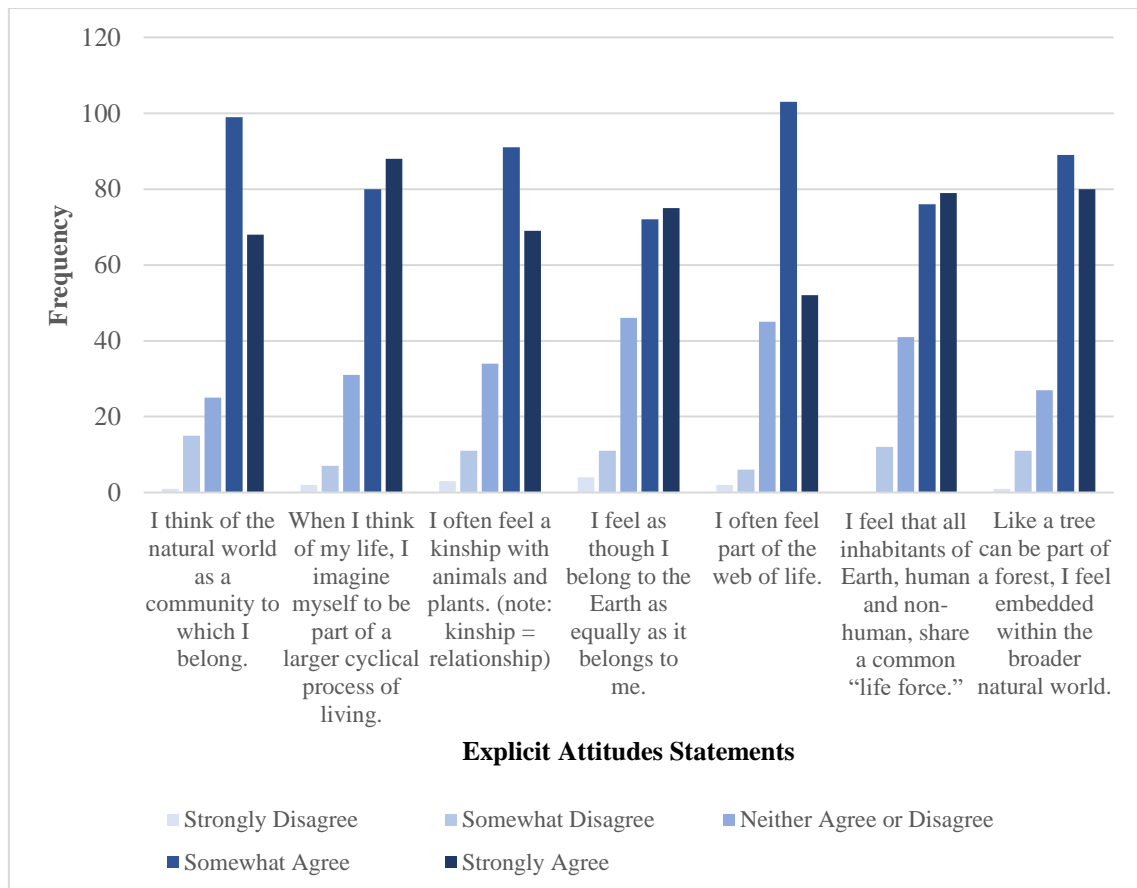


Table G2

Frequency Distribution of Environmental Attitudes Statements

	I like organic food because it is processed without the use of chemicals.	I like organic food because it is environmentally friendly.
Strongly Disagree	6	0
Somewhat Disagree	2	4
Neither Agree or Disagree	19	20
Somewhat Agree	86	86
Strongly Agree	95	98

Graph G2

Bar Graph of Environmental Attitudes Statements

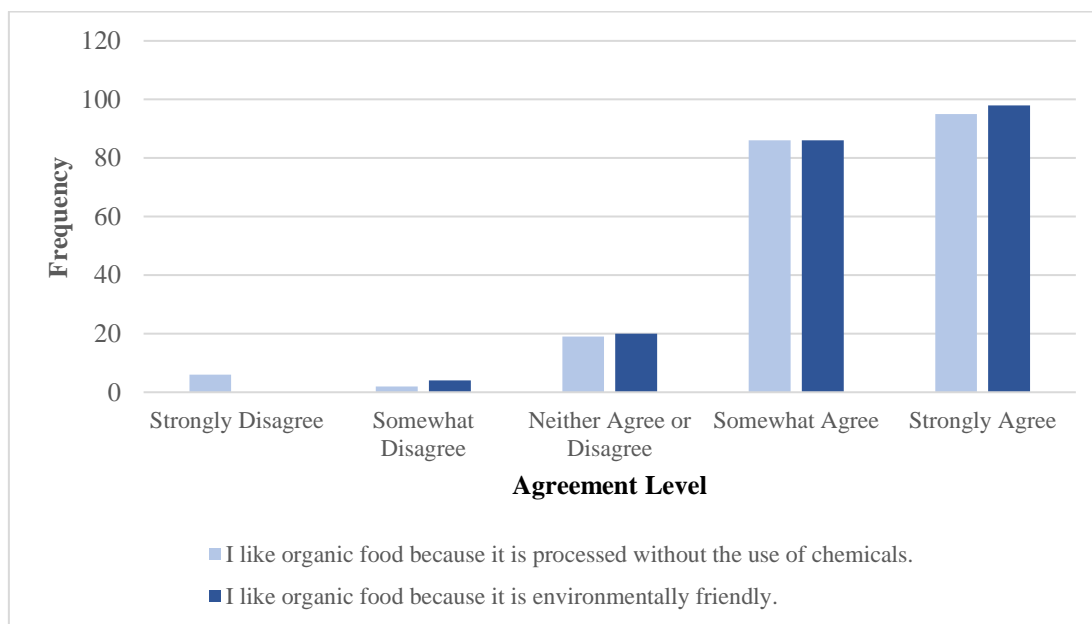


Table G3

Frequency Distribution of Health Attitudes Statements

	I like organic food because it is more nutritious.	I like organic food because it is healthier to consume.
Strongly Disagree	2	1
Somewhat Disagree	8	2
Neither Agree or Disagree	42	17
Somewhat Agree	76	56
Strongly Agree	80	132

Graph G3

Bar Graph of Health Attitudes Statements

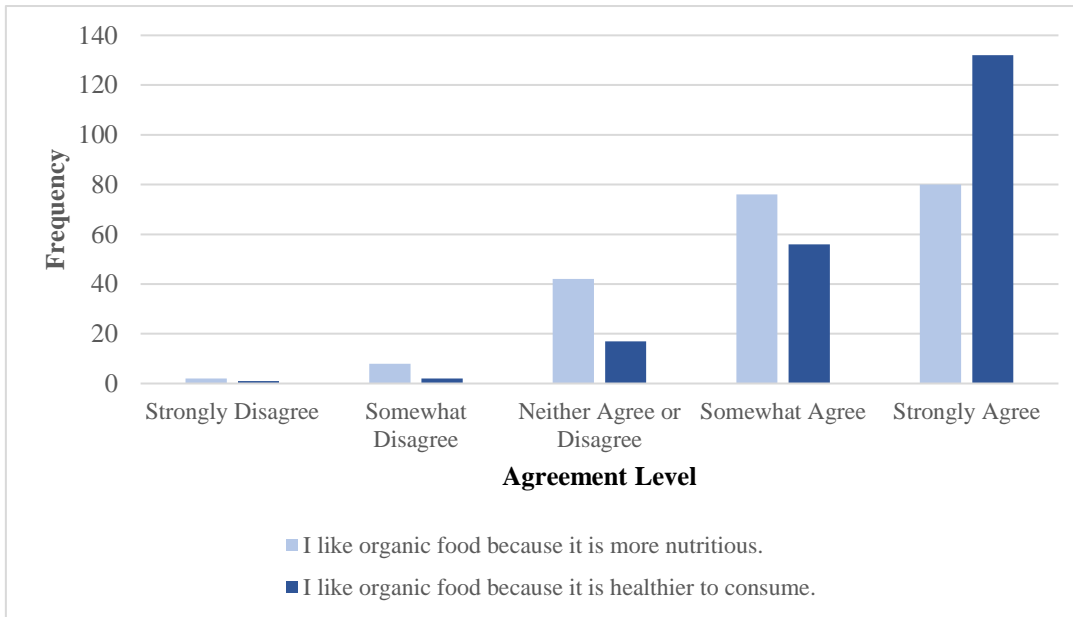


Table G4

Frequency Distribution of Warm Glow Statements

	Every time I consume organic food, I feel good about myself because I have protected the environment.	I am satisfied because I have contributed to the efficiency of natural resources by consuming organic food.	Consuming organic food makes me feel good because it contributes to the preservation of the quality of the Earth
Strongly Disagree	3	1	0
Somewhat Disagree	11	10	6
Neither Agree or Disagree	39	45	36
Somewhat Agree	95	81	83
Strongly Agree	60	71	83

Graph G4

Bar Graph of Warm Glow Statements

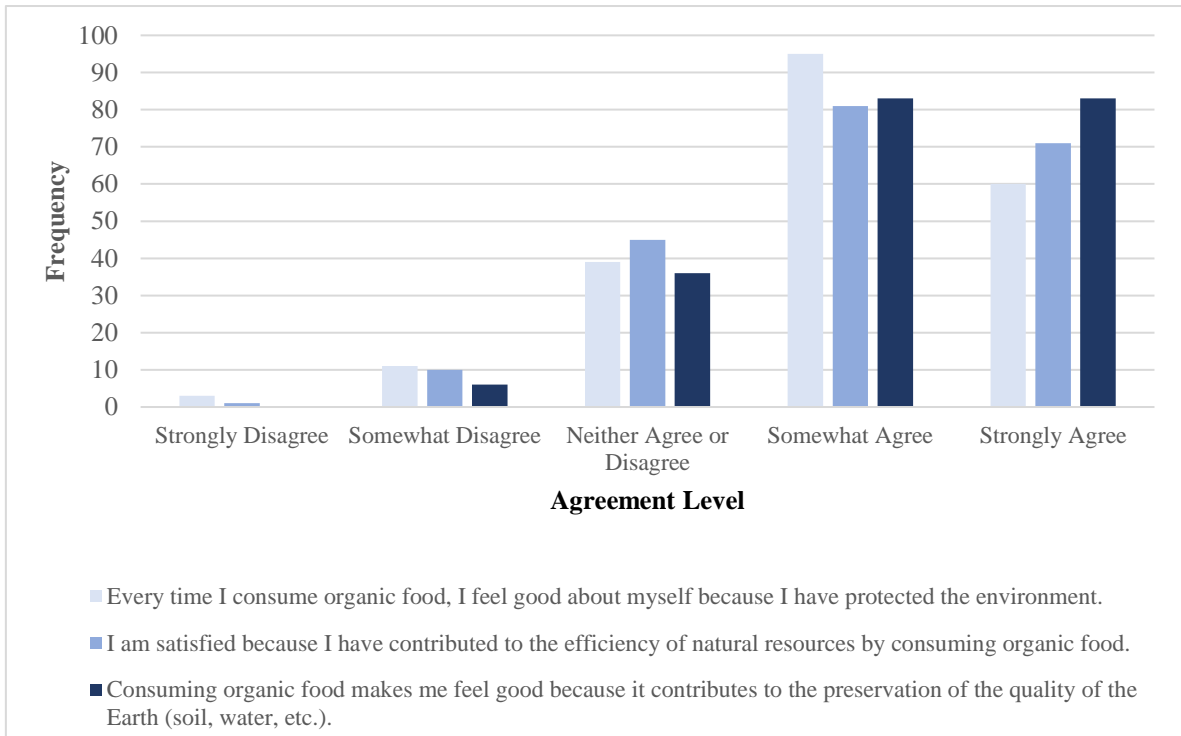


Table G5

Frequency Distribution of Egoistic Motive Statements

	I eat organic food to better maintain my health.	I eat organic food to provide my body with more nutrition.	I choose organic foods to obtain products that are safer to
Strongly Disagree	3	5	2
Somewhat Disagree	10	12	4
Neither Agree or Disagree	27	37	24
Somewhat Agree	68	76	78
Strongly Agree	100	78	100

Graph G5

Bar Graph of Egoistic Motive Statements

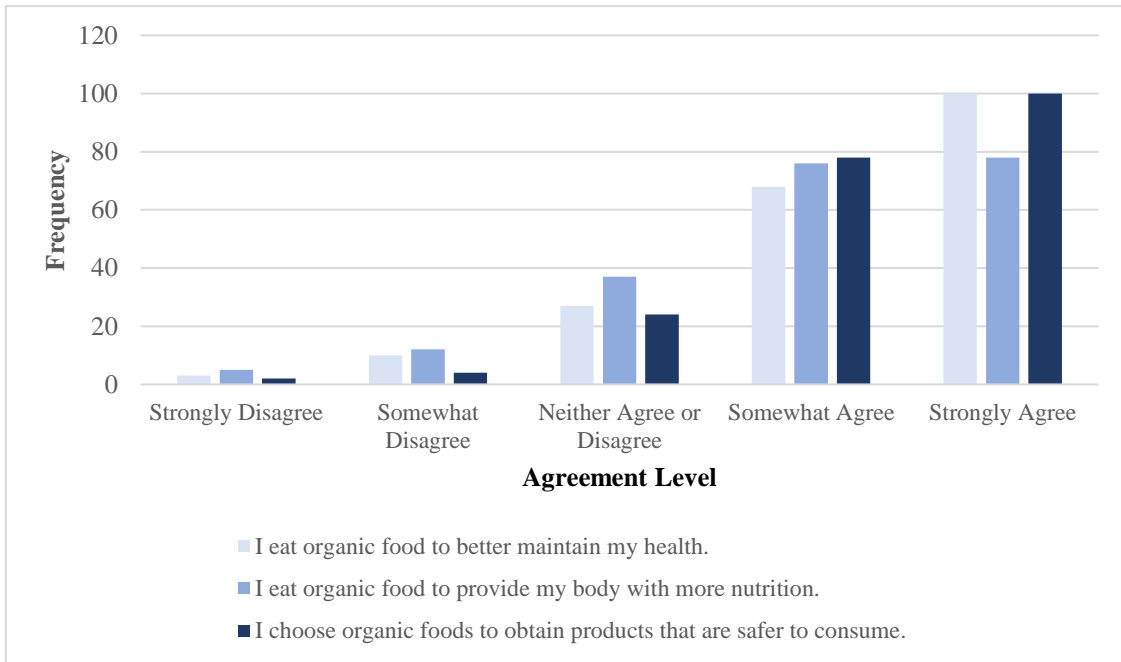


Table G6

Frequency Distribution of Buying Frequency of Organic Food Categories

	Buying Frequency of Organic Food						
	Vegetables	Fruits	Dairy	Meat	Fish	Staple	Sweets
Never	2	0	12	10	10	20	42
Sometimes	39	43	46	39	51	38	71
About Half the Time	38	43	53	43	55	37	33
Most of the Time	71	75	51	59	56	54	27
Always	57	47	38	41	28	58	26
I don't know / Not applicable (NA)	1	0	8	16	8	1	9

Graph G6

Bar Graph of Buying Frequency of Organic Food Products Categories

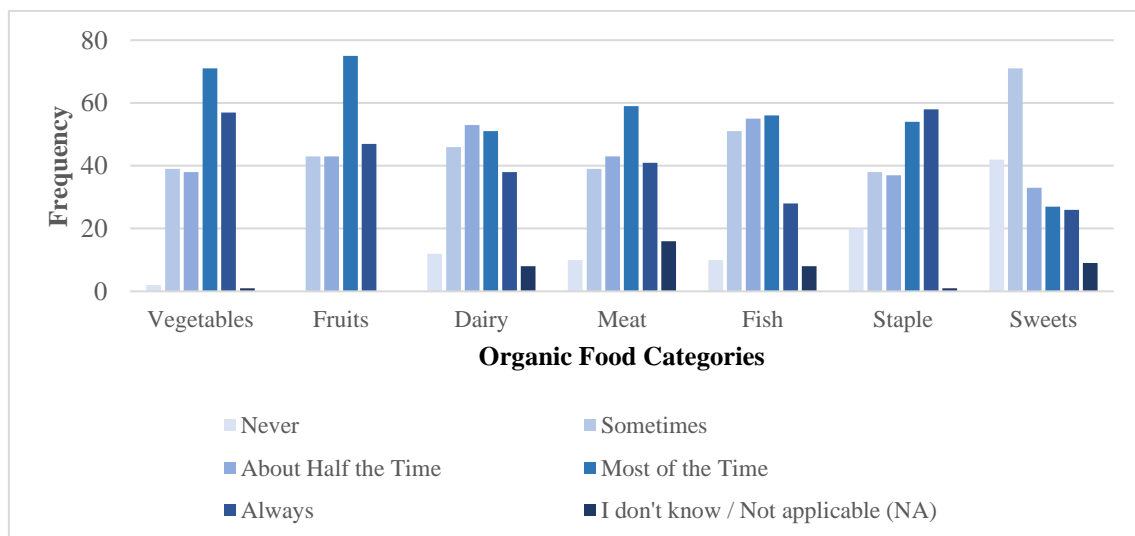


Table G7

Frequency Distribution of Explicit IAT Counterpart Questions

	Explicit IAT Counterpart - Natural Environment	Explicit IAT Counterpart - Built Environment
Strongly Others	7	9
Moderately Others	22	34
Slightly Others	34	39
Neither Others nor Myself	44	49
Slightly Myself	32	37
Moderately Myself	54	36
Strongly Myself	15	4

Graph G7

Bar Graph of Explicit IAT Counterpart Questions

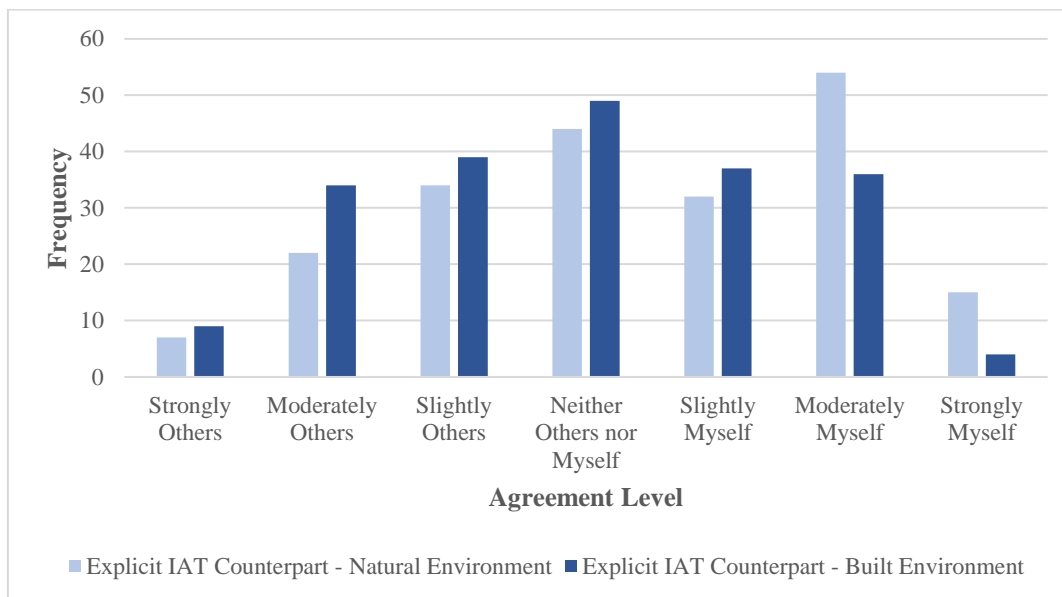


Table G8

Frequency Distribution of IAT D-scores

	N
Negative D-score	43
Positive D-score	165

Table G9

Frequency Distribution of Store Choice

	N
Conventional Supermarket Chain	55
Organic Food Store	153

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