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THE FEAR-THE-RARE PHENOMENON

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Abstract

It is remarkable that people often fear rare, unlikely events more than common ones. The goal of the present study is to advance our understanding of this fundamental bias which I define as the “fear-the-rare phenomenon”. The essence of this phenomenon is that lack of exposure to stimuli can lead to fear, which makes rare stimuli more threat-provoking. In this paper, I explore the ubiquitous fear of the unknown by means of a learning perspective. First, I describe two possible exposure-based explanations of the “fear-the-rare phenomenon”, the mere-exposure and conditioned stimulus pre-exposure hypothesis. Subsequently, I attempt to identify the most likely explanation by examining the effects of exposure to hypothetical fruit stimuli in the context of an interactive story.

Keywords: fear, familiarity, unknown, learning, mere exposure, CS pre-exposure.

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"The oldest and strongest emotion of mankind is fear, and the oldest and strongest kind of fear is fear of the unknown." (Lovecraft, 1927, p. 23)

1. Introduction

1.1. The Fear-the-Rare Phenomenon

Fear is often seen as an adaptive emotion, because it prepares us for potential threats (Bateson, Brilot & Nettle, 2011). It is obvious, however, that our fears are not always appropriate. When they are exaggerated and disproportional to the actual threat, they are called phobias. In this case fear causes serious impairment. The 12-month prevalence of specific phobias has been estimated to be 12.1% in the U.S.A. (Kessler, Petukhova, Sampson, Zaslavsky & Wittchen, 2012) and 6.4% in Europe (Wittchen et al., 2011). Furthermore, a worldwide study found that anxiety disorders in general were the most frequent disorders in almost all studied countries with a 12-month prevalence in the range 2.4% to 18.2% (Demyttenaere et al., 2004).

Another striking phenomenon is that many people are frequently terrified of rare and unlikely disasters such as terrorist attacks (Gigerenzer, 2006), plane accidents (Oakes & Bor, 2010), rare diseases like H1N1 influenza (McDonnel, Nelson & Schunk, 2012), etc. In contrast, more common dangers which pose a much greater risk to public health are often feared very little. Examples of these include traffic accidents, alcohol and cigarettes, unhealthy food, common diseases, etc. Consider the fact that most people travel by car more frequently than by plane but that fewer people afraid of driving than of flying. The lifetime prevalence of flying phobia is estimated to be 2.5-2.9%, while this is only 0.7% for driving phobia (LeBeau et al., 2010). It is thus much more likely that someone is scared of air travel, and avoids this mode of transportation. Nevertheless, statistics show that travelling by car is more harmful than flying. If one chooses to drive the length of an average nonstop flight instead of taking an airplane, the risk of a fatal accident is multiplied by 65 (Sivak & Flannagan, 2003). Furthermore, unjustified fear of rare events is not the only problem; lack of fear of everyday matters can be just as detrimental to an individual's health. A notable example is smoking, a leading cause of death yet for many a normal part of daily life. According to the World Health Organization (2013), there are one billion smokers worldwide and this number only appears to be increasing. This is truly astonishing, given that tobacco will prove to be fatal for 50% of these people.

In the following I will define this tendency to fear exceptional events as the “fear-the-rare phenomenon”. This phenomenon can be related to a number of other phenomena. First of all, there are links with the literature on risk perception. The perplexing discrepancy between objective and subjective risk has fascinated scientists for decades, and it has been known from quite some time that our exorbitant reaction to the unknown is one of the main factors underlying this “risk perception gap” (Fischhoff, Slovic, Lichtenstein, Read & Combs, 1978; Slovic, Fischhoff & Lichtenstein, 1982; Slovic, 1987; Ropeik, 2010). Over the years, a multitude of theories, models and heuristics have been proposed in an attempt to explain why the fears so often fail to match the facts. Nevertheless, these explanations often do not directly address why novelty triggers such excessive fear, and conversely, why familiarity can create an illusion of safety. Psychometric researchers working, for example, have investigated several factors that affect risk perception, and were able to identify two major dimensions: dread and novelty (Fischhoff et al., 1978; Slovic, Fischhoff, & Lichtenstein, 1980; but see also Sjöberg, 2004). Although the psychometric approach has been very influential, it remains merely a descriptive model and does not consider the question *why* novelty (or dread for that matter) distorts risk perception. The psychometric approach is, however, not alone in this respect, considering that other models (i.e., Basic Risk Perception, social amplification of risk) also do not offer any insight into the causal mechanisms involved in risk perception (Wåhlberg, 2001).

Another dominant approach to understanding the risk perception gap proposes that general cognitive limitations can provide a satisfactory explanation for the public’s irrational fears. This “heuristics and biases” program emphasizes the role that mental heuristics play in distorting probability judgments in general, and risk perceptions in particular. The availability heuristic (Tversky & Kahneman, 1973) is often mentioned in this context and refers to the erroneous inference that the ease with which one can recall instances of an event is an accurate reflection of its true probability. An illustration is the misrepresentation of causes of mortality in newspapers (Combs, & Slovic, 1979; Frost, Frank & Maibach, 1997; but see also Adelman & Verbrugge, 2000). By over-reporting rare lethal threats, the mass media may make people mistakenly believe they are less likely to die from a heart attack than at the hands of a terrorist (Ost, Granhag, Udell & Hjelmsäter, 2008). There is, however, no overwhelming evidence that we should blame the media for our unreasonable fears (Wåhlberg & Sjöberg, 2000; Sjöberg & Engelberg, 2010) and heuristics in general do not appear to have much explanatory power when it comes to risk perception (Sjoberg, 2000).

This largely cognitive framework can be contrasted with the “risk as feelings” approach (Slovic, Finucane, Peters & MacGregor, 2004) which states that people are guided by an affect heuristic, and often rely on a general affective impression or “gut feeling” rather than analyzing probabilities (Finucane, Alhakami, Slovic & Johnson, 2000; but see also Sjöberg, 2006; 2007). In his book “The Science of Fear” Daniel Gardner (2009) formulates it as follows: “When faced with something, Gut may instantly experience a raw feeling that something is Good or Bad. That feeling then guides the judgments that follow.” (p.76). It is difficult to understand, however, how a referral to “gut” can advance our understanding of the fear-the-rare phenomenon, since it appears to raise more questions than it answers. How do we define and measure a concept such as “gut”? Another important limitation of this approach is that it fails to explain where these gut feelings come from, and thus it remains unclear why humans have a negative gut feeling to rare events.

This brief overview of the literature suggests that we still do not have an adequate explanation for the mismatch between our fears and reality, notwithstanding the significant progress achieved in the past decades. Although the perception gap has been well-described, the causal mechanisms underlying our fear of the unknown remain largely unexplored. Moreover, the current popular theories of risk perception leave a lot of variance unexplained, which leads Sjoberg (2000) to conclude that “a new and quite different approach is needed.” (p. 8)

To all appearances, explaining the fear-the-rare phenomenon will be a complex and challenging undertaking. After decades of research by some of the most talented scholars in the domain of fear and risk perception, we are still not close a solution to this vexing issue. Furthermore, a complete explanation will need to account for the emotions that characterize this phenomenon but also the cognitions and behaviors that may accompany it. According to contemporary views, fears of certain events cannot be separated from the cognitive evaluation of these events and the actions that allow us to cope with them (Steimer, 2002). Moreover, it is known that phobias are characterized by cognitive biases and specific actions such as avoidance of the phobic stimulus (Hood & Antony, 2012). It is therefore possible that people do not only fear and dislike rare events more than common ones, but that they also consider these events to be more dangerous and that they adjust their actions accordingly (Gigerenzer, 2006; Turvey, Onyango, Cuite & Hallman, 2010).

1.2. A Learning Perspective

Notwithstanding the complexity of the fear-the-rare phenomenon, it is undeniable that the core of this phenomenon is learned fear. Unfortunately researchers in this field have devoted little attention to the etiology of fear, and have consistently overlooked the fact that fears and phobias usually do not appear out of nowhere. It is essential to realize, however, that fear is frequently a *learned* response. More precisely, the development of both rational as irrational fears can often be explained in terms of classical conditioning (Davey, 1992; Field, 2006). When a conditioned stimulus (CS), for instance, an airplane, is paired with an aversive unconditioned stimulus (US), for instance, a plane crash, the previously neutral CS will come to elicit a conditioned response (CR), in this case fear. This learned response will be established if the CS-US association is actually experienced, but also when this association is merely verbally described (Field, Argyris & Knowles, 2001; Field, Hamilton, Knowles & Plews, 2003; Field & Lawson, 2003; Muris & Field, 2010; Phelps, O'Connor, Gatenby, Gore, Grillon & Davis, 2001; Tabbert, Stark, Kirsch & Vaitl, 2006). The latter observation is crucial, considering that most people will never die in a plane crash, suffer from H1N1 influenza or become a victim of terrorism. Yet people still believe these disasters could happen to them, and these beliefs appear to find their origin in the verbal information received about these events. In other words, when it comes to the fear-the-rare phenomenon, we appear to be dealing with a specific type of classical conditioning, that is, instructed fear conditioning (Mechias, Etkin & Kalisch, 2009). This effect of threatening instructions on the development of fear can be explained by propositional models of associative learning (Mitchell, De Houwer & Lovibond, 2009). According to this approach, learning is the result of conscious propositional reasoning, and can thus be influenced both by direct experience as by verbal information. Rather than automatically forming associations between representations of the CS and US, people construct beliefs about the nature of the CS-US relationship.

Although instructed fear conditioning appears to provide a plausible explanation for the fear of rare events, the question remains why people are not at least equally afraid of common events. Surely, cars and cigarettes are verbally linked with hazardous outcomes as well. In this thesis, however, it is proposed that the frequent exposure people have had to these events, will make them less likely to believe these verbal threats. The million-dollar question is: Can exposure cause people to disbelieve fear instructions and experience less fear of potentially hazardous events?

I will discuss and test two possible explanations of the fear-the-rare phenomenon, which are both based on learning and emphasize the importance of exposure to possibly dangerous events. These are the mere exposure and CS pre-exposure hypothesis. The former explanation is based on research dating back to the seminal work of Robert Zajonc (1968) which examined the effects of repeated unreinforced exposure on people's preferences. According to Zajonc, mere exposure to a stimulus is sufficient to make our attitude more positive towards it, and to prefer this stimulus over unfamiliar ones. This remarkable influence of exposure on liking is known as the mere exposure effect (MEE). I will investigate the possibility that in this context, the increase in liking that results from mere exposure counteracts learned fear. The fear-the-rare phenomenon pertains to frequent (i.e., often exposed) versus infrequent (i.e., rarely experienced) events that are potentially hazardous, and it is conceivable that exposure-induced liking somehow reduces fear for frequent relative to infrequent events.

The other hypothesis addressed in the present work finds its origin in a different line of research. Within the literature on classical conditioning, it is common knowledge that prior non-reinforced exposure to the CS decreases the probability of subsequent conditioning (Lubow, & Gewirtz, 1995). This remarkable phenomenon is known as the CS pre-exposure effect, or latent inhibition. The CS pre-exposure hypothesis predicts that unpaired pre-exposure to the CS will interfere with subsequent learning about the negative consequences of the CS. If, for instance, after CS-exposure, participants are told that this CS is dangerous, they will respond with disbelief. In other words, a fear instruction will be less effective for pre-exposed CSs and these stimuli will accordingly be feared less. Thus, the outcome will be the fear-the-rare phenomenon.

Is the fear-the-rare phenomenon an instance of a mere exposure or CS pre-exposure effect? Before I can address this question, I need to precisely explain these effects and how they might pertain to the fear-the-rare phenomenon. The next section will be devoted to these issues. To test my hypotheses, I will investigate the effects of exposure on one particular category of stimuli, namely fictitious foods. The acquisition of food preferences is a domain in which learning and exposure is known to play a crucial role (Appleton, 2013; Birch, 1999; Birch & Marlin, 1982; Birch, McPhee, Shoba, Pirok & Steinberg, 1987; Borzekowski & Robinson, 2001; Cooke, 2007; Dovey, Staples, Gibson & Halford, 2008; Halford, Gillespie, Brown, Pontin & Dovey, 2004; Harper & Sanders, 1975; Hobden & Pliner, 1995; Methven, Langreney & Prescott, 2012; Pliner, 1982; Sullivan & Birch, 1990; Wardle, Herrera, Cooke & Gibson, 2003), and therefore provides an excellent testing ground to study the fear-the-rare phenomenon. Furthermore, it is known that humans are often cautious of novel foods, and prefer to eat things that are familiar (Pliner & Salvy, 2007). Food neophobia can thus be seen as an expression of the fundamental bias to fear what is uncommon, and it has been shown that exposure can reduce this fear (Pliner, Pelchat & Grabski, 1993).

1.2.1. The Mere Exposure Effect

In his acclaimed paper, Zajonc provides empirical evidence that mere repeated exposure to a stimulus is sufficient to make our attitude more positive towards it (Zajonc, 1968). For example, in his first experiment, he demonstrated that participants rated nonsense words more favorably if they had pronounced them more often. The same basic finding was replicated in other experiments with different procedures; frequently exposed stimuli were consistently preferred over less exposed stimuli. Zajonc’s striking observations stimulated a considerable amount of research in the following decades, and a meta-analysis of these studies established the robustness and reliability of the mere exposure effect (MEE) (Bornstein 1989). Moreover, the MEE has been demonstrated with many different stimuli. Early studies focused on the visual (Zajonc, 1968) and auditory (Wilson, 1979) domain, but research suggests that exposure can also enhance our attitude towards gustatory (Pliner, 1982), olfactory (Balogh & Porter, 1986) and haptic stimuli (Jakesch & Carbon, 2012).

In the mere exposure literature the notion of perceptual fluency and its relationship with exposure and affect, has been the subject of much research. Perceptual fluency, or the ease with which a stimulus is processed, is known to be enhanced after pre-exposure (Jacobv & Dallas, 1981). This observation has led researchers to wonder whether increased fluency may somehow be responsible for the positive affective reactions people often have towards pre-exposed stimuli. To begin, I will briefly describe some dominant theories on this matter. Afterwards, I explore whether the results of the present study may shed some new light on the relationship between fluency and affect.

The influential perceptual fluency/attributional (PF/A) model of the MEE proposes that repeated exposure automatically enhances perceptual fluency (Bornstein & D'Agostino, 1992; 1994). In other words, pre-exposed stimuli are assumed to be easier to process (Jacobv & Dallas, 1981). According to Bornstein and D'Agostino (1994), these stimuli are liked more because participants misattribute the neutral experience of perceptual fluency to liking for the stimulus when they are asked to rate the valence of stimuli. If the participant is asked to rate other stimulus properties (e.g. brightness or darkness), perceptual fluency can also change these ratings (Mandler, Nakamura & Van Zandt, 1987). Notwithstanding its considerable merits, the PF/A model has also been criticized. For example, the more recently developed hedonic fluency (HF) model states that the experience of fluency is not neutral, but affectively positive (Winkielman, Schwarz, Fazendeiro, & Reber, 2003) and thus only enhances positive reactions such as liking and prettiness (Reber, Winkielman & Schwarz, 1998). Furthermore, it has been demonstrated with electromyography that fluency increases facial activity related to positive affect (Winkielman and Cacioppo, 2001).

In the present study we aim to investigate the MEE in a new domain, namely that of potentially dangerous, fear-provoking stimuli. In particular, we explore whether mere exposure makes these stimuli seem less threatening, in addition to enhancing liking. The question is whether a hypothesis based on the MEE (i.e. enhanced liking after repeated exposure) can account for the fear-the-rare phenomenon. Put simply, does repeated exposure not only increase liking but also reduce fear? A first possibility is that the positive affect people experience when viewing a familiar, but potentially hazardous stimulus causes them to be less scared of this stimulus. According to Schwarz (2010), feelings are used as a source of information, with positive feelings often leading to more positive judgments. For example, research has shown that positive affect results in lower risk perceptions (Haase & Silbereisen, 2011) and can even cause people to underestimate risks (Keller, Lipkus, & Rimer, 2002). In contrast, fear is associated with less optimistic risk perceptions. Similarly, people it has been suggested that people rely on an affect heuristic when estimating risks, and base their judgment on an overall affective impression (Slovic, Finucane, Peters & MacGregor, 2007). Consequently, if a stimulus elicits positive affect, it is usually judged to have both high benefits as low risks (Finucane, Alhakami, Slovic & Johnson, 2000). It is possible that people interpret the positive affect a familiar stimulus elicits as a signal that this stimulus is safe. Thus, liking results in less fear. Moreover, it is important to note that people may experience a feeling of cognitive dissonance (Festinger, 1957) when they are told that a familiar stimulus is dangerous. The cognitions “I like this stimulus” and “This stimulus is dangerous” are clearly inconsistent, and the individual may feel compelled to resolve this conflict. One way to achieve consistency is by denying that the stimulus is actually dangerous. Smokers, for example, are known to downplay the dangers of their unhealthy but pleasurable habit (Lee, 1989; Halpern, 1994; McMaster & Lee, 1991). In short, a substantial body of research suggests that a people are unlikely to believe that a well-liked stimulus can pose a threat to their health.

Interestingly, the reverse causal relation could also be true. Humans may prefer familiar stimuli because they think that these are not dangerous, and because they do not feel afraid of them. According to Zajonc (1968), a novel stimulus will elicit fear, uncertainty and avoidance. But when it is repeatedly presented without any negative consequences, this response will be transformed because the individual now knows that this stimulus is safe, and thus should not be feared (Zajonc, 2001). A stimulus that is viewed as safe will be liked more, resulting in the mere exposure effect. This explanation of the MEE also accounts for the fear-the-rare phenomenon. Common events cease to elicit fear due to repeated exposure, but rare events still do. Zajonc claimed to have found support for his hypothesis in a skin conductance experiment, in which he showed that familiar stimuli evoke less arousal than novel ones and that repeated exposure decreases galvanic skin responses (GSRs) (Zajonc, 1968). Nevertheless, this study does not provide conclusive evidence for the proposal that novel stimuli evoke fear, and that exposure attenuates this response. Skin conductance is a measure of general autonomic arousal, influenced by emotional, cognitive, and attentional processes (Critchley, 2002). An attenuated response could be an indicator of a reduction in positive or negative emotions (Lang, Greenwald, Bradley & Hamm, 1993), a decrease in mental effort (Andreassi, 2000) or a decline in attention (Frith & Allen, 1983). Based on Zajonc's data, one could even argue that repeated exposure decreases the sexual arousal one feels towards non-words (Costa & Esteves, 2008). Obviously, this interpretation is problematic, but the proposal that participants were genuinely afraid of non-words seems almost as improbable. Novel stimuli do not always elicit fear; they are sometimes actively sought out and can even be rewarding (Bunzeck & Duzel, 2006; Butler, 1953). Moreover, although a cautious strategy makes evolutionary sense (Hill, 1978), being afraid of *every* new stimulus one encounters is likely to be maladaptive. Strong food neophobia, for example, can lead to an unhealthy and nutritionally deficient diet (Capiola & Raudenbush, 2012; Falciglia, Couch, Griebble, Pabst & Frank, 2000) and is associated with unsound maternal feeding practices (Tan & Holub, 2012). In addition to being implausible, Zajonc's hypothesis was also not confirmed in later studies. Psychophysical evidence suggests that, instead of decreasing fear, repeated exposure increases positive affect (Harmon-Jones & Allen, 2001).

In conclusion, there is not much evidence for a direct influence of mere exposure on fear. Nevertheless, a mere exposure hypothesis can still provide a reasonable explanation for the fear-the-rare phenomenon. The positive affect that familiar stimuli evoke can cause people to believe that these stimuli are not dangerous and maybe even beneficial (Finucane et al., 2000; Haase & Silbereisen, 2011). Thus, mere exposure can indirectly influence fear and risk perceptions through liking.

1.2.2. The CS Pre-Exposure Effect

In classical conditioning a CS comes to elicit a conditioned response (CR) after it is coupled with an US. For example, the sound of a bell will make a dog salivate if the bell has been paired with food. A well-known phenomenon is that the learning of this association between the CS and US is retarded when the participant is pre-exposed to the CS. Thus, if the dog has repeatedly been pre-exposed to the bell in isolation before it is paired with food, he will not easily learn this relation. This effect was first observed by Lubow and Moore (1959) in experiments with goats and sheep, and subsequent studies demonstrated that the effect is robust and occurs in many different species including humans (Lubow, 1973). One possible difference between human and animal studies is that a masking task may be necessary to obtain the effect in human adults (Lubow, & Gewirtz, 1995), although this premise has recently been called into question (Escobar, Arcediano & Miller, 2003).

Lubow and Moore (1959) named the effect of non-reinforced pre-exposure to the CS “latent inhibition” because they assumed that it is a form of latent learning that inhibits conditioning. The term CS pre-exposure effect is also frequently used, and may be preferred over latent inhibition because it does not commit itself to any mental process explanation of the effect. We opt for such a functional definition in line with the arguments of De Houwer (2011) and thus define the CS pre-exposure effect as the modulation of the classical conditioning effect by the CS pre-exposure procedure.

In the present paper we will focus on the CS pre-exposure effect in the context of instructed fear conditioning. In this case, participants do not learn about CS-US contingencies through direct contact with the CS-US pairings, but by receiving instructions about these relationships (Mechias, et al., 2009). The fact that personal experience of paired-events appears to be unnecessary for conditioning to occur can be explained by propositional models. According to these models, learning is the result of the non-automatic formation and evaluation of propositions, which can be based on experience but also on instructions (De Houwer, 2009).

Just like observational learning (Askew & Field, 2008), instructed fear conditioning can be seen as a form of social learning of fear (Olsson & Phelps, 2007). Furthermore, because language is the means by which fear develops, we can say that the conditioned response is symbolically acquired (Phelps, 2006), which makes this type of classical conditioning unique to humans. Nevertheless, research shows substantial similarities with other forms of fear conditioning. For example, the instruction that a colored circle will be followed by a shock leads to comparable avoidance behavior as the direct experience of this relationship (Dymond, Schlund, Roche, De Houwer & Freegard, 2012).

Because of the similarities between instructional learning and other forms of fear conditioning, unpaired pre-exposure to the CS will presumably also lead to the CS pre-exposure effect in this context. When participants have been pre-exposed to a certain CS, the instruction that this CS will be followed by an aversive US might be less effective. It becomes less probable that the participant will see the CS as an accurate predictor of the US, and therefore the probability that the CS elicits fear decreases. The result will be that participants feel less afraid of CSs they have been pre-exposed to. In other words, CS pre-exposure will lead to the fear-the-rare phenomenon. Rare stimuli, that have not been pre-exposed, will be easily believed to be the cause of the aversive US, and will thus be viewed as more threatening than common stimuli.

1.2.3. Summary

To conclude, we see that the mere exposure and CS pre-exposure hypothesis both predict that people will be unlikely to believe that a pre-exposed stimulus is dangerous. Nevertheless, it is crucial to be aware of the difference between these two explanations of the fear-the-rare phenomenon (see Figure 1, for a schematic representation of the phenomenon and the two learning explanations of the phenomenon). According to the mere exposure hypothesis, participants will deny that the pre-exposed stimulus is dangerous because they like this stimulus. They will not, however, question the idea that this stimulus can have positive consequences because this information is completely compatible with their positive feelings toward the stimulus. The CS pre-exposure hypothesis, in contrast, predicts that pre-exposure will interfere with the learning of both negative and positive consequences of CSs. In other words, participants will deny that a pre-exposed stimulus is dangerous, but they will also deny that it is beneficial. Thus, in both cases participants will not believe a fear instruction, but the reason for this disbelief differs between the mere and CS pre-exposure hypothesis. Moreover, only the mere-exposure hypothesis predicts that information regarding beneficial outcomes will be regarded as true.

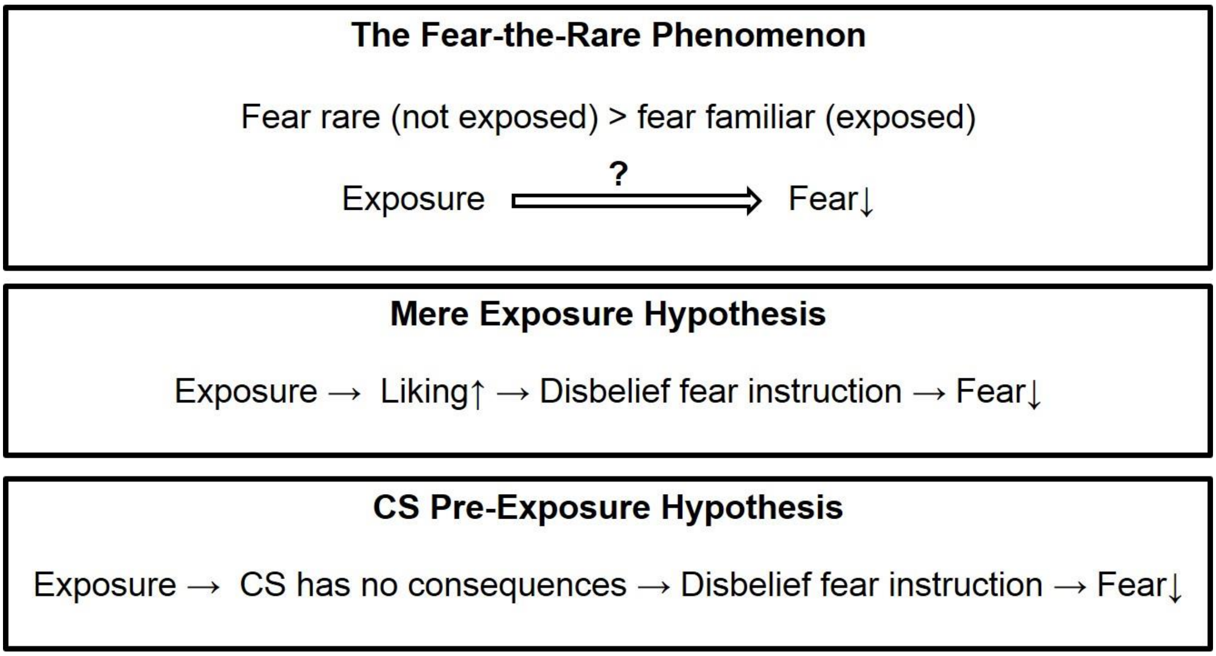

Figure 1: The Fear-The-Rare Phenomenon Explained By The Mere Exposure and CS Pre-Exposure Hypothesis

1.3. Current research: The Fear-The-Rare Phenomenon as an Instance of the Mere Exposure Effect or an instance of CS Pre-Exposure Effect?

The crucial difference between rare and common events is the degree of exposure one has had to them. To account for the fear-the-rare phenomenon from a learning perspective, it therefore makes sense to investigate the influence of exposure. We have previously discussed two possible explanations that both focus on what happens to a stimulus when it is repeatedly presented in isolation. According to the mere exposure hypothesis, pre-exposed stimuli will be preferred over others and could accordingly be feared less if they are later paired with a fear instruction. The CS pre-exposure hypothesis, on the other hand, states that the participant is less likely to notice that there exists a (strong) relationship between the CS and any event that is paired with the CS (be it a positive or negative event).

Although both explanations can possibly account for the fear-the-rare phenomenon, they do not make the same predictions under all conditions. To differentiate between these two hypotheses we will use dangerous, but also favorable outcomes that are paired with frequent and infrequent stimuli. The mere exposure and CS pre-exposure hypotheses both predict that stimuli that were instructed to be dangerous will be less feared when they have been pre-exposed.

These hypotheses, however, make different predictions about the effects of pre-exposure on beneficial stimuli.

To determine whether the fear-the-rare phenomenon is an example of a MEE or CS pre-exposure effect, we will make use of perceptually similar stimuli that differ with regard to the extent to which they are pre-exposed and the information about the consequences of the stimuli. The participant is told that the one kind of stimuli can have beneficial effects, whereas the other can have aversive consequences. Therefore, the former can be seen as beneficial and the latter as dangerous. Additionally, the stimuli also differ on the factor pre-exposure: one of the beneficial and one of the dangerous stimuli is pre-exposed, while the other two are not pre-exposed. The mere exposure hypothesis predicts that pre-exposure will have the same effect on beneficial and dangerous stimuli. In both cases, pre-exposed stimuli will be liked more than those that were not pre-exposed. The CS pre-exposure hypothesis, however, does not make the same predictions for beneficial and dangerous stimuli. Because pre-exposure of a stimulus is assumed to interfere with learning about all consequences of that stimulus, instructions about both beneficial and dangerous consequences should be less effective for pre-exposed than for non-exposed stimuli. This will cause dangerous pre-exposed stimuli to be viewed as less threatening than non-exposed stimuli, while beneficial pre-exposed stimuli will be seen as less favorable than non-exposed stimuli.

The stimuli chosen to test these hypotheses are novel food stimuli. Humans are known to display food neophobia, and have a consistent preference for familiar foods (Pliner, Pelchat & Grabski, 1993; Pliner & Salvy, 2007). Moreover, research has shown that exposure is the crucial factor underlying food preferences (Birch, 1999; Cooke, 2007). These characteristics make food stimuli especially suited to study the fear-the-rare phenomenon. Indeed, one could even say that food neophobia is an expression of this phenomenon. We will not, however, use real food stimuli and participants will also not be directly exposed to them. Instead, this experiment employs an interactive story with the participant as main character.

The procedure consists of three sequential phases. During the first phase, the participant will be pre-exposed to two of the four CSs, while performing a masking task. After the pre-exposure phase, the participant will be told that half of the CSs can be followed by favorable consequences, but that the other CSs can have negative effects. In other words, two CSs will be verbally associated with a positive US (hope instruction), and the other two will be linked with a negative US (fear instruction). One of the dangerous and one of the beneficial CSs will have been pre-exposed, whereas the other two CSs will never have been seen before. After the instruction phase the test phase will begin. During this last phase, I will measure the effects of exposure and instruction on the various measures of emotional responses (fear, hope, and valence ratings, as well as a choice preference test).

For the fear-instructed CSs, the mere and CS pre-exposure hypothesis make identical predictions. The pre-exposed dangerous CS will be given more positive valence ratings, higher hope but lower fear ratings, and will be chosen more than the not pre-exposed dangerous CS. For the hope-instructed CSs, however, the two hypotheses make opposite predictions. According to the mere-exposure hypothesis exposure will have the same effect on dangerous and beneficial stimuli. The CS pre-exposure hypothesis, in contrast, predicts that the pre-exposed beneficial CS will receive less positive valence ratings, lower hope and higher fear ratings, and will be chosen less often than the not pre-exposed beneficial CS.

2. Method

2.1. Participants

Seventy-four students at Ghent University participated for course credits or monetary compensation. Two participants had to be excluded from analysis: one who was not proficient enough in Dutch to understand the instructions, the other because of technical difficulties. The remaining sample consisted of 48 women and 24 men with a mean age of 21.42 (range 17-38, *SD* = 3.86). All students gave written informed consent prior to the experiment, and received a debriefing sheet after their participation.

2.2. Materials

The stimuli were line drawings of four types of nonexistent fruit, which were created for this experiment by combining simple geometric shapes. The four stimuli used were selected based on a pretest of 30 types of fruit in a sample of 24 students at Ghent University (21 women, mean age 19.54, *SD* = 2.62). For each stimulus, participants rated valence, familiarity and probability of being poisonous. The ratings were then analyzed to find stimuli that were neutral, relatively unfamiliar and not very likely to be poisonous. The chosen stimulus set had the following characteristics: valence (means from -1 to 1 on a scale from -10 to 10, *SD* = 4.07 - 5.00), familiarity (means from -4 to -2 on a scale from -10 to 10, *SD* = 4.86 – 6.28) and probability of being poisonous (means from 30 to 40 on a scale from 0 to 100, *SD* = 23.91 – 29.95). Pictures of the four stimuli can be found in Appendix 1, and their characteristics are described in Appendix 2.

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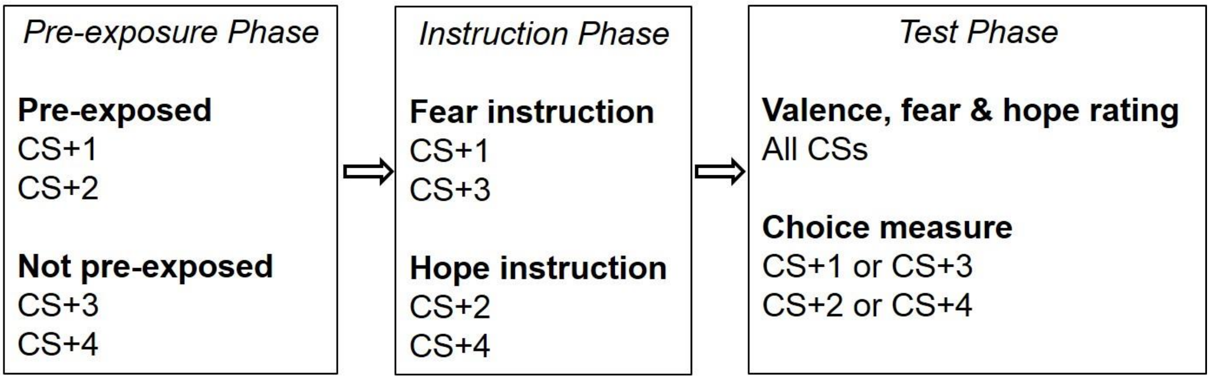

Figure 2: Schematic Overview of The Experimental Procedure

2.3. Procedure

2.3.1. Experimental Procedure

This experiment employed a 2 (Pre-exposure: pre-exposed, not pre-exposed) x 2 (Instruction: dangerous, superfruit) within-subjects factorial design with order of dependent variables and assignment of fruit stimulus (CS) to condition as counterbalancing factors. That is, the CSs that were pre-exposed or not pre-exposed were counterbalanced across participants, just like the CSs that are paired with a fear or hope instruction.

Up to two participants were tested simultaneously in a quiet room. They worked alone, each on their own computer and at separate desks. The whole experiment was programmed in E-Prime 2.0 and was conducted on Dell precision m4700 laptops with 17’’ screens and a screen resolution of 1024 by 768. All instructions appeared on the screen and responses were given using the keyboard.

After entering the lab room, participants were asked to turn off their cell phones and to refrain from speaking during the course of the experiment.

All experimental manipulations and measures were given in the context of an interactive story of which the participant was said to be the main character. There were three main experimental phases that were all situated within this story: a pre-exposure phase, an instruction phase and a test phase (see Figure 2).

During the pre-exposure phase, the participant was exposed to two of the four fruits or CSs during a masking task. These CSs are the pre-exposed stimuli; the other two were not pre-exposed. The pre-exposed CSs were presented interspersed with four distinct animals or filler stimuli. The participant’s task was to count one particular type of animal (monkeys), and to ignore the other stimuli. This task can be seen as a masking task, which distracts attention from the pre-exposed CSs. These stimuli are thus presented in an incidental manner, which may be necessary to produce CS pre-exposure effects in humans (Lubow & Gewirtz, 1995, but see also Escobar, Arcediano & Miller, 2003). Each pre-exposed CS was shown six times and each filler stimulus was shown four times. The CSs and filler stimuli were presented in random order. CSs were shown for 2500ms, filler stimuli for 2000ms and the fixed interstimulus interval (ISI) was 4000ms.

The pre-exposure phase was followed by an instruction phase in which the participant received information about the CS-US contingencies. Two of the CSs were involved in a fear instruction (i.e. this fruit is poisonous for some people with a special sensitivity to them), and the other two CSs were involved in a hope instruction (i.e. this fruit is “superfruit” and gives strength and immediate energy to people with a special sensitivity). Thus, the participant was told that the former stimuli could have aversive outcomes, whereas the latter could have beneficial outcomes. The participant received these instructions two times. Both times, all four CSs were shown simultaneously on the screen and each CS was accompanied by the fear or hope instruction. The participant was allowed to watch these instructions until he or she had fully comprehended them. The instruction disappeared from the screen when the participant pressed a key to continue with the experiment. The participant had seen one dangerous and one safe CS during the pre-exposure phase. The other two CSs were not pre-exposed.

The experiment ended with a test phase in which the participant was asked to answer a few questions about the four CSs. First, the dependent variables corresponded to fear, hope and valence ratings, and a choice measure. The order of the dependent variables was counterbalanced across participants, but the choice measure was always presented last. For the valence rating, the participant had to indicate on a scale of -10 to 10 how visually pleasant the CS was to him or her. For the fear and hope ratings, the participant was asked to rate how much hope he or she had that this CS would have a beneficial outcome (i.e. safe his friend), and how much fear he or she had that this CS would have an aversive outcome (i.e. kill his friend). Valence, fear and hope ratings were collected for all four CSs.

For the choice measure, the participant was presented in two trials with only two CSs and was asked to choose one of two CSs. In one of the trials, both CSs had been paired with a fear instruction in the instruction phase, in the other trial; both CSs had been previously paired with a hope instruction. In each of the trials, one of the CSs was pre-exposed and the other was not. The participant in each trial thus had to decide between a pre-exposed and a not pre-exposed stimulus, once among the stimuli that could have an aversive outcome (i.e. dangerous fruits) and once among those that could have a beneficial outcome (i.e. “superfruit”). Finally, memory was tested to control if the participant remembered which CS belonged to which category. He or she was asked to indicate which CSs was presented during the pre-exposure phase and which CSs had been paired with a fear or hope instruction.

2.3.2. Interactive Story

The three experimental phases were all situated within the following interactive story. First, the participant was told to have won a luxury cruise to an exotic destination, and was asked to choose someone (s)he cares deeply about to accompany him or her on this vacation and to write down the name of the accompanying person. After writing down the name of this person, the adventure began.

The pre-exposure phase began when the ship stranded on an unknown island. The participant decided to explore the island alone and was told to count how many monkeys were presented and to ignore other animals and fruits. Instructions specified to pay attention only to the monkeys. During his exploration, the participant encountered four types of animals and two types of fictitious fruit. These two encountered types of fruit were the pre-exposed stimuli. After this phase, the participant returned to the friend. Together, they succeeded in catching fish and were able to survive on the island for a couple of days.

When the participant decided to explore the island alone again, (s)he met a group of islanders. These people appeared to be friendly, so the participant attempted to communicate with them. This was when the CS-US instruction phase began. The islanders gave the participant information about the four types of fruit that grow on the island. They said that two types of fruit are dangerous, and that the two other types are “superfruit”. The dangerous fruit are poisonous for some people with a special sensitivity to them. These people can die when they eat these fruits. The “superfruit” give strength and immediate energy to people with a special sensitivity to them. These people can be cured from diseases when they eat these fruits. When the instruction phase ended, the participant went back to the friend. They lived on the island for a few more weeks, until the friend suddenly contracted a mysterious illness. The participant didn’t know how to help his friend, but remembered what the islanders told him about the existence of “superfruit”, so (s)he decided to go look for this fruit.

During the test phase the participant was asked to answer a few questions about the four types of fruit. Irrespective of which fruit the participants chose, the experiment ended with the message that the participant had made the correct choice; the friend had eaten “superfruit” and had never felt better.

3. Results

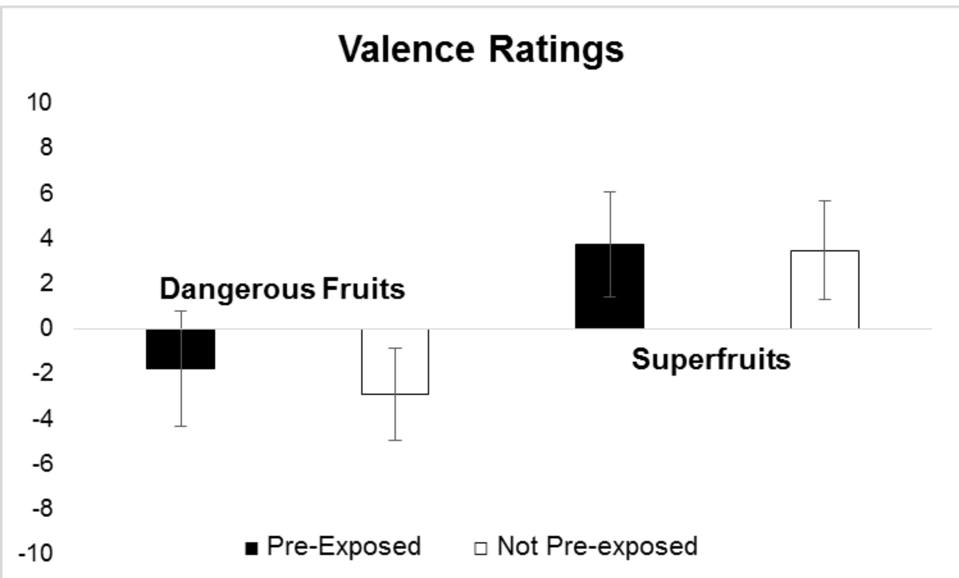

Figure 3: The Effects of Pre-Exposure and Instruction on Valence Ratings

Valence, fear and hope ratings were analyzed using repeated measures ANOVAs. Valence ratings showed a significant main effect of instruction, $F(1,71) = 59.73$, $p < .001$. The effects of pre-exposure $F(1,71) = 2.49$, $p = .12$, and the interaction $F(1,71) = 0.76$, $p = .39$ were not significant.

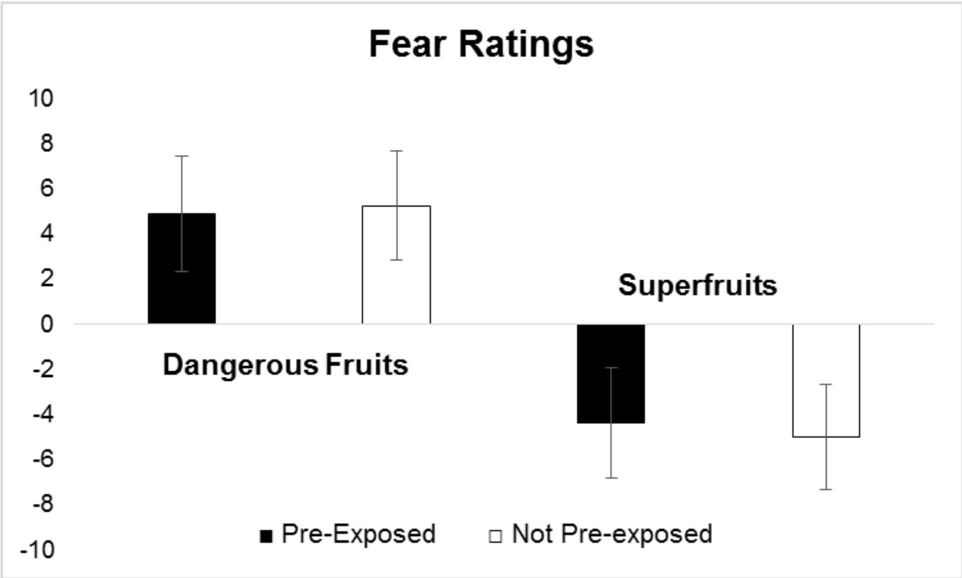

Figure 4: The Effects of Pre-Exposure and Instruction on Fear Ratings

The fear ratings showed a significant main effect of instruction, $F(1,71) = 130.12$, $p < .001$, but not of pre-exposure $F(1,71) = 0.14$, $p = .71$. The interaction was marginally significant, $F(1,71) = 3.02$, $p = .09$. To further investigate this interaction, follow-up paired samples t-tests were conducted within the conditions “dangerous” and “superfruit”. Within the dangerous condition, fear ratings were lower for pre-exposed ($M = 4.90$, $SD = 0.61$) than for not pre-exposed ($M = 5.26$, $SD = 0.57$) dangerous fruits, but this difference was not significant, $t(71) = 0.72$, $p = .48$ (two-tailed). Within the condition of “superfruits” fear ratings were higher for pre-exposed ($M = -4.36$, $SD = .58$) than for not pre-exposed ($M = -5.00$, $SD = .55$) “superfruits”, but this difference was also not significant, $t(71) = 1.49$, $p = .14$ (two-tailed). The mere exposure hypothesis predicts less fear for pre-exposed “superfruits”, whereas the CS pre-exposure hypothesis makes the opposite prediction. Thus, although these results are not statistically significant, they are more in line with the CS pre-exposure hypothesis than with the mere exposure hypothesis (see fFigure 3).

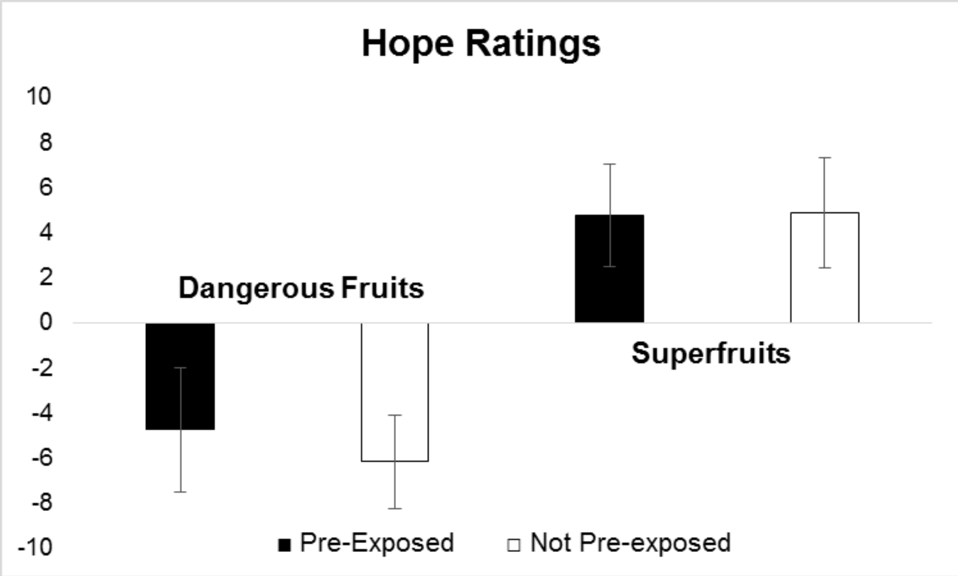

Figure 5: The Effects of Pre-Exposure and Instruction on Hope Ratings

For the hope ratings, the main effect of instruction was significant, $F(1,71) = 144.62$, $p < .001$, while the effect of pre-exposure, $F(1,71) = 2.63$, $p = .11$, was not. The interaction was again marginally significant $F(1,71) = 3.53$, $p = .06$. Again, follow-up paired samples t-tests were conducted. Within the condition of dangerous fruits, hope ratings were higher for pre-exposed ($M = -4.74$, $SD = .65$) than for not pre-exposed ($M = -6.15$, $SD = .49$) dangerous fruits and this effect was significant $t(71) = 2.19$, $p = .03$ (two-tailed). Within the condition of "superfruits", the hope ratings were, however, lower for pre-exposed ($M = 4.76$, $SD = .54$) than for not pre-exposed ($M = 4.89$, $SD = .58$) fruits, although this difference was not significant. $t(71) =.26$, $p = .80$ (two-tailed). If anything, these results are again in line with the CS pre-exposure hypothesis, despite being insignificant (see figure 4).

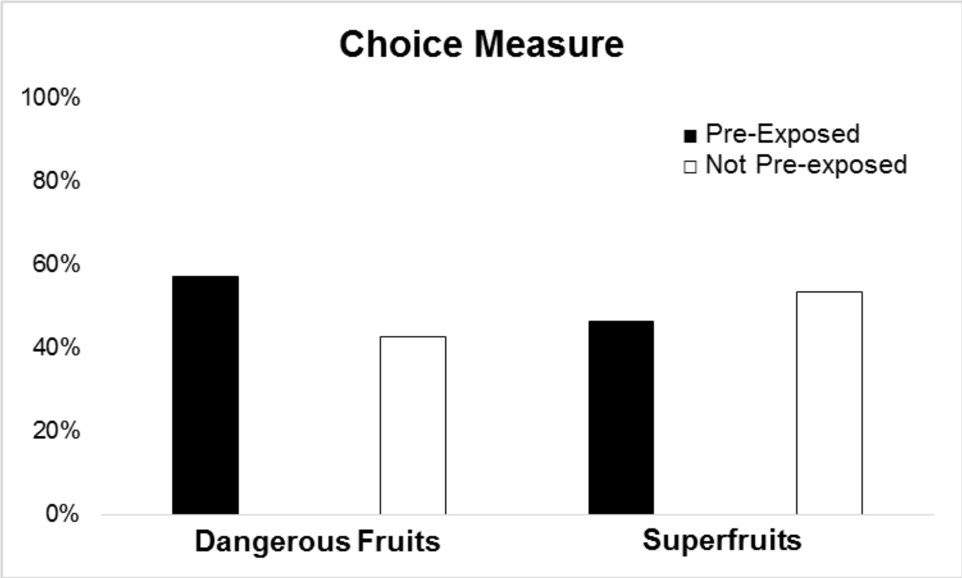

Figure 6: The Effects of Pre-Exposure and Instruction on The Choice Measure

Chi-square tests were used to analyze the results of the choice measure. For the dangerous fruits, 39 participants chose the pre-exposed stimulus, while 29 chose the not pre-exposed fruit. This effect, however, was not significant, $\chi^2(1, N = 68) = 1.47, p = .23$. The opposite pattern of results emerged for the “superfruits”. Here, most participants chose the not pre-exposed stimulus (34 vs. 39) but this effect was also insignificant, $\chi^2(1, N = 73) = 0.34, p = .56$. Just like for the hope and fear ratings, the results of the choice measure are in line with the CS pre-exposure, but not with the mere exposure hypothesis. Unfortunately, these results are not statistically significant as well (see Figure 5). To test whether the effect of exposure is different for dangerous than for superfruits, a McNemar's test was conducted. This test, however, also failed to produce a significant result, $\chi^2(1) = 1.441, p = .23$.

4. Discussion

4.1. The Processes that Underlie The Fear-The-Rare Phenomenon

The aim of this paper was to broaden our understanding of the fear-the-rare phenomenon, which refers to the tendency to fear rare events more than common events. More specifically, we investigated whether this phenomenon is an example of a mere exposure or a CS pre-exposure effect. Thus, we have tried to provide an explanation in terms of the environmental elements that determine the behavior (De

Houwer, 2011). According to the CS pre-exposure hypothesis, pre-exposure to the CS decreases the probability that the participant will believe the CS to be the cause of any outcome. Thus, pre-exposure will make both fear and hope instructions less believable. The mere exposure hypothesis, in contrast, states that pre-exposure will enhance liking. Because the participant will favor pre-exposed stimuli, he or she will be less likely to believe that these stimuli can have aversive consequences. The impact of hope instructions, on the other hand, should not be affected by after pre-exposure. The results, albeit non-significant, appear to favor the CS pre-exposure hypothesis. For the “dangerous” fruits, participants gave numerically lower fear and higher hope ratings when these stimuli had been pre-exposed. Moreover, pre-exposed “dangerous” fruits tended to be selected more than their not pre-exposed counterparts during a forced-choice preference test. The opposite tendency emerged for the “superfruits”. Thus, pre-exposure appears to have made both fear as hope instructions less effective.

In sum, the present study offered some preliminary support for the hypothesis that the fear-the-rare phenomenon should be seen as an example of a CS pre-exposure effect. In the following paragraphs, I attempt to go further than this functional explanation and speculate on the mental processes that could be responsible for the fear-the-rare phenomenon as an instance of CS pre-exposure. I will discuss two possible process explanations for the CS pre-exposure effect, namely an associative and a propositional approach (De Houwer, 2009). The former regards classical conditioning as the result of the automatic formation of associations between the mental representations of the CS and US, whereas the latter approach considers learning to be the outcome of conscious propositional reasoning.

According to the associative model, the CS pre-exposure effect can be explained in terms of the automatic formation of associations. During the pre-exposure phase, an association could be formed between the CS and the context in which it occurs (e.g. Hall & Pearce, 1979). Another possibility is that a context-stimulus-no consequence association is formed (Lubow, & Gewirtz, 1995). In both cases, the subject learns that the CS does not signal anything of significance. This may result in decreased attention to the CS (Lubow, Schnur & Rifkin, 1976), which then hinders the formation the CS-US association. Alternatively, it is possible that the CS-US association can still be formed, but that the association established during pre-exposure interferes with expression of the CS-US association (Miller & Matzel, 1988). The propositional model, on the other hand, states that the CS pre-exposure effect can be explained by the non-automatic formation and evaluation of propositions, for example the proposition “CS doesn’t lead to any consequence”.

Associative models have long dominated the literature on classical conditioning and can provide an acceptable explanation of the CS pre-exposure effect when learning is the result of direct experience of CS-US contingencies. Nevertheless, these models run into trouble when the CR is the result of a fear instruction. The problem is formulated by Mitchell, De Houwer and Lovibond (2009) as follows: “The automatic link-formation mechanism is non-propositional. It cannot, therefore, be affected directly by verbal instruction, rules, or deduction.” (p. 188). In other words, associative models predict that fear and hope instructions will not influence associative learning effects. In the present study, however, a significant main effect of instruction was clearly present in participants’ evaluations of the stimuli. These results cannot easily be accounted for by automatic link-formation, and suggest that propositional reasoning may be the psychological mechanism responsible for the fear-the-rare phenomenon. Note, however, that some have argued that instructions can somehow result in associations (e.g., Field, 2006; Gawronski & Bodenhausen, 2006).

4.2. The Explanatory Power of a Learning Framework

In the present paper I have argued that a learning framework can provide a credible and compelling explanation for people’s fundamental fear of the unknown. This perspective is founded on the premise that fear and risk perception are a function of the strength of the CS-US relationship. In terms of a propositional approach, this assumption implies that fear depends both on how strongly people believe that there, exist a relationship between the CS and the US, and how strong they believe this relationship to be (Mitchell, De Houwer & Lovibond, 2009). The current work highlighted one factor that influences associative strength, namely unpaired pre-exposure to the CS. Pre-exposure causes people to respond with disbelief when a pre-exposed CS is later verbally linked with an aversive US. In this way, a learning perspective can account for the fear-the rare phenomenon.

It is crucial to realize, however, that CS pre-exposure is of course not the only determinant of beliefs. Instead, whether people believe that a certain CS predicts or causes a US, depends on a wide variety of factors (e.g.., properties of the stimuli, relationship between the stimuli, nature of organism, context). Equally important is the observation that novelty is not the only recognized cause of irrational fears and horribly skewed perceptions of risk. In the risk perception literature, a number of factors have been identified that distort people's view of reality and contribute to the infamous risk perception gap. These considerations raise an interesting question: could it be that these distorting factors are, just like novelty, determinants of associative strength? Put briefly, are we dealing with simple learning effects here as well? In this following paragraphs, I will argue that this may indeed be the case and I will give a few examples to support this contention.

A first major influence on risk perception is the dread factor, which refers to how terrible and painful the outcome of a risk is imagined to be (Ropeik, 2004). Being eaten alive by a shark, for example, scores very high on the dread factor and elicits strong anxiety. Some authors describe this reaction as irrational, because the probability of a shark attack is negligible. If we look at this behaviour from a learning perspective, however, it makes perfect sense that a CS associated with such an intense US will elicit a strong CR. The intensity or salience of the US is known to be an important determinant of classical conditioning and might also be a determinant of fear conditioning via instructions. This would explain why verbal information about dreadful events can elicit excessive fear.

Another interesting phenomenon in the risk perception literature is the delay effect. An event that can have immediate aversive consequences evokes more fear than something that can be deadly somewhere in the unforeseen future. Smoking is an excellent illustration of the delay effect. We all know that tobacco can cause many forms of cancer, cardiovascular disease and pulmonary illness (Newcomb & Carbone, 1992; Bartecchi, MacKenzie & Schrier, 1994; Ockene & Miller, 1997). Nevertheless, we also know that these effects will not already be present after smoking a few cigarettes, so why worry? The delay effect often perplexes researchers, but can also be accounted for by a learning perspective. People are much more likely to believe that a CS causes a US if the CS is immediately followed by the US. A delay obscures the CS-US relationship, and thus makes it less likely that this relation will have an impact on people's behaviour.

The learning perspective advocated in this paper suggests that it may not be accurate to attribute the discrepancy between subjective and objective risk perceptions to discrepancies between behavior and the beliefs that people hold. Someone who expects fear and risk perception to be based on a multiplication of probability and severity of adverse consequences, will invariably come to the conclusion that humans are among the most irrational beings to have ever walked this earth. At least in some cases, however, irrationality might result from incorrect beliefs. The learning literature provides us with a number of reasons why people might not pick up the actual contingencies that are present (e.g., pre-exposure to stimuli, extremity of events, delays, …). Yet, this does not imply that humans are irrational in the sense of behaving in a way that contradicts their beliefs. Instead, maladaptive fear may be the result of the same processes of associative learning as adaptive fear.

4.3. Practical and Applied Implications

The fear-the-rare phenomenon implies that humans have a strong preference for familiarity, and often fear rare and uncommon events. Some authors propose that this bias can be seen as evolutionary adaptive. For example, Bornstein (1987) argues that the familiar is generally safe, whereas the unknown is potentially dangerous and that it therefore makes perfect sense to prefer the former and fear the latter. Similarly, many view food neophobia as a mechanism that protects us against the ingestion of possibly harmful substances, although it is not always functional in modern life (Cooke, Wardle & Gibson, 2003). A reluctance to eat unfamiliar plants can definitely help avoid poisoning, but few parents will call their children's aversion of broccoli adaptive.

The presence of fearful reactions to novel events in many species suggests that neophobia is an evolved response which is often important for survival (Zajonc, 1968). This behavior, however, ceases to be adaptive when the familiar is not safe and when the novel is not dangerous. In some cases, familiarity can create a false sense of security, and make dangers that are part of daily life seem less harmful and threatening than they truly are. The fear of rare events can likewise be maladaptive, and cause people to invest time and effort in avoiding disasters that are likely to never to occur. Hence, one should not automatically assume that familiar events are always safer than their rarer counterparts. Moreover, we should not underestimate the magnitude and repercussions of the fear-the-rare phenomenon. One particularly disturbing manifestation of this phenomenon was documented by Gigerenzer (2004; 2006), who demonstrated that the September 11 attacks caused many Americans to switch from air to road transportation. In an attempt to avoid the rare risk of another terrorist attack, an estimated number of 1,595 people died in all too common traffic accidents (Gigerenzer, 2006).

The frequent mismatch between people's fears and reality has led some scholars to adopt a rather pessimistic outlook. Cross (1998), for example, has argued that when it comes to policymaking, the worst decision we can make is to trust the public, since "reliance on public perceptions of risk means more premature deaths" (p.27). Authors who describe these irrational fears as instincts or gut reactions (Slovic & Peters, 2006), likewise give us little hope. Attempts to change people's perceptions will most likely be a waste of time and energy, because "we cannot undo what appear to be deeply ingrained patterns of psychological responses to risks" (Ropeik, 2004, p.59). Furthermore, trying to understand human fears may be an equally futile exercise, because "Gut is a black box; Head can't peer inside." (Gardner, 2009, p. 69).

Should we regard the fear-the-rare phenomenon as something that is beyond comprehension and hardwired into the human brain? In the preceding pages, I have defended a radically different point of view. The central argument of my thesis is that human fear is often a learned response (Davey, 1992; Field, 2006). Usually these reactions are adaptive; they lead us to avoid dangerous events and keep us safe from harm (Bateson, Brilot & Nettle, 2011). In some cases, however, our fears fail to match the facts. Yet this does not mean that we should dismiss these fears as irrational and incomprehensible. They are the product of the same learning principles as the fears that protect us. Therefore, they can be understood and we can identify their underlying causal mechanisms. Even more importantly, understanding why the unknown strikes terror into people's heart is a first step towards dealing with the fear-the-rare phenomenon. Research on associative learning has inspired many successful therapies for treating anxiety disorders, and there is no reason to assume why the same principles could not also be applied for improving risk communication and modifying irrational fear in general. To conclude, maladaptive fears are not necessarily unalterable, and a learning framework may provide us with the tools to change them.

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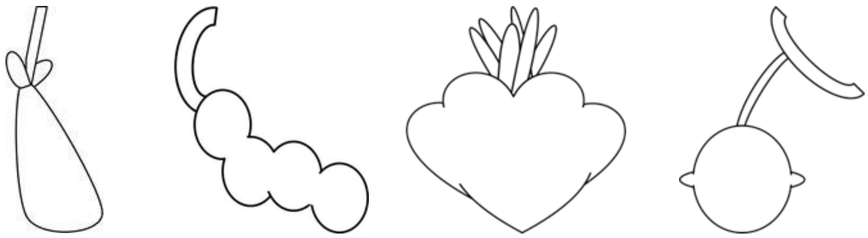
6. Appendix

Appendix 1: *Pictures of the four types of non-existent fruit used in the experiment.*



Fruit1 Fruit2 Fruit3 Fruit4

Appendix 2: *Characteristics of the four fruits.*

	Valence	**Familiarity**	**Poisonous**
Fruit1	-.59	-2.59	37.78%
Fruit2	.33	-2.00	38.33%
Fruit3	.93	-2.19	37.41%
Fruit4	-.37	-3.31	34.81%

Note: valence (scale from -10 to 10), familiarity (scale from -10 to 10) and probability of being poisonous (scale from 0% to 100%).

7. Dutch Summary

Mensen vertonen vaak een buitensporige en irrationele angst voor het onbekende, terwijl het alledaagse regelmatig een vals gevoel van veiligheid uitlokt. Zo zijn velen bijvoorbeeld bang om te reizen met het vliegtuig, maar een ritje met de auto lokt zelden angst uit. Onderzoek heeft echter duidelijk aangetoond dat het risico op een ongeval veel groter is indien men de auto neemt.

In deze masterproef, wordt de tendens om zeldzame gebeurtenissen te vrezen gedefinieerd als het “fear-the-rare phenomenon”. In een poging dit fenomeen te verklaren wordt er gebruik gemaakt van een leerperspectief. Er wordt onderzocht hoe eerdere ervaring met iets er toe kan leiden dat men niet gelooft dat dit object kan gevaarlijk zijn. Meer bepaald worden er twee hypotheses tegen elkaar uitgespeeld: de “mere exposure” en “conditioned stimulus pre-exposure” hypothese. Om te bepalen wat de meest waarschijnlijke verklaring is, wordt er gebruik gemaakt van een interactief verhaal.