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How neuromarketing can increase willingness to try **Analysis on Novel food market**

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Introduction

The demographic growth that has characterised the last two centuries has highlighted the need for new resources that we constantly need. However, these resources are often not sufficiently present, or their production has an important environmental impact for mass production to meet the entire global demand. From this need arises the search for alternative sources that can replace the previous ones, also succeeding in making significant improvements for the whole community.

Analysing the context more specifically, currently the intensive breeding of animals for the food sector represents one of the most significant sources of greenhouse gas pollution and also one of the activities that most erode natural resources such as drinking water, and for this reason over the years it has become increasingly evident that these activities also need more sustainable alternatives, both in terms of emissions and in terms of exploitation of resources.

Given the initial premise, the breeding and market of insects and derived products represents an opportunity, as it is an activity that needs scarce primary resources compared to traditional ones.

In Europe a form of legislation towards new foods was introduced in 1997 under the name and regulation of the so-called "Novel Food".

Since then the regulations on the subject have changed over the years both in Europe and other nations, given the need to update and fill the regulatory gaps that have emerged over the years. In light of these reasons, from 2015 onwards, in Europe, it is allowed to introduce insects or products derived from them into the market after a centralized approval procedure established to identify and quantify health risks through a scientific procedure. In Italy insects are considered Novel Food since 8 January 2018.

With reference to this background, the present study aims to test how the presence of an image on the packaging of a product based on insects, can influence the willingness to try the product.

For the experiment that will be described in detail below, images of a product processed with insects, in this case cricket flour, have been specially created.

The choice of the product was arbitrary and the realization of the product was preferred over products available on the market to avoid any form of alteration of judgment by respondents. In fact our primary objective was to understand whether or not the presence of insects on the packaging could have an effect on the willingness to try the product.

In the first chapter, recent literature was examined, paying particular attention towards previous research that helped to explain the reason why the hypothesis and theoretical model were built. At the end of this chapter a section called "what is new" was included to describe which elements of the theoretical model are considered new and different compared to previous research.

The second chapter describes the methods. In particular, sample characteristics, experimental conditions and procedures and how data were acquired.

In the third chapter, statistical analysis conducted is shown.

In the fourth chapter a consolidated discussion is presented considering the four hypotheses. Then managerial and neuromarketing implications are discussed, also taking into account limitations of the theoretical model and suggestions for further research.

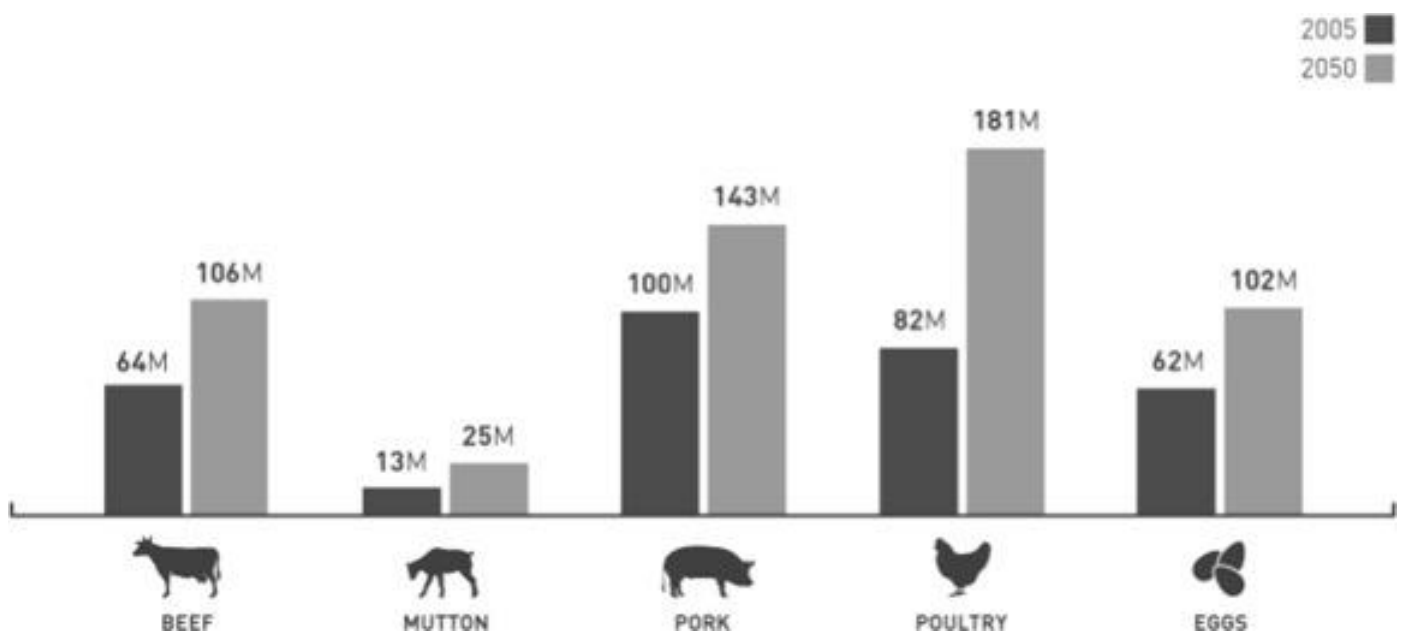
Chapter 1.

Literature Review

1.1 The edible insects market

Nowadays insects represent an interest in the global economy for two main reasons: they are a more sustainable source of food and also a new economic opportunity for nations and entrepreneurs.

The edible insect market represents, with over 2000 edible species¹, a more sustainable source of food because evidence shows that this sector produces 75 per cent less carbon and uses half as much water as poultry farms². Searching for new ways to produce protein base food and now also potential food to introduce in peoples' diets has become a necessity, if we take in to account that in the coming years the demand for meat products is expected to increase from current levels by more than 75% in 2050 due to population growth and rising incomes. The per capita increase will be larger in developing countries (from 28 kg in 2005/2007 to 42 kg in 2050) than in developed countries (from 80 to 91 kg)³.



(Fig.1) Trends in global demand for meat (in tons) - predictions for 2050.

Source: FAO estimates. ESA Working paper N. 12-03.

There are different questions that these data are bringing to light, but it is clear that a reform is needed in the sustainability model we are using. For instance, it is evident that a problem of the traditional model is the need for land to be able to start new intensive production that will gradually be taken away from agriculture given

¹ Åsa Berggren, Anna Jansson, and Matthew Low. Approaching Ecological Sustainability in the Emerging Insects-as-Food Industry. *Trends in Ecology & Evolution*, February 2019, Vol. 34, No. 2

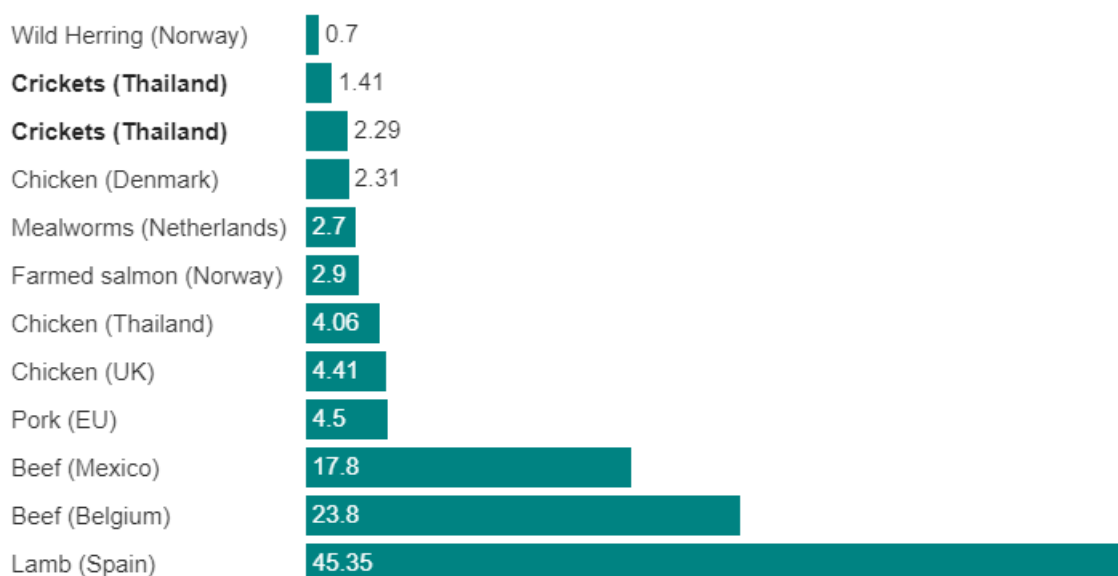
² Kristian Sjøgren. How much more environmentally friendly is it to eat insects?. *Science Nordic* May 2017

³ Arnold van Huis¹ & Dennis G. A. B. Oonincx¹. The environmental sustainability of insects as food and feed. A review. *Agron. Sustain. Dev.* (2017) 37: 43

the higher profit margin, thus generating more and more problems. Therefore the introduction of these forms of nutrients where they do not represent tradition can lead to a change and an improvement in the quality of life on our planet.

The introduction of edible insect market represents a solution also in terms of quantity of land used, in fact the production of 1 kg of beef requires about 50 times more land than the production of 1 kg of vegetables, while greenhouse gas emissions are about 100 times higher, all depending on the production system used.

Kilograms CO2 equivalent



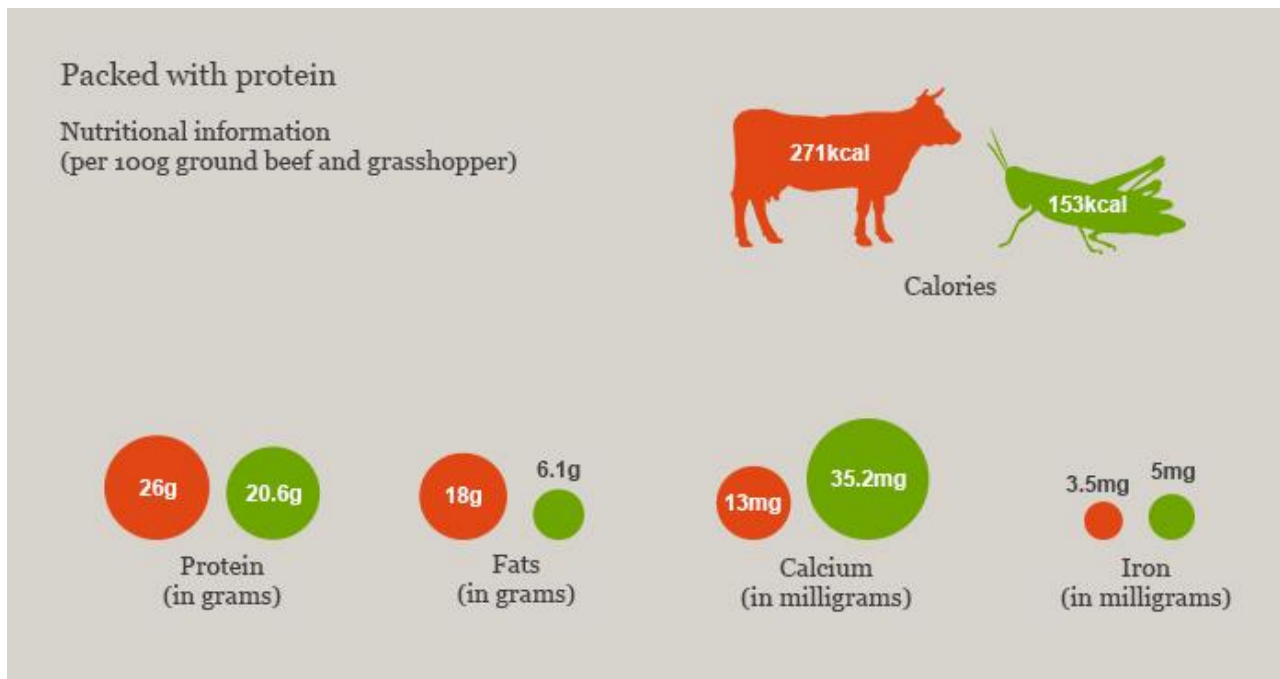
(Fig.2) Global warming potential of selected animal source foods
Source: Afton Halloran, University of Copenhagen, Denmark

As mentioned earlier this opportunity offers advantages in terms of carbon dioxide emissions produced, the amount of water used for production and the space needed for production compared to traditional models, thus enabling us to stem the problem of biodiversity loss, the preservation of green spaces and the degradation of soil and water.

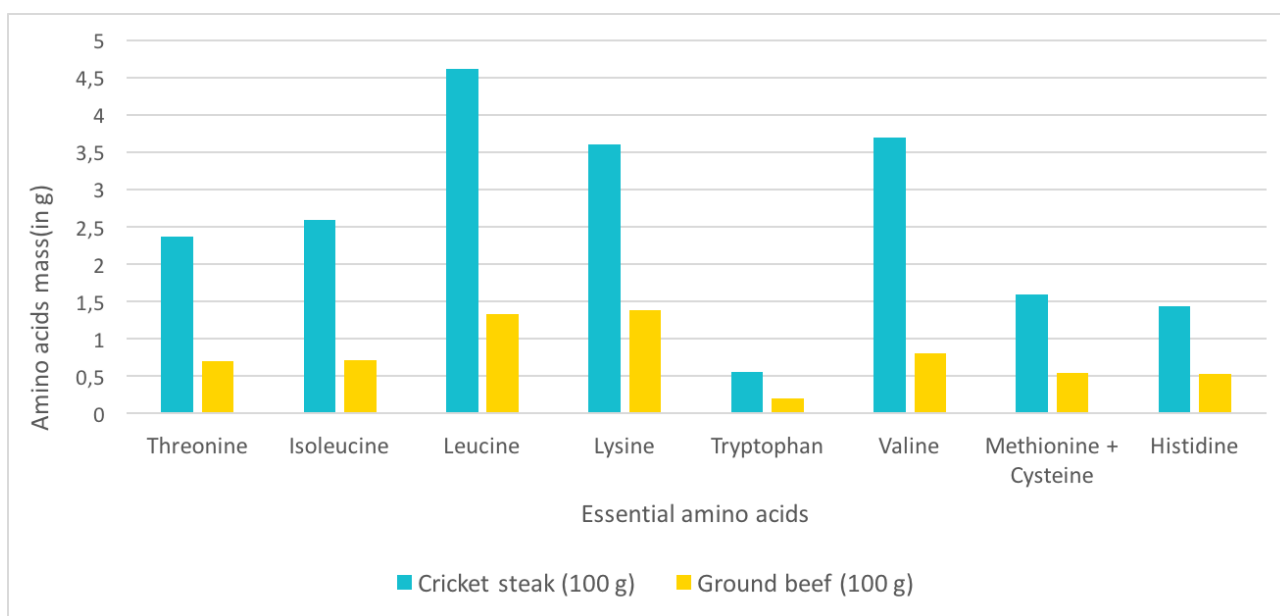
The interesting fact, however, is that the production of some insect species⁴ can be carried on by being fed with the waste products of agricultural production to animals such as rice leaves. These data are particularly interesting because it represents the transformation of a product with a low nutritional content into a high protein source through the use of abundant resources and at zero cost, reducing the impact not only of traditional livestock farming, but potentially also of activities close to it such as agriculture.

It is also important to point out that the introduction of this product does not lead to a loss in the nutritional quality of what is served on our tables, as it is characterized by a high protein content, calcium and oligo elements.

⁴ Food wastage footprint. FAO 2013



(Fig.3) Nutritional information (per 100g ground beef and grasshopper) Source: www.dw.com



(Fig.4) Essential acids in cricket and beef. Source: www.quora.com

The introduction of edible species does not necessarily have to represent a change in the diet for humans, they can be valid substitutes in other markets, such as animal feed as fish⁵.

From an economic point of view, the production of insects for food purposes represents an opportunity for Western countries. If on the one hand globalization and the opening up of frontiers allow consumers to take this type of product into consideration, on the other hand it represents a market with great growth potential in which one can invest for the creation of new jobs and new prospects.

⁵ Ragnar L. Olsen, Mohammad R. Hasan. *A limited supply of fish meal: Impact on future increases in global aquaculture production.* Trends in Food Science & Technology 27 (2012) 120e128

By 2022 this market could reach the threshold of one billion dollars and 3% of total feed market.⁶

In Europe, the possibility of investing in this market was officially granted in 2018 with the introduction of the new regulation on Novel Foods in which these forms of breeding and production are regulated for the protection of consumers, although in Switzerland and earlier still in Belgian markets it has been available for certain species or products since 2017.

With the new regulation of January 2018, however, this is now allowed in the entire continent and the French government has earmarked one billion euros for a food development program of smart proteins such as microalgae and edible insects and aims to become a world market leader by 2030, creating thousands of jobs and developing production of new proteins for human nutrition through the Nouvelle France Industrielle platform

⁶ Arcluster. Insect Feed Market Report. 2020

1.2 Theoretical Framework

1.2.1 Independent and dependent variable

The product packaging design plays a very important role in branding an item in the retail environment. One thing that should be noted is that the 'catchier' the design is, the more audiences it will attract. Good packaging will also enable companies to differentiate the products from their competitors.

Lots of the top branded items use a kind of packaging known as innovative packaging design for their brands.

It is essential to know the appropriate characteristics of an effective and successful design, to create a product packaging that will build a brand image that stands out from the competition.

Successful packaging design should include:

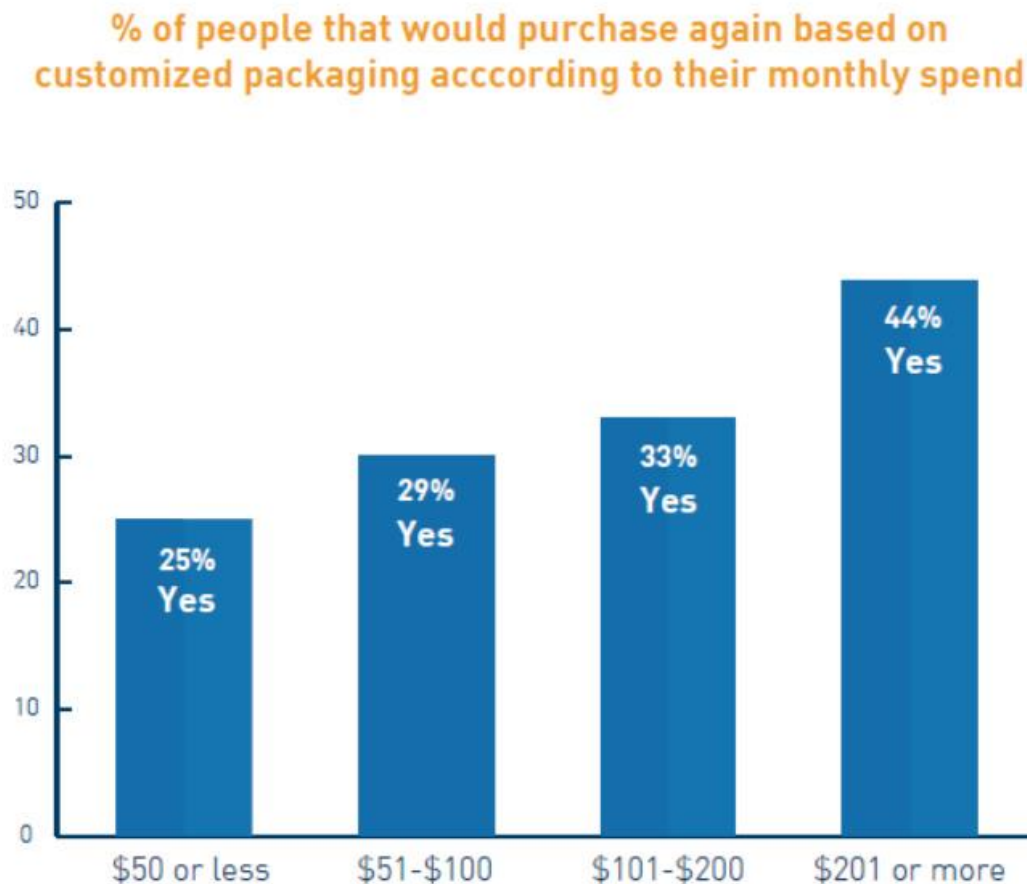
- Always give the public a reason why they would choose a specific brand over others. "Why-to-purchase statement" allows companies to attract customers to brands in a clear and simple way. This "Why-to-purchase statement" tells them what the brand actually does. Basically, this "why-to-purchase statement" should be written in large and bold print. It is important that this "why buy" be put on the front of the pack.
- It is important to highlight the brand's product promise statement at the top of the packaging. The statement should be informative and simple, so that customers can read all the features of the item and how they can benefit from it.
- The design of the packaging should immediately capture the public's attention. Always remember that this is the public's good experience with the brand. Therefore, the structural design should create a "never forget" introduction.
- The graphic design of the product packaging should match the structural packaging. If this does not happen, the potential audience will lose interest in the brand.

Research has shown that there is clearly a strong association regarding the influence of packaging on the purchasing decision, with more than 73% of surveyed consumers saying they rely on packaging to help their decision making at the time of purchase⁷.

This is even more important in an extremely competitive market such as the food market where a good market

⁷ L.E. Wells, H. Farley, G.A. Armstrong. *The importance of packaging design for own-label food brands*
International Journal of Retail & Distribution Management

strategy is fundamental to success and survival compared to competitors⁸.



(Fig.5) Source: Here's How Packaging Design Can Increase Your Sales. August 12, 2020, by Tina Lombardo

In the competitive world of food retailing, packaging has to work harder than ever if the product is to be noticed through the congestion of competitive products⁹, surprisingly few food retailers appreciate the power of packaging as a piece of direct communication.¹⁰

The existing literature demonstrated that packaging is able to create more positive consumer responses increasing impacts on the consumer's WTT.¹¹

Taking into account this background, the presence of insect or non-presence of insect can be considered the independent variable of the theoretical framework, while WTT can be studied as a variable that is expected to be

⁸ Stewart-Knox, B. and Mitchell, P. (2003), "What separates the winners from the losers in new food product development?", *Trends in Food Science & Food Technology*, Vol. 14 Nos 1/2, pp. 58-63.

⁹ Milton, H. *Packaging Design*. Bourne Press Ltd, Bournemouth. 1991

¹⁰ Pieters, R. and Warlop, L. (1999), "Visual attention during brand choice: the impact of time pressure and task motivation", *International Journal of Research in Marketing*, Vol. 16 No. 1, pp. 1-16.

¹¹ Qing Chen, Sven Anders and Henry An. *Measuring consumer resistance to a new food technology: A choice experiment in meat packaging*. *Food Quality and Preference*. Volume 28, Issue 2, June 2013, Pages 419-428

dependent on the manipulation of the independent variable.



(fig.6) H1(Own Model)

H1: The package with image has a negative effect on willingness to try

1.2.2 Mediator

Closely linked to the theme of Novel food is the consumer response to these new products.

Given the importance of investments for the introduction of these products in markets such as the Western ones that, both culturally and historically, are not inclined to use them, it is important to understand how a consumer can interface with them.

Disgust plays an important role in our everyday lives. For instance, disgust can influence eating behaviour¹², hand washing¹³ and have an impact on food waste production.¹⁴

The function of disgust as a promoter of pathogen prevention in the food sector had previously been questioned and understood¹⁵. Evidence has suggested that a disgust reaction is one such highly functional system that aims to reduce the contact with and thus the likelihood of infection from parasites, bacteria or other pathogens developed by humans during the evolutionary process as a detection-system in the processes of natural selection. In fact disgust represents a regulating human emotion whose function is linked to the behavioural immune system because it cognitively triggers preventive behaviour to avoid health threats¹⁶. In addition to the behavioural component, disgust is characterised by specific physiological reactions and a characteristic facial expression. Food disgust, at the centre of research, is represented by the rejection of food aimed at preventing the ingestion of potentially harmful substances and/or loaded with pathogenic agents. In particular bitter tastes are a stimulus for an innate rejection by the taste, which leads to not ingesting what is considered unpleasant and potentially toxic¹⁷. Disgust is triggered by signals indicating the presence of danger and the presence of pathogens. Such triggers involve all the senses and which are detectable in some odours (e.g. rotten food smell), visual signals (e.g. mould), tactile signals (e.g. slime) and auditory input¹⁸. The factors that cause disgust can be not only culturally specific, but also the same in all cultures¹⁹. Some elicitors are directly related to the presence of pathogens, while others do not

¹² Eickmeier, K., Hoffmann, L., Banse, R. *The 5-factor disgust scale*. European Journal of Psychological Assessment Pages 1-11

¹³ Robert Pellegrino, Philip G.Crandall Han-Seok Seo. *Hand washing and disgust response to handling different food stimuli between two different cultures*. Food Research International Volume 76, Part 2, October 2015, Pages 301-308

¹⁴ Aisha Egolf, Michael Siegrist Christina Hartmann. *How people's food disgust sensitivity shapes their eating and food behaviour*. Appetite Volume 127, 1 August 2018, Pages 28-36

¹⁵ Christina Hartmann, Michael Siegrist. Development and validation of the Food Disgust Scale. ETH Zurich, Department Health Science and Technology (D-HEST), Consumer Behavior, Switzerland

¹⁶ John A. Terrizzi, Jr. aNatalie, J. ShookaMichael and A. McDaniel. *The behavioral immune system and social conservatism: a meta-analysis*. Evolution and Human Behavior Volume 34, Issue 2, March 2013, Pages 99-108

¹⁷ Hanah A. Chapman Adam K. Anderson. *Understanding disgust*. Volume 1251, Issue 1 The Year in Cognitive Neuroscience March 2012 Pages 62-76

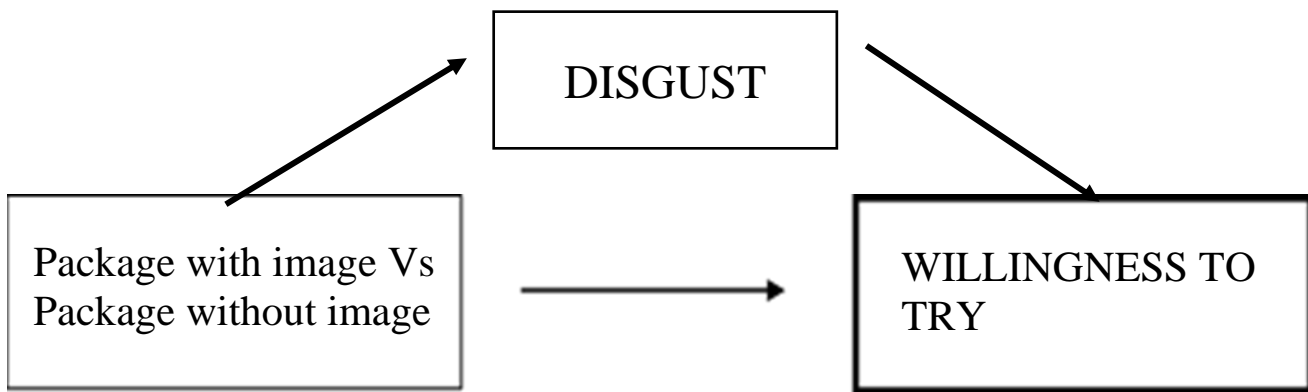
¹⁸ Valerie Curtis, Adam Biran. *Dirt, Disgust, and Disease: Is Hygiene in Our Genes?*. Johns Hopkins University Press Volume 44, Number 1, Winter 2001 pp. 17-31

¹⁹ Tybur, J. M., Lieberman, D., Kurzban, R., & DeScioli, P. (2013). *Disgust: Evolved function and structure*. Psychological Review, 120(1), 65–84

directly pose a health threat.

In food research, it is important take into account the moral domain when it comes to either the acceptance of new food technologies²⁰ or differentiation between appropriate and inappropriate animal based food products. Most Western people would find it disgusting to eat animals that in their culture represent pets (in terms of morally unacceptable and offensive), whereas in non-Western cultures they can be considered traditional food. Food-related moral disgust is especially relevant with regard to culturally determined food appropriateness, though there is presumably a low level of variation between individuals from the general population within a cultural region. Therefore, the moral domain of disgust was not considered in the present research.

So, we can consider disgust as a mediator in the relation between Insect image vs Insect no image and WTT.



(Fig.7) H2 (Own Model)

H2: The relation between Package with image Vs Package without image and willingness to try is mediating by disgust.

²⁰ Sydney E. Scott, Yoel Inbar, Paul Rozin Evidence for Absolute Moral Opposition to Genetically Modified Food in the United States. *Perspective on Psychological science* 11(3) 315-324

1.2.3 Moderator

As already mentioned, introducing novel foods to accompany traditional protein sources represents a turning point in terms of environmental pollution and over-exploitation of natural resources.

Starting from the assumption that environmental attitudes and behaviour are linked to people's values²¹ and the value scales of Rokeach (1973) and Schwartz (1994) have been successfully used for explaining general environmental concern (Schultz & Zelezny, 1999) as well as more specific environmental attitudes and beliefs (Stern & Dietz, 1994; Stern, Dietz, & Guagnano, 1995). Karp (1996) demonstrated that Schwarz's values were significantly correlated to various self-reported behaviours, such as recycling behaviour, consumer behaviour, and political behaviour to protect the environment²², also achieving significant results such as the 23% decrease in the EU between 1990 and 2016²³.

For this reason policy makers are interested in cost-effective and socially acceptable ways of encouraging the public to adopt more environmentally-friendly lifestyles and the focus on 'catalyst behaviour', the notion that taking up a new behaviour (such as recycling) may cause people to adopt other pro-environmental behaviours²⁴. In this way different nations these years established an ambitious target in terms of reduction in greenhouse gas emissions²⁵.

Environmental concern signals how environmentally knowledgeable and willing consumers are to engage with sustainability through their consumption choices²⁶. It is considered to offer major insight into why consumers consume (un)sustainably; however, research causality can be weak²⁷, requiring further investigation. Combined, given their potential behavioural impacts, the interconnections between them are of considerable interest; yet there is very little research exploring this.

For this reason it can be an interesting starting point to analyse whether the environmental concern that has grown over the years due to the environmental situation that involves our country can influence the propensity to try this

²¹ Dunlap, R. E., Grieneeks, J. K., & Rokeach, M. (1983). Human values and pro-environmental behavior. In W.D. Conn (Ed.), *Energy and material resources: Attitudes, values, and public policy*. Boulder, CO, 1983. pp. 145-168

²² Wouter Poortinga, Linda Steg, Charles Vlek. *Values, Environmental Concern, and Environmental Behavior: A Study into Household Energy Use*. Volume: 36 issue: 1, page(s): 70-93

²³ SWD(2017) - relazione "Due anni dopo Parigi - Progressi nella realizzazione degli impegni dell'UE in materia di clima". https://ec.europa.eu/clima/policies/strategies/progress_it

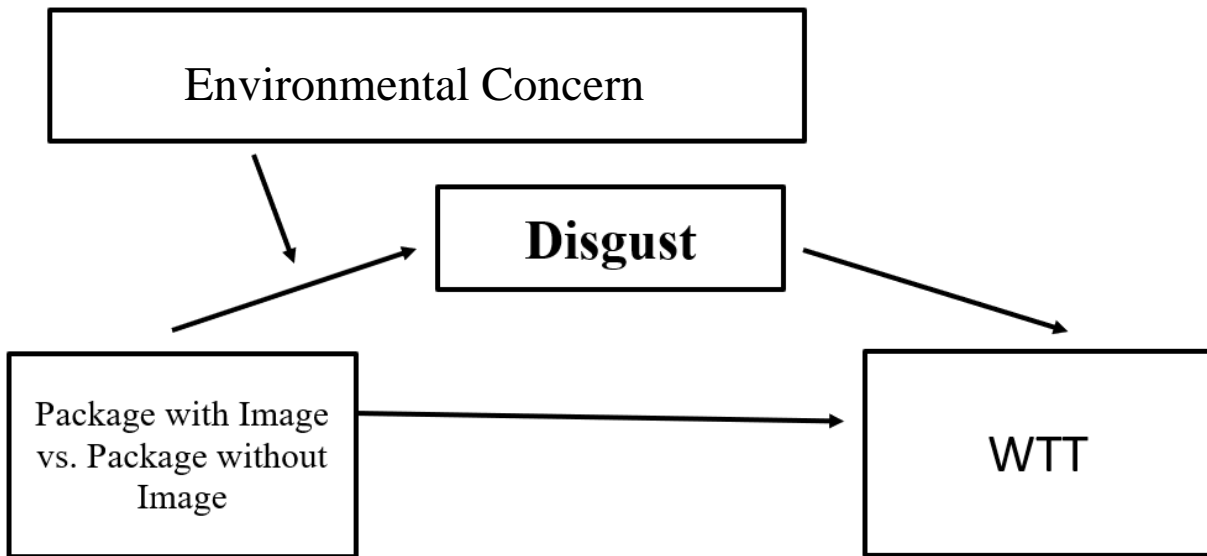
²⁴ Lorraine Whitmarsh & Saffron O'Neill. *Green identity, green living? The role of pro-environmental self-identity in determining consistency across diverse pro-environmental behaviours*. 2010 *Journal of Environmental Psychology* 30(3):305-314

²⁵ Corinne Le Quéré et al. *Drivers of declining CO2 emissions in 18 developed economies*. 2019 *Nature Climate Change* 9(3):213-217

²⁶ Dermody, Janine and Hanmer-Lloyd, Stuart and Koenig-Lewis, Nicole and Zhao, Anita Lifen (2015). *Advancing sustainable consumption in the UK and China: the mediating effect of proenvironmental self-identity*. *Journal of Marketing Management*, 31 (13-14), 1472-1502

²⁷ Thøgersen, J. (2000). *Knowledge barriers to sustainable consumption*. In P. F. Bone (Ed.), *Marketing and Public Policy Conference Proceedings 2000*. Chicago: AMA

type of product because there are different research programmes related to environmental concern and willingness to try, but never in correlation with food.



(Fig.8) H3a, H3b (Own Model)

H3a: The relation between Package with image Vs Package without image and wiliness to try is moderated by Environmental concern.

H3b: The relation between disgust and willingness to try is moderated by environmental concern.

1.3 What is new

A literature review allowed building the theoretical model, as shown on the previous page.

The main novelty of the model presented is the use of the environmental concern variable as moderator, and disgust as a mediating variable in relation to willingness to try. Previous research had already dealt with this type of variable without ever putting them together in the same study and consequently seeking a plausible relationship which is not at all taken for granted given the data collected so far and previously presented.

Poortiga et al (2004) for example have worked in this sense in research of the environmental concern in domestic energy consumption.

Shultz (2014) highlighted the characteristics and structure of the environmental concern by talking about the values that distinguish it and how to distinguish between egoistic, altruistic, and biospheric environmental concerns²⁸. Here the behaviour of people is analysed from a different perspective from the policy maker's aims, but the study in this respect, more directed towards human behaviour, is not focused on the theme of novel food in any way.

M. Siegrist et al (2018) similarly investigated a topic with similar potential and theme. In fact, even cultivated meat is part of novel foods and their purpose in the search for consumer acceptance of the product²⁹ can be combined with the willingness to try. This research highlights the environmental potential of this new market, and analyses the disgust evoked by this product in relation to its naturalness perceived by consumers and therefore the results with respect to market acceptance of this product.

Martins et al (1997) studied the relationship between disgust towards novel food and willingness to taste³⁰ and highlighted interesting evidence such as the fact that participants were more willing to reject novel foods of animal origin than those of non-animal origin, but did not treat insects in any way and made no reference to disgust as a mediator or environmental concern.

From the above studies it can be seen that:

- in Novel Food research there is scarce measuring of environmental concern;
- research with disgust in relation to packaging is poor;

This research introduces these topics in new perspectives.

In the following chapters methods, results and discussion are examined.

²⁸Paul Wesley Schultz. *The structure of environmental concern: Concern for self, other people, and the biosphere*. Journal of Environmental Psychology Volume 21, Issue 4, December 2001, Pages 327-339

²⁹Michael Siegrist, Bernadette Sütterlin and Christina Hartmann. Perceived naturalness and evoked disgust influence acceptance of cultured meat. Meat Science Volume 139, May 2018, Pages 213-219

³⁰ Martins, Pelchat & Pliner. "Try it; it's good and it's good for you": Effects of Taste and Nutrition Information on Willingness to Try Novel Foods. *Appetite*, 1997,28, 89-102

Chapter 2.

Methods section

2.1 Methods

In order to test the hypotheses formulated in the theoretical framework, variables were analyzed taking into account two types of images,:

- A pack of cricket flour without animal representation inside it;
- A pack of cricket flour with animal representation inside it.



(Fig.9) Experimental Packaging (Own Pictures)

The images represent a hypothetical product on the market but they do not represent a hesitant brand, nor do they take up its paper or colors in order to collect data and empirical evidence without affecting the respondents in any way with brands or packages present in the market.

2.1.1 Participants

Three hundred twenty (n=320), 40% males and 60% women from 19 to 75 years (Age M= 42 years; SD 15.3) coming from all over Italy without limitations or specific interests for targeted cities participated in this study. They were invited to participate and randomly submitted from the platform Qualtrics to the sight of one packaging rather than another.

2.1.2 Experimental conditions

The Qualtrics platform was used in order to test the experimental hypothesis and collect the data .



Figure 9 - Qualtrics Logo (Own picture)

Qualtrics is an application that allows users to create questionnaires and share them with social media by collecting the results and then exporting them to the platforms designated for the analysis of the data collected.

Two side-by-side screenshots of a Qualtrics questionnaire interface. The left screenshot shows a question: "Prima di acquistare un prodotto è importante conoscere: Cosa pensano gli altri di diversi marchi o prodotti." with a 7-point Likert scale from "1 Fortemente in disaccordo" to "7 Fortemente d'accordo". The right screenshot shows a question: "Si prega di valutare le seguenti frasi che ti riguardano: Sono molto particolare riguardo ai cibi che mangio." with a 7-point Likert scale from "1 Molto falso di me" to "7 Molto vero di me". The second question on the right is "Assaggio costantemente cibi nuovi e diversi." with a 7-point Likert scale from "1 Molto falso di me" to "7 Molto vero di me". Both screenshots show a blue "Next" button at the bottom.

Figure 10 - Qualtrics Logo (Own picture)

In the study in question respondents are randomly exposed to two different images to record their reaction in relation to disgust and willingness to try (WTT). Our intention is to focus on the possible presence of higher disgust with images of insects on the packaging and if the environmental concern moderates the relation between those two variables.

2.2 Data Acquisition

Participants completed a questionnaire reporting one mediator one moderator and the dependent variable of the theoretical framework:

- Disgust: Eight-item short version of the Food Disgust scale (FDS short)³¹ was used in a 7- point Likert scale with “not at all disgusting (1)/very disgusting (7)” as end-points.
- Environmental Concerns: four items measuring social consumption motivation (SCM)³² were used in a 7-point Likert scale with “Not at all descriptive of the ad (1)/ described the ad very well (7)” as end-points.
- Willingness to try: two questions “Please rate your willingness to try this food?” and “Please rate your willingness to eat this food” with regards to the image of the products.

The questionnaire was designed using Qualtrics. All surveys were exported into an Excel file and then analyzed with the SPSS software.

³¹ Christina Hartmann, Michael Siegrist. *Development and validation of the Food Disgust Scale*. ETH Zurich, Department Health Science and Technology (D-HEST), Consumer Behavior, Switzerland

³² Dermody, Janine and Hanmer-Lloyd, Stuart and Koenig-Lewis, Nicole and Zhao, Anita Lifen (2015). *Advancing sustainable consumption in the UK and China: the mediating effect of proenvironmental self-identity*. Journal of Marketing Management, 31 (13-14), 1472-1502

Chapter 3.

Results

3.1 Statistical analysis

Statistical analysis was conducted using SPSS software. The first step was to eliminate incomplete questionnaires or questionnaires that were completed in a longer time than suggested by the platform, this procedure was necessary to eliminate any sort of bias due to distraction or lack of concentration, from 394 responders to 320.

3.1.1 Reliability and validity Analysis

Reliability statistics were conducted in order to provide the actual value for Cronbach's alpha.

The coefficient alpha is a measure of internal consistency reliability that is the average of all possible split-half coefficients resulting from different splittings of the scale items. The coefficient varies from 0 to 1, and a value of 0.6 or less indicates unsatisfactory internal consistency reliability.³⁸

The results:

- Cronbach's alpha value was 0.798 for Environmental concern (EC) (4 items)
- Cronbach's alpha value was 0.734 for disgust (8 items)
- Cronbach's alpha value was 0.952 for the variable insects, thus indicating a high level of internal consistency within all scales with the specific sample considered.

For the validity statistics we proceeded with the Promax method to avoid problems of interdependence between the variables. The results highlight the presence of the three main factors identifiable within the model.

3.1.2 Manipulation check

One-way ANOVA was conducted on the dependent variable Willingness to try (WTT), the dependent variable Insects, the mediator Disgust (dis_med) and the moderator Environmental concern (EC) .

Disgust revealed a significant effect ($F(52,335) = -14.29, p < .000$), participants showed a higher affective response to disgust when they saw the image of the product so the mediator is significant.

However, the insect is not significant ($F(52,335) = 0.291, p = .7709$), so we can say that the presence or absence of a photo on the packaging does not influence the propensity to try this product, but the answer to this question is to be found elsewhere in future research.

Environmental concern is not significant ($F(52,335) = 1.269 = 0.205$). there is no mediator effect on environmental concerns on willingness to try and no mediator effect on moderate variable disgust.

Chapter 4.

Discussion and conclusion

4.1 Hypothesis discussion

4.1.1 Hypothesis one

The main goal of the present study is to point out that disgust can influence the willingness to try and understand the role of people's environmental concerns to have a clear overview of the marketing needs for this type of product in order to outline a focused marketing strategy that takes into account what is needed to reach consumers without investing resources in the wrong direction.

From this point of view, two types of possible packaging have been created to understand the effectiveness of the product by showing the image of the raw product as well as the information that characterizes it in one case, while in the other there is only the product with the characteristics without visual references.

In one hypothesis we expected the presence of an insect on the package to have a negative effect on willingness to try.

Results in the manipulation checks section reject this statement because the variable insects in the data analysis was found to be not significant.

Different motivations may have led to this result, the theory of planned behavior (TPB)³³ suggests that behavior is guided by intention that, in turn, is driven by attitudes toward the behavior (for example the favourable or unfavorable evaluation of the behavior), subjective norms, as well as perceived social pressure, and perceived behavioral control (PBC), which accounts for the perceived ability to perform the behavior of interest. According to the TPB, human behavior is guided by considerations regarding its likely consequences (behavioral beliefs), by perceived opinions of the social environment (normative beliefs), and by individual perceptions of barriers and facilitators existing when attempting to perform the behavior (control beliefs).³⁴

This theory has been applied in the past to explain and predict broad categories of food-related behaviors, such as healthy eating, dietary behavior or green food consumption or more specific behaviors related to healthy- vs. risky food choices, including eating fruit and vegetables.³⁵

In this study the focus on attitude and subjective norms highlighted the presence of main barriers preventing the intention of eating food products containing insect flour are the sense of disgust arising from seeing insects around, the incompatibility with local food culture and the lack of products in the supermarket.

Observing these results a motivation is the lack of awareness in the product that causes distrust and disgust,

³³ I. Ajzen. *The theory of planned behavior* *Organizational Behavior and Human Decision Processes*, 50 (2) (1991), pp. 179-211

³⁴ M. Fishbein, I. Ajzen. *Predicting and changing behavior: The reasoned action approach*. Psychology Press, Taylor & Francis Group, New York (2010)

³⁵ R.R.C. McEachan, M. Conner, N. Taylor, R.J. Lawton. *Prospective prediction of health-related behaviors with the Theory of Planned Behavior: A meta-analysis*. *Health Psychology Review*, 5 (2011), pp. 97-144

therefore a solution can be to promote the characteristics of this market not only through its nutritional and environmental benefits but also by promoting products that are able to convince consumers because they are visually convincing and taste identical to traditional products. Existing studies suggest that information can modify willingness to try novel foods³⁶ so the right amount of information in all aspects (nutritional data, allergens, safety, taste) can be a solution.

4.1.2 Hypothesis two

Hypothesis two assumed that the relation between Package with image Vs Package without image and willingness to try is mediated by disgust.

As mentioned earlier previous research showed that disgust is an emotion that has a protective function and is connected to our immune system for the prevention of pathologies, bacterial and pathogenic infections³⁷. It cognitively triggers preventive behaviour to avoid health threats³⁸ and for this reason influences eating behaviour³⁹, hand washing⁴⁰ and have an impact on food waste production.⁴¹

From the perspective of consumer behaviour what most influences disgust is culture and the issues that affect it such as cultural self-identity⁴² and sense of belonging⁴³ in this sense, food is not only a source of nourishment, but a sense of belonging, a daily life and a cultural heritage which we trust and have been attached to since childhood. To verify this hypothesis the eight item short version of the Food Disgust scale (FDS short)⁴⁴ was used and statistical results confirmed hypothesis two, it can be pointed out that disgust has a mediator effect on willingness to try.

³⁶ Tuorila H., Bell R., Cardello A., Johnson W., Meiselman H. *Effect of label and information on perceived uncertainty and hedonic ratings of novel foods by subjects with varying neophobia*. Food Preservation 2000, Natick, Massachusetts (1993)

³⁷ Oaten, M., Stevenson, R. J., & Case, T. I. (2009). *Disgust as a disease-avoidance mechanism*. *Psychological Bulletin*, 135(2), 303–321.

³⁸ John A.Terrizzi, Jr.aNatalie, J.ShookaMichael and A.McDaniel. *The behavioral immune system and social conservatism: a meta-analysis*. *Evolution and Human Behavior* Volume 34, Issue 2, March 2013, Pages 99-108

³⁹ Eickmeier, K., Hoffmann, L., Banse, R. *The 5-factor disgust scale*. *European Journal of Psychological Assessment* Pages 1-11

⁴⁰ Robert Pellegrino, Philip G.Crandall Han-Seok Seo. *Hand washing and disgust response to handling different food stimuli between two different cultures*. *Food Research International* Volume 76, Part 2, October 2015, Pages 301-308

⁴¹ Aisha Egolf, Michael Siegrist Christina Hartmann. *How people's food disgust sensitivity shapes their eating and food behaviour*. *Appetite* Volume 127, 1 August 2018, Pages 28-36

⁴² Roberta Sassatelli & Alan Scott. *NOVEL FOOD, NEW MARKETS AND TRUST REGIMES: Responses to the erosion of consumers' confidence in Austria, Italy and the UK*. *Journal European Societies* 2010 Volume 3 Pages 213-244

⁴³ D.N.Cox G.Evans. *Construction and validation of a psychometric scale to measure consumers' fears of novel food technologies: The food technology neophobia scale*. *Food Quality and Preference*. Volume 19, Issue 8, 2008, Pages 704-710

⁴⁴ Christina Hartmann, Michael Siegrist. *Development and validation of the Food Disgust Scale*. ETH Zurich, Department Health Science and Technology (D-HEST), Consumer Behavior, Switzerland

4.1.3 Hypotheses three A and three B

Hypothesis three A supposed that the relation between Package with image Vs Package without image and willingness to try is moderated by environmental concern.

Hypothesis three B supposed that the relation between disgust and willingness to try is moderated by environmental concern.

Results in the manipulation checks section reject those statements because the variable environmental concern in the data analysis was found to be not significant.

Different motivations may have led to this result. Previous research focused on environmental concern in the theory of planned behavior (TPB), the results revealed that consumer attitudes, perceived behavioural control significantly influence purchase intention, whereas subjective norms and environmental concern did not demonstrate significant relationships with purchase intention⁴⁵.

However, research showed that consumers' environmental concern positively and significantly affects their intention to purchase products with environment-friendly packaging. This study postulates that although insect foods, organic foods, and products with environment-friendly packaging are helpful for the environment, conceptually, consumers do not consider insect foods as environment-friendly, and therefore environmental concern is not a factor influencing purchase intention⁴⁶.

Given these assumptions the use of the environmental concern variable has not given the expected results, but it would be interesting to relate it to sustainable packaging for novel food and understand its effectiveness.

4.2 Implications

4.2.1 Neuromarketing Implications

Over the last 15 years, consumer neuroscience has experienced great growth, both in academic and business practices. The growth of this branch is due to the results and innovative methodologies in the search for scientific evidence for the development of marketing and communication strategies, not surprisingly, especially in extremely competitive sectors such as large retailers multinationals are increasingly internalizing within their departments teams specialized in neuroscience and neuromarketing, or rely on consultants.

⁴⁵ Hsiao-Ping Chang, Chun-Chieh Ma and Han-Shen Chen. Climate Change and Consumer's Attitude toward Insect Food. *Int J Environ Res Public Health*. 2019; 16(9): 1606.

⁴⁶ Prakash G., Pathak P. *Intention to buy eco-friendly packaged products among young consumers of India: A study on developing nation*. *J. Clean. Prod.* 2017;141:385–393

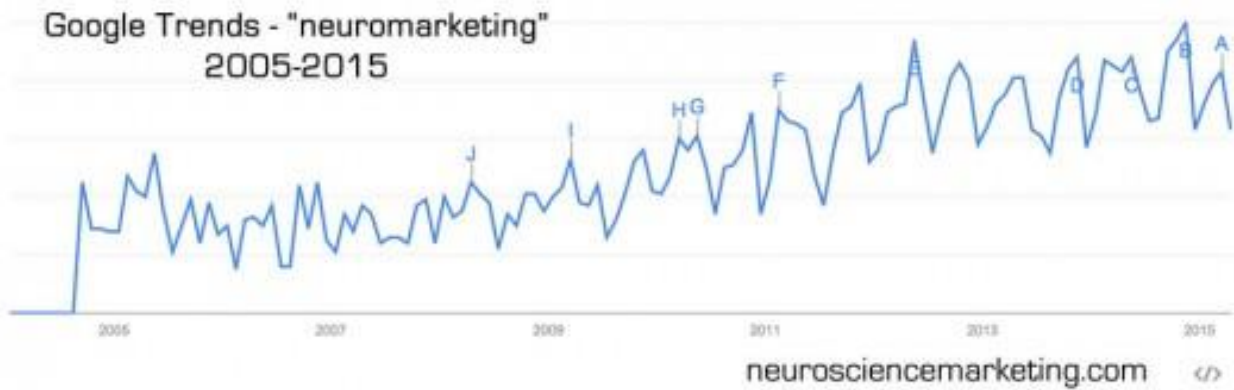
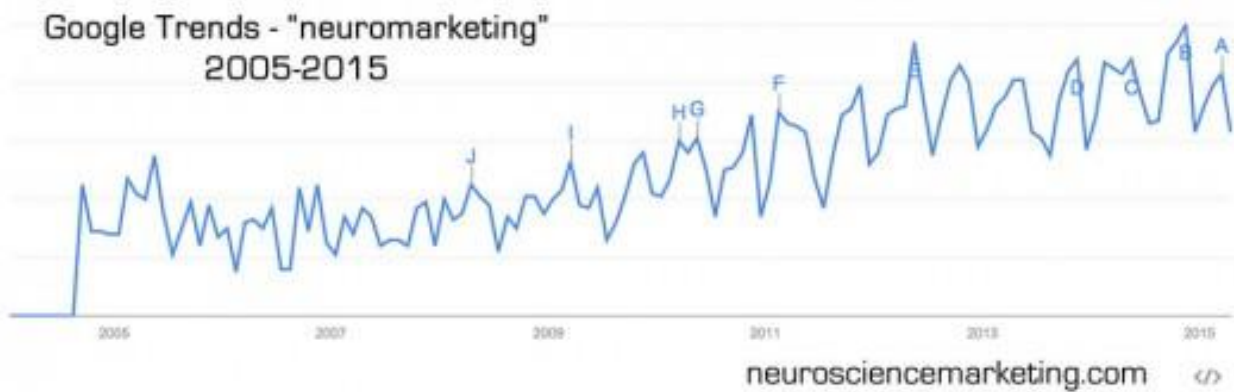


Figure 10 - neuroscience.com Google trends-“neuromarketig” 2005-2015



Neuromarketing can be defined as the part within marketing that studies the effect of marketing stimuli on consumers’ sensorimotor, cognitive and affective responses. Today, it is often seen as the commercial use of neuroscience insights and tools that companies can use to better understand consumer behavior.

The use of neuromarketing methods has countless applications in research with particular products like this one, in fact where there is the presence of a psychological wall due to the nature of the product the study of the body's autonomous reactions can give us certain results as opposed to traditional self-reports⁴⁷.

In these areas of research the use of such techniques has already been taken into consideration in several studies. The main findings reveal that cultural background and individual experiences play an important role on consumers acceptance, that consumers have a higher willingness to eat processed insect-based foods compared to unprocessed foods; that social acceptance for these new foods is higher when consumers had experience with insect food and when they are incorporated into familiar food items⁴⁸, that the type of communication influences the willingness to eat insects as food and that the emotional effect deriving from the view and the contact of the insect product

⁴⁷ Pozharliev. Social Neuromarketing: The role of social context in measuring advertising effectiveness. 2017. IRIS - Institutional Research Information System

⁴⁸ G. Le Goff, J. Delarue. *Non-verbal evaluation of acceptance of insect-based products using a simple and holistic analysis of facial expressions*. Food Quality and Preference, 56 (2016), pp. 285-293

influence the willingness to try it in order to reduce the impact of these foods out of our cultural framework⁴⁹.

To this end, further studies are required to better explore the barrier of prejudices towards insect food and to reduce the visual impact in order to improve the willingness to accept and buy this novel food.

These results have been possible by combining the use of:

- eye-tracking: It is used to measure attention and memory, this tool is a sender and receiver of light in the infrared spectrum of light. A light is beamed into the eyes, and the reflection of each eye is recorded by a set of infrared cameras. A software program recognizes the eyes in the recordings, and infers where the eyes are looking on the screen. The use of eye tracking makes it possible to identify what captures the attention of consumers in what they observe and gives important feedback on the effectiveness of advertising and communication.
- galvanic skin response (GSR): it is used to measure excitement and arousal. It works by perceiving the change in conductivity of the skin due to changes in the state to which the user is subjected by perceiving a stimulus. In fact, in the presence of excitement or arousal the human body tends to increase sweating to imperceptible levels and this machinery is able to constantly monitor them in order to provide information about what is proposed to the observer and compare its effectiveness.
- electrocardiogram (ECG): it is used to measure valence of emotion as arousal and attention from speed and heartbeat, it works monitoring electrical activity of the heart
- Electroencephalography (EEG): It is the most commonly used neuroscience method in marketing and advertising research and is used to measure the voltage fluctuations resulting from ionic current flows within the neurons of the brain recording the electrical activity along the cortical brain regions, in this way change in activity can be detected and measured among brain regions.

The use of these tools in the research could have led to different results. With the use of eye tracking we could effectively understand the interaction between disgust and other variables.

⁴⁹ A. Baselice, B. De Devitiis, G. Nardone, A. Stasi, R. Viscecchia. *Italian consumers' perception towards insect food with a neuromarketing approach*. 53th SIDEA Congress, Bolzano 22–26 September 2016 (2016)



Figure 11 - eye-tracking examples (Own picture)

The images shown above represent a potential result of our research using eye tracking which shows a greater attention to the packaging when there is the image of an insect, in this case through the use of the other elements mentioned above, in particular EEG and GSR, we have the ability to understand if this focus of attention on the image is positive or negative and we are able to get results by using a smaller sample optimizing research time, but increasing the effectiveness of the results.

The use of these analytical methodologies is useful not only for large competitive markets but also for potential markets where the investment of large capital is potentially risky and these tools allow a deeper and more deeply rooted knowledge of the phenomenon making it safer to make an entrepreneurial decision.

4.2.2 Managerial Implications

The present study has several implications for marketers in charge of designing advertising and communication strategy, for policy makers involved in novel food issues and neuromarketing researchers.

In today's economy research on novel food is branching out into various sectors, the most promising are the market for edible insects and laboratory meat production, both of which are characterised by the same problems that are emerging on the market due to the cultural and ethical context, but with this in mind it is important to remember that we are also living in a globalised century characterised by the loss of certain preconceptions of traditional

cultures⁵⁰ and here novel food can gain consensus over the years. Also market forecast expects a 46% improvement of the compound annual growth rate between 2019 and 2026⁵¹.

Sales forecasts and the culture that is changing with time are arguments that can encourage entrepreneurs to invest in this sector using neuromarketing tools, but for policy makers, the ability of these tools can be fundamental to study the right policies to incentivise novel food with the aim of increasing environmental sustainability and safeguarding the resources of each country.

Evidence also showed that the use of the neuroscience tool can improve the educational system⁵², in the same way policy makers could use the neuroscience tool to change the behaviour and improve the efficacy of a pro-environmental policy. In this way, for example, western countries could accept edible insects faster, and the sector could grow over the expected forecast.

Neuromarketing researchers should ride the wave of the emerging spread of novel food.

They should start to measure unconscious reactions when they propose those product, in order to understand what happens in terms of attention, emotion, interest or cognitive workload in order to provide both marketing managers and research in general with useful insights in terms of efficacy of novel food communication.

4.3 Limitations and Further research

As highlighted in the method, in this research respondents were manipulated in order to understand if, somehow, they could answer the raised questions in a more objective way, instead of a very personal one.

Moreover, we decided to manipulate respondents in order to have an equal percentage of people exposed to packaging with insect image and packaging without insect image. Manipulation was a fundamental ingredient to achieve the desired goal of right proportions between scenarios.

Conversely, manipulating people may not represent the best way to understand whether disgust may have or not a real effect on willingness to try novel food. In fact, people did not answer questions, related to the scenario they were randomly assigned to, referring to their sincere and impulsive perception of things. In other words, they could not have been truly honest.

⁵⁰ Lene Arnett Jensen, Jeffrey Jensen Arnett Jessica McKenzie. *Globalization and Cultural Identity*. Handbook of Identity Theory and Research pp 285-301

⁵¹ Kunal Ahuja, Kritika Mamtani. *Edible Insects Market Size By Product (Beetles, Caterpillars, Grasshoppers, Bees, Wasps, Ants, Scale Insects & Tree Bugs), By Application (Flour, Protein Bars, Snacks), Industry Analysis Report, Regional Outlook, Application Potential, Price Trends, Competitive Market Share & Forecast, 2020 – 2026*. www.gminsights.com

⁵² Denis Mareschal, Brian Butterworth, Andy Tolmie. *Educational Neuroscience*. 2014 John Wiley and Sons Ltd

Another reason of limitation could be seen in the fact that we built our research using only environmental concern, in such sense we should include other possible variables related with environmental issues as environmental knowledge, attitude, and perceived behavioural control.⁵³

Even though the results gave us a sufficient Cronbach index, other scales could be used or implemented to measure fit with a higher accuracy.

We suggest that future research should analyse the topic investigated without using manipulated scenarios but giving space to the measurement of true reactions, in order to have more realistic answers. Furthermore, researchers could run experiments on different insect products to understand the differences among them and understand which one is more accepted than others.

Another possibility, over the use of neuromarketing tool like eye-tracking, GSR, fMRI and EEG to understand the unconscious behaviours of respondents, is to run a real time experiment in a neutral scenario proposing different types of product, including blind tests and analyse the difference in willingness to try among different age groups, in this way we can also have evidence of propensity among younger generations with different cultural heritage.

⁵³ Guomin Li, Wei Li, Zihan Jin and Zhihao Wang. Influence of Environmental Concern and Knowledge on Households' Willingness to Purchase Energy-Efficient Appliances: A Case Study in Shanxi, China. *Sustainability* 2019, 11, 1073

Conclusions

To sum up the hypotheses made, their results and implication it can be concluded that:

- Hypothesis one was not confirmed: the presence or not of an insect image do not influence the willingness to try of the product, previous researches suggest that people are not willing to try this product because do not trust yet this kind of food.
- Hypothesis two was confirmed: disgust have a mediator effect on wiliness to try novel food, this result it is important because it give us important notions for future research and for the development of a marketing strategy based on the right characteristics.
- Hypothesis three a and three b are not confirmed: there is no moderator effect of environmental concern on wiliness to try, environmental concern do not influence the willingness to try novel food but evidence showed that have positive effect with low impact packaging, so use this type of packaging could work for promote better this product.

The main implications of the present study are:

- for the very first-time environmental concern and wiliness to try novel food was analyzed together for understand the relation between these variables;
- the effect of disgust on wiliness to try do not depend on the presence of insect on packaging, but there are not study about the effectiveness of one packaging than the other;
- neuromarketing tools are more accurate than self-report in assessing emotional and unconscious responses: self-report results cannot prove that disgust affects customers' WTT in the same way than neuromarketing tools.

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Summary

The demographic growth that has characterized the last two centuries has highlighted the need for new resources that we constantly need. However, these resources are often not sufficiently present, or their production has an important environmental impact for mass production to meet the entire global demand. From this need arises the search for alternative sources that can replace the previous ones, also succeeding in making significant improvements for the whole community.

Analysing the context more specifically, currently the intensive breeding of animals for the food sector represents one of the most significant sources of greenhouse gas pollution and also one of the activities that most erode natural resources such as drinking water, and for this reason over the years it has become increasingly evident that these activities also need more sustainable alternatives both in terms of emissions and in terms of exploitation of resources.

Given the initial premise, the breeding and market of insects and derived products represents an opportunity as it is an activity that needs scarce primary resources compared to traditional ones.

In Europe a form of legislation towards new foods has been introduced since 1997 with the name and regulation of the so-called "Novel Food".

With reference to this background, the present study aims to test how the presence of an image in the packaging of a product based on insects, can influence the willingness to try the product.

For the experiment that will be described in detail below, images of a product processed with insects, in this case cricket flour, have been specially created.

The choice of the product was arbitrary and the realization of the product was preferred over products available on the market to avoid any form of alteration of judgment by respondents. In fact our primary objective was to understand whether or not the presence of insects on the packaging could have an effect on the willingness to try the product.

In the first chapter, recent literature was examined, paying particular attention towards previous research that helped to explain the reason why the hypothesis and theoretical model were built. At the end of this chapter a section called "what is new" was included to describe which elements of the theoretical model are considered new and different compared to previous research.

The second chapter describes the methods. In particular, sample characteristics, experimental conditions and procedures and how data were acquired.

In the third chapter, statistical analysis conducted is shown.

In the fourth chapter a consolidated discussion is presented considering the four hypotheses. Then managerial and neuromarketing implications are discussed, also taking into account limitations of the theoretical model and suggestions for further research.

Nowadays insects represents an interest in the global economy for two main reason, they are a more sustainable source of food and also new economic opportunity for nations an entrepreneurs. The edible insect market represent with over 2000 edible species a more sustainable source of food because evidence show that this sector produces 75 per cent less carbon and use half as much water as poultry farms. Searching for new ways to produce protein base food and now also potentials food to introduce in peoples' diets has become a necessity, if we take in to account that in the coming years the demand for meat products is expected to increase from current levels by more than 75% in 2050 due to population growth and rising incomes. The per capita increase will be larger in developing countries (from 28 kg in 2005/2007 to 42 kg in 2050) than in developed countries (from 80 to 91 kg).

The introduction of edible species does not necessarily have to represent a change in the diet for humans, they can be valid substitutes in other markets, such as animal feed as fish.

From an economic point of view, the production of insects for food purposes represents an opportunity for Western countries. If on the one hand globalization and the opening up of frontiers allows consumers to take this type of product into consideration, on the other hand it represents a market with great growth potential in which one can invest for the creation of new jobs and new prospects.

For this reason we need to understand why it is important packaging in this market sector.

Successful packaging design should include:

- Always give the public a reason why they would choose a specific brand over others. "Why-to-purchase statement" allows companies to attract brands to the public in a clear and simple way. This "Why-to-purchase statement" tells them what the brand actually does. Basically, this "why-to-purchase statement" should be written in large and bold. It is important that this "why buy" is on the front of the pack.
- It is important to highlight the brand's product promise statement at the top of the packaging. The statement should be informative and simple, so that customers can know all the features of the item and how they can benefit from it.
- The design of the packaging should immediately capture the public's attention. Always remember that this is the public's good experience with the brand. Therefore, the structural design should create a "never forget" introduction.
- The graphic design of the product packaging should match the structural packaging. If this does not happen, the potential audience will lose interest in the brand.

Research has shown that there is clearly a strong association regarding the influence of packaging on the purchasing decision, with more than 73% of consumers surveyed saying they rely on packaging to help their decision making at the time of purchase.

This is even more important in an extremely competitive market such as the food market where a good market strategy is fundamental to success and survival compared to competitors.

In the competitive world of food retailing, packaging has to work harder than ever if the product is to be noticed through the congestion of competitive products, surprisingly few food retailers appreciate the power of packaging as a piece of direct communication.

The existing literature demonstrated that packaging is able to create more positive consumer responses increasing impacts on the consumer's WTT.

Taking into account this background, the presence of insect or not presence of insect can be considered the independent variable of the theoretical framework, while WTT can be studied as a variable that is expected to be dependent on the manipulation of the independent variable.



H1: The package with image has a negative effect on willingness to try

Closely linked to the theme of Novel food is the consumer response to these new products.

Given the importance of investments for the introduction of these products in markets such as the Western ones that both culturally and historically are not inclined to use them, it is important to understand how a consumer can interface with them.

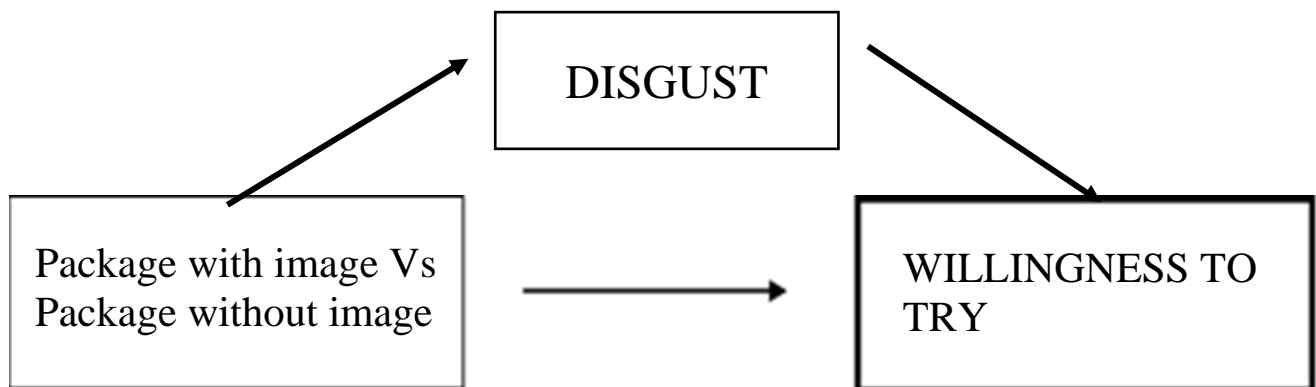
Disgust plays an important role in our everyday lives. For instance, disgust can influence eating behaviour, hand washing and have an impact on food waste production.

The function of disgust as a promoter of pathogen prevention in the food sector had previously been questioned and understood. Evidence has suggested that a disgust reaction is one such highly functional system that aims to reduce the contact with and thus the likelihood of infection from parasites, bacteria or other pathogens developed by humans during the evolutionary process as a detection-system in the processes of natural selection. In fact disgust represents a regulating human emotion whose function is linked to the behavioural immune system because it cognitively triggers

preventive behaviour to avoid health threats.

In food research, it is important take into account the moral domain when it comes to either the acceptance of new food technologies⁵⁴ or differentiation between appropriate and inappropriate animal based food products. Most Western people would find it disgusting to eat animals that in their culture represent pets(in terms of morally unacceptable and offensive), whereas in non-Western cultures they can be considered traditional food. Food-related moral disgust is especially relevant with regard to culturally determined food appropriateness, though there is presumably a low level of variation between individuals from the general population within a cultural region. Therefore, the moral domain of disgust was not considered in the present research.

So, we can consider disgust as a mediator in the relation between Insect image vs Insect no image and WTT.



H2: The relation between Package with image Vs Package without image and willingness to try is mediating by disgust.

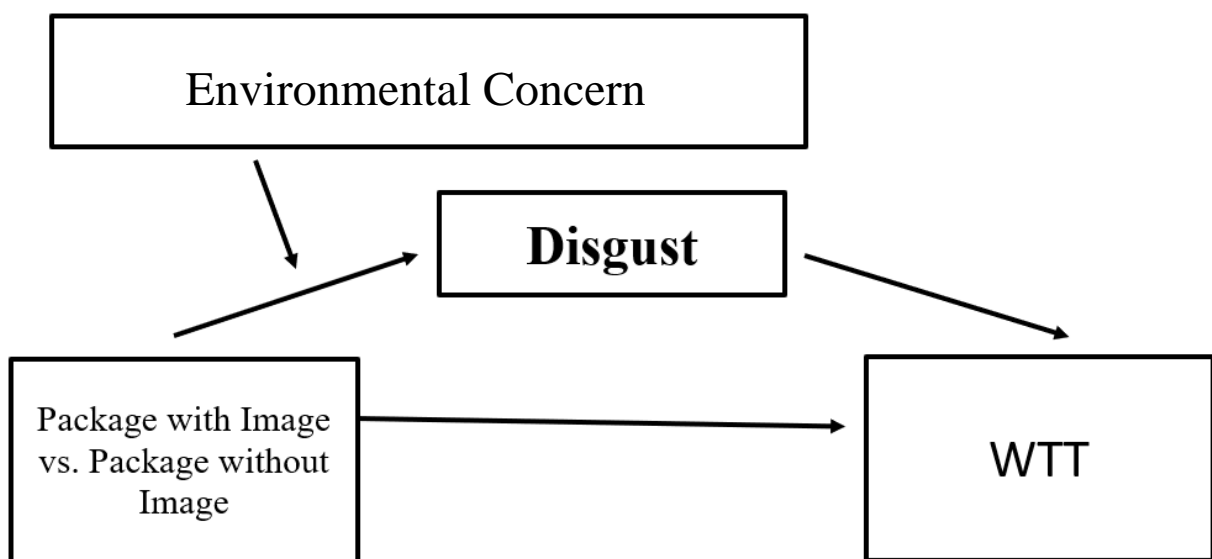
As already mentioned, the introduction of novel foods to accompany traditional protein sources represents a turning point in terms of environmental pollution and over-exploitation of natural resources.

Starting from the assumption that environmental attitudes and behaviour are linked to people's values and the value scales of Rokeach (1973) and Schwartz (1994) have been successfully used for explaining general environmental concern (Schultz & Zelezny, 1999) as well as more specific

⁵⁴ Sydney E. Scott, Yoel Inbar, Paul Rozin Evidence for Absolute Moral Opposition to Genetically Modified Food in the United States. *Perspective on Psychological science* 11(3) 315-324

environmental attitudes and beliefs (Stern & Dietz, 1994; Stern, Dietz, & Guagnano, 1995). Karp (1996) demonstrated that Schwarz's values were significantly correlated to various self-reported behaviors, such as recycling behavior, consumer behavior, and political behaviors to protect the environment. Also achieving significant results such as the 23% decrease in the EU between 1990 and 2016.

For this reason policy makers are interested in cost-effective and socially acceptable ways of encouraging the public to adopt more environmentally-friendly lifestyles and the focus on 'catalyst behaviour', the notion that taking up a new behaviour (such as recycling) may cause people to adopt other pro-environmental behaviours. In this way different nations these years established ambitious target in terms of reduction in greenhouse gas emission.



H3a: The relation between Package with image Vs Package without image and wiliness to try is moderated by Environmental concern.

H3b: The relation between disgust and willingness to try is moderated by environmental concern.

The literature review allowed to build the theoretical model, as shown in the picture.

The main novelty of the model presented is the use of the environmental concern variable as moderator, and disgust as a mediating variable in relation to willingness to try. Previous research had already dealt with this type of variable without ever putting them together in the same study and consequently seeking a plausible relationship which is not at all taken for granted given the data collected so far and previously exposed.

From the previous studies it can be seen that:

- in Novel Food research there is scarce measurement of environmental concern;
- research with disgust in relation to packaging is poor;

This research introduces these topics into new perspectives.

Results in the manipulation check section reject Hypothesis One because the variable insects in the data analysis was found to be not significant.

Different motivations may have led to this result, the theory of planned behavior (TPB) suggests that behavior is guided by intention that, in turn, is driven by attitudes toward the behavior (for example the favourable or unfavorable evaluation of the behavior), subjective norms, as well as perceived social pressure, and perceived behavioral control (PBC), which accounts for the perceived ability to perform the behavior of interest. According to the TPB, human behavior is guided by considerations regarding its likely consequences (behavioral beliefs), by perceived opinions of the social environment (normative beliefs), and by individual perceptions of barriers and facilitators existing when attempting to perform the behavior (control beliefs).

Hypothesis two assumed that the relation between Package with image Vs Package without image and willingness to try is mediating by disgust.

To verify this hypothesis the eight item short version of the Food Disgust scale (FDS short) was used and statistical results confirmed hypothesis two, it can be pointed out that disgust have a mediator effect on wiliness to try.

Hypothesis three A supposed that the relation between Package with image Vs Package without image and wiliness to try is moderated by environmental concern.

Hypothesis three B supposed that the relation between disgust and willingness to try is moderated by environmental concern.

Results in the manipulation checks section reject those statements because the variable environmental concern in the data analysis was found to be not significant.

Different motivations may have led to this result, precedent research focused on environmental concern in the theory of planned behavior (TPB), the results revealed that consumer attitudes, perceived behavioural control significantly influence purchase intention, whereas subjective norms and environmental concern did not demonstrate significant relationships with purchase intention.

Over the last 15 years, consumer neuroscience has experienced great growth, both in academic and business practices, the growth of this branch is due to the results and innovative methodologies in the search for scientific evidence for the development of marketing and communication strategies, not surprisingly, especially in extremely competitive sectors such as large retailers multinationals are increasingly internalizing within their departments teams specialized in neuroscience and neuromarketing, or rely on consultants.

Neuromarketing can be defined as the part within marketing that studies the effect of marketing stimuli on consumers' sensorimotor, cognitive and affective responses. Today, it is often seen as the commercial use of neuroscience insights and tools that companies can use to better understand consumer behavior.

The use of neuromarketing methods has countless applications in research with particular products like this one, in fact where there is the presence of a psychological wall due to the nature of the product the study of the body's autonomous reactions can give us certain results as opposed to traditional self-reports.

In these areas of research the use of such techniques has already been taken into consideration in several studies.

The main findings reveal that cultural background and individual experiences play an important role on consumers acceptance, that consumers are higher willingness to eat the processed insect-based foods compared to the unprocessed foods; that the social acceptance for these new foods is higher when consumers had experience with insect food and when they are incorporated into familiar food items, that the type of communication influences the willingness to eat insect as food and that emotional effect deriving from the view and the contact of the insect product influence the willingness to try it in order to reduce the impact of these foods out of our cultural framework.

In such sense, further studies are required to better explore the barrier of prejudices towards insect food and to reduce the visual impact in order to improve the willingness to accept and buy this novel food.

The present study has several implications for marketers in charge of designing advertising and communication strategy, for policy makers involved in novel food issues and neuromarketing researchers.

In today's economy research on novel food is branching out into various sectors, the most promising are the market for edible insects and laboratory meat production, both of which are characterised by the same problems that are emerging on the market due to the cultural and ethical context, but with this in mind it is important to remember that we are also living in a globalised century characterised by the loss of certain preconceptions of traditional cultures and here novel food can gain consensus over the years. Also market forecast expect a 46% improvement of the compound annual growth rate between 2019 and 2026.

Sales forecasts and the culture that is changing with time are arguments that can encourage entrepreneurs to invest in this sector using neuromarketing tools, but for policy makers, the ability of these tools can be fundamental to study the right policies to incentivise novel food with the aim of increasing environmental sustainability and safeguarding the resources of each country.

Evidence showed also that the use of neuroscience tool can improve the educational system, in the same way policy makers could use neuroscience tool for change the behaviour and improve the efficacy of pro environmental policy, in this way for example western country could accept faster edible insect, and the sector could grow over the expected forecast.

Neuromarketing researchers should ride the way of the emerging spread of novel food.

They should start to measure unconscious reactions when they propose those product, in order to understand what happens in terms of attention, emotion, interest or cognitive workload in order to provide both marketing manager and research in general with useful insights in terms of efficacy of novel food communication.

There are different limitations in this research, for example respondents were manipulated in order to understand if, somehow, they could answer in a more objective way, instead of a very personal one, to the raised questions.

Moreover, we decided to manipulated respondents in order to have an equal percentage of people exposed to packaging with insect image and packaging without insect image. Manipulation was a fundamental ingredient to achieve the wished goal of right proportions between scenarios.

Conversely, manipulating people may not represent the best way to understand whether disgust may have or not a real effect on wiliness to try novel food. In fact, people did not answer to questions, related to the scenario they were randomly assigned to, referring to their sincere and impulsive perception of things. In other words, they could not have been truly honest.

Another reason of limitation could be seen in the fact that we built our research using only environmental concern, in such sense we should include other possible variables related with environmental issues as environmental knowledge, attitude, and perceived behavioral control.

Even though the results gave us a sufficient Cronbach index, other scales could be used or implemented to measure fit with a higher accuracy.

Future research should analyze the topic investigated without using manipulated scenarios but giving space to the measurement of true reactions, in order to have more realistic answers. Furthermore, researcher could run experiments on different insects product for understand the differences among them and understand which one is more accepted than others.

Another possibility, over the use of neuromarketing tool like eye-tracking, GSR, fMRI and EEG for understand the unconscious behaviours of respondents, it is to run a real time experiment in a neutral scenario proposing different types of product, including blind tests and analyze the difference in wiliness to try among different age groups, in this way we can also have evidences of propension

among younger generations with different cultural heritage.

The main implications of the present study are:

- for the very first-time environmental concern and wiliness to try novel food was analyzed together for understand the relation between these variables;
- the effect of disgust on wiliness to try do not depend on the presence of insect on packaging, but there are not study about the effectiveness of one packaging than the other;
- neuromarketing tools are more accurate than self-report in assessing emotional and unconscious responses: self-report results cannot prove that disgust affects customers' WTT in the same way than neuromarketing tools.