ERASMUS UNIVERSITEIT ROTTERDAM

ERASMUS SCHOOL OF ECONOMICS

Master Thesis

Emotional Influence on Ambiguity Attitudes:
The perspective of Disgust

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Rotterdam, 04/12/2015

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Abstract

How emotions influence people's decision making is a recent research topic. This thesis makes the first attempt to investigate whether the emotion of disgust has an impact on decisions under uncertainty and more specifically on people's ambiguity attitude. To do so, 85 completed online questionnaires filled in by subjects of European citizenship were analyzed. Based on the results, this study examines the effect of the alternatives that provoke the emotion of disgust on people's decision making. Moreover, it studies if people's disgust sensitivity scores have an effect on their ambiguity attitudes and if there is a connection between gender and disgust sensitivity. This research replicates previous research, suggesting that there are gender differences in disgust sensitivity. Furthermore, the research finds evidence for both ambiguity aversion and familiarity bias. However, contrary to what expected it cannot be concluded that the emotion of disgust influences the process of decision making.

1. Introduction

The human nature has been a mystery to people for ages. If we were able to understand all the aspects of it, it would change the way we think, perceive and respond to important problems and challenges in the real world. As the world becomes more complex to understand, we need more reasoning than when we were living in small communities.

The remarkable works of Keynes, Knight, and Ramsey in the 1920s enhanced our understanding of the nature of decision making under uncertainty. They suggested that people may be ambiguity averse in preferring bets involving known probabilities to those based on contingencies without known probabilities (Chew et al., 2012). This suggestion underlay the inspiration and the basis for further research by Ellsberg (1961) who introduced his famous paradox. After three decades, Heath and Tversky (1991) found that people's decisions are influenced by the source of the information provided. This conclusion was a result of a different approach to the ambiguity aversion hypothesis. It showed that people prefer sources of uncertainty they feel more competent or knowledgeable about over those about which they feel less competent (Trautmann and Van de Kuilen, 2013). On top of it, Fox and Tversky (1995) moved forward and developed the comparative ignorance theory. Fox and Tversky (1995) distinguished and studied the phenomenon of familiarity bias in which people tend to have different preferences over bets. The phenomenon involves best from a familiar source of uncertainty than which arose from a less familiar source. The authors came to the remarkable conclusion that: "ambiguity aversion is driven primarily by a comparison between events or between individuals, and it is greatly reduced or eliminated in the absence of such a comparison."

Based on an extensive and growing body of research, it has been shown that emotions play, also, an active role in decision-making. Despite the recent fruitful results of affect and cognition research, relatively few theories have systematically addressed the influences of specific emotions on judgment and choice (Lerner & Keltner, 2000). The goal of this thesis is to present an emotion-specific framework - that of disgust - for studying affective influence on decisions under uncertainty.

Disgust can be described as a negative emotion related with certainty in conformity with cognitive appraisal patterns (Smith & Ellsworth, 1984). It is triggered by a noteworthy diverse set of elicitors, which can vary from spoiled food and carriers of infection to moral transgressions and similarities with animals. This diversity, from concrete to abstract triggers, depicts the evolutionary role of disgust through time. This role was primarily driven by the human inherent need for bodily protection from diseases and toxic substances. Currently, the evolution of it shapes cultural and moral behaviors in human society.

In addition to the aforementioned and consistent with the acknowledgement that emotions have an impact on decision-making process, appraisal theorists have shown that emotions activate appraisal tendencies, which are relatively automatic processes that guide subsequent perception and judgment (Lerner & Keltner, 2000).

Hence, it results that disgust influences the evaluation of alternatives. People who are more sensitive to that emotional experience have stronger unwillingness to follow unknown situations and may exhibit more ambiguity averse behaviors. Moreover, certainty revealed by disgust may lead to the avoidance of further evaluation of the alternatives. Thus, objective features of them may be underestimated because of people's refusal to process them further.

This combination of psychological and modern decision making concepts provide a useful result regarding the economic and social behavior of people. Taking this into consideration, the present research investigates whether the emotion of disgust has an impact on ambiguity attitudes of individuals.

Having considered the above stated premises, the main research question that arises is the following:

"Does the emotion of disgust influences people's ambiguity attitude?"

The thesis makes the first attempt to investigate this research question by conducting a survey among adults of European citizenship.

2. Theoretical Framework

2.1 Introduction to the emotion of disgust

Disgust consists one of the six basic evolved emotions (anger, disgust, fear, joy, sadness, surprise) and it was studied for the first time by Charles Darwin (1872). As a basic emotion, it is experienced and expressed by all human beings and has a characteristic facial expression (Ekman & Friesen, 1975; Izard, 1971), an appropriate action (distancing of the self from an offensive object), a distinctive physiological manifestation (nausea), a characteristic feeling state (revulsion) and characteristic neurological signs (lowered blood pressure, lowered galvanic skin response) (Rozin & Fallon, 1987; Curtis & Biran, 2001). These specific body reactions of a person, when facing the object of disgust, make it a negative and "aversive" emotion.

It is surprising that this powerful emotion was long neglected and has recently re-emerged through a remarkable research. Paul Rozin, Jonathan Haidt and Clark McCauley contributed significantly to it. Their empirical investigations provided an important support to this growing body of research, giving a new perspective to disgust. They claimed that during the human evolution, disgust has been extended from food rejection to immoral and unfair acts into the social domain. In addition, they argued that disgust is both a product of natural selection as well as social construction and its social functions may become more important than its biological functions (Haidt, Rozin, McCauley & Imada, 1997).

For a better understanding of the topic, several tools have been developed to measure individual differences in sensitivity to this emotion, and to examine the relationships among different kinds of disgust (e.g. Rozin et al.1984, Davey et al. 1993, Templer et al.1984, Tybur et al., 2009). Nevertheless, many of them were not suitable to be used as a general measure of disgust sensitivity as they are limited to some types of disgust elicitors or domains. For the purpose of this thesis, the well-known "Disgust Scale" (DS),

generated by Jonathan Haidt, Clark McCauley and Paul Rozin (1994), is used in order to measure participant's sensitivity to disgust.

2.1.1 Distaste and Disgust

"Tastes (i.e. manifested preferences) are the practical affirmation of an inevitable difference. It is no accident that when they have to be justified, they are asserted purely negatively, by the refusal of other tastes" (Bourdieu 1984:56).

Disgust verbatim means "bad taste" and its defense mechanism consist of a spontaneous and especially energetic act of saying "no" (Hamblin, 2014).

Distaste is the refusal of other tastes. This act takes into account the awareness of other taste options and the comparison between them.

Humans have always been omnivorous and for that reason they have been exposed in innumerable taste dilemmas. On the other hand, nature except of an oversupply of nutritious sources offers also a variety of poisonous, toxic and nutritionally imbalanced foods. Therefore, the exploration process of new foods includes the emotion of fear, which eliminates potential trials of new tastes, and disgust, which indicates what not to eat in the physical world. It seems to be no coincidence that universal or almost universal disgust elicitors such as feces, saliva and rats may consist sources of viruses, bacteria and many other toxic stuff transmissions.

Both disgust and distaste can provide information about potential threats but different cues serve each situation. As a consequence, it is not necessary to use the sense of taste in order to detect possible dangers. More particularly, there is no need to eat a mouse to be disgusted by it. Disgust also differs from distaste in that disgusting substances are much more contaminating than distasteful substances (Rozin & Fallon, 1987). Thus, contamination sensitivity complements significantly the role of disgust in avoiding offensiveness. Despite the aforementioned, it could be said that disgust is an offshoot of distaste as they share the oral rejection.

2.1.2 The role of culture in conformation of disgust

Several anthropologists such as Kellog (1841), Tylor (1958) and Mary Douglas (1966) have proposed that dietary rules both in primitive and later cultures were formed in a health protecting way. These laws may stem from religious or ideological contexts for the survival of society and can be explained by the need of disease avoidance. Non-obedience to the principles disrupts the balance of the system and may result in serious consequences. For that very vital reason, exceptions have been defined as dirty and impure and were banished. As Levi-Strauss (1970) remarked, food tastes are culturally shaped and socially controlled. What is eaten has symbolic and metaphorical meaning. Moreover, many societies consider that the main role of a woman in a family is to breed and ensure children's nutrition. The acceptance of this role makes women to pay more attention on the election of the food that will nourish the family. As a result, women may perceive disgust stimuli faster and more intensively than men and may show stronger responses supporting food rejection (Hopp and Quirin, 2008).

Additionally, Rozin and Fallon (1987) argue that disgust is absent at birth and develops through early and middle childhood. Between two and five years of age children do not develop disgust reactions. Disgust substances draw their attention and very often use them to play. During this time, infants imitate their parents who want to protect them from infections and potential treats and gain basic understanding of what is edible and what is not. Through this process, children learn gradually and implicitly the emotion of disgust, and adopt corresponding responses to repulsive objects.

Hence, disgust differs from place to place and from individual to individual. Even if there are some universal disgust elicitors there are many others that appear only in one or a few cultures and it seems that are not only genetically inherited, but also socially transmitted (De Block & Cuypers 2012).

Based on the theory above, the following hypothesis can be formed:
H1: Women are more disgust sensitive than men

2.1.3 The borders of the self

Regarding the findings of Allport (1955) and Harper (1964) people feel disgusted with their own body fluids, and in general body products, when they leave their own bodies and not when they are inside them. For example, although saliva in one's mouth does not elicit a disgust response, it becomes repulsive outside of the body when it comes to drink from a glass into which someone has spitted. Similar behaviors appear with chewed food, feces, blood and generally human substances. Nevertheless, the borders of the self can extend beyond the bodily self, depending on the context (Rozin & Fallon, 1987). For instance, body products among lovers or among parents and children may be converted from disgusting to pleasant because of the source of the object.

2.1.4 Human need for distinction from other animals

A psychological perspective of what makes us feel disgusted is based on our avoidance of any similarity with animals. This view is consistent with the fact that there is a widespread aversion to consuming animals that are physically similar to humans or in close interactive relations with humans (e.g., pets) (Rozin & Fallon, 1987). We feel intensively the need to distinguish ourselves from animals (Leach, 1989; Ortner, 1973; Tambiah, 1969) and whatever reminds us our animal nature or provokes ambiguity to the distinction between human-animal makes us feel disgust. Feces and blood, for example, are body products that we have in common with animals. Therefore, we find them disgusting. On the other hand, tears, which are uniquely human, are not revolting to us.

If physical disgust is about distinguishing ourselves from animals, then social disgust is about distinguishing ourselves from "demonic" wrongdoers and "beastly" criminals. We simply want to keep the category "human being" clearly defined (De Block & Cuypers 2012) and for that reason disgust has had horrible history.

2.1.5 Morality and disgust

Throughout the past, disgust has been liable for the formation of several moral attitudes related with sexual behavior and practices. Apart from this, it has admittedly led people to act in a terrible way, reinforcing their decision making while using a specific prism of morality. A prism, shaped with values that are not necessarily shared with other people and cultures. Hence, the emotion of disgust has been expressed, also, as a sign of social superiority to minorities and other disadvantaged groups.

As Nussbaum (2001) states it, "certain disgust properties – sliminess, bad smell, stickiness, decay, foulness – have repeatedly and monotonously been associated with ... Jews, women, homosexuals, untouchables, lower-class people – all of these are imagined as tainted by the dirt of the body."

Disgust metaphors and elicitors figure prominently in genocidal narratives (Savage, 2007), with feelings of disgust routinely evoked to derogate enemies in times of war and to moralize the persecution of minorities (Taylor, 2007). This feeling of revulsion invites one to raise his/her moral disapproval towards one's vulnerability like s/he is an animal. Therefore, repugnance guards the human–animal boundary in social cognition, playing the dual role of distancing ourselves from "lower" creatures and reaffirming our own humanity (Buckels & Trapnell 2013).

2.2 Ambiguity

All people, many times in their lives, make choices that have uncertain consequences. Decisions to switch to a new product, to undergo surgery or to sell shares are made without knowing in advance whether the new product will satisfy their expectations, the operation will be successful or the sale of shares will generate significant cash.

Sometimes, the decision maker is aware of the probabilities of potential outcomes. For example, a pregnant woman might be told that there is a chance 1 in 1000 that a woman

of her age will have a baby with Down syndrome; a dice gambler may know that the probability of rolling doubles is equal to 16.6%.

However, more often than not, decision makers are exposed in contexts where they have to assign subjective probabilities to events. The probabilities are usually based on their intuition, computation and/ or rumors, with some degree of imprecision or vagueness. Knight (1921) was the first one who discussed this difference between clear and vague probabilities. He raised the issue by diversifying the risk (measurable uncertainty) from the uncertainty (unmeasurable uncertainty). He claimed that in risk the probabilities are known and precise while in uncertainty the probabilities are unknown.

He suggested that entrepreneurs are reimbursed for bearing uncertainty. Contemporaneously, Keynes (1921) offered a different view by adding a psychological perspective on decision making. He distinguished between *judged probability*, which represents the balance of evidence in favor of a particular proposition, and the *weight of evidence*, which represents the quantity of evidence supporting that balance (Fox & Weber, 2002). He then wondered, "If two probabilities are equal in degree, ought we, in choosing our course of action, to prefer that one which is based on a greater body of knowledge?" [p. 313].

Later theorists initiated a different approach of probabilistic thinking disregarding the contrast between clear and vague probabilities. Subjectivists (e.g., Ramsey, 1926, 1931), for example, assumed that choices are not influenced by vagueness independently of preference between bets. Savage (1954) contributed significantly to the foundation of subjective probabilities based on the expected utility model of von Neumann and Morgenstern (1944). Although, he thoroughly covered the topic of vague probabilities, he argued that they are not relevant in a rational theory of choice.

2.2.1 Ellsberg paradox

In the early sixties, the problem of decision under ignorance drew attention and a various papers shifted their focus on it. The most critical to the topic was written by Ellsberg

(1961). Ellsberg, inspired by Knight and Keynes, showed the impact of ambiguity on decision making. Situations with unknown or uncertain probabilities are often called *ambiguous*, to distinguish them from situations with objectively known probabilities, which are typically called *risky* (Trautmann & Van De Kuilen, 2013). Ellsberg's simplest demonstration is the classical two-color bet that has also been used for the purpose of this paper with minor changes. More specifically, in the original Ellsberg's experiment, subjects were only asked to choose between the two urns described below while in the experiment made for this study, subjects were asked to state their willingness to accept (WTA) for each urn. In more details, it was explained to the subjects that there are two urns, one transparent and one opaque, and each of them contains 100 balls mixture of black and red. Urn transparent (risky urn) is completely transparent and contains exactly 50 black and 50 red balls. Urn opaque (ambiguous urn) is completely opaque and the proportion of red and black balls is unknown. Subjects were asked to indicate: which is the lowest amount they are willing to sell a ticket that would pay them €100 if they drew a red ball from urn transparent and nothing otherwise. The same for a black ball from urn transparent, a red ball from urn opaque and a black ball from urn opaque. In the experiment, participants' mean willingness to sell the ticket was € 32.8 more for the complementary bets (red and black ball) of the risky urn than of the ambiguous urn, sample size (N) = 85, $p < 0.01$. This result implies that the participants' subjective probability for black and red balls for the ambiguous urn is smaller than the risky urn and it can be shown below as:

$$P_{amb}(black) < 0.5 \qquad\qquad (1)$$

$$P_{amb}(red) < 0.5 \qquad\qquad (2)$$

$$P_{amb}(black) + P_{amb}(red) < 1 \qquad\qquad (3)$$

where $P_{amb}(\cdot)$ is the probability for the ambiguous urn. From the above, it is observed that participants' preferences are inconsistent with expected utility theory because the sum of probabilities is not equal to unity (3).

The results of this experiment has shown consistency with Ellsberg's hypothesis that people generally prefer to bet on known rather than unknown probabilities. Ellsberg claimed that except of the utility of outcomes and the probability of events determining them, there is one more factor that affects decision makers. This factor was called by him 'ambiguity' and was defined as: "a quality depending on the amount, type, and 'unanimity' of information, and giving rise to one's degree of 'confidence' in an estimate of relative likelihoods" (p. 657). Since Ellsberg presented his famous paradox, economists and psychologists stayed puzzled and an active literature initiated in the study of ambiguity aversion. Researchers have been interested in understanding and modeling ambiguity attitudes and have generated a various replications manipulating the parameters of the paradox.

2.2.2 New insights on ambiguity aversion

Ambiguity is of particular interest to economists and decision scientists for several reasons: 1) it is present in most real-world decisions, 2) it presents choice paradoxes for which standard expected utility theory has difficulty accounting, and 3) it is specific to human-decision making. In that its resolution requires communication or assessment of a second-order expectation about probabilities (Huettel, Stowe, Gordon, Warner & Platt, 2006).

The latest researches shed more light on decision maker's attitude towards clear over vague probabilities. They emphasize on the understanding of preferences between one source of uncertainty over the other and how uncertainty itself arises. More particularly, Heath and Tversky (1991), contrary to the ambiguity aversion hypothesis, found that people prefer to bet on their vague beliefs in situations where they feel especially competent or knowledgeable, although they prefer to bet on chance when they do not.

Fox and Tversky (1995) based their research on these results and moved forward by showing the importance of the context into the decision maker operates. They stated that ambiguity aversion is driven by a *comparison* with more *familiar sources* of uncertainty

or more knowledgeable people (which makes the notion of competence more salient), and is not in the absence of such a comparison (where the notion of competence is less salient) (Fox & Weber, 2002). This argument arose by their comparative ignorance hypothesis that was confirmed in several experiments where subjects were exposed in comparative and non-comparative contexts within which had to evaluate either lotteries with both clear and vague probabilities, or probable scenarios of natural events.

Even if comparative ignorance is difficult to be modeled there is a room for substantial economic implications. Ambiguity aversion has been shown to be economically relevant and to persist in experimental market settings (Gilboa, 2004; Sarin & Weber, 1993) and among business owners and managers familiar with decisions under uncertainty (Chesson & Viscusi, 2003).

Fox and Tversky (1995) obtained a remarkable result which triggered, also, a new stream of replications with another direction of academic research (e.g., Chew & Sagi, 2008; Ergin & Gul, 2009) where experimental economics and behavioral genetics are combined in order to investigate people's economic decision making through the prism of their genetic base.

2.3 Emotional influence on decision making

According to the aforementioned and as it is widely accepted, many times, emotions prevail over logic, influence our thoughts and guide our behaviors. Aristotle (350 BCEl 1991) and Hume (1739), many centuries afterward, are some of the philosophers who touched, implicitly, upon this fact. Even if the emotion research was not at the front line in the 20th century, now it consists a development area where new insights are generated. Various theories that emerged from these insights have established contradictory conclusions to the traditional approaches related with emotions and have stated that emotions have been consistently shown to influence decision-making.

The process examines how people actually choose between different options. It is shown that emotions play a key role in human social and economic decisions that people have to make in their everyday life. Each individual has its own subjective way in evaluating the objective features of each alternative that is proposed to him and emotions are regarded to define these subjective evaluations.

Each emotion affects in a different and unique way the attitude of the individual towards the offered alternatives in a decision making situation. It is observed, for instance, that an individual filled with the emotion of happiness or anxiety is more positive against a risk averse choice while someone who is feeling sad is tolerant or even seeking of a risky alternative (Blanchette & Richards, 2010).

The way that an emotion affects the judgment of an individual, that is prompted to decide between some proposed alternatives, has gradual impact on the different steps of decision making process. Firstly, the decision maker is trying to understand his/her personal feelings about the alternatives proposed. Then, these feelings play the role of information as they guide the judgment of the individual, affecting his/her subjective evaluation towards the risky or less risky options. Finally, the decision maker instead of trying to make sense out of all the logical reasons for choosing one of the available alternatives, he/she is comparing and integrating his/her feelings regarding them and then he/she takes a decision.

2.3.1 Appraisal Theory

For a better understanding of emotions and their impact, some psychologists categorized emotions based on the influence they have on decision-making. Appraisal theorists (Lazarus 1991; Roseman 1984; Scherer 1988; Smith and Ellsworth 1985) contributed to the division of the different principal emotions, adding their point of view. They claimed that emotions cannot only be distinguished by their positive and negative valence but, also, by their level of appraisal. The term "appraisal" refers to the different ways people

estimate and understand their current situations and the events taken place around them. It is asserted that appraisals not only influence the behavior of an individual during a specific situation that s/he is facing but they also affect him/her after this situation has ended, in his/her future activities.

Smith and Ellsworth evolved the psychological approach mentioned above by examining all the cognitive appraisal dimensions. Through empirical research, they defined six of them as those that can be used for describing the different emotions on an appraisal base. These cognitive appraisals are: certainty, pleasantness, attentional activity, control, anticipated effort, and responsibility. The emotion of disgust is mainly defined as a negative affect that is related to certainty. Other dimensions of disgust are that of unpleasantness and control, and both of them come after certainty in terms of strength.

The study of Smith and Ellsworth inspired many researchers (e.g Scherer, 2001, Gratch & Marsella, 2004) to contribute to their findings and to shed light on new paths of research. In particular, as researchers were able to more accurately distinguish emotions between each other, they started to conduct research in order to identify how specific emotions influence people's choices.

Lerner & Keltner (2000) presented the Appraisal-Tendency Framework that was based on the appraisal influence on emotions and the cognitive dimensions that define each of them. This framework addressed how and why specific emotions experienced previously influence or colour impending judgments and choices. The authors concluded that emotions activate appraisal tendencies, which are relatively automatic processes that guide subsequent perception and judgment.

On top of this framework, Tiendes and Linton (2001) provided more specific information related with certainty, the main dimension of disgust. They stated that certainty associated with an emotion affects the certainty experienced in subsequent situations. That arises because feeling certain is an internal cue that one is already correct and accurate, it may also suggest that further processing is not necessary (Tiendes & Linton, 2001). Hence, people who are more sensitive to disgust may be less willing to try new

things. When facing ambiguity, their unwillingness to expose themselves to things that are unknown and foreign may make them exhibit more ambiguity averse behaviors.

Additionally, as the emotion of disgust is associated with certainty according to the appraisal theory, alternatives that elicit the emotion of disgust would be less preferred as people shut their mental account for these alternatives and refuse to process them further.

Based on the theory above, the following hypotheses can be formed:

H2: People prefer alternatives that do not elicit the emotion of disgust to the ones that do.

H3: People more sensitive to disgust are more averse to ambiguity

3. Methodology

3.1 Introduction

The previous chapters included the relevant literature and the main research hypotheses as a basis of reasoning for the main research question of this thesis. All hypotheses that will be tested by conducting a research are proposed as following:

H1: Women are more disgust sensitive that men

H2: People prefer alternatives that do not elicit the emotion of disgust to the ones that do

H3: People more sensitive to disgust are more averse to ambiguity

3.2 Purpose of research

This study aims to collect data about individuals' sensitivity to disgust, and to examine how it influences their ambiguity attitude.

More specifically, it tries to explore if there is a relationship among people's disgust sensitivity levels and their decisions under uncertainty. Uncertainty produced either by the degree of uncertainty and its source, by a comparison with less ambiguous events or by a comparison with less certain emotions.

3.3 Experimental design

3.3.1 Design

For the purpose of this research a within-subject experimental design has been chosen. Therefore, all participants were exposed to every condition of this survey.

3.3.2 Sample and frame selection

The creation of a questionnaire was a useful and effective collection tool taking into account the limited budget and the large volume of data needed to be collected in a short time. The questionnaire used in this study can be found in Appendix A. Qualtrics hosted the questionnaire since it is a user-friendly tool that provides the options to include images into the questionnaire as well as to change easily the order in which participants can see parts of the survey. The distribution of questionnaires was completed through e-mails and social networks (Facebook and LinkedIn) because of the speed and the low cost of this method of collection. The participants of this research were adults and European citizens. Being a European citizen was a prerequisite for filling in this survey. The reason behind was a specific task of the questionnaire, which requires participants to be familiar with the countries of Europe. The questionnaire stayed online from 22/05/2015 until 25/06/2015.

3.3.3 Input measurements

3.3.3.1 Demographics

The first four questions of the questionnaire are related with the demographic characteristics of the participants. More specifically, they ask the participants to submit their gender (q.1), age (q.2), education level (q.3) and nationality (q.4).

3.3.3.2 Disgust sensitivity measurement

Questions 5 and 6 include a matrix table with 14 and 13 items respectively. The matrices allow the participants to give a single answer for each item and rate it on 5-point Likert scale.

In question 5 participants were asked to indicate the extension they agree or disagree with each statement of the matrix, with a rating from 1= strongly disagree to 5=strongly agree.

In question 6 respondents were asked to indicate their level of disgust towards each of the 13 experiences described in the matrix on a likert scale, rating from 1= not disgusting at all to 5=extremely disgusting.

These two questions (q.5 and q.6) consist the "Disgust Scale (DS)" (α=0.7) developed by Jonathan Haidt, Clark McCauley, and Paul Rozin. As they have stated (1994): "This scale is used to measure individual differences in sensitivity to disgust, and to examine the relationships among different kinds of disgust." Using the DS, the following subscales of disgust show up: "core disgust" (including food, animals, and body products), "animal reminder" (death and envelope violations) and "contamination disgust" (concerns about interpersonal transmission of essences).

Additionally, in the DS are included two items, which allow the researcher to identify the respondents who are either not concentrated or not taking the task seriously. These items are:

-"I would rather eat a piece of fruit than a piece of paper" with rates 0=strongly disagree (very untrue about me) and 1=mildly disagree (somewhat untrue about me)

-"You see a person eating an apple with a knife and fork" with rates 3=very disgusting and 4=extremely disgusting

3.3.3.3 Contexts with ambiguous sources

The following tasks were created in order to measure subjects' ambiguity drivers and attitude of different contexts.

Task 1 - Based on "Ellsberg's paradox"

This task was described extensively in chapter 2.2.1.

Task 2 - Based on the "Comparative ignorance" theory

This task was based on the study of Fox and Tversky (1995), which tests the comparative ignorance hypothesis using natural events.

More specifically, subjects were asked to indicate the lowest amount they are willing to sell a ticket that would pay them €100 if the temperature at 2:00 pm in Athens will be *less* than 25ºC one week from today, and €0 otherwise. The same for Athens with temperature *more* than 25ºC, San Francisco with temperature *less* than 25ºC and for San Francisco with temperature *more* than 25ºC.

The study was adapted to this research with small changes in the locations. Athens and San Francisco are cities with similar climates. In addition, Athens in comparison with San Francisco is a familiar city for Europeans. Moreover, in the description of this task participants were asked their willingness to accept (WTA) instead of their willingness to pay (WTP) that Fox and Tversky asked.

Task 3 - Created to show emotional influence on decision making

The goal of this task is to observe the impact of the affect of disgust on subjects' decision making. More specifically, it aims to test if alternatives that elicit the emotion of disgust would be less preferred than the ones that do not.

At the beginning of this task participants were induced to feel a certainty-associated negative emotion (disgust) by viewing a painting. This painting portrayed the head of a dead woman surrounded by insects, crawling animals and blood. Then, subjects were asked to indicate which is the lowest amount they are willing to sell a ticket that would pay them €100 if the disgust inducing painting was finished *before* the year of 1650, and €0 otherwise. The same for completion date *earlier* than the year of 1650.

The next step was to present the audience with an emotionally neutral painting (called "Night Scene") and by asking the abovementioned questions to reflect their WTA perception between the paintings.

The sum of selling prices of the two complementary "Head of Medusa" painting's bets was defined as the less ambiguous variable. On the other hand, the sum of selling prices of the two complementary "Night scene" painting's bets was defined as the ambiguous variable. These definitions are based on the theoretical background of this research that was a result of the existing literature and argumentation.

3.3.3.4 Ambiguity attitude

To investigate further the measurement of ambiguity attitudes, an additional format was used. This time, the sum of selling prices of the two complementary "risky" bets used in task 1, applied as the risky variable. The rest of the complementary bets of all of the tasks identified as the ambiguous variables.

As a result, four more conditions were created where participants' ambiguity attitude was measured by:

- The difference between the sum of selling prices of "risky urn" bets and that of Athens bets
- The difference between the sum of selling prices of "risky urn" bets and that of San Francisco bets
- The difference between the sum of selling prices of "risky urn" bets and that of "Head of Medusa" painting's bets
- The difference between the sum of selling prices of "risky urn" bets and that of "Night Scene" painting's bets

3.3.4 Images used in the questionnaire

For the coherence of the questionnaire two images were used for each task.

However, the images were essential only in task three. In task one, each image illustrates an urn. One of them depicts an urn with a question mark in the center (ambiguous urn) and the other one an urn with the proportion of black and red balls (risky urn). In task two, one photo shows the center of Athens and the other one the center of San Francisco. And in task three, one picture portrays the "Head of Medusa" (a painting created by Peter Paul Rubens) and the other one the "Night Scene" (a painting created by Peter Paul Rubens). Both paintings are created by the same artist, in the same period and with the same style.

The illustration of the painting "Head of Medusa" was used to instill disgust in the participants and the "Night Scene" to provoke neutral emotional reactions. For the goal achievement of this dissertation, both the questionnaire and the pictures were approved by my supervisor. All images used in the questionnaire can be found in Appendix B.

3.3.5 Questionnaire design

All participants were assigned to the same questionnaire by clicking on its link. However, the survey flow had two different patterns. The reason behind was the restriction of potential biases caused by the order the information was presented to the subjects. Both patterns started with a small introduction to the research, thanking the participants for their participation and explaining them briefly the aim of this research. Then, participants were asked to submit some demographic data about themselves. Next, they were randomly shown either the "disgust sensitivity scale" followed by the three "ambiguity attitude" tasks, or vice versa. Furthermore, the "ambiguity attitude" tasks were also presented in a random sequence regardless of whether they were displayed before or after the "disgust sensitivity scale".

4. Data

4.1 Data cleaning

A total of 173 individuals clicked on the link of the questionnaire and 100 completed it. This response rate was roughly 58%. However, even if there were not missing answers 15 of them included wrong answers and consequently removed from the data analysis. As a result, 85 completed questionnaires in total were left for the analysis.

4.2 Sample size and power

No power calculation was made to determine the size of the sample needed for this study. However, according to Van Voorhis & Morgan (2007), as well as the generally accepted rule of thumb in statistics (n>= 30), 85 observations determine a sample size with sufficient power. Hence, the goal of this research can be served using the data collected.

4.3 Participants' profile

Among the 85 participants, 40 were female (47%) and 45 were male (53%). Their age ranged from 19 to 70 with an average of 30 years old. Furthermore, the educational level of the majority (87%) of respondents was "bachelor/master". Last, as far as nationalities are concerned, all of the participants were Europeans with most of them being Greeks. From the abovementioned data arise that the sample was somehow biased towards relatively highly educated young people from Greece.

4.4 Variables description

The data analysis of this study was made by the usage of the statistical software SPSS. The table below presents the variables created for the purpose of this research, as well as, their description.

Table 1: Variables description

Name	Description
DS	Average score of the Disgust Sensitivity test
male	Gender, takes value 1 if male, and 0 if female
task	Takes value 1 for task 1 (Ellsberg's paradox), 2 for task 2 (comparative ignorance), 3 for task 3 (disgust influence on decision making)
temp_ATH	The sum of selling prices of the two complementary bets on the temperature of Athens
temp_SF	The sum of selling prices of the two complementary bets on the temperature of San Francisco
paint_HM	The sum of selling prices of the two complementary "Head of Medusa" painting's bets

paint_NS	The sum of selling prices of the two complementary "Night Scene" painting's bets
urn_Risk	The sum of selling prices of the two complementary "risky" bets
urn_Amb	The sum of selling prices of the two complementary "ambiguous" bets
temp_diff	The difference between the sum of selling prices of Athens bets and that of the San Francisco bets
urn_diff	The difference between the sum of selling prices of "risky urn" bets and that of "ambiguous urn" bets
paint_diff	The difference between the sum of selling prices of "Head of Medusa" painting's bets and that of "Night Scene" painting's bets
dif_risk_ATH	The difference between the sum of selling prices of "risky urn" bets and that of Athens bets
dif_risk_SF	The difference between the sum of selling prices of "risky urn" bets and that of San Francisco bets
dif_risk_HM	The difference between the sum of selling prices of "risky urn" bets and that of "Head of Medusa" painting's bets
dif_risk_NS	The difference between the sum of selling prices of "risky urn" bets and that of "Night Scene" painting's bets

4.5 Summary Statistics

The following table summarizes the data collected by the online survey, referenced above, and produced by the development of models used in chapter 5.

Table 2: Summary statistics

	N	Mean	Median	Std. Deviation	Minimum	Maximum
temp_ATH	85	110,12	100	44,65	0	200
temp_SF	85	99,1	100	45,32	0	200
paint_HM	85	112,31	100	49,31	0	200
paint_NS	85	112,44	100	48,08	0	200
urn_Risk	85	118,94	100	59,58	0	200
urn_Amb	85	86,14	98	55,65	0	200
urn_diff	85	32,8	20	70,36	-200	200
temp_diff	85	11,01	,00	24,8	-30	100
paint_diff	85	-,12	,00	27,15	-100	100
dif_risk_ATH	85	8,82	,00	61,77	-200	200
dif_risk_SF	85	19,83	,00	60,24	-200	200
dif_risk_HM	85	6,62	,00	57,8	-200	120
dif_risk_NS	85	6,49	,00	54,61	-200	110
DS	85	2,8	2,92	,56	1,64	3,88
age	85	30,25	27	9,85	19	70

5. Results

This chapter is divided into three sections. All of them present the results of the data analysis made based on the hypotheses tests. The first section illustrates the way the disgust score is calculated, as well as, the relationship between the dependent variable DS and the independent variables: age, education and gender. The second section shows subjects' behavior under the aforementioned tasks. Afterwards, it presents in details the measurement of participants' ambiguity attitude. The third section demonstrates the relationship between ambiguity attitude (dependent variable) and the DS (independent variable).

5.1 Disgust Sensitivity Score

For the calculation of the disgust score the instructions given by Jon Haidt (2007) were followed. Hence, the means of the three subscales of disgust (core, animal reminder and contamination) were computed firstly in order to calculate afterwards, the whole disgust scale score (DS with mean equals to 2.8).

 The variables demonstrated in this part are two continuous (male, age) and two ordinals (education, DS). The histograms created for each variable were not all symmetric. Therefore, to test whether participants' gender, age and education (independent variables) are positively correlated with their disgust sensitivity (dependent variable), a Spearman correlation test was run in SPSS. The results of this non-parametric measure are depicted in table 3.

Table 3: Correlations – Spearman's test

	DS	male	education	age
DS	1 .	-,288*** (,008)	,248** (,022)	-,016 (,884)
male	-,288*** (,008)	1 .	-,020 (,857)	,045 (,683)
education	,248** (,022)	-,020 (,857)	1 .	,130 (,235)
age	-,016 (,884)	,045 (,683)	,130 (,235)	1 .

*** Significant at the 0.01 level (2-tailed)
** Significant at the 0.05 level (2-tailed)

These results determine the relationship between participants' disgust sensitivity (DS) and their demographic characteristics (male, education and age). It is revealed that there is a negative and significant correlation between DS and male ($r_{s\ (2)}$= -,288, p =,008). Moreover, there is a positive and significant correlation between DS and education ($r_{s\ (3)}$= ,248, p =,022) and a negative but not significant between DS and age ($r_{s\ (4)}$= -,016, p =,884).

Thus, **hypothesis 1 is supported.**

5.2 Ambiguity attitudes

5.2.1 Subjects' ambiguity attitudes and drivers

To measure if the difference in the complementary bets of each task was statistical significant a non-parametric test was run. That was Wilcoxon signed-rank test and it run three times, one for each task. This test was appropriate for testing the significance of these differences because each time it was used to compare two different continuous variables (temp_ATH & temp_SF, paint_HM & paint_NS, urn_Risk & urn_Amb) that come from the same participants.

In table 4 is shown the median and the statistical significance of the difference between the complementary bets of each task.

Table 4: Paired Samples Test – Wilcoxon Signed Ranks Test

Task 1	Risky urn	Ambiguous urn	p-value
Median	100	98	,000***
Task 2	**Athens**	**San Francisco**	**p-value**
Median	100	100	,000***
Task 3	**Head of Medusa**	**Night Scene**	**p-value**
Median	100	100	,959

*** Significant at the 0.01 level (2-tailed)

Based on the results of table 4, the change in the bets between the paintings "Head of Medusa" and "Night Scene" was not significant (p=,059). On the other hand, task 1 and 2 elicited a statistically significant change between the complementary bets (p<,001).

Tables 5, 6, 7 illustrate the mean willingness to accept (WTA) for each bet in each task.

Table 5: Task 1- Ellsberg's paradox

Options	WTA		
	Black	**Red**	**Total**
Urn transparent (risky urn)	€59,17 (3,28)	€59,7 (3,2)	urn_Risk = €118,9 (6,4)
Urn opaque (ambiguous urn)	€43,4 (3,04)	€42,7 (3,02)	urn_Amb = €86,1 (6,03)
Attitude			urn_diff = €32,8 (7,6)

Note: standard errors are into brackets

Observing the mean willingness to accept of "urn_Risk" and "urn_Amb" arises that the risk bets are more attractive than the ambiguous bets. Additionally, it seems there is not a specific color preference between betting on red or black either urn. The bets in each condition were priced with slight differences and the color preference of bets in urn transparent (red) was different than the urn opaque (black).

The difference between "urn_Risk" and "urn_Amb" (urn_diff) indicates the ambiguity attitude of the participant. When "urn_diff" is positive the individual is ambiguity averse otherwise ambiguity seeking. This is emerged, taking into account that the WTA ranges between zero and one hundred euros.

In task 1, subjects are more ambiguity averse, $p < 0,001$.

Table 6: Task 2 – Natural events

Options	WTA		
	At least 25ºC	**Less than 25ºC**	**Total**
Athens (familiar)	€74 (2,9)	€36 (3,4)	temp_ATH =€110 (4,8)
San Francisco (unfamiliar)	€51 (3,6)	€28 (3,5)	temp_SF =€79 (4,9)
Attitude			temp_diff= €31 (2,6)

Note: standard errors are into brackets

In task 2, participants were exposed in a comparative context. The total column of table 6

presents the means of the sums of the complementary bets. Focusing on this column, it is detected that participants were willing to accept on average €31 more to bet on familiar Athens temperature than on unfamiliar San Francisco temperature, p<0,001. In addition, there is a clear source preference since in both prospects; the bets of the propositions were priced higher for Athens.

Hence, participants exhibit familiarity bias.

Table 7: Task 3 - Paintings

	WTA		
Options	**No earlier than age 1650**	**Before age 1650**	**Total**
Head of Medusa *(Disgust inducing painting)*	€57,7 (3,56)	€54,6 (3,4)	paint_HM = €112,3 (5,3)
Night Scene *(Neutral painting)*	€58,5 (3,36)	€53,9 (3,29)	paint_NS = €112,4 (5,2)
Attitude			paint_diff = €-,1 (2,9)

Note: standard errors are into brackets

From table 7 it is revealed that the difference between the cash equivalents of each prospect was trivial. The ambiguous prospect was priced only €0,1 more than the risky one. Furthermore, **their difference is insignificant, p>0,05**.

Hence, hypothesis 2 is not supported.

5.2.1.1 Ambiguity attitude measurement

In the additional format, four more conditions were formulated. Each of them had as result the creation of one of the following variables: dif_risk_ATH, dif_risk_SF, dif_risk_HM and dif_risk_NS. These variables are described in table 8 and measure subjects' ambiguity attitude. The bigger these differences are, the more ambiguity averse a person is.

For each supplementary condition a one-sample Wilcoxon signed-rank test run.

This test was appropriate for testing if the medians of these variables are not equal to zero. More particularly, it tests if respondents' ambiguity attitude is not neutral. The table below illustrates the significance of the results revealed by the use of this test.

Table 8: One-sample Wilcoxon Signed Rank Test

Variables	Sign.
dif_risk_ATH	,233
dif_risk_SF	,003**
dif_risk_HM	,184
dif_risk_NS	,137
urn_diff	,000**

Asymptotic significances (2-tailed) are displayed.
**Significance level is 0.05

From the information given in table 8 arises that for the variables: dif_risk_NS, dif_risk_HM, dif_risk_ATH the null hypothesis is rejected because p >0.05.

Only, dif_risk_SF and urn_diff support the null hypothesis.

5.3 DS and ambiguity attitude

To test hypothesis 3, five linear regression models were run. All of them used the same explanatory variable that of "DS". For each of the five models the dependent variable was the variable that measures participant's ambiguity attitude. More specifically, the dependent variables used were: "dif_risk_ATH", "dif_risk_SF", "dif_risk_HM", "dif_risk_NS" and "urn_diff".

The table below indicates if there is a significant association between the two variables of each linear regression model.

Table 9: Linear Regression

	Dependent Variables				
	dif_risk_ATH	**dif_risk_SF**	**dif_risk_HM**	**dif_risk_NS**	**urn_diff**
Constant	10,4 (,765)	1,9 (,955)	2,8 (,1932)	16,9 (,582)	43,1 (,277)
DS	-,556 (,963)	6,4 (,589)	1,4 (,904)	-3,7 (,730)	-3,697 (,789)
Adjusted R^2	-,012	-,008	-,012	-,011	-,011
N	85	85	85	85	85

Note: p-values are in the brackets

The regression equation of each condition is presented as:

Athens: dif_risk_ATH = 10,4 - 0,556(DS)+e

San Francisco: dif_risk_SF = 1,9 + 6,940(DS) +e

Head of Medusa: dif_risk_HM = 2,8 + 1,4(DS) +e

Night Scene: dif_risk_NS = 16,9 -3,7(DS) +e

Urns: urn_diff = 43,1 -3,697(DS) +e

Table 9 provides us with the information that in dif_risk_ATH, dif_risk_NS and urn_diff conditions it is appeared a negative correlation between participants' disgust sensitivity and ambiguity attitude. On the other hand, in dif_risk_SF and dif_risk_HM the same correlation is positive. However, the intercepts and the coefficients of all of the prospects are non-significant.

Thus, **hypothesis 3 is not supported**.

5.4 Hypotheses test result

Chapter 5 shows and interprets the results given by the data analysis selected for this study. From the four research hypotheses, two of them were confirmed and two were rejected.

Table 10: Hypotheses test results

Hypothesis	Result
H1: Women are more disgust sensitive that men	Supported
H2: People prefer alternatives that do not elicit the emotion of disgust to the ones that do	Rejected
H3: People more sensitive to disgust are more averse to ambiguity	Rejected

6. Discussion

In this section, the results of the previous chapter will be further analyzed and discussed.

6.1 Disgust sensitivity score

As expected, disgust sensitivity score was related significantly with participants' gender. More specifically, as Spearman's coefficient was negative, being a male was associated with a smaller disgust sensitivity score compared to being a female, ceteris paribus.

From an adaptationist view, it could be expected that greater disgust sensitivity in women compared to men is due to women's increased parental investment (Trivers, 1972).

This increased parental investment may arise from the acceptance of the role, the society and the culture have given to women. More specifically that women, in comparison with men, are more reliable for the edification and breeding of their child. However, females are, also, mammals and this fact by itself makes them invest time and energy into lactating and protecting their children. Thus, as mentioned before, it is reasonable that women who feel the need to protect their kids to be more sensitive to potential threats and repulsive cues in comparison with men.

6.2 Task 1

Based on the literature review, it was expected that the participants would have a preference for the urn with known rather than the one with the unknown probabilities. In addition, it was assumed that the respondents would be indifferent between betting on one or another color of the balls for either urn. In accordance with the results, the color of the balls did not influence participants' decisions to bet on, regardless of the urn used. Moreover, as in Ellsberg's example (1961) subjects felt more knowledgeable on the risky urn since the probabilities were known and showed a strict preference on it. Therefore, they exhibited ambiguity averse behavior.

6.3 Task 2

According to Tversky and Fox (1995) when people compare prospects become more sensitive to the contrast of their knowledge. As a result, the less familiar (ambiguous) prospect is priced lower than the more familiar (clear) prospect. Based on the empirical results of this study, San Fransisco's (unfamiliar city) temperature was priced lower than to Athen's (familiar city) temperature. Hence, it arises that people were more ambiguity averse towards San Fransisco's temperature than to Athen's temperature. Again this could

be explained by the fact that under a comparative condition, people's choices are influenced by the source of uncertainty and become familiarity biased.

6.4 Task 3

Theory indicated that when feeling a certainty-associated emotion such as disgust, subsequent decisions would be affected by the certainty experienced. Nevertheless, no significant results were found in this research for the difference in WTA between the prospect that induced the emotion of disgust and that one that did not. 'Head of Medusa' (disgust inducing) painting was priced almost the same as the 'Night Scene' (neutral) painting. A possibly explanation for this is that the degree to which participants felt certain, provoked by the disgust image used, was not high enough.

6.5 Ambiguity attitude

This research analyzed the change in participant's behavior due to unknown probabilities in order to study their ambiguity behavior. This change was captured measuring the difference between the ambiguous sources and the risky source. The risky Ellsberg urn was the risky source since the probabilities were known and the rest of the variables, that measure the complementary bets of each prospect, were the ambiguous sources. Based on the literature review, it was expected that the participants would price higher the bets of the risky source than the ambiguous sources and thereby their difference would be positive. Consistent with the theory, the difference between the WTA for Ellsberg's risky urn and the WTA for all of the ambiguous sources was positive. Therefore, participants were ambiguity averse to all of the differences made. However, only the difference between the WTA for Ellsberg's risky urn and the WTA for San Francisco's temperature, as well as, the WTA for Ellsberg's ambiguous urn were statistical significant, $p<0.005$. Therefore, for the rest of the variables, there is no statistical evidence that the differences in sources are not due to chance.

6.6 DS and ambiguity attitude

The main reason why disgust sensitivity was expected to have a significant positive relationship with ambiguity averse behavior is that disgust is associated with certainty and consequently may enhances aversion to the unknown. Although, there is no theoretical background to support this assumption, it was reasonable to expect that the risk perception of the participants would be influenced by the main dimension of disgust, that of certainty.

Higher disgust sensitivity score resulted in more ambiguity averse behaviour for the 'San Francisco' and 'Head of Medusa' prospect. So, it could be concluded that there is a positive relationship between disgust sensitivity score and the unfamiliar and disgust induced source of ambiguity. Contrary to what expected, higher disgust sensitivity score resulted in less ambiguity averse behavior for the 'Athens', 'Ellsberg's ambiguous urn' and 'Night Scene' prospect. However, both the intercepts and coefficients of all of the prospects were non-significant. Therefore, it cannot be concluded that there is a linear relationship between DS and ambiguity attitude. A possible explanation could be that even if certainty is the main dimension of disgust, the other dimensions such as unpleasant or control could play also an important role on decision making.

7. Conclusions

7.1 Main findings and general conclusions

The purpose of this study is to find if there is a relationship between ambiguity attitude and disgust. In order to achieve this, it examines the effect of disgust sensitivity on ambiguity attitudes. Moreover, this research examines the effect of the alternatives that provoke the emotion of disgust on people's decision making. Last, this thesis tries to find a connection between gender and disgust sensitivity.

Based on the existing literature and after an extensive research on it, the creation of a model arose so as to test the research hypotheses. This model is proposed and described

extensively in the third chapter of the study. The model tries to relate disgust and ambiguity attitude provoked by different sources.

Unfortunately, the main findings cannot suggest that disgust sensitivity score has a positive relationship with ambiguity averse behavior since the results are not coherent between all of the prospects and above all are not significant. Furthermore, alternative that provokes the emotion of disgust in this study had not a significant difference in WTA with the neutral alternative.

On the other hand, this study replicates previous research suggesting (Prokop and Jancovicova, 2013; Oaten et al., 2009) that there are gender differences in disgust sensitivity. And more specifically, that women are more disgust sensitive than men. Additionally, as far as different contexts in which a person evaluates both clear and vague prospects are concerned, the research finds evidence for both ambiguity aversion and familiarity bias. Thus, it adds to previous findings of decision making under uncertainty and contributes to a deeper understanding of it.

Given these outcomes, it cannot be concluded that the emotion of disgust influences the process of decision making.

7.2 Limitations and future research

The model developed in this thesis has its limitations that should be considered in the interpretation of the results and the suggestions for future research.

First, the sample cannot be considered as a representative one since it was limited to 85 respondents who show similar characteristics. The participants of the sample were relatively highly educated young people from Greece and therefore it does not allow the generalization of the results to other populations.

Furthermore, after the induction of disgust using a picture, the valence of the emotion was not captured. Thus, it was not tested how effective the use of this specific picture was and how strong it was the feeling provoked. Another limitation of this research is the lack

of measurement of the duration of the affect provoked as well as the direct comparison with the subsequent prospect. Hence, it was not clear if participants were still under the influence of disgust when they indicated their WTA for the neutral prospect. Future research could give insights addressing the above issues. Additionally, as emotions have been suggested as mediators of decision making, more research on the link between emotions and ambiguity attitudes is needed.

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APPENDICES

Appendix A

Thesis questionnaire

Hello and thank you in advance for your participation. Your answers will be helpful in explaining how specific emotions influence people's decisions.

>>

Demographic characteristics

What is your gender?

Male

Female

I would prefer not to say

What is your age?

What is your highest level of education?

Elementary School

High School

Bachelor / Master

Phd

>>

Disgust Sensitivity Score

Please indicate how much you agree with each of the following statements.

	Strongly Disagree	Mildly Disagree	Neither Agree nor Disagree	Mildly Agree	Strongly Agree
I might be willing to try eating monkey meat, under some circumstances	O	O	O	O	O
It would bother me to be in a science class, and to see a human hand preserved in a jar	O	O	O	O	O
It bothers me to hear someone clear a throat full of mucous	O	O	O	O	O
I never let any part of my body touch the toilet seat in public restrooms	O	O	O	O	O
I would go out of my way to avoid walking through a graveyard	O	O	O	O	O

Seeing a cockroach in someone else's house doesn't bother me	O	O	O	O	O
It would bother me tremendously to touch a dead body	O	O	O	O	O
If I see someone vomit, it makes me sick to my stomach	O	O	O	O	O
I probably would not go to my favorite restaurant if I found out that the cook had a cold	O	O	O	O	O
It would not upset me at all to watch a person with a glass eye take the eye out of the socket	O	O	O	O	O
It would bother me to see a rat run across my path in a park	O	O	O	O	O
I would rather eat a piece of fruit than a piece of paper	O	O	O	O	O
Even if I was hungry, I would not drink a bowl of my favorite soup if it had been stirred by a used but thoroughly washed flyswatter	O	O	O	O	O
It would bother me to sleep in a nice hotel room if I knew that a man had died of a heart attack in that room the night before	O	O	O	O	O

>>

How disgusting would you find each of the following experiences?

Please choose a scale point of disgust to indicate your answer.

	Not disgusting at all	Slightly disgusting	Moderately disgusting	Very disgusting	Extremely disgusting
You see maggots on a piece of meat in an outdoor garbage pail	O	O	O	O	O
You see a person eating an apple with a knife and fork	O	O	O	O	O
While you are walking through a tunnel under a railroad track, you smell urine	O	O	O	O	O
You take a sip of soda, and then realize that you drank from the glass that an acquaintance of yours had been drinking from	O	O	O	O	O
Your friend's pet cat dies, and you have to pick up the dead body with your bare hands	O	O	O	O	O
You see someone put ketchup on vanilla ice cream, and eat it	O	O	O	O	O
You see a man with his intestines exposed after an accident	O	O	O	O	O
You discover that a friend of yours changes underwear only once a week	O	O	O	O	O
A friend offers you a piece of chocolate shaped like dog doo	O	O	O	O	O
You accidentally touch the ashes of a person who has been cremated	O	O	O	O	O

You are about to drink a glass of milk when you smell that it is spoiled	○	○	○	○	○
As part of a sex education class, you are required to inflate a new unlubricated condom, using your mouth	○	○	○	○	○
You are walking barefoot on concrete, and you step on an earthworm	○	○	○	○	○

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Task 1

Please consider the following situations.

Urn transparent is completely transparent and contains exactly 50 black and 50 red balls.
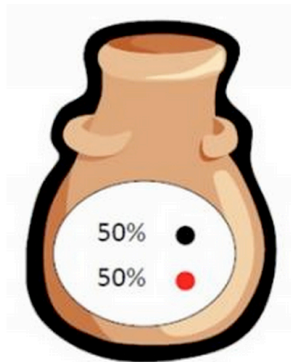
Urn transparent

You have been offered a ticket that will pay you €100 if you draw a **red** ball from **Urn transparent** (50 red and 50 black balls), and €0 otherwise. What is the lowest amount that you are willing to sell the ticket for?

The lowest amount is €

[   ]

You have been offered a ticket that will pay you €100 if you draw a **black** ball from **Urn transparent** (50 red and 50 black balls), and €0 otherwise. What is the lowest amount that you are willing to sell the ticket for?

The lowest amount is €

[   ]

<div style="text-align: right">[>>]</div>

Urn opaque is completely opaque and contains 100 red and black balls. You don't know how many balls are black and how many are red.

Urn opaque

You have been offered a ticket that will pay you €100 if you draw a **red** ball from **Urn opaque** (unknown proportion), and €0 otherwise. What is the lowest amount that you are willing to sell the ticket for?

The lowest amount is €

[ ]

You have been offered a ticket that will pay you €100 if you draw a **black** ball from **Urn opaque** (unknown proportion), and €0 otherwise. What is the lowest amount that you are willing to sell the ticket for?

The lowest amount is €

[ ]

Task 2

Next please consider the following situations.

Athens

You have been offered a ticket that will pay you €100 if the temperature at 2:00 pm in **Athens** is **at least 25ºC** one week from today, and €0 otherwise. What is the lowest amount that you are willing to sell the ticket for?

The lowest amount is €

[ ]

You have been offered a ticket that will pay you €100 if the temperature at 2:00 pm in **Athens** is **less than 25ºC** one week from today, and €0 otherwise. What is the lowest amount that you are willing to sell the ticket for?

The lowest amount is €

[ ]

San Francisco

You have been offered a ticket that will pay you €100 if the temperature at 2:00 pm in **San Francisco** is **at least 25ºC** one week from today, and €0 otherwise. What is the lowest amount that you are willing to sell the ticket for?

The lowest amount is €

[ ]

You have been offered a ticket that will pay you €100 if the temperature at 2:00 pm in **San Francisco** is **less than 25ºC** one week from today, and €0 otherwise. What is the lowest amount that you are willing to sell the ticket for?

The lowest amount is €

[   ]

Task 3

Please look carefully the pictures and then answer the following questions.

Picture 1 (Head of Medusa)

You have been offered a ticket that will pay you €100 if the painting of **Picture 1** (Head of Medusa) was finished **before** the year of 1650, and €0 otherwise. What is the lowest amount that you are willing to sell the ticket for?

The lowest amount is €

[ ]

You have been offered a ticket that will pay you €100 if the painting of **Picture 1** (Head of Medusa) was finished **no earlier than** the year of 1650, and €0 otherwise. What is the lowest amount that you are willing to sell the ticket for?

The lowest amount is €

[ ]

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Picture 2 (Night Scene)

You have been offered a ticket that will pay you €100 if the painting of **Picture 2** (Night Scene) was finished **before** the year of 1650, and €0 otherwise. What is the lowest amount that you are willing to sell the ticket for?

The lowest amount is €

[   ]

You have been offered a ticket that will pay you €100 if the painting of **Picture 2** (Night Scene) was finished **no earlier than** the year of 1650, and €0 otherwise. What is the lowest amount that you are willing to sell the ticket for?

The lowest amount is €
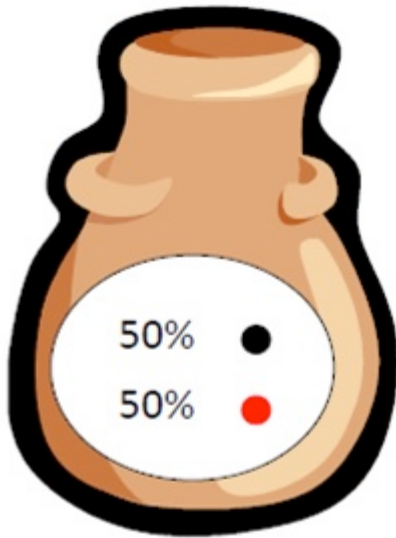
[   ]

We thank you for your time spent taking this survey.
Your response has been recorded.

Appendix B

All images used in each task of the questionnaire can be found below.

Task 1

Urn transparent   Urn opaque

Task 2

Athens

San Francisco

Task 3

Disgust inducing painting

Neutral painting