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The Illusory Truth Effect in the Visual Context: An Exploration of Potential Applications

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ABSTRACT

In recent years, studies and experiments regarding heuristics and biases in judgments under uncertainty have proliferated. Nonetheless, few of these focused on visual communication, thus on information conveyed using symbols and imagery. Considering that this latter context can represent a fertile soil for heuristics and biases to arise, this study intended to explore these subjects in the visual context. Specifically, we tried to study the well-known Illusory Truth Effect in the visual context, that is, by using images as stimuli, instead of words. The classic Illusory Truth effect shows that sentences that are perceptually fluent are more likely to be judged as true. In our own study, we manipulated image fluency by using a photography filter (image exposure): darker images represented the disfluent condition, brighter images represented the fluent condition. The objective was twofold: 1) test whether image fluency affected individuals' judgment on image veracity; 2) test if fluent images were more likely to be perceived as true.

In order to accomplish this objective, we conducted an experiment in which each of 102 respondents saw 16 images, and then they were requested to judge their actual veracity. Respondents were randomly divided into two groups. Within each group, a random sequence of false/true, fluent/disfluent images were shown, such that images shown in the fluent condition in one group were in the disfluent condition in the other group. Thus, an ANOVA was run to test the two hypotheses. Our findings show that images' perceptual fluency does indeed influence individuals' perception of their actual veracity. However, fluent images are not always perceived as more true. What we do find is that inducing disfluency in picture viewing makes actual true images seem less true and actual false images seem less false.

In our discussion we propose how this study can lead the way for an all-round exploration of heuristics and biases in visual communication. Moreover, we explain why this findings are relevant both in marketing and public policies contexts.

Keywords: Illusory Truth Effect, visual communication, heuristics and biases, public policy tools.

INTRODUCTION

Nowadays people are overwhelmed by a massive amount of information, advertising, and news, and most of it unsolicited. It comes from countless sources, an increasing proportion of it consists of visual information (pictures, video, …). Many observers of this phenomenon have argued that it has become impossible for people to process all the information they receive (Hasher, 1979). In such a context, it would simply be impossible for people to put enough effort into analysing, and therefore truly understanding, each message they receive. Thus, it happens that much information is passively assimilated and elaborated by the use of heuristics and, therefore, it could be misunderstood. The use of heuristics in judgment does not necessarily imply poor decision outcomes. It let us save energies and effectively deal with a massive amount of information. It can happen, nonetheless, that problems requiring a much more effortful analysis are solved with heuristics and, therefore, these lead to a poor decision outcome. This situation is potentially exploitable by firms.

Past research studied a multitude of heuristics, both in theory and in practice, and the Illusory Truth Effect is part of such literature.

The Illusory Truth Effect is, generally, the tendency to believe that a statement is true if it is easier to process, or if it elicits familiarity, regardless of its actual veracity. A lot of firms know how it does work and, consequently, they design some of their advertising strategies to exploit this effect; for instance, we can easily recall advertising statements such as "*number one in its category*" written on products' packaging or ads, these are intended to work through repetition, indeed, by reading again and again such statements, individuals will likely start to believe what they read. This is an example of the Illusory Truth Effect caused by repetition, and the resulting experience of familiarity with a given statement. The Truth Effect can work even in the short run. Indeed, by creating a statement that is easy to process, it is more likely it to be believed. As a result, these statements help to build favorable ideas of the brand/product and, therefore, improve brand image, likeability and so on.

All prior studies on illusionary truth used text-based experiments and, therefore, they are valid only in such context. Even if texts and words constitute a significant

communication tool, images and videos are important as well, and for several reasons they are a more direct tool in communication. The communication between firms and their customers takes place largely in the visual context, that is, with the use of images, videos and so on. The prevalence of visual information heavily rose in recent years, with massive use of online social networks such as Facebook and Instagram. Firms design their advertising in order to reach potential consumers wherever they are and, currently, they spend an impressive amount of time on average using these platforms. In platforms as Facebook, there is a balanced presence of both, images and words, but in others, such as Instagram, the presence of images is predominant. Therefore, communication through such platforms takes place thanks to the use of visual content.

Consequently, it is necessary to explore how heuristics work in the visual context. This study aims to apply the available knowledge about the Truth Effect in the world of images, that is, to experiment whether individuals are subject to the Truth Effect with images other than words. Considering that images are as much used in communication as words are and, therefore, individuals gather information through images as well, the Illusory Truth Effect, and heuristics in general, could be effective even with images. Furthermore, pictures are easier to recognize and to process for individuals (Paivio, 1971).

Finally, this study will test whether the truth effect, and the heuristic and biases related, are valid in the visual context. Specifically, it will test two hypotheses:

H1: The judgment of truth of the message conveyed by an image is affected by the ease of processing of the stimulus.
H2: The message conveyed by an image is more likely to be perceived as true if the image is easier to process.

That is, the more an image is fluent to process for an individual, the more likely he will believe in the message it conveys.

True and False Images

At this point, before testing whether the truth effect is valid with images, it is necessary to define what truthfulness within an image does mean: what does it mean that an image is true or sincere for an individual?

Firstly, images convey information as words do. But they do it in a different manner: by using a different level of communication. While textual communication takes places through argumentation, visual communication works by association (Muller, 2003). Therefore, an image is not true (e.g. fake) if it conveys information that is not real, or are not an accurate reflection of the reality, that is, it elicits associations that do not correspond to the reality depicted by the image.

For example, this picture on Instagram (see Exhibit 1) conveys information to the social network's users. Even if it is not explicitly stated, the image is visually communicating that these products resist and work well in such environmental situations; indeed, it displays Norrona's products being used in an extreme natural environment. If the picture (Exhibit 1)[1] turns out to be unreal (i.e. photoshopped), this means that the image is not true, thus the associations which it elicits are not true. On the other hand, if an image conveys true information, and elicits associations that are coherent with reality, it is possible to define it as true.

A common issue within images veracity lies in travel photographs and what experience they let you imagine. Among travel bloggers, using intelligent perspectives and Photoshop when making and modifying photos is becoming more and more popular. Their activity consists mainly of traveling around the world and post photo coverages on social networks so that their followers get inspiration. By using Photoshop, for example, their travel experience can be perceived as different from how it actually is (Exhibit 2). In Exhibit 2, it becomes clear how people's perception of travel experience can be distorted from reality because of an image. Indeed, in bloggers' photos, the Great Wall of China seems like a peaceful and wonderful place. But in the photo in Exhibit 2, it seems everything but a peaceful place.

Of course, this matter is not limited to travel bloggers and Instagram. Potentially, every image can induce a misperception of reality because, like words, images are not reality itself, but only a representation of it. It is even critical to investigate, within this study, whether people are not as used to think critically about visual information as they are with textual information. If individuals will result to be less critical when they face visual information, thus being less capable to detect false information, this would result in a much more powerful Truth Effect in the visual context.

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[1] Exhibits (Exhibit 1, 2, 3, 4, 5, and 6) are shown in the Appendix of the text.

Public Policy Tools

Being welfare the basis of modern societies, it is clear why it is extremely important for democratic governments to effectively influence the behaviour of citizens. Public policies with the intent of influencing individuals' behaviours, aim to improve their welfare and are, in general, in the interest of the public.

To implement public policies, governments use public policy tools such as legislation, sanctions, regulations, taxes, and subsidies (Andrews et al, 1995).

One tool governments can dispose of, according to the Office of Technology Assessment, is *information reporting* (Andrews et al, 1995). This specific tool aims to affect individuals behaviour mainly by delivering relevant information regarding a problematic issue, for example, texts such as "alcohol abuse can kill you" provide information which is meant to alter individuals behaviour. Chosen information usually refers to environmental concerns or individuals health issues.

Visual communication is a relevant issue in public policies. Indeed, in recent years information reporting showed an increase in the use of pictures and graphics, which demonstrated to be a practical and effective tool for affecting people's habits. This study will take into account one of the most known examples of visual communication as a public policy tool: warning labels on cigarettes' packaging (see Exhibit 6).

LITERATURE REVIEW

This section provides a review of previous research about the Illusory Truth Effect. Moreover, in order to better comprehend how the effect works, it is necessary to explain how the mechanism behind the act of believing works itself. Therefore, in the following paragraph, an analysis of several theories and studies about *How the Mental System Believes* is made.

Finally, in order to understand the reason why the Truth Effect should work in the visual context, a review and a comparison of the existing literature about Visual and Textual Communication is provided.

How the Mental System Believes

Past research conducted by Gilbert and his colleagues (Gilbert, Malone & Krull, 1990), shows how people are generally prone to believe the information they receive. Indeed, *Seeing Is (Like) Believing* (Gilbert, Malone & Krull, 1990, s.610), meaning that individuals first assume their perception of reality are true, without reasoning about its actual veracity. Only after they comprehend and accept as true given information, they can think about it and determine whether it is false (Figure 1). This is the view of the well know philosopher Baruch Spinoza (Spinoza, 1677/1982). He suggested that all ideas are firstly represented in the mind as true

Figure 1. Source: Believing the Unbelievable: Some Problems in rejecting False Information.
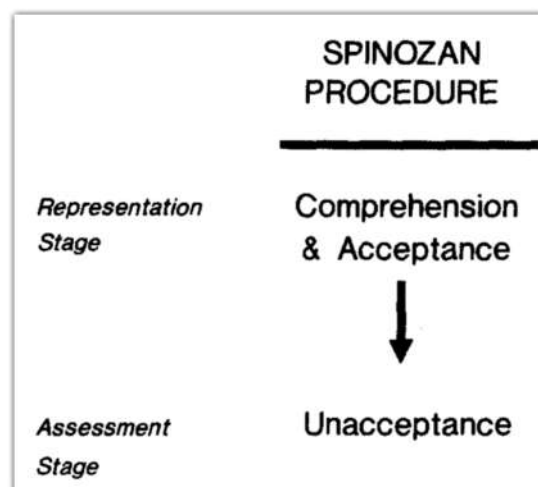
prior to rational analysis and, then, some of them are subsequently represented as false.

As suggested by Gilbert (Gilbert, 1991, s.116), people are very much prone to accept as true things they hear and see, that is, they are truth biased. This happens because our brain faces both, time and energy restraints when thinking; therefore, in order to be efficient, it may fail in unaccepting the ideas it involuntary accept during comprehension.

In addition, it is important to note that not all ideas are rationally analysed, instead, our brain actively analyses only a very small percentage of all retained information. Therefore, individuals usually end up believing false information.

Even if Spinoza's view seems to be reasonable, until recent years the "Descartes' view", regarding the mental process to assess veracity, was commonly and widely accepted. Only with the growth of scientific research in the field of heuristics and biases (about how our brain often works intuitively and automatically), Spinoza's work started to be considered.

Therefore, in order to obtain a deeper knowledge, the Cartesian account is outlined. Descartes argued that, in contrast with Spinoza, not all ideas were accepted but, instead, they were all comprehended, analysed and then accepted or rejected (Descartes, 1641/1993). "Figure 2" shows how the two different views operate with false information.

Figure 2. Source: Descartes Versus Spinoza: Truth, Uncertainty and Bias.
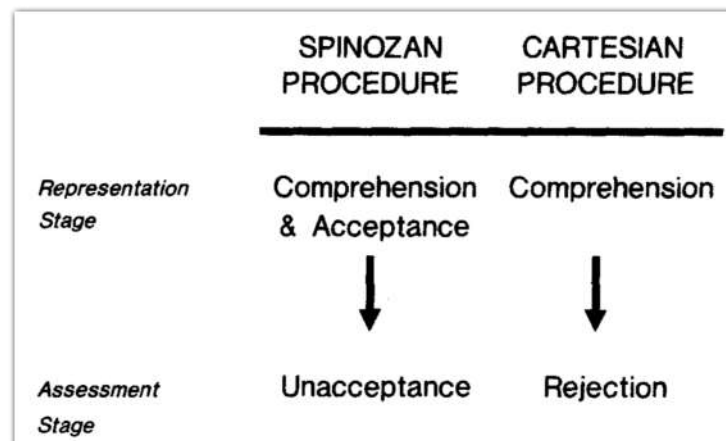
The main difference is that in the Cartesian's view our mind is able to comprehend an idea without assessing its veracity, and there is an initial period of non-decision and then the evaluation (Street & Richardson, 2015). On the other hand, Spinoza explained that an automatic belief always takes place and, then, a cognitively effortful phase of evaluation follows.

Gilbert (Gilbert, 1991, s.108) provided a smart example to clarify how the two alternative views work and differ from each other: the librarian example. Imagine the human brain to be a library, and the information gathered to be several volumes. There are at least two ways by which one could tag the spines of books in order to distinguish which one is fiction and which is not (false and true information gathered). One possibility consists in reading all the books and determine whether they are fiction or not and, therefore, to tag the volumes by using two different colours, depending on the books' nature. This process' major advantage is that the librarian will be sure about which book is fiction and which is not, but its disadvantage lies in the fact that the process requires much effort and time. This is the Cartesian account.

On the other hand, as Spinoza argued, the alternative method is to use a tagged-untagged system, in which tagged books are fiction, and untagged ones are non-fiction. In Spinoza's view books were represented before being assessed but, because of its particular system, a new volume without a tag looked exactly like a non-fiction book, thus like true information. The new volumes will be placed in the shelf without any tag, and just in case the librarian finds out that the book is a fiction work, he will tag its spine. Here, the advantage is that the librarian doesn't necessarily have to read all the books before placing them on the shelf, thus, it is possible to deal with a huge amount of information. Instead, the obvious disadvantage consists in the fact that the librarian, before he individually reads the books, may tag fiction books (false information) as nonfiction books (true information).

Finally, even if the Cartesian account had never been really contested until recent studies regarding automatic psychological processes, the evidence in support of Spinoza's view is growing nowadays; therefore, it confirms that individuals could be often truth-biased in their judgments.

Fluency Causes the Illusory Truth Effect

Spinoza argued that our brain assumes most of the information it receives as true. But it was still not clear how this process took place. The philosopher understood that individuals are not able to deal with the huge amount of data he faces, therefore, on the base of this intuition, he built its theory. Modern psychologists found out that this "truth assumption" happens when our brain is working with low effort, that is,

automatically. Indeed, our brain is well known for being an extremely efficient machine, saving energies whenever it is possible. Saving energies means, simply, do not reason. Just to give an example, try to remember how it was hard to solve mathematic equations in high school. This is what it means to put effort into thinking.

In conclusion, it can be said that Spinoza was trying to explain that the individuals' mental system uses shortcuts (heuristics) in the process of believing. According to Gilbert (1991), people automatically believe in statements they understand, as well as they believe the objects they see. Indeed, understanding is a necessary clue for processing fluency. On the other hand, when there is no comprehension more effort is required in order to understand and, therefore, there is no fluency in mental processing.

Processing fluency itself affects judgments of truth (Reber & Schwarz, 1999) and, therefore, elicits the truth effect. The truth effect occurs because people learn that fluency and truth are generally positively correlated, thus, the effect is partly based on the wrong attribution of the experienced fluency in processing a given stimulus (Unkelbach, 2007). As suggested by Unkelbach (Unkelbach, 2007), fluency is used in truth judgments according to its ecological validity.


Processing fluency is not the only way through which the illusory truth effect is elicited. For example, familiarity is also a possible antecedent of a truth judgment, and it usually arises through repetition. That is, the more an individual is exposed to a given stimulus, the more it will become familiar to him. Furthermore, repeated exposure to a statement increases the probabilities that the statement is judged as true (Goldstein & Toppino, 1977). Some researchers argued that the effect of familiarity is rather due to perceived source variability, which means that the individual erroneously attributes repeated statements to different sources. But as shown by Roggeveen (Roggeveen & Johar, 2002), repetition seems to be the predominant mechanism underlying the truth effect. An interesting study was conducted by Fazio, Payne, Brashier & Marsh (2015), in which they discover that *"Knowledge Does Not Protect Against Illusory Truth"*. That is, even when studies' participants showed a valid knowledge about a given subject, they were affected by the truth effect. This is because, in judging, they relied on fluency rather than their knowledge.

Visual Communication vs Textual Communication

Even if available research about visual communication is far narrower compared to textual communication, the former is deeply inherent in human nature, while the latter has to be taught to individuals by individuals. Images are not only easier to recognize and process compared to words, but they are also less effortful to recall. When words enter long-term memory they do so with a single code (textual code). Images, instead, contain two codes: visual and verbal, and each one is stored in different places in the brain (Paivio, 1971).

Visual communication is, basically, the conveyance of information and/or ideas through the vision. It occurs through different kind of visual content, such as images, videos, body language, etc. (Müller, 2007). An interesting difference in comparison with textual communication is that "images are not read, they are seen" (Müller, 2003). This distinction is relevant, and it suggests that different mental processes are used when individuals face texts and images. Even if both, textual and visual communication convey information, they do that in a different way, through different instruments and channels. It is not possible to affirm which one is more effective, in the same way as it is not possible to tell whether it is better to travel by train or by airplane (otherwise they would not coexist). Probably, these two ways of communicating have more similarities rather than differences. For example, both of them can lead to illusions of truth, that is, both of them can convey wrong or false information. The well-known Muller-Lyer illusion, showing two lines, which appear to be different in length, but they are not, is a simple example of an illusion of truth in the visual context (see Figure 3).

Figure 3. Muller-Lyer Illusion.
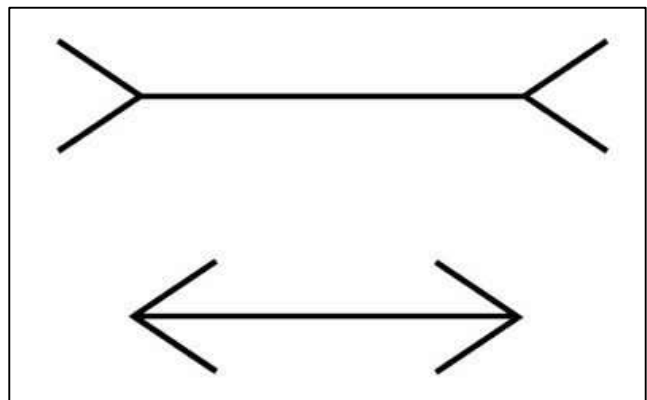
Visual Communication as a Policy Tool

In this study, we focus specifically on warning messages on cigarettes' packaging as a public policy tool, because of the extensive available research regarding graphic warnings on tobacco products.

Nowadays, almost everyone has seen the scary pictures printed on cigarettes' packs. They represent various health diseases caused by smoking tobacco. They are chosen to have a strong emotional impact on individuals, specifically, they tend to evoke a feeling of fear (Kees, Burton, Andrews, & Kozup, 2010).

Examined past research has proven that visual communication, in the form of graphic warnings, is effective in influencing individuals. For example, it has been demonstrated that pictorial warnings are significantly more effective than text-only messages (Hammond, 2011). Moreover, the graphic warnings evoke fear, in turn, fear mediates the effect graphics has on the intention to quit smoking (Kees, Burton, Andrews, & Kozup, 2010). Finally, there is sufficient evidence suggesting that this form of visual communication increases the knowledge of risk and could lead to smoking cessation and prevention. Other studies confirmed what Hammond wrote, for example, O'Hegarty et al showed that text-plus-graphic warning labels are more salient than text labels, this lead to the conclusion that visual communication is an effective and necessary public policy tool.

Scary pictures on packs effectively influence individuals because they firstly comprehend the message behind the photos and, secondly, find it relevant for themselves. Therefore, it is crucial whether these people judge pictures as real or not, that is, whether they consider them depicting real health diseases caused by smoking or unrelated diseases. In case individuals believe images on warning labels as false or not related to smoking, there would be no consequent intention to quit smoking.

As explained before, judged veracity of images is related to the actual underlying message, therefore, people thinking a warning label to be false means they think the message conveyed by the label is not true, that is, that disease is not caused by smoking or the image is fake.

Finally, the Illusory Truth Effect can be a relevant issue for graphic warning labels specifically, and public policies tools (such as information reporting) in general.

RESEARCH METHODOLOGY

This study aims to test whether the existing literature regarding the Illusory Truth Effect is applicable in the context of visual communication. Therefore, past experiments' designs that have been used to test the truth effect with sentences will be adapted to the visual context.

Instead of using, as in the experiments conducted by Reber and Schwarz (Reber & Schwarz, 1999), sentences presented in different conditions, that is, easy or difficult to read, in this experiment we will utilize images that, even conveying the same message, are easy or difficult to process.

In order to test the truth effect with images, it is useful to try out different ways of manipulating the intensity of perceptual fluency. For example, the same image can be rendered blurred or sharp, bright or dark, small or large, straight or bent, etc.

Everyone is aware of the timeless debate regarding the veracity of the first moon landing of the 21st of July 1969. The so-called "moon landing conspiracy theories" claim that some of all elements of the moon landing were hoaxes staged by NASA. If we take a look at "Exhibit 3.1" it is easy to note that the footage of the moon landing was blurred and dark. The fact that these images were not fluent to process may have played a role in people's perception of the actual veracity of the image and therefore of the information that humans have been on the moon. If individuals' perception of information through the form of images can be biased because of the graphic characteristics of the image itself, it means that these graphic characteristics do play an important role on the following judgment of truth. Another example is represented by the ascertained photoshopped image (see Exhibit 3.2) used by the Iranian government press to induce people in thinking the government was able to create a high-tech drone. The manipulated image was in high quality and resolution, and this particular could have induced a lot of people in thinking it was actually a real image with true content. The manipulation was discovered thanks to experts in photo editing.

When asked to judge whether a statement is true or false, a hypothetical study's participant basically judges the likelihood of what the statement explicitly means. Instead, in the visual context, judging whether an image is true or not is, principally, related to the veracity of the underlying communication. Thus, judging whether the

image in Exhibit 3.1 is true or false is equivalent to judge about the veracity of the moon landing.

Experiment

The experiment is an adaptation of the one conducted by Reber and Schwarz (Reber & Schwarz, 1999), with which it had been tested the illusory truth in textual communication. The experiment consisted in showing several sentences to respondents, both true and false, manipulated to be more or less fluent, thus easy or effortful to read. This was made possible, in short, through the use of blurred filters to create the disfluent condition and sharp and clear font for the fluent condition.

In the current experiment, one hundred two undergraduates and graduated people between 18 – 25 years old answered the survey.

Sixteen images were presented to each respondent. Half of these images were true, and the other half false. Perceptual fluency was manipulated by altering the image light exposure, that is, rendering images dark or bright. Easy to process images were brighter; hard to process images were darker. Therefore, sixteen selected images were shown to respondents, and the manipulation of fluency occurred between groups, thus each image appeared brighter to half the respondents and darker to the other half. The random sequence of true/false and fluent/disfluent images is described later in the text and observable in the following pages (see Figure 3.1 to 3.16)[2].

Respondents were asked to judge on a scale from one to seven whether they agreed the shown image was true. With "1" being "*completely agree*", and "7" "*completely disagree*". A brief but clear explanation about what the researcher meant with true and false images was given to participants.

Also, in order not to bias respondents' judgment because of the manipulation (dark/bright), participants were told that some images were dark to calculate the difference in response time to different stimuli.

Finally, demographic and education questions were asked at the end of the survey. The whole survey required an average of three minutes time for respondents to

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[2] The sequence is shown from page 14 to page 16. Please note that due to the reduction in size and lower image quality in this document, dark images seem to be too dark and incomprehensible. In the study they appeared to respondents on mobile devices in bigger size and higher quality.

complete it. The experiment was made short with the purpose not to annoy participants and therefore alter their judgment quality.

Qualtrics online software was used to realize the survey. The questionnaire design consisted of a first description of the experiment to respondents; then, respondents were randomly assigned to one of the two groups. The two groups basically saw the same images, but the images that were bright for the first group were dark for the second group, and vice versa. The final demographic and education questions were the same for all respondents.

Exhibit 4 and Exhibit 5 show further information and provide examples of the questionnaire presented to respondents.

Selected Images

All images are taken from the web and the majority of false images are photoshopped. They show different subjects and they are relevant in different contexts. The aim was to find contexts in which images play a key role in influencing people's behaviour. Indeed, by looking at Figures from 3.1 to 3.16, it appears that Figure 3.1 and Figure 3.8 are relevant for the fashion industry; Figures 3.2, 3.4, 3.6, 3.11, 3.13, and 3.15 are relevant within the political environment; Figures 3.3, 3.7, 3.9, and 3.16 focus on branding, product placement and advertising in general; Figures 3.5, 3.10, 3.12, and 3.14 are relevant in the food industry.

Within the eight true images, five images are easier to recognize as true (Figures 3.1, 3.3, 3.9, 3.10, and 3.14), and three images are more difficult to recognize as true (Figures 3.11, 3.13, and 3.16) because they convey information that is unusual or unlikely to be true. On the other hand, four false images are easier to recognize as false (Figures 3.4, 3.7, 3,12, and 3.15), instead, the other half describes a more likely situation (Figures 3.2, 3.5, 3.8, and 3.16).

False photos are divided into two categories:

- photoshopped images (Figures 3.2, 3.4, 3.7, 3.8, 3.15, and 3.16);
- real images conveying false information (Figures 3.5, and 3.12).

In order to select the best images for this experiment, we conducted a qualitative exploratory study: individual in-depth interviews helped in gathering useful insights about the nature of images. Too ambiguous false pictures were discarded, as well as photoshopped images that were too obviously denoted as false.

Figure 3.1: a female model parade for fashion event.
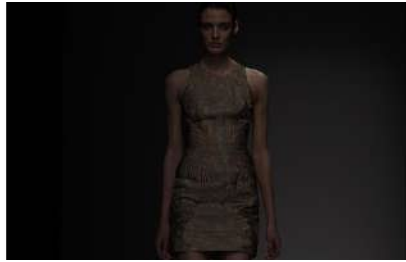
Figure 3.2: a very tall Berlusconi posing with Obama and his wife Michelle.

Figure 3.3: a BMW car's "drift".

Figure 3.4: Us Marines soldiers camping in front of Giza's pyramids.

Figure 3.5: a really perfect sushi composition.

Figure 3.6: Obama operating in charity.

Figure 3.7: Alpinist on the mount Everest with a very light gear.

Figure 3.8: an unnatural female model posing.

Figure 3.9: a random photo from Starbucks.

Figure 3.10: a random food photo from Instagram.

Figure 3.11: Us Marines soldiers under the Fuji mountain.

Figure 3.12: a perfect looking fast food's hamburger.

Figure 3.13: *Kim Jong Un and Donald Trump handshake.*

Figure 3.14: *A random food photo from the web.*

Figure 3.15: *Matteo Salvini in the role of a immigrants' teacher.*

Figure 3.16: *a dreamlike resort.*

Data Collection and Preparation

The data have been gathered with the use of online surveys powered by Qualtrics. The survey was spread via a link, mainly on mobile devices such as phones. There were no privacy concerns, indeed, the only personal information asked were basic demographics and the whole questionnaire was anonymous.

Gathered data were analysed with statistical software (SPSS) in order to detect any significant pattern in the results and test the hypotheses. Nonetheless, data gathered through Qualtrics were not yet ready for running statistical analyses. For this reason, a consistent time has been invested in data preparation in order to obtain a dataset that fitted the necessary statistical analyses on SPSS. In particular, the original

dataset considered each different image in the two groups as being a single variable of analysis. Therefore, all images observations have been rearranged and grouped to obtain a binary variable for between-subjects analysis (fluency) and a within-subject variable (true/false, resulting in two variables on SPSS). Data preparation for the statistical SPSS tool was conducted on Microsoft Excel because of its higher degree of flexibility to manipulate available data.

RESULTS

Manipulation Check

In order to select the best images for this experiment qualitative researches were conducted: individual in-depth interviews helped in gathering useful insights about the nature of images. In particular, thirty random respondents were asked about their general impression about the questionnaire at first, then, if they did not talk about the fluency manipulation spontaneously, further questions regarding their attitudes towards dark and bright photos would have been asked. They all reported finding it more difficult, thus more effortful, to watch and analyse the content of the dark images. Nonetheless, they reported to still be able to comprehend and analyse all the dark images, they just required a few seconds more before to make their judgment. Being the objective of the exposure manipulation to alter the easiness of processing, it appears that the manipulation was successful in altering the effort required to interpret the images.

Overall Model

All respondents' evaluations were used in the analysis: one hundred two people answered the questionnaire, resulting in 816 total observations. In the experiment, 408 cases represented disfluent images, and 408 cases were fluent images. Half of the fluent and disfluent images were true, and half were false. In order to test the two hypotheses, an ANOVA 2 x 2 repeated measures with a between-subject factor was run. The truthfulness of the stimulus (true or false image) was tested within groups, instead the perceptual fluency (dark or bright image) was tested between groups.

Means and standard deviations with true and false images are shown in Table 1 and Table 2. It was expected that a disfluent stimulus was more likely to be associated with a more accurate judgment. The results showed an opposite pattern compared to what was predicted; indeed fluent true images were judged more likely as true, $t(407) = 31.96$, p = .000, compared to disfluent images, $t(407) = 34.41$, p = .000. In the same way, false images showed the same effect, thus fluent false images being

judged more often as false, $t(407) = 36.88$, p = .000, rather than disfluent false images, $t(407) = 36.36$, p = .000.

Table 1:   *Mean of the judgment of truth of fluent and disfluent true images, and fluent and disfluent false images.*

	N	Mean	Std. Deviation	Std. Error Mean
Fluent False	408	3.88	2.125	.105
Fluent True	408	2.52	1.594	.079
Disfluent False	408	3.50	1.941	.096
Disfluent True	408	2.71	1.588	.079

Table 2:   *One-Sample Test among the four means of the factor combinations.*

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence… Lower	95% Confidence… Upper
Fluent-False	36.888	407	.000	3.880	3.67	4.09
Fluent-True	31.964	407	.000	2.522	2.37	2.68
Disfluent-False	36.364	407	.000	3.495	3.31	3.68
Disfluent-True	34.412	407	.000	2.706	2.55	2.86

The overall model ANOVA results are shown in Table 3 and Table 4. The 2 x 2 factorial ANOVA treating fluency as a between factor and truth as a within-subjects factor, revealed firstly that respondents were, in general, able to distinguish true images from false images, $F(1, 814) = 172.81$, $p < .001$ and, moreover, that respondent's judgment was affected by fluency, $F(1, 814) = 12.12$, $p = .001$ (Table 3).

Table 3: *Test of Within-Subjects Contrasts*

Source	Truth	Type III Sum of squares	df	Mean Square	F	Sig.	Partial Eta Squared
Truth	Linear	470.206	1	470.206	172.813	.000	.175
Truth*Fluency	Linear	32.980	1	32.980	12.121	.001	.015
Error (Truth)	Linear	2214.814	814	2.721			

Nonetheless, results in Table 4 showed that fluency effect alone was not significant, $F(1, 814) = 1.04$, $p = .308$. This is due to the fact that fluency had opposite effects on true and false images, as previously reported by the comparison of the means.
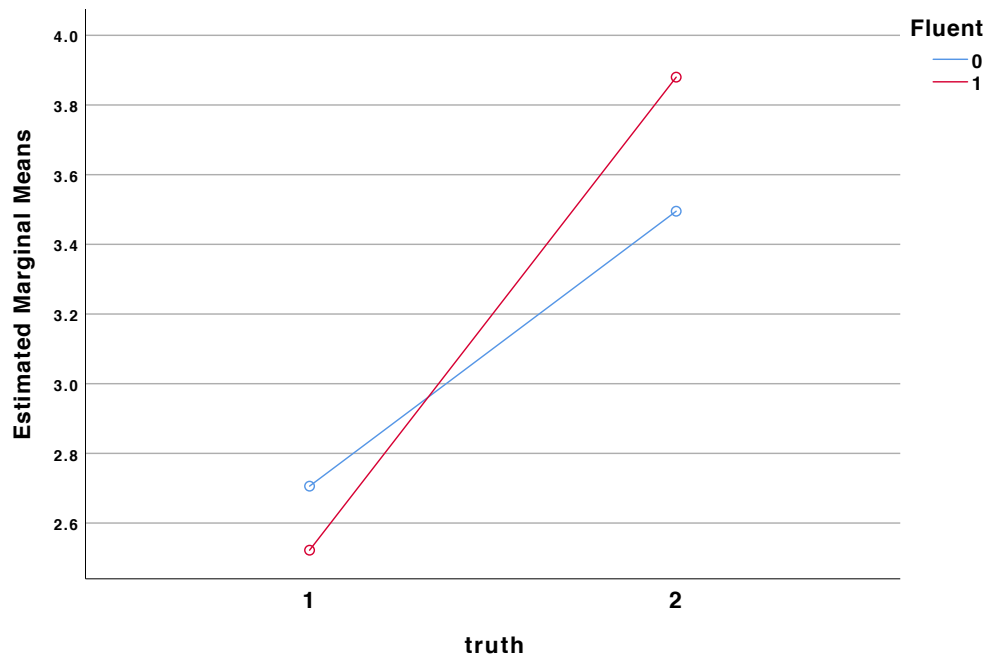
As it is clear to interpret from the interaction plot (Table 5) disfluent false images are more likely to be judged as true, and disfluent true images are more likely to be judged as false. In the General Discussion section of the text, a possible explanation is provided. Moreover, fluency has a stronger effect with false images, that is, the difference in judgment between false fluent images and false disfluent images is greater than the difference in judgment between true fluent images and true disfluent images.

Table 4: Test of Between-Subject Effects

Source	Type III Sum of squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	16201.081	1	16201.081	4099.628	.000	.834
Fluency	4.120	1	4.120	1.043	.308	.001
Error	3216.799	814	3.952			

Table 5: interaction plot showing the interaction between the two factors.
(true images = 1, false images = 2; disfluent images = 0, fluent images = 1)

Finally, as shown in Table 6, with regard to the first hypothesis of this study it is possible to reject the null hypothesis (no effect of perceptual fluency on the judgment of truth) and affirm that perceptual fluency does play an influence in the judgment of truth of a given image. On the other hand, it is not possible to affirm, as it was demonstrated in the textual-context, that when perceptual fluency is high,

thus a given stimulus is easier to process, the message conveyed is more likely to be judged as true.

Table 6: Hypotheses Summary

Hypothesis	Result
H1: The judgment of truth of the message conveyed by an image is affected by the easiness of processing of the stimulus.	**Not Rejected**
H2: The message conveyed by an image is more likely to be perceived as true if the image is easier to process.	**Rejected**

GENERAL DISCUSSION

Within the textual context, Reber and Schwarz (Reber & Schwarz, 1999) demonstrated that a fluent stimulus in the visual context is more likely to be judged as true. Therefore, this study aimed at first to test whether perceptual fluency affected truth judgments in the visual context and, second, to test if this effect was the same demonstrated by Reber and Schwarz (Reber & Schwarz, 1999). As results showed, the first hypothesis appears to be consistent, thus truth judgment of images is affected by the perceptual fluency of the image itself; on the other hand, in the visual context, fluency does not cause a truth effect, but disfluency does. False images that were hard to process were judged more often as true. The explanation for this effect could be that when individuals have to judge whether an image is true and that image is difficult to interpret, they focus their attention on details in order to detect any inconsistency. But in doing so, the individual is not anymore interpreting the image as a whole, thus the content the image conveys. For example, in image 4 of the experiment (see Figures from 3.1 to 3.16) it is easy to understand the incoherence between US Marines soldiers and the pyramids of Giza. But if the individual does not pay attention to the image as a whole but, instead, focuses on particulars, it becomes hard to judge. Therefore, because the photoshopped image 4 was manipulated by an expert, on average people were not able to find inconsistent details, leading to a truth effect in the visual context. Thus, it can be said that disfluent images lead the individual to overthinking, causing a bias in the following judgment of truth.

Different Kinds of False

In studying the available literature about the illusory truth effect and the images' veracity, the most interesting fact that emerged was that there was no single definition of what a true image is. Instead it appeared easy to assess what it does mean that a statement is false. Therefore, the efforts started targeting what it does mean that an image is false, and it became easier and obvious which images could be said to be false. In this study three main kinds of false images were used:

- photoshopped images: images manipulated by using one or more software in order to alter its content.
- images depicting fake content: images that are not manipulated ex-post. Instead they show a content that was false in reality as well, for example, Figure 3.12, shows a tasty burger, and the burger image was not manipulated by the use of software, instead it was created a fake burger that looked tasty and then it was photographed.
- Images showing unrealistic circumstances: this is the case of travel bloggers and travel advertising. Exhibit 2 shows how does it look like to visit the great wall; nonetheless, on travel blogs or websites, it is more likely to find images showing the great wall as a peaceful and calm place, in which you can walk alone enjoying a good view. This is not true.

Assess what does it mean that an image is true or false is not straightforward, and it adds to the fact that communication through images is more direct and subtle, resulting in a higher probability of bias in the judgment of truth in the visual context rather than in the textual context.

Spinoza or Descartes?

As discussed in the literary review, in Cartesian's view of how our mental system assesses veracity, our mind comprehends an idea without assessing its veracity, and there is an initial non-decision period followed by the evaluation (Street & Richardson, 2015). Instead, Spinoza explained that an automatic belief always takes place and, then, a cognitively effortful phase of evaluation follows. More simply, Spinoza thought every information is first assumed to be true, and afterward corrected if false; Descartes said that before any assumption of veracity an effortful evaluation phase takes place.

According to recent research and studies in the field of heuristics and biases, Spinoza's view is gaining a lot of support more compared to the past. Nonetheless, the fact that a large part of recent studies focuses on heuristic and biases does not necessarily mean that our brain is not able to work in other ways. Indeed, as the Nobel prize in Economics Daniel Kahneman assumes (Kahneman, 2011), our brain operates predominantly in two ways: first, it is capable of effortful thinking, as when involved in difficult mathematics problems; second, it is able to respond to

various stimuli automatically, thus with low or no effort. This last case refers to heuristics and biases.

Therefore, as with thinking in its general terms, it is straight forward to assume that even in truth judgments the brain could work either without effort or with consistent thinking. Thus, Spinoza and Descartes could have been both right, they simply did not consider that their views could be complementary one to the other. It seems an exaggeration to assume that humans' brain analyses and think about every stimulus it receives before to asses about its veracity; in the same way, it is unlikely that every information it receives is assumed to be true at first. Indeed, it is possible that when the brain considers it to be worth to invest energies in analysing a given piece of information, it works as Descartes said; on the other side, when given information is not worth the attention it probably firstly assumes it to be true. Our brain needs to be efficient and not to waste energies, therefore it allocates resources for the most important purposes.

Finally, it is possible that being visual stimuli a more direct and subtle form of communication, they create a mental condition in which less effort is required compared to words. Consequently, individuals could more likely behave according to Spinoza's view when it comes to deal with images and, instead, follow Cartesian interpretation when it comes to words and sentences.

Illusory Truth Effect in the Visual Context

Even though this pilot study requires further research in order to confirm its findings if what emerged from data is actually consistent it would mean that the truth effect occurs in visual communication as well. Nonetheless, it appears that it works in the opposite way compared to textual communication: Reber and Swartz (Reber & Schwarz, 1999) discovered that false sentences that were easy to read, thus perceptually fluent, were more often judged as true; instead, in this study, false images that were perceptually disfluent had been judged as being more true, and true images that were perceptually disfluent had been judged as more false. This difference leads to two main conclusions in the visual context: first, false disfluent images are judged as being more true, second, true disfluent images are judged to be less true. Therefore, the truth effect is elicited by the disfluency of the visual stimulus when the image is false.

The fact that the illusory truth effect can arise from visual stimuli is an important finding because it means that heuristics and biases do exist in visual communication. Moreover, considering that heuristics are usually used in low effort mental conditions (Kahneman, 2011) and images represent a very direct and subtle way of communication, the visual context could represent a much more fertile condition for them to take place.

Marketing Implications of Biased Judgment of Images

The main point in the study of heuristics and biases is that they can lead the individual straight to a poor decision outcome. This is true with words as well as with images. For example, if a customer had to decide whether to buy a car, it is unlikely that his final decision would be only affected by all the textual information gathered. Indeed, our mind would be full of retained images from our own memory or from advertising and other kinds of imagery. Consciously or unconsciously, our final decision will, of course, take into account the visual information gathered in our memory. But as it is shown in this study, not all images convey real and qualitative information, and individuals can be unable to inspect about the truthfulness of the image itself. Moreover, they can be biased toward a wrong judgment about its veracity, thus, leading to a non-optimal decision outcome.

Of course, purchases are not the only behaviour affected by images. Indeed, as researched by Gardner (1985), attitude toward an advertisement affects attitude toward the advertised brand, therefore, considering that advertising conveys information in large part by the use of images (brands their self are images), potential biases and heuristics can bias customers' perception of the ad, alter the formation of brand attitudes and, consequently, of brand image.

Considering that biases take place in the visual context it is crucial for marketing managers to control the quality and identity of information delivered through images, and inspect whether the message they intend to deliver is actually the one perceived by customers. The example provided in this study is probably just one of the multitude of heuristics and biases existing in visual communication. Online ads, pictures in magazines or websites, firm's Instagram profiles, advertising videos, etc. They all provide important communication channels for firms, and if something can affect the entity and the quality of delivered information it is necessary to understand how does it work, to control it and, eventually, to exploit it.

Basically, in all situations in which a given customer faces any kind of imagery regarding a firm, an exchange of information takes place, and this leads to communication between the two parts. The information perceived by the customer can be biased and different from what intended by the firm. This could happen because of certain conditions that let potential heuristics and biases to arise. For this reason, those responsible for firms' communication should be informed about eventual circumstances that cause an alteration of the identity and quality of the information they intend to deliver.

The Truth Effect Relevance within Public Policies

As described in the literature review, graphics are widely used in communication in public policies. Public policy tools such as information reporting rely on graphic content to deliver powerful messages to citizens.

In order to design effective visual communication in public policies, used images should be perceived as true from individuals, that is, having real content. Indeed, individuals' judgment about veracity determines whether they will be prone to alter their behaviour as suggested by the public policy. For example, if a smoker believes a graphic warning message on a cigarette pack not related to smoking (false content), he/she would not consider that information as relevant and, therefore, he/she would likely ignore it.

As shown in this study, the Illusory Truth Effect influences individuals judgment of truth about pictures. Therefore, in designing visual public policies such as graphic warnings, policymakers should consider how certain graphic filters, effects, and formats, could affect people's perception of conveyed message veracity.

Finally, it is clear that the Illusory Truth Effect is relevant in visual communication within public policies.

Future Research

A consistent body of knowledge in the field of cognitive biases has developed in recent years. Nonetheless, a restricted part studied the existence of important biases and heuristics in the context of purely visual communication through the use of pictures, photos, videos, etc. Not only truth decisions require further investigation, but also a much wider scope of heuristics and biases should be explored in this context. Being aware that the interpretation of visual stimuli can be biased and lead

to heuristics in judgment consequently require that further studies and researches explore and investigate this new field of application that is the visual context. Images and videos surround individuals nowadays, on their phones, computers, on billboards, etc. There are literally visual stimuli and visual information everywhere. And as communication in general, visual communication is prone to biases.

Considering that textual and visual communication share multiple similarities, a plausible and effective method to explore the visual context could be the one adopted in this study: to start from heuristics and biases already studied in other fields of communication and explore their eventual effectiveness and application in the visual context. In order to provide an example, it is known that the illusory truth effect can arise from perceptual fluency or familiarity, and this study tried to replicate the conditions for perceptual fluency to arise in the visual context. Therefore further research could test whether perceived familiarity within a visual stimulus does lead to any kind of influence in truth judgments. Furthermore, there could be interesting implications in further research studying the well-known availability heuristic in conjunction with the Dual Coding Theory (Paivio, 1986), which explains that images are easier to memorize and recall as information when compared to words.

Finally, considering that this study manipulated common clear images in order to create a disfluent condition, further research should also investigate a potential condition of "super-fluency" in which images are rendered much more fluent and easy to be mentally processed. In this way, the other half of the possibilities within fluency and manipulation would be explored, thus providing a more exhaustive analysis of what are the implications of perceptual fluency of visual stimuli in judgments of truth. This super-fluency condition could be obtained by the use of different filters or software. In order to give an example, the same technology used to restore and improve the quality of old movies could be used for that purpose (see Figure 4).

Figure 4: old movie restoration.

Source: news.cgtn.com
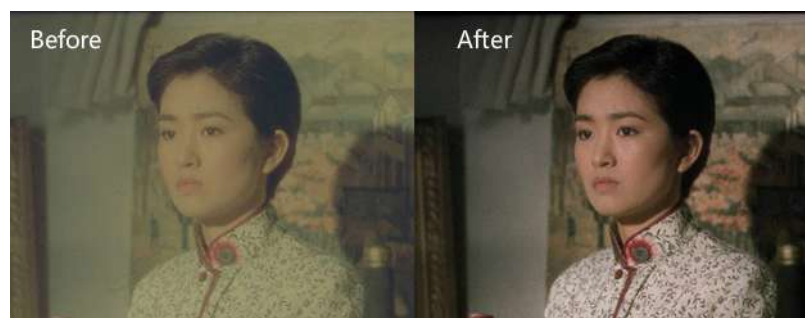
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APPENDIX

Exhibit 1: *image of Norrona's products on the official firm's Instagram page.*

Source: Norrona's Instagram Page

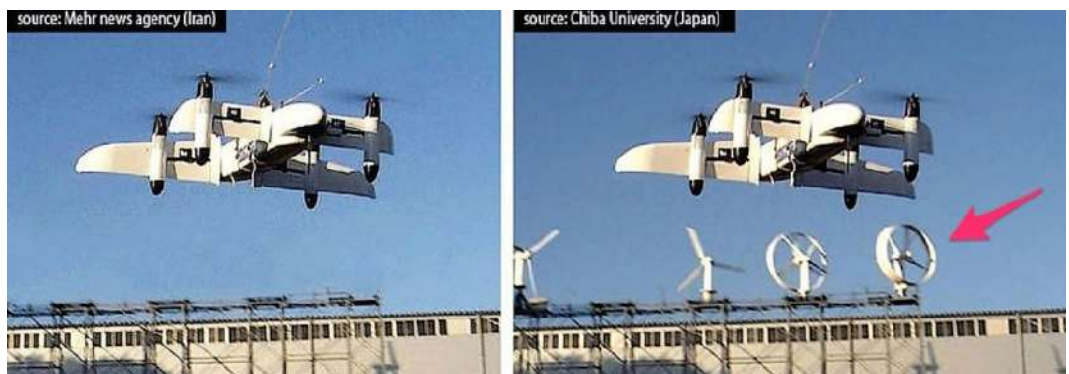**Exhibit 2**: *the Great Wall of Cina.*

Source: The Thelegraph - https://www.telegraph.co.uk/travel/news/Instagram-vs-reality-how-travel-photos-are-a-lie/

Exhibit 3.1*: authentic footage of the first men on the moon.*

Source: authentic footage of the first men on the moon.

Exhibit 3.2*: photoshopped image of a drone for political purposes.*

Source: Focus.it, "Le Foto Storiche Ritoccate (e Smascherate)"
https://www.focus.it/tecnologia/digital-life/foto-tarocchi-storici-smascherati?gimg=63808#img63808

Exhibit 4: examples of the experiment's questionnaire.

Exhibit 5: information provided to respondents.

LEGGI CON ATTENZIONE: Il seguente questionario è anonimo. Ti verranno mostrate 16 foto e dovrai giudicare quanto queste ti sembrano realistiche, cioè quanto le informazioni che comunicano ti sembrano vere.

Al fine di calcolare il tempo di reazione a stimoli diversi da interpretare, ad alcune foto (sia vere che false) è stato applicato un filtro per renderle più scure.
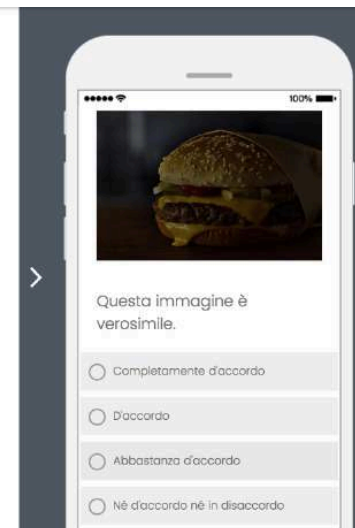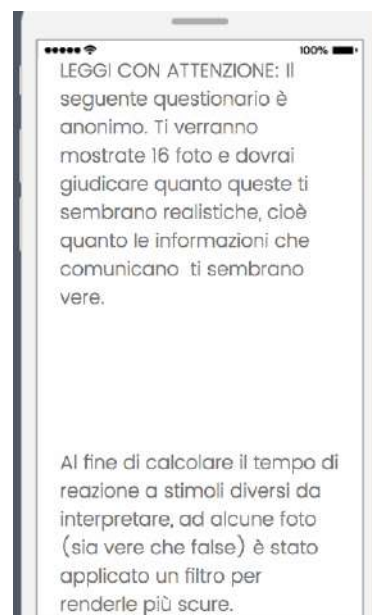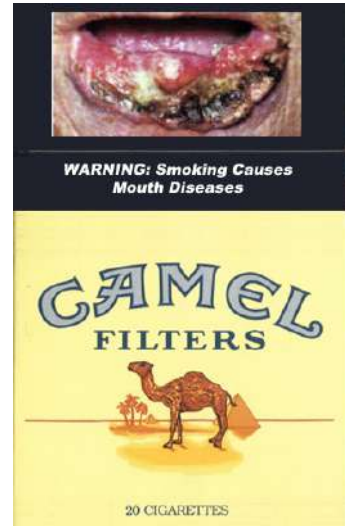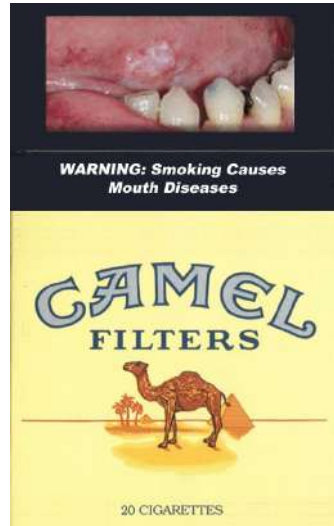
The Illusory Truth Effect
in the Visual Context:
An Exploration of Potential Applications

- Summary

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ABSTRACT

In recent years, studies and experiments regarding heuristics and biases in judgments under uncertainty have proliferated. Nonetheless, few of these focused on visual communication, thus on information conveyed using symbols and imagery. Considering that this latter context can represent a fertile soil for heuristics and biases to arise, this study intended to explore these subjects in the visual context. Specifically, we tried to study the well-known Illusory Truth Effect in the visual context, that is, by using images as stimuli, instead of words. The classic Illusory Truth effect shows that sentences that are perceptually fluent are more likely to be judged as true. In our own study, we manipulated image fluency by using a photography filter (image exposure): darker images represented the disfluent condition, brighter images represented the fluent condition. The objective was twofold: 1) test whether image fluency affected individuals' judgment on image veracity; 2) test if fluent images were more likely to be perceived as true.

In order to accomplish this objective, we conducted an experiment in which each of 102 respondents saw 16 images, and then they were requested to judge their actual veracity. Respondents were randomly divided into two groups. Within each group, a random sequence of false/true, fluent/disfluent images were shown, such that images shown in the fluent condition in one group were in the disfluent condition in the other group. Thus, an ANOVA was run to test the two hypotheses.

Our findings show that images' perceptual fluency does indeed influence individuals' perception of their actual veracity. However, fluent images are not always perceived as more true. What we do find is that inducing disfluency in picture viewing makes actual true images seem less true and actual false images seem less false.

In our discussion we propose how this study can lead the way for an all-round exploration of heuristics and biases in visual communication. Moreover, we explain why this findings are relevant both in marketing and public policies contexts.

INTRODUCTION

Nowadays people are overwhelmed by a massive amount of information, advertising, and news, and most of it unsolicited. It comes from countless sources, an increasing proportion of it consists of visual information (pictures, video, ...). Many observers of this phenomenon have argued that it has become impossible for people to process all the information they receive (Hasher, 1979). In such a context, it would simply be impossible for people to put enough effort into analysing, and therefore

truly understanding, each message they receive. Thus, it happens that much information is passively assimilated and elaborated by the use of heuristics and, therefore, it could be misunderstood. The use of heuristics in judgment does not necessarily imply poor decision outcomes. It let us save energies and effectively deal with a massive amount of information. It can happen, nonetheless, that problems requiring a much more effortful analysis are solved with heuristics and, therefore, these lead to a poor decision outcome. This situation is potentially exploitable by firms.

Past research studied a multitude of heuristics, both in theory and in practice, and the Illusory Truth Effect is part of such literature.

The Illusory Truth Effect is, generally, the tendency to believe that a statement is true if it is easier to process, or if it elicits familiarity, regardless of its actual veracity. A lot of firms know how it does work and, consequently, they design some of their advertising strategies to exploit this effect; for instance, we can easily recall advertising statements such as "number one in its category" written on products' packaging or ads, these are intended to work through repetition, indeed, by reading again and again such statements, individuals will likely start to believe what they read. This is an example of the Illusory Truth Effect caused by repetition, and the resulting experience of familiarity with a given statement. The Truth Effect can work even in the short run. Indeed, by creating a statement that is easy to process, it is more likely it to be believed. As a result, these statements help to build favorable ideas of the brand/product and, therefore, improve brand image, likeability and so on.

All prior studies on illusionary truth used text-based experiments and, therefore, they are valid only in such context. Even if texts and words constitute a significant

communication tool, images and videos are important as well, and for several reasons they are a more direct tool in communication. The communication between firms and their customers takes place largely in the visual context, that is, with the use of images, videos and so on. The prevalence of visual information heavily rose in recent years, with massive use of online social networks such as Facebook and Instagram. Firms design their advertising in order to reach potential consumers wherever they are and, currently, they spend an impressive amount of time on average using these platforms. In platforms as Facebook, there is a balanced presence of both, images and words, but in others, such as Instagram, the presence of images is predominant. Therefore, communication through such platforms takes place thanks to the use of visual content.

Consequently, it is necessary to explore how heuristics work in the visual context. This study aims to apply the available knowledge about the Truth Effect in the world of images, that is, to experiment whether individuals are subject to the Truth Effect with images other than words. Considering that images are as much used in communication as words are and, therefore, individuals gather

information through images as well, the Illusory Truth Effect, and heuristics in general, could be effective even with images. Furthermore, pictures are easier to recognize and to process for individuals (Paivio, 1971).

Finally, this study will test whether the truth effect, and the heuristic and biases related, are valid in the visual context. Specifically, it will test two hypotheses:

H1: The judgment of truth of the message conveyed by an image is affected by the ease of processing of the stimulus.

H2: The message conveyed by an image is more likely to be perceived as true if the image is easier to process.

That is, the more an image is fluent to process for an individual, the more likely he will believe in the message it conveys.

True and False Images

At this point, before testing whether the truth effect is valid with images, it is necessary to define what truthfulness within an image does mean: what does it mean that an image is true or sincere for an individual?

Firstly, images convey information as words do. But they do it in a different manner: by using a different level of communication. While textual communication takes places through argumentation, visual communication works by association (Muller, 2003). Therefore, an image is not true (e.g. fake) if it conveys information that is not real, or are not an accurate reflection of the reality, that is, it elicits associations that do not correspond to the reality depicted by the image.

For example, this picture on Instagram (see Exhibit 1) conveys information to the social network's users. Even if it is not explicitly stated, the image is visually communicating that these products resist and work well in such environmental situations; indeed, it displays Norrona's products being used in an extreme natural environment. If the picture (Exhibit 1)[1] turns out to be unreal (i.e. photoshopped), this means that the image is not true, thus the associations which it elicits are not true. On the other hand, if an image conveys true information, and elicits associations that are coherent with reality, it is possible to define it as true.

Potentially, every image can induce a misperception of reality because, like words, images are not reality itself, but only a representation of it. It is even critical to investigate, within this study, whether people are not as used to think critically about visual information as they are with textual information.

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[1] Exhibits (Exhibit 1, 2, 3, 4, and 5) are shown in the Appendix of the text.

If individuals will result to be less critical when they face visual information, thus being less capable to detect false information, this would result in a much more powerful Truth Effect in the visual context.

The Illusory Truth Effect

Processing fluency itself affects judgments of truth (Reber & Schwarz, 1999) and, therefore, elicits the truth effect. The truth effect occurs because people learn that fluency and truth are generally positively correlated, thus, the effect is partly based on the wrong attribution of the experienced fluency in processing a given stimulus (Unkelbach, 2007). As suggested by Unkelbach (Unkelbach, 2007), fluency is used in truth judgments according to its ecological validity.

Processing fluency is not the only way through which the illusory truth effect is elicited. For example, familiarity is also a possible antecedent of a truth judgment, and it usually arises through repetition. That is, the more an individual is exposed to a given stimulus, the more it will become familiar to him. Furthermore, repeated exposure to a statement increases the probabilities that the statement is judged as true (Goldstein & Toppino, 1977). Some researchers argued that the effect of familiarity is rather due to perceived source variability, which means that the individual erroneously attributes repeated statements to different sources.

An interesting study conducted by Fazio, Payne, Brashier & Marsh (2015), showed that "*Knowledge Does Not Protect Against Illusory Truth*". That is, even when studies' participants showed a valid knowledge about a given subject, they were affected by the truth effect. This is because, in judging, they relied on fluency rather than their knowledge.

Visual Communication as a Policy Tool

Being welfare the basis of modern societies, it is clear why it is extremely important for democratic governments to effectively influence the behaviour of citizens. Public policies with the intent of influencing individuals' behaviours, aim to improve their welfare and are, in general, in the interest of the public.

To implement public policies, governments use public policy tools such as legislation, sanctions, regulations, taxes, and subsidies (Andrews et al, 1995).

One tool governments can dispose of, according to the Office of Technology Assessment, is *information reporting* (Andrews et al, 1995). This specific tool aims to affect individuals behaviour mainly by delivering relevant information regarding a problematic issue, for example, texts such as "alcohol abuse can kill you" provide information which is meant to alter individuals behaviour. Chosen information usually refers to environmental concerns or individuals health issues.

Visual communication is a relevant issue in public policies. Indeed, in recent years information reporting showed an increase in the use of pictures and graphics, which demonstrated to be a practical and effective tool for affecting people's habits. This study will take into account one of the most known examples of visual communication as a public policy tool: warning labels on cigarettes' packaging.

Nowadays, almost everyone has seen the scary pictures printed on cigarettes' packs. They represent various health diseases caused by smoking tobacco. They are chosen to have a strong emotional impact on individuals, specifically, they tend to evoke a feeling of fear (Kees, Burton, Andrews, & Kozup, 2010).

Examined past research has proven that visual communication, in the form of graphic warnings, is effective in influencing individuals. For example, it has been demonstrated that pictorial warnings are significantly more effective than text-only messages (Hammond, 2011). Moreover, the graphic warnings evoke fear, in turn, fear mediates the effect graphics has on the intention to quit smoking (Kees, Burton, Andrews, & Kozup, 2010). Finally, there is sufficient evidence suggesting that this form of visual communication increases the knowledge of risk and could lead to smoking cessation and prevention.

Scary pictures on packs effectively influence individuals because they firstly comprehend the message behind the photos and, secondly, find it relevant for themselves. Therefore, it is crucial whether these people judge pictures as real or not, that is, whether they consider them depicting real health diseases caused by smoking or unrelated diseases. In case individuals believe images on warning labels as false or not related to smoking, there would be no consequent intention to quit smoking.

As explained before, judged veracity of images is related to the actual underlying message, therefore, people thinking a warning label to be false means they think the message conveyed by the label is not true, that is, that disease is not caused by smoking or the image is fake.

EXPERIMENT

This study aims to test whether the existing literature regarding the Illusory Truth Effect is applicable in the context of visual communication.

To test the truth effect with images, it is useful to try out different ways of manipulating the intensity of images' perceptual fluency. For example, the same image can be rendered blurred or sharp, bright or dark, small or large, straight or bent, etc.

Everyone is aware of the timeless debate regarding the veracity of the first moon landing of the 21st of July 1969. The so-called "moon landing conspiracy theories" claim that some of all elements of the moon landing were hoaxes staged by NASA. If we take a look at "Exhibit 3.1" it is easy to note that the footage of the moon landing was blurred and dark. The fact that these images were not fluent to process may have played a role in people's perception of the actual veracity of the image and therefore of the information that humans have been on the moon. If individuals' perception of information through the form of images can be biased because of the graphic characteristics of the image itself, it means that these graphic characteristics do play an important role on the following judgment of truth.

To conduct the manipulation check qualitative researches were conducted: individual in-depth interviews helped in gathering useful insights about the nature of images. All participants reported to find it more difficult, thus more effortful, to watch and analyse the content of the dark images. Nonetheless, they reported to still be able to comprehend and analyse all the dark images, they just required a few seconds more before to make their judgment. Being the objective of the exposure manipulation to alter the easiness of processing, it appears that the manipulation was successful in altering the effort required to interpret the images.

Design

The experiment is an adaptation of the one conducted by Reber and Schwarz (Reber & Schwarz, 1999), with which it had been tested the illusory truth in textual communication. The experiment consisted in showing several sentences to respondents, both true and false, manipulated to be more or less fluent, thus easy or effortful to read.

Sixteen images were presented to each respondent. Half of these images were true, and the other half false. Perceptual fluency was manipulated by altering the image light exposure, that is, rendering images dark or bright. Easy to process images were brighter; hard to process images were darker. Therefore, sixteen selected images were shown to respondents, and the manipulation of fluency occurred between groups, thus each image appeared brighter to half the respondents and darker to the other half.

Respondents were asked to judge on a scale from one to seven whether they agreed the shown image was true. With "1" being *completely agree*", and "7" "*completely disagree*". A brief but clear explanation about what the researcher meant with true and false images was given to participants.

Also, in order not to bias respondents' judgment because of the manipulation (dark/bright), participants were told that some images were dark to calculate the difference in response time to different stimuli.

The whole survey required an average of three minutes time for respondents to complete it. The experiment was made short with the purpose not to annoy participants and therefore alter their judgment quality.

The questionnaire design consisted of a first description of the experiment to respondents; then, respondents were randomly assigned to one of the two groups. The two groups basically saw the same images, but the images that were bright for the first group were dark for the second group, and vice versa.

Exhibit 4 and Exhibit 5 show further information and provide examples of the questionnaire presented to respondents.

Results

All respondents' evaluations were used in the analysis: one hundred two people answered the questionnaire, resulting in 816 total observations. In the experiment, 408 cases represented disfluent images, and 408 cases were fluent images. Half of the fluent and disfluent images were true, and half were false. In order to test the two hypotheses, an ANOVA 2 x 2 repeated measures with a between-subject factor was run. The truthfulness of the stimulus (true or false image) was tested within groups, instead the perceptual fluency (dark or bright image) was tested between groups.

Means and standard deviations with true and false images are shown in Table 1 and Table 2. It was expected that a disfluent stimulus was more likely to be associated with a more accurate judgment. The results showed an opposite pattern compared to what was predicted; indeed fluent true images were judged more likely as true, $t(407) = 31.96$, p = .000, compared to disfluent images, $t(407) = 34.41$, p = .000. In the same way, false images showed the same effect, thus fluent false images being judged more often as false, $t(407) = 36.88$, p = .000, rather than disfluent false images, $t(407) = 36.36$, p = .000.

Table 1:   *Mean of the judgment of truth of fluent and disfluent true images, and fluent and disfluent false images.*

	N	Mean	Std. Deviation	Std. Error Mean
Fluent False	408	3.88	2.125	.105
Fluent True	408	2.52	1.594	.079
Disfluent False	408	3.50	1.941	.096
Disfluent True	408	2.71	1.588	.079

Table 2: *One-Sample Test among the four means of the factor combinations.*

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence… Lower	95% Confidence… Upper
Fluent-False	36.888	407	.000	3.880	3.67	4.09
Fluent-True	31.964	407	.000	2.522	2.37	2.68
Disfluent-False	36.364	407	.000	3.495	3.31	3.68
Disfluent-True	34.412	407	.000	2.706	2.55	2.86

The overall model ANOVA results are shown in Table 3 and Table 4. The 2 x 2 factorial ANOVA treating fluency as a between factor and truth as a within-subjects factor, revealed firstly that respondents were, in general, able to distinguish true images from false images, $F(1, 814) = 172.81$, $p < .001$ and, moreover, that respondent's judgment was affected by fluency, $F(1, 814) = 12.12$, $p = .001$ (Table 3).

Table 3: *Test of Within-Subjects Contrasts*

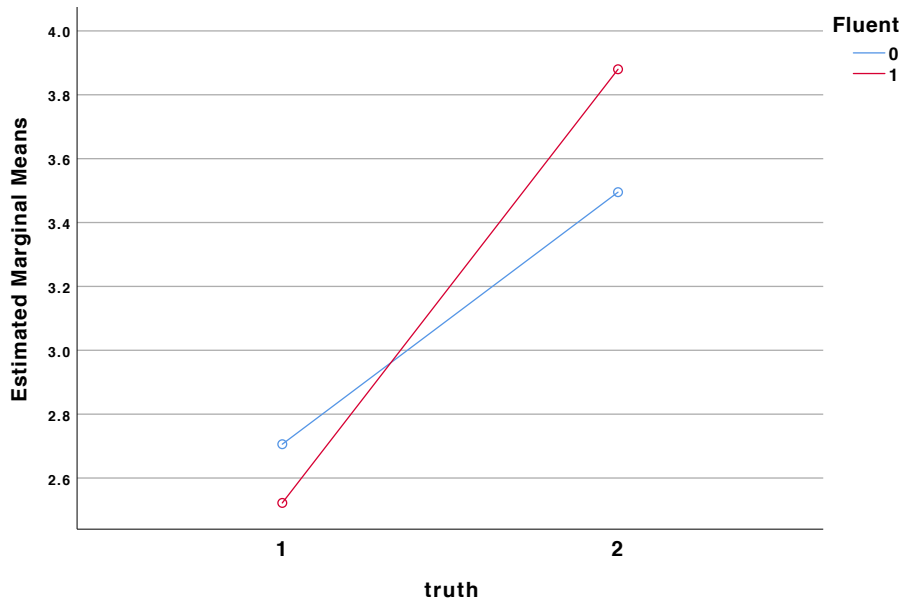| Source	Truth	Type III Sum of squares	df	Mean Square	F	Sig.	Partial Eta Squared
Truth	Linear	470.206	1	470.206	172.813	.000	.175
Truth*Fluency	Linear	32.980	1	32.980	12.121	.001	.015
Error (Truth)	Linear	2214.814	814	2.721			

Nonetheless, results in Table 4 showed that fluency effect alone was not significant, $F(1, 814) = 1.04$, $p = .308$. This is due to the fact that fluency had opposite effects on true and false images, as previously reported by the comparison of the means. As it is clear to interpret from the interaction plot (Table 5) disfluent false images are more likely to be judged as true, and disfluent true images are more likely to be judged as false. In the General Discussion section of the text, a possible explanation is provided. Moreover, fluency has a stronger effect with false images, that is, the difference in judgment between false fluent images and false disfluent images is greater than the difference in judgment between true fluent images and true disfluent images.

Table 4: *Test of Between-Subject Effects*

Source	Type III Sum of squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	16201.081	1	16201.081	4099.628	.000	.834
Fluency	4.120	1	4.120	1.043	.308	.001
Error	3216.799	814	3.952			

Table 5: *interaction plot showing the interaction between the two factors.*
(true images = 1, false images = 2; disfluent images = 0 fluent images = 1)

Finally, with regard to the first hypothesis of this study it is possible to reject the null hypothesis (no effect of perceptual fluency on the judgment of truth) and affirm that perceptual fluency does play an influence in the judgment of truth of a given image. On the other hand, it is not possible to affirm, as it was demonstrated in the textual-context, that when perceptual fluency is high, thus a given stimulus is easier to process, the message conveyed is more likely to be judged as true.

GENERAL DISCUSSION

Within the textual context, Reber and Schwarz (Reber & Schwarz, 1999) demonstrated that a fluent stimulus in the visual context is more likely to be judged as true. Therefore, this study aimed at first to test whether perceptual fluency affected truth judgments in the visual context and, second, to test if this effect was the same demonstrated by Reber and Schwarz (Reber & Schwarz, 1999). As results showed, the first hypothesis appears to be consistent, thus truth judgment of images is affected by the perceptual fluency of the image itself; on the other hand, in the visual context, fluency does not cause a truth effect, but disfluency does. False images that were hard to process were judged more often as true. The explanation for this effect could be that when individuals have to judge whether an image is true and that image is difficult to interpret, they focus their attention on details in order to detect any inconsistency. But in doing so, the individual is not anymore interpreting the image as a whole, thus the content the image conveys. For example, in image 4 of the experiment (see Figures from 3.1

to 3.16) it is easy to understand the incoherence between US Marines soldiers and the pyramids of Giza. But if the individual does not pay attention to the image as a whole but, instead, focuses on particulars, it becomes hard to judge. Therefore, because the photoshopped image 4 was manipulated by an expert, on average people were not able to find inconsistent details, leading to a truth effect in the visual context. Thus, it can be said that disfluent images lead the individual to overthinking, causing a bias in the following judgment of truth.

Illusory Truth Effect in the Visual Context

Even though this pilot study requires further research in order to confirm its findings if what emerged from data is actually consistent it would mean that the truth effect occurs in visual communication as well. Nonetheless, it appears that it works in the opposite way compared to textual communication: Reber and Swartz (Reber & Schwarz, 1999) discovered that false sentences that were easy to read, thus perceptually fluent, were more often judged as true; instead, in this study, false images that were perceptually disfluent had been judged as being more true, and true images that were perceptually disfluent had been judged as more false. This difference leads to two main conclusions in the visual context: first, false disfluent images are judged as being more true, second, true disfluent images are judged to be less true. Therefore, the truth effect is elicited by the disfluency of the visual stimulus when the image is false.

The fact that the illusory truth effect can arise from visual stimuli is an important finding because it means that heuristics and biases do exist in visual communication. Moreover, considering that heuristics are usually used in low effort mental conditions (Kahneman, 2011) and images represent a very direct and subtle way of communication, the visual context could represent a much more fertile condition for them to take place.

Marketing Implications of Biased Judgment of Images

The main point in the study of heuristics and biases is that they can lead the individual straight to a poor decision outcome. This is true with words as well as with images. For example, if a customer had to decide whether to buy a car, it is unlikely that his final decision would be only affected by all the textual information gathered. Indeed, our mind would be full of retained images from our own memory or from advertising and other kinds of imagery. Consciously or unconsciously, our final decision will, of course, take into account the visual information gathered in our memory. But as it is shown in this study, not all images convey real and qualitative information, and individuals can be unable to inspect about the truthfulness of the image itself. Moreover, they can be biased toward a wrong judgment about its veracity, thus, leading to a non-optimal decision outcome.

Of course, purchases are not the only behaviour affected by images. Indeed, as researched by Gardner (1985), attitude toward an advertisement affects attitude toward the advertised brand, therefore, considering that advertising conveys information in large part by the use of images (brands their self are images), potential biases and heuristics can bias customers' perception of the ad, alter the formation of brand attitudes and, consequently, of brand image.

Considering that biases take place in the visual context it is crucial for marketing managers to control the quality and identity of information delivered through images, and inspect whether the message they intend to deliver is actually the one perceived by customers. The example provided in this study is probably just one of the multitude of heuristics and biases existing in visual communication. Online ads, pictures in magazines or websites, firm's Instagram profiles, advertising videos, etc. They all provide important communication channels for firms, and if something can affect the entity and the quality of delivered information it is necessary to understand how does it work, to control it and, eventually, to exploit it.

Basically, in all situations in which a given customer faces any kind of imagery regarding a firm, an exchange of information takes place, and this leads to communication between the two parts. The information perceived by the customer can be biased and different from what intended by the firm. This could happen because of certain conditions that let potential heuristics and biases to arise. For this reason, those responsible for firms' communication should be informed about eventual circumstances that cause an alteration of the identity and quality of the information they intend to deliver.

The Truth Effect Relevance within Public Policies

As described in the literature review, graphics are widely used in communication in public policies. Public policy tools such as information reporting rely on graphic content to deliver powerful messages to citizens.

In order to design effective visual communication in public policies, used images should be perceived as true from individuals, that is, having real content. Indeed, individuals' judgment about veracity determines whether they will be prone to alter their behaviour as suggested by the public policy. For example, if a smoker believes a graphic warning message on a cigarette pack not related to smoking (false content), he/she would not consider that information as relevant and, therefore, he/she would likely ignore it.

As shown in this study, the Illusory Truth Effect influences individuals judgment of truth about pictures. Therefore, in designing visual public policies such as graphic warnings, policymakers

should consider how certain graphic filters, effects, and formats, could affect people's perception of conveyed message veracity.

Finally, it is clear that the Illusory Truth Effect is relevant in visual communication within public policies.

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APPENDIX

Exhibit 1*: image of Norrona's products on the official firm's Instagram page.*

Source: Norrona's Instagram Page

Exhibit 2*: the Great Wall of Cina.*

Source: The Thelegraph

Exhibit 3: *authentic footage of the first men on the moon.*

Source: authentic footage of the first men on the moon.

Exhibit 4: *examples of the experiment's questionnaire.*

Questa immagine è verosimile.
- Completamente d'accordo
- D'accordo

Questa immagine è verosimile.
- Completamente d'accordo
- D'accordo
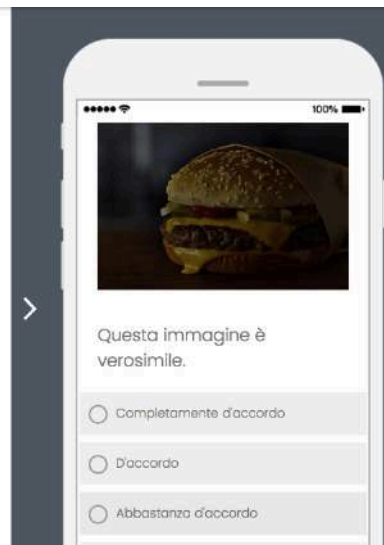- Abbastanza d'accordo
- Né d'accordo né in disaccordo
- Abbastanza in disaccordo

Questa immagine è verosimile.
- Completamente d'accordo
- D'accordo

Questa immagine è verosimile.
- Completamente d'accordo
- D'accordo
- Abbastanza d'accordo

Exhibit 5*: information provided to respondents.*

LEGGI CON ATTENZIONE: Il seguente questionario è anonimo. Ti verranno mostrate 16 foto e dovrai giudicare quanto queste ti sembrano realistiche, cioè quanto le informazioni che comunicano ti sembrano vere.

Al fine di calcolare il tempo di reazione a stimoli diversi da interpretare, ad alcune foto (sia vere che false) è stato applicato un filtro per renderle più scure.