Forthcoming in *Australasian Journal of Philosophy*, please cite the published version.

# Iconic prioritization and Representational Silence in emotion

Andrea Rivadulla-Duró
LOGOS Research Group in Analytic Philosophy, Universitat Autònoma de Barcelona

**Abstract:** Emotions can be insensitive to certain attributes of a situation: Fear of flying is not always reduced by remembering air crash probabilities. A large body of evidence shows that information on probabilities, large numerical counts, and intentions is frequently disregarded in the elicitation and regulation of emotions. To date, no existing theory comprehensively accounts for the features that tend to be overlooked by emotion. In this paper, I call attention to the common denominator of such features: they do not contribute to the iconic representation of events. For instance, the exceedingly low probability of a plane crash does not affect its imagistic representation (i.e., the iconic representation of the event is silent about the event's probability). This paper introduces the Iconic Prioritization Hypothesis, positing that the prioritization of input in the iconic format by emotions can explain the neglect of information that is representationally silent in this format. Delving into the causes of this format prioritization, I argue that emotion might favour iconicity as it is the format of immediate information about our surroundings (perception) and of stored first-hand evidence (episodic memory). Lastly, the hypothesis's compatibility with philosophical theories of emotion causation and its implications for experimental research are examined.

**Keywords:** Iconicity, iconic format, mental imagery, emotion, decision-theory, recalcitrant emotions

## 1. Introduction

‘What you see is all there is’

Daniel Kahneman[1]

Our decisions and judgments are frequently influenced by being in the grip of an emotion. Take the case of Alba, who repeatedly imagines a crash landing, causing a fear response that impedes her from taking a flight. Emotions constitute a powerful and pervasive driver of decision-making (Lerner, Li, *et al*. 2015) and evaluative judgment (Miller and Cushman 2013). For example, fear elicited by contemplating possible outcomes can prevent us from acting, causing avoidance (Ji, Heyes, *et al*. 2016). Similarly, anger tends to increase the severity of our moral judgments (Horberg, Oveis, and Keltner 2011).

Often, emotions respond to relevant information and contribute adaptively to our decisions and judgments. The fear elicited by a sudden loud noise from a snow avalanche facilitates a flight response by the hiker. However, emotional responses can also hide relevant and available information. In this case, emotions can lead to decisions against our self-interest or best knowledge. This is the case, for example, of the fear that assails us when imagining circumstances that we know are highly improbable, leading to maladaptive behaviors aimed at preventing a low-probability event from happening (Witte and Allen 2000).

Understanding the discrepancies between what elicits and mediates strong emotional responses and what does not is still a theoretical challenge. In order to bridge the gap

[1] Kahneman, Daniel. (2011). *Thinking, Fast and Slow.* Penguin Books. p 118.

between emotion and the pool of accessible information, I examine three distinct and well-established phenomena. These phenomena highlight instances where, under the sway of emotions, subjects make suboptimal decisions or judgments by overlooking key pieces of information. In the cases examined, overlooked information concerns 1) statistical knowledge (Identifiable Victim Effect), 2) known probabilities (Probability Neglect and Nonlinear Probability Weighting), and 3) intentions in omissions (Omission Bias). Set against the backdrop of these phenomena, this paper seeks to answer the following question: Why is certain information overlooked in eliciting and regulating emotional responses, while other information is overweighted? That is, which aspects are factored in, and which aspects are factored out?

To address this question, I first call attention to a critical characteristic of attributes that are frequently disregarded by emotions. Information often neglected by emotions shares a common trait: it fails to contribute to the iconic representation of a target event. Such information is, so to speak, *representationally silent* in the iconic representation of the event. To illustrate the concept I coin as Representational Silence, consider an example involving probabilistic information. The probability of an event occurring is representationally silent within the event's iconic representation, as it is not explicitly represented in the event's image-like depiction. That is, variations in the probability of the event happening will not trigger changes in the iconic features of the event. When anticipating a flight, Alba may envision being in a shaking plane about to crash. While entertaining this image, she might remember that the probability of a plane crashing is indeed very low. However, the mental image of a shaking plane will be unaffected by Alba's recall of such minimal probability, or by variations in the probability range. Information about the event's probability is not integrated into the iconic representation of the event, which depicts what it would be like to *experience* the event.

After underscoring the representational silence in the iconic format of information frequently disregarded by emotions, I put forth a clear hypothesis as to why *this* information has a scant influence on emotion. According to the *Iconic Prioritization Hypothesis* I introduce in this paper, disparities between accessible information and emotional responses result from the prioritization of iconic representations in emotion. The preference for iconic-format information in emotional processing elucidates the disregard for information silent in such representations. Paraphrasing Kahneman's quote: In the elicitation and regulation of emotions, what can be seen is all there is. Given the evolutionary role of emotions in facilitating fast responses (Frijda and Mesquita 1994), they might be designed to prioritize the format of immediate information of our surroundings (perceptual evidence), which is indeed also the format of stored first-hand evidence (episodic memory). Highlighting the role of the iconic format in emotion can explain why representationally silent information in this format is frequently overlooked in emotional processes. Consequently, the prioritization of the iconic format in emotion—and the ensuing 'silencing' of certain information—is proposed as a mechanism through which emotions can influence judgments and choices in suboptimal ways, offering a unified explanation for an array of seemingly heterogeneous phenomena.

In the following section, I introduce the notion I have termed representational silence and the Iconic Prioritization Hypothesis. In §3, I examine a range of phenomena where emotional responses systematically overlook key attributes of a situation, leading to adverse effects on decision-making and judgment. I argue that the representational silence of relevant information within a target iconic representation is a significant factor in the phenomena under discussion and advance the Iconic Prioritization Hypothesis as a parsimonious and comprehensive explanation of the effects. In §4, I underscore the potential adaptiveness of emotion's prioritization of input in an iconic format.

Additionally, I explore the implications of the Iconic Prioritization Hypothesis for philosophical theories of emotion causation, as well as its impact on related experimental research.

## 2. Representational silence and the iconic format

‘A sentence uttered makes a world appear

Where all things happen as it says they do’

W.H Auden, Words[2]

Two kinds of representational formats are frequently distinguished: iconic or image-like representations and discursive or language-like representations (Fodor 2007; Carey 2009: 8; Quilty-Dunn 2016). Perceptual representations and mental imagery are typically considered iconic or picture-like (Kosslyn 1994; Pearson, Naselaris, *et al*. 2015), while cognition is primarily seen as discursive or language-like (Block 2023: 215). The difference between iconic and discursive representations has been characterized in several ways. Here, I will focus on two key aspects: 1) the type of resemblance they bear to what they represent, and 2) the way they can be decomposed.

An initial distinction between iconic and discursive representations highlights that discursive representations are inherently arbitrary and stipulative, whereas iconic representations are natural and mimetic. As Greenberg (2023) notes, the Latin word *arbor* bears an arbitrary connection to the concept of a tree; another word like *barbor* could

[2] Auden, W. (1976) *Collected Poems.* Random House. p.473.

suffice just as easily. In contrast, a picture of a tree bears a natural and direct relation to the tree it depicts. Iconic representations are not arbitrary but rather 'resemble' the object they represent (Kosslyn, Thompson, and Ganis 2006: 12).

The idea that iconic representations resemble what they represent has also been explained by appealing to structural preservation: icons preserve the structure of what they represent (Meir 2010). Robust formulations of this principle go further, claiming that in iconic representations, 'the represented 'distances' among the portions of the representations *must* correspond to the distances among the corresponding portions of the actual object (as they appear from a point of view)' (Kosslyn, Thompson, and Ganis 2006: 12, emphasis mine).

Related to structural preservation, in the cognitive science literature a prevalent criterion for demarcating iconic and discursive representations suggests that iconic representations, unlike discursive ones, are not amenable to canonical decomposition but instead adhere to the Parts Principle (Fodor 2007: 108; Carey 2009; Kosslyn 1994; Toribio 2011). As per this principle, in iconic representations: 'Every part of the representation represents some part of the scene represented by the whole representation' (Quilty-Dunn, 2016: 256), or, as Kosslyn, Thompson, and Ganis put it, 'each portion of the representation must correspond to a visible portion of the actual representation' (2006: 12). As an illustration, consider pictures, the paradigm example of iconic representations in the visual modality. As per the Parts Principle, irrespective of how a picture is segmented, its divided parts will invariably carry meaning—that is, they will portray a segment of the scene captured by the picture. Conversely, discursive representations do not conform to this principle. If we were to dissect a sentence, its individual parts would

not necessarily convey meaning, given that sentences contain elements (e.g., prepositions) that lack standalone significance.[3]

Structural differences between these formats can lead to variations in the information they convey. As Marr posits, 'any particular representation makes certain information explicit at the expense of information that is pushed into the background.' (1982: 21). In the present case, discursive and iconic representations can each render different pieces of information explicit and accessible. Consider the following illustrative example, inspired by Green and Quilty-Dunn (2021). During a trip to the woodlands of eastern Russia, fascinated by the presence of a Siberian tiger, I might decide to 1) send a message to a friend saying, 'There is a large, yawning Siberian tiger in front of me', or 2) send a picture of the tiger to my friend. Deciding to use one of these two formats will result in differences in the information transmitted. For example, the picture will represent specifics and low-level properties of the tiger, such as the irregular shine of its fur and its wet, pallid tongue, of which the sentence is silent. Conversely, the sentence explicitly represents the tiger as being a *Siberian* tiger, which the picture does not (Green and Quilty-Dunn, 2021: 669).

My assumptions regarding representational formats throughout the paper are limited to three—not particularly contentious—claims: 1) visual perception and visual imagery are constitutively iconic in format (Carey 2009; Block 2023; Dretske 1981; Tye 2002),

[3] The Parts Principle has faced numerous critiques (Kulvicki 2014; Block 2023), leading to the development of alternative criteria for iconicity. For the purposes of our discussion, we need not advocate for a specific notion of iconicity, nor enter into debates about the nature of pictorial representations such as paintings. Given that this paper focuses on the role of formats in cognition, it will suffice to use the markers of these formats as described in the cognitive science literature. Other interpretations of iconicity encompass Shepard's 'Second-order Isomorphism' (1978), Hopkins' (1995) invocation of 'experienced resemblance,' and Block's (2023) notion of 'Analog Mirroring.' More recently, rules-based theories of iconicity have been put forth by Lee, Myers, and Rabin (2022) and Greenberg (2023).

2) there are structural differences between discursive and iconic representations, and 3) the use of one format over another in a given task may result in variations in the content processed, as different formats make explicit and accessible distinct pieces of information (Kosslyn, Thompson, and Ganis 2006: 12).

### 2.1 Lost in translation: Format prioritization and the silencing of information

Depending on the task at hand, it may be necessary to translate information from an iconic format to a discursive form, or vice versa. One practical example is describing a painting after a museum visit. Unable to convey the iconic memory of the painting directly, we may rely on the mental image of the artwork and describe it discursively. For instance, when describing Cy Twombly's *Leda and the Swan*, one might focus on the furiously thrashing overlays of crayon pencil and ruddy paint, and how a few recognizable signs—hearts, a phallus—fly out from what seems to be an explosion at the center of the painting. It is crucial to acknowledge that translating information from an iconic format to language will, in most cases, leave out some details. Due to communicative constraints, the detail in the verbal description of the painting may not fully convey the volume of information that the iconic representation can integrate. For example, the iconic representation makes explicit and accessible a near-infinite number of spatial relations among the elements of the painting—something that realistic descriptions in natural communication will not capture. As a result, some information encoded in the iconic representation may be 'lost in translation' when describing the painting.[4]

[4] I am not committed to the stronger claim that even the most exhaustive description of the painting could not contain the same amount of information as its iconic representation. The example aims to illustrate that,

The same can happen in the reverse direction; propositionally stored information can contribute to iconic representations. For instance, when anticipating possible scenarios through visual imagery, we may use stored propositional information to form episodic simulations of events. Consider the following example. When anticipating possible weather scenarios for her outdoor wedding, Clara visualizes two distinct outcomes based on her beliefs: one with rain, evoking despair, and one without, bringing her joy. In doing so, Clara might integrate relevant stored propositional information about the event into each iconic representation. For instance, if she knows that the wedding venue is filled with palm trees, she will incorporate palm trees into the imagined scene. Should she learn that the palm trees have been replaced by cypresses, she can adjust the representation accordingly, integrating cypresses into it instead.

However, I want to call attention to the fact that relevant pieces of propositional information about the event will be 'lost in translation' in its iconic representation. Let's say Clara knows that there is a 20% chance of rain and an 80% chance of no rain. Crucially, the iconic representations of the two possible scenarios of the wedding (rain and no rain) will be unaffected by variations in the probability of each of them happening. Contrary to Auden's initial quote, the proposition stating the likelihood of rain does not alter the visual depiction of the rainy wedding. After learning about their probabilities, the iconic representations of scenarios 1 and 2 will appear to Clara just as they did before she acquired information about each outcome's likelihood, since probabilistic information is not explicitly represented when visualizing a specific scenario.

---

due to time constraints in natural contexts, the explicit information conveyed in the iconic representation of the painting will, in most cases, not be communicated when describing it verbally.

I refer to this phenomenon as representational silence. Information X is *representationally silent* in representation Y in format Z if and only if variations in the dimension of information X do not trigger changes in the features explicitly represented by Y in Z. In Clara's example, probabilistic information about the event is representationally silent in the iconic representation of the rainy wedding since variations in probabilistic information about the event do not trigger changes in the features explicitly represented in the iconic depiction of the rainy wedding, which represents the event as *happening*.[5] Before proceeding further, two caveats about the phenomenon I term representational silence are in order.

First, it is important to distinguish the representational silence of information from attentional phenomena in which information might also, in a weaker sense, be 'pushed into the background.' Take the case of Jim looking at the sunset on the beach. By attending to certain bits of the scene, Jim can make certain information explicit at the expense of other information. For instance, he might attend to a seagull doing a little dance. While doing so, the sunset will still be represented but, in a sense, pushed into the background because attention is focused on the seagull. However, here the sunset can be made explicit by means of an attentional shift. On the contrary, in Clara's case, probabilities cannot be made explicit in the iconic representation of the wedding just by an attentional shift towards other elements in the iconic representation. This is a stronger sense of

[5] The claim that probabilistic information is representationally silent in iconic representations of events is not to be equated with the claim that probabilistic information cannot be iconically represented, such as in graphs. Although we can think about probabilistic information when seeing or imagining graphs, such graphs are representationally silent about what it would be like to experience the event. That is, the experiential character of the event (how it would be like to experience the event) and its probability (the chances of the event happening) cannot be explicitly represented and merged in a single iconic representation.

information not being integrated into the representation and is the one I refer to in the paper.[6]

Second, the fact that information is representationally silent in a particular representation in a specific format does not preclude this information from being synchronically represented in another format. It is not the same to say that information is representationally silent within a representation in a specific format as it is to say that the information is not represented at all. While envisioning the rainy wedding, Clara might indeed be thinking, 'There is a 20% probability that this event will happen'. However, information explicitly represented by the iconic representation of the rainy event will not change if Clara obtains new probabilistic information such as, 'There is a 60% probability that this event will happen'.

In the following section, I argue that certain cognitive processes may prioritize input in one representational format over another. This prioritization renders these processes primarily sensitive to features explicitly represented within the preferred format, often disregarding synchronically available information trafficking in other formats. Consequently, information may be overlooked within a mental process if it is silent in format prioritized by that process.

## 2.2 The Iconic Prioritization Hypothesis

[6] I thank an anonymous referee for bringing up this example and highlighting the different ways in which representations can 'push information into the background'.

The representational silence of information in a format can have relevant consequences for cognition. Should a process favor a specific representational format as input, any information that cannot be integrated into representations in this format—thereby becoming representationally silent—might be disregarded or undervalued within the context of that particular process.[7] For instance, the prioritization of information in the iconic format in emotion elicitation can account for why Clara, despite learning that the probability of rain is quite low—only a 5% chance—, still experiences feelings of despair when immersing herself in the mental projection of the rainy scenario.

In the following, I review three well-established phenomena in which relevant information is 1) representationally silent in the iconic representation of events and 2) neglected in the elicitation and regulation of emotion. This information concerns large numerical counts (the Identifiable Victim Effect), probabilities (Nonlinear Probability Weighting), and intentions in omissions (the Omission Bias). I contend that the representational silence of information in iconic representations, in conjunction with the prioritization of such format by emotion, explains why this information is not duly weighted in emotional responses mediating these effects.

I term the prioritization of iconic representations by emotion as the Iconic Prioritization Hypothesis. The Iconic Prioritization Hypothesis posits that iconic input has stronger causal powers in eliciting and regulating emotions. As a result, if the iconic representation of a negatively valenced event is active, we may struggle to fully regulate our emotions based on nearby discursive information that is not explicitly represented

[7] The term 'integrated' is used here as synonymous with 'explicitly represented.' Previous research has highlighted the limitations of the iconic format in carrying information and its effects on cognitive processes (Pautz, 2020). Similarly, Weksler (2023), in a recent critique of predictive processing theory, argues that perception cannot possess disjunctive content: while one can think that a box is either blue or red, it is not possible to see a box as being blue or red.

within the iconic format. This hypothesis should not be understood as implying that the affective system *only* responds to iconic representations. Rather, it implies that, in the presence of an iconic representation, emotions will primarily respond to what is depicted, disregarding discursive information that may be in the vicinity but is not explicitly represented in the iconic representation. Additionally, iconic prioritization does not exclude the interplay between information in a discursive format and information in an iconic format. For example, learning about the low probability of a negative event might lead us to stop visualizing it, which in turn might impact our emotions.[8]

Also, iconic prioritization does not preclude the possibility of emotions being triggered by cues presented in a discursive format, such as reading fiction. However, it is important to note that no direct conclusions can be drawn about which format is primarily responsible for triggering emotions in cognition based solely on the format in which a cue is provided. The presentation of a cue in a linguistic or language-like format does not exclude the involvement of other representational forms in its cognitive processing. Indeed, evidence suggests that perceptual representations may be engaged during reading. For many, reading fiction evokes vivid visual imagery of scenes and actions described (Bergen, Lindsay, *et al*. 2007).[9] Supporting the proposed hypothesis, studies indicate that aphantasics—individuals who are unable to experience visual imagery—report reduced emotional engagement with, and sympathy for, story characters when reading fiction (Wicken, Keogh, and Pearson 2021; Speed, Eekhof, and Mak 2024).

[8] Section 3.2 addresses the interplay between iconic representations and discursive ones in regulating emotions.

[9] I am not assuming an embodied, simulationist view of language processing, in which language processing is constituted by perceptual representations. For this case, it is enough to note that, in line with the evidence, it is plausible that perceptual representations are sometimes involved when reading, which may play a role in our emotional responses to fiction.

Lastly, iconic prioritization is formulated in relation to emotion rather than general cognition for several reasons. In the cases I address in this paper, there is a conflict between emotion and a pool of available information. This pool might include both iconic representations (e.g., imagining what it would be like to experience a future event) and discursive information (e.g., objective probabilistic information about the event's likelihood). It is not uncommon for subjects to use this probabilistic information to form judgments. That is, alongside an ongoing emotion, subjects often simultaneously endorse a 'cold' judgment about what they should do, even though they may be unable to act on it in the presence of the emotion. For instance, a person afraid of flying might consider discursive information about the safety of flying and think, 'I should take that plane.' The crucial point is that, although such information is available, it often has a limited impact on emotion—and, consequently, on the final decision. In the presence of a conflicting cold judgment and emotion, the subject might decide not to take the plane. The bodily, valence, and arousal dimensions that typically characterize emotions equip them with stronger causal power in guiding decisions and action tendencies. The fact that decisions in such cases are mediated by emotion, and that cold judgments often integrate information neglected by emotions, supports situating iconic prioritization at the level of emotion elicitation rather than general cognition. Further research will help delineate the role of the iconic format in other cognitive domains. At this point, I propose that the evidence presented here motivates stating the Iconic Prioritization Hypothesis at the level of the elicitation and regulation of emotions.[10]

[10] As suggested by an anonymous reviewer, I agree that iconic prioritization ultimately has a significant role in overall cognition. However, I argue that this can be explained by: 1) iconic prioritization influencing emotion elicitation, and 2) emotions' ability to override 'cold' reasoning processes in guiding action tendencies. Certainly, some non-emotional cognitive operations might also prioritize input in the iconic format. For instance, when making estimations, we might use perceptual imagination for epistemic purposes. Following a simulation heuristic (Kahneman and Tversky 1981), we might evaluate our chances

In the following section I argue that the phenomenon of representational silence and the Iconic Prioritization Hypothesis jointly offer a succinct, overarching explanation of a variety of seemingly disparate phenomena in which emotions influence decisions and judgments in suboptimal ways.[11]

## 3. Phenomena to be explained

### 3.1 The Identifiable Victim Effect

> 'The death of a single Russian soldier is a tragedy. A million deaths is a statistic.'
>
> Joseph Stalin, as quoted in Nisbett and Ross, 1980: 43.

It is well-established that we are more willing to donate, and donate more, to a personalized victim than to victims represented as large numerical counts. Extensive research shows that people place greater importance on identifiable victims compared to statistical victims (Jenni and Loewenstein 1997; Slovic 2007; Small, Loewenstein, and

---

of crossing a river based on our ability to visualize ourselves crossing it. We might do this instead of basing our estimation on discursive testimonial information, such as reports from friends of similar height who have been able or not to cross in the past. If such a heuristic is at play, input in the iconic format (i.e. the perceptual simulation) would also be prioritized over discursive pieces of information (i.e. reports from friends).

[11] There are other mechanisms by which emotions can have a pernicious influence, differing from the phenomena I address in this paper. For instance, emotions may direct our reasoning to reach a specific conclusion or make a specific decision by relying on a biased set of cognitive processes (Kunda 1990). For example, in confirmation bias, affectively laden motivations and desires can promote the tendency to search for, interpret, and recall information in a way that confirms or supports one's favoured hypothesis. These latter cases differ from those reviewed because, in them, information is not overlooked due to architectural constraints on format during the process of eliciting and regulating the emotion, but for other reasons.

Slovic 2007). This phenomenon, known as the 'Identifiable Victim Effect', occurs even when statistical data indicates a greater need for funds in cases involving large numerical counts of victims compared to a single victim (see Lee and Feeley 2016 for a meta-analytic review).

The following real example illustrates the phenomenon. Statistical information about food shortages in Malawi affecting over 3 million children, or the fact that an estimated three million Zambians face hunger, tends to evoke less generosity compared to an appeal centered around the individual story of Rokia, a 7-year-old girl from Mali who 'is desperately poor and faces a threat of severe hunger or even starvation' (Slovic 2007). In the seminal paper on the topic, Schelling (1968: 142) suggested that the death of a particular person evokes 'anxiety and sentiment, guilt and awe, responsibility and religion, [but] … most of this awesomeness disappears when we deal with statistical death'. The mediation of emotions in the Identifiable Victim Effect has been substantiated by subsequent research. Lee and Feeley (2016) show that a single identified victim evokes stronger sympathy or distress compared to a group of victims. Slovic (2007) illustrates that people's emotional responses towards assisting victims are most intense when focusing on a single victim, begin to fade when the number of victims increases, and collapse with a more significant number of victims that simply becomes a statistic (an effect he names 'the numbing of numbers'). But, when and why does emotion become magnitude insensitive?

Crucially, although we can easily be aware of the inefficiency of concentrating large sums of money on a single victim, and of the lack of reasons for the discrepancy in our donations, this does not rule out the Identifiable Victim Effect. To explore the possibility of rectifying this bias between identified and statistical victims in charitable giving, Small, Loewenstein, and Slovic (2007) examined the impact of deliberation in decisions

on generosity. They found that deliberative thought diminishes sympathy for identifiable victims. When individuals pondered on the inconsistency in their giving patterns between identifiable and statistical victims, donations towards the former decreased. However, sympathy and donations remained consistently low for statistical victims, suggesting that emotional indifference towards statistical victims is not overridden by cognitive reflection (2007: 143).

Vividness has been proposed as the cause of the stronger emotional response for identified victims (Jenni and Loewenstein 1997). According to this interpretation, identifiable victims produce more vivid imagery. The vivacity of imagery has been shown, in turn, to enhance emotional responses (Miller, Levin, *et al*. 1987; Holmes and Mathews 2005). However, the relevant takeaway of the Identifiable Victim Effect extends beyond the fact that vividness intensifies emotional responses towards the identified victim. A more relevant takeaway is that what is not susceptible to be vivid (what is silent in the iconic format) is scarcely pondered in the process leading to the emotional response. I contend that the scarce effect of large statistical numbers of victims in emotions is jointly explained by 1) the representational silence of statistical victims in the iconic format, and 2) the prioritization in emotional responses of iconic information (i.e., the Iconic Prioritization Hypothesis).

To illustrate, consider Stalin's famous quote referenced earlier: One can visually imagine (represent iconically) the grief of one soldier's mother, but fail to perceptually grasp the collective anguish of a million mothers. One is just unable to internally conjure the image and might not even try. If one attempts to include a very large number of victims in a mental image, they will appear as a cluster of dots from a distance. In such an iconic representation, their suffering will be representationally silent: variations in information regarding their emotional state will not alter the iconic depiction of the large

number of victims seen from afar. The Iconic Prioritization Hypothesis explains why identified victims elicit a much stronger emotional response; they can be iconically represented and therefore have a stronger influence on emotion. Moreover, the fact that we cannot visually represent the suffering of a vast number of victims accounts for our milder or scarce emotional response toward them. These differential emotional responses could, in turn, influence our patterns of donation, shedding light on the underlying dynamics of the Identifiable Victim Effect.

### 3.2 Nonlinear probability weighting and probability neglect

Literature in decision-making highlights that people overweight small probabilities and underweight large ones. The probability function that best describes behavior under uncertainty is described as nonlinear: the weight that people place on the potential consequences of a decision is not directly proportional to the likelihood of those outcomes occurring (Kahneman and Tversky 1979; Quiggin 1982). Additionally, people often show a lack of sensitivity to variations in probabilities that fall within the mid-range (Prelec 1998).

Illustrative examples of this phenomenon are that of the person who refuses to take a plane, despite acknowledging that the risk of an accident is exceptionally small, or that of the agoraphobic patient who is well aware that there is little to fear in the situations she avoids. Importantly, this pattern is not confined to those grappling with severe phobias. It is quite commonplace for people to overestimate the likelihood of extraordinarily improbable outcomes, such as terrorist attacks (Sunstein 2003). Equally compelling—though less calamitous—instances can be found in everyday activities. The inclination to

overvalue small probabilities and undervalue high probabilities is exemplified in phenomena like horse betting (Hausch, Lo, and Ziemba 2008). Similarly, the habitual lottery player who buys a ticket every Sunday is, in effect, placing a disproportionate emphasis on the slim chance of winning. The overemphasis of minimal probabilities, which intrinsically results in the underestimation of larger ones, infiltrates our daily decision-making processes.

Thinking about the possible consequences of one's decisions can have an immediate effect on emotions, and many have suggested a mediator role of emotions in decision-making phenomena such as probability weighting (Loewenstein 1996; Loewenstein, Weber, *et al*. 2001; Loewenstein and Lerner 2003; for a review, see Lerner, Li, *et al.* 2015). In describing how we tend to neglect probabilities, Sunstein (2003) found that people tend to focus on the badness of the outcome rather than on probability when strong emotions are evoked. Emotions such as fear help explain excessive reactions to low-probability risks. Regarding positive emotions, the joy elicited when envisioning a lottery win could contribute to the excessive emphasis placed on the slim chances of victory.

Although emotion does not influence every decision, it should be noted that the role of affect in decision-making is not solely present when we are obviously under the sway of strong visceral emotions such as fear and anger. The role of affect, even at a lower level, has been reported to play an insidious role in most decisions involving risk.[12] In Slovic and Peters' (2006) account, most daily risk analysis is handled quickly and automatically by feelings that need not be full-fledged emotions but rather a 'faint whisper of emotion called affect,' which arises from what they term the 'experiential' mode of thinking (Slovic and Peters 2006; Slovic, Finucane, *et al*. 2004). They further

[12] For a review on the role of affect in higher-level cognition, see Blanchette and Richards (2010).

clarify that these feelings do not amount to full-fledged emotions: 'Fortunately, most of the time people are in a calmer state, being guided by much subtler feelings' (2006: 322). They term the process of relying on emotional responses to guide judgments—using these felt experiences as informational cues—the 'affect heuristic.'

The described influence of emotion in decision-making implies the following: the relationship between the recognized objective probability of an outcome and the emotions triggered in anticipation of this outcome is not linear. The question then becomes why this relationship is not linear. Why does emotion frequently neglect probabilities about a possible event happening, which are known and available to us?

Before addressing this question, it is important to note that during decision-making, we do not rely solely on discursive reasoning about what to do. Rather, the process often involves anticipating potential outcomes in an experiential way—through mental imagery (Moulton and Kosslyn 2009; Schacter *et al.* 2017; Ji *et al.* 2022).[13] This may include recalling instances from episodic memory related to past events (Costello and Watts 2014). In line with this, emerging research suggests that discrepancies in probability weighting may stem from option-specific attentional biases during the information search process (Zilker and Pachur 2022).

In line with the Iconic Prioritization Hypothesis, I propose the following explanation for probability neglect under the sway of emotions. Given the representational format prioritized by emotion (i.e., the iconic format) does not integrate the outcome's objective probability into its representation, when we entertain unlikely scenarios, our emotional

[13] Individuals differ in their tendency to rely on experiential thinking. For instance, aphantasics, individuals who lack the ability to visualize in detail or altogether, might be an exception to the tendency and capacity to invoke perceptual representations when thinking about the future (Dawes, Keogh, *et al.* 2022).

responses might not correspond to the exceedingly low probability of such outcomes materializing. While empirical evidence proves that the relationship between the probability of an event and the intensity of the emotions triggered in anticipating it is not linear, I do not want to claim that such a relationship is arbitrary. I aim instead to specify the factors that might pollute such an ideally linear relationship. I propose that factors such as the prioritized representational format in emotion elicitation, the cognitive style of an individual (e.g., imagistic vs. propositional), and the level of attention devoted to specific representations can provide insights into the nonlinearity of this relationship. Let me develop this further.

It is widely acknowledged that the minuscule probability of an event happening does not prevent a strong emotion from being triggered when the event is visualized mentally (Holmes and Matheus 2010). This emotion, in turn, can influence our decisions. This is illustrated in the following example: while we can vividly imagine being inside a plane that is about to crash, available propositional information such as 'The probability of dying in a plane crash is 1 in 120,000' does not figure in the iconic representation of the impending crash. The absence of probabilistic data in the iconic representation, coupled with the Iconic Prioritization Hypothesis, can help explain the fear-driven decision to avoid air travel, even when the individual acknowledges the extremely low objective probability of an aircraft accident. The decision to avoid air travel, which implies an oversight of the minuscule risk probability, may stem from the emotions elicited by the iconic depiction of the tragic event, where the low probability of the outcome is not represented. In the account here presented, two factors underlie the fear-driven decision to not fly. First, the representational silence of the very low probability of a plane crash

in the iconic representation of the event.[14] Second, the prioritization of information in the iconic format in emotional processing (i.e., the Iconic Prioritization Hypothesis).

At this point, it is useful to anticipate the following objection. Becoming aware of the near-zero probability of a negative event typically tempers the emotional response for most people, enabling them to align—at least to a certain extent—their decisions with the actual probability of the event occurring. However, this observation is compatible with the claim that probabilistic information is silent in the iconic representation of the event and with the Iconic Prioritization Hypothesis. Crucially, the two tenets defended in this paper provide an explanation of how emotion regulation might function in such instances. Learning about the low probability of an event will frequently motivate us to cease entertaining its episodic anticipation (i.e., its iconic representation). For instance, discovering that the likelihood of a plane crash is exceedingly low will lead most people to stop visualizing such an event (i.e., suppress its iconic representation). Notably, this will affect our emotions—our fear response, for example, will subside—allowing us to make decisions that align with the low probability of the event.[15]

---

[14] Some cognitive scientists think that probabilities are represented in perceptual cues (Ernst and Banks 2002; Reiger and Xu 2017), a claim that has been contested in the philosophical debate (Block 2018; Siegel 2022). However, current controversies about whether iconic representations can represent probabilistic information concern representations originating in perception. I want to note that the examples in this paper dealing with probabilistic information concern internally triggered iconic representations of events. In such cases, there is no perceptual cue integration; rather, subjects engage in an imaginative project that depicts what it would be like to experience an event. In this respect, the iconic format of internally triggered representations can be seen as a subspecies of the iconic format as a genus, and claims about whether such representations convey probabilistic information should be tailored to it.

[15] Individual differences in people's ability to attenuate emotional responses may be attributed to cognitive styles. Individuals vary in their tendency to rely on the 'experiential' mode of thinking and in the way they react affectively (Slovic and Peters 2006). A well-regulated person might stop visualizing a plane crash once they know its probability is very small. Conversely, those who struggle to downregulate their emotions may have a tendency to remain in the experiential mode of thinking and continue imagining negative outcomes even when they know these are unlikely.

That is, the regulation of emotion via probabilistic information might be mediated by the modulation of simulations involving iconic representations. The claim that, if iconic representations are activated, emotions will be mainly regulated by them does not preclude the possibility that such representations can be sensitive to attentional shifts caused by the acquisition or retrieval of discursive information. Since iconic representations play a crucial role in eliciting emotions, shutting them down naturally facilitates emotion regulation.

In conclusion, emotions leading to probability neglect, can be attributed to 1) the format in which we sample possibilities (iconically), 2) the inherent limitations of the iconic format in integrating probabilistic information in the simulation of events, and 3) the preferential role of iconic representations in evoking emotions. The overestimation of small probabilities in emotionally charged decisions can be jointly explained by the representational silence of probabilities in the iconic format and the Iconic Prioritization Hypothesis.

### 3.3 Moral judgments of omissions vs. commissions: the Omission Bias

Accumulating evidence shows harm done through omission is evaluated as less morally wrong and less blameworthy than harm caused by commission. This phenomenon, known as the Omission Bias, highlights the tendency to attribute lesser moral culpability to harms resulting from inaction (Ritov and Baron 1990; Spranca, Minsk, and Baron 1991; Bostyn and Roets 2016; for a review, see Feldman, Kutscher, *et al*. 2020). To illustrate this effect, consider the following scenarios involving John and Brian, rivals in an elite sport, dining at a restaurant:

**Scenario 1:** Knowing that Brian is allergic to peanuts, John discreetly brings a handful of chopped peanuts to dinner. Seizing an opportunity while Brian is away, John intentionally spills the peanuts into Brian's soup, hoping to induce an allergic reaction. Eating the peanuts causes Brian to fall ill later that night.

**Scenario 2:** John knows that Brian is allergic to peanuts and that all dishes at the restaurant contain peanuts. Unaware of this information, Brian orders the house salad containing peanuts. Intending to make Brian sick, John allows him to proceed with the order without intervening. Eating the peanuts causes Brian to fall ill later that night.[16]

Research consistently demonstrates that people tend to perceive acts of commission, such as John's actions in scenario [1], as morally worse than acts of omission, as in scenario [2] (Spranca, Minsk, and Baron 1991; Jamison and Feldman 2020). Moreover, this discrepancy in moral judgment persists even when intentions, outcomes, and knowledge are held constant (Hayashi 2015). Such findings challenge the normative view that, when intention is held constant, omissions and commissions should be considered morally equivalent—something that follows from definitions of morality that place at the center the intended consequences of our decisions. This phenomenon has sparked a heated debate in moral philosophy, prompting efforts to provide an explanation that aligns with

[16] These scenarios are inspired by those in the seminal study conducted by Spranca, Minsk, and Baron (1991), in which a tennis player intentionally harms an opponent to secure victory in an upcoming match.

prevailing moral intuitions (Clarke 2014). In this regard, I propose that emotions mediate the Omission Bias, and that the representational silence of intentions in omissions, along with the Iconic Prioritization Hypothesis, jointly explain the Omission Bias.

Asymmetries in judging action and inaction have been linked to emotions in several domains. The action-effect, as described by Kahneman and Tversky (1982), highlights the tendency for individuals to experience heightened feelings of regret when negative outcomes stem from their actions rather than from inaction. Landman (1987) reported that joy towards consequences resulting from actions is stronger than joy elicited by the same consequences following inaction. Regarding the Omission Bias, emotions such as anger and sadness have been shown to correlate with it (Baron and Ritov 2009). Although a direct causal link between emotion and Omission Bias has not been established, extensive research indicates the influence of emotional processing on evaluative and moral judgments. Moral dilemmas have been shown to vary systematically depending on the engagement of emotional processing (Greene, Sommerville, *et al*. 2001; Greene and Haidt 2002). Building upon these precedents, it is reasonable to hypothesize that emotions play a role in the Omission Bias. Commissions might cause a more robust emotional response than omissions, influencing the moral judgment that commissions are morally worse. However, how and why do commissions elicit higher emotional responses than omissions? In this regard, I propose two factors that may explain this phenomenon: 1) the representational silence of intentions in omission scenarios and 2) the prioritization of information in the iconic format by emotion.

Let me illustrate this with an example. If we visually imagine an ordinary and innocent dinner between John and Brian, adding to it John's intention to poison Brian—as in scenario [2]—does not visibly alter the image-like representation of the event. On the contrary, when the intention to poison Brian is acted upon in commission, as depicted in

scenario [1], it does affect the iconic representation of the dinner. In commissions, intentions manifest in observable actions. In contrast, in omissions, intentions do not result in any noticeable distinct movement. Therefore, even though we acknowledge that intentions remain the same in both the commission and omission scenarios, we can indirectly 'perceive' such intentions only in the representation of commissions. This claim aligns with research indicating that commissions are perceived as more intentional, even when the agent's intention is held constant across descriptions of commission and omission scenarios (Hayashi 2015).

If, as proposed by the Iconic Prioritization Hypothesis, emotions are primarily triggered and regulated by iconic input, it is to be expected that there will be a stronger emotional response towards acts of commission. This is because commissions involve the iconic representation of intentions, which are translated into observable movement. This observation is consistent with empirical evidence showing that moral judgments in the omission-commission context are affected by the presence of movement in commission (Spranca, Minsk, and Baron 1991). While from a normative perspective, movement should lose its relevance if intention is maintained equal, it has been shown to impact the evaluation of scenarios like [1] and [2].[17]

The asymmetry in moral judgment observed in the Omission Bias might therefore be mediated by emotions towards the perpetrator in commission scenarios. These emotions, in turn, are stronger in commission than in omission due to two factors: 1) intentions in omissions are not explicitly represented—they are representationally silent in iconic

[17] In a more speculative vein, it is worth noting that the effect appears reversed when movement occurs without intention. Consider this example: while dancing at a wedding on a wet floor, John accidentally falls into the wedding cake. Although the guests know he didn't intend to ruin the cake, their initial feelings of anger may still arise. Here, the mere act of movement itself seems to serve as the immediate trigger for their anger, overriding their awareness of John's innocent intentions.

depictions of the event, and 2) emotions take representations in the iconic format as primary input.

Other phenomena in the realm of moral judgment align with the explanation put forth for the Omission Bias. Evidence in moral psychology reports Abstract/Concrete paradoxes (Sinnott-Armstrong 2008). These paradoxes show our tendency to hold agents more responsible for their actions when a situation is described concretely rather than abstractly.[18] For instance, Nichols and Knobe (2007) presented participants with vignettes depicting a deterministic universe and inquired about the moral responsibility of agents within that universe. In the abstract condition, participants were asked if it was possible for someone to be fully morally responsible in such a universe without being given a specific act. 86% responded negatively. In the concrete condition, participants were provided with a specific scenario involving an agent who kills his wife and children to be with his secretary. 72% of participants asserted that the agent was 'fully morally responsible.' The Iconic Prioritization Hypothesis explains this effect as follows: concreteness and detail engage iconic representations, which, in turn, trigger stronger emotions and influence moral judgment. In contrast, the abstract scenario is likely processed in a discursive manner, as abstract information does not promote the depiction of a specific scenario.

## 4. Implications and further considerations

[18] For a review of abstract/concrete paradoxes in judgment, see Mandelbaum and Ripley (2012).

In accounting for the influence of emotion over rational considerations in the phenomena reviewed, I have presented and defended two claims. Firstly, I have argued for the representational silence of large numerical counts, probabilities, and intentions in iconic representations of events. Secondly, I have put forth the Iconic Prioritization Hypothesis, according to which information in the iconic format has a privileged role in triggering and regulating emotional responses. This comprehensive hypothesis offers a unified explanation for a heterogeneous group of phenomena, surpassing the need for ad hoc explanations specific to each domain. At this juncture, several questions emerge. What is the adaptive function of iconic prioritization in emotions? What are the implications of Iconic Prioritization Hypothesis for theories of emotion causation and empirical research? While space constraints prevent a detailed exploration of these pertinent questions, it is valuable to briefly touch upon them to grasp the breadth of the hypothesis presented here.

### 4.1 Adaptiveness: Why would emotions prioritize information in the iconic format?

Emotions have been defined as states shaped by natural selection, serving the purpose of increasing fitness in specific situations (Nesse 1990). Their evolutionary role is to signal and facilitate rapid, adaptive responses in a given context (Frijda 1986; Frijda and Mesquita 1994). Components of the emotion process (e.g., physiological and behavioral responses) are therefore seen as features designed to increase our ability to respond promptly to threats and opportunities present in a situation.

Given the need for emotional responses to be fast, the process triggering them might save cognitive processing by limiting the information considered. I hypothesize that this

limitation could be implemented through a format restriction. More specifically, by prioritizing representations in the iconic format as input in the elicitation and regulation of emotional responses (i.e., iconic first!). By adhering to this straightforward guideline, the affective system can streamline the processing of information and filter out peripheral considerations that do not concern our immediate context. In support of this hypothesis, it is important to underscore that if we focus on the function of emotions as facilitators of swift responses in an ongoing situation, the prioritization of the iconic format aligns with this purpose for three main reasons.

First, the iconic is the format of immediate information about our surroundings, as obtained through visual perceptual experience. Given the evolutionary role of emotions in facilitating fast responses, it is logical that they are designed to prioritize the format of information that is obtained in the *here and now*. In relation to this, it is relevant to note that the prioritization of the iconic format in emotion is also present in cases where iconic representations originate in perception. For example, consider the case of food's appearance and disgust. Disgust towards a food with a repulsive appearance is not entirely overridden by learning about the food's safe composition and good taste. Evidence shows that people are averse to eating fudge shaped like dog feces and disinclined to put their mouths on a piece of newly purchased vomit-shaped rubber, though perfectly willing to do so with a sink stopper of similar size and material (Rozin, Millman, and Nemeroff 1986; Rozin and Nemeroff 1990). The Iconic Prioritization Hypothesis provides the following explanation for why disgust is not fully regulated in such cases: information about the chemical composition of food is representationally silent in the perceptual representation of food, which is in the iconic format. In light of the food's repulsive appearance, disgust is not fully regulated because (1) information on its innocuous composition is representationally silent in the iconic format (as such knowledge does not

alter the food's appearance), and (2) emotions prioritize information in the iconic format. In the case of disgust, as in the cases reviewed in §3, iconic input seems to be emotion's favorite informant. If the iconic representation shows something as disgusting, the affective system trusts that it merits disgust.[19]

Second, first-hand experiences from the past are often stored in the iconic format, as evident in episodic memory. Indeed, episodic memory not only signals the evidentiary status of a piece of information, but it also signals its first handedness (i.e., that it stems from an experience we had in the past). For example, if an individual has had a bad experience with an aggressive cat of breed X in the past, encountering a cat of the same breed will trigger the iconic memory of that hostile encounter. This iconic memory, in turn, will elicit an emotional response, amplifying the individual's instinctive urge to withdraw from the potentially dangerous cat.

Lastly, the spatial layout of iconic representations is crucial for guiding actions driven by emotions. For optimizing emotional action tendencies (e.g., where to attack, in which direction to smile), spatially structured iconic representations are ideal. In the midst of anger, an aggressive response informed by the proposition 'The enemy is in front of you' is not as effective as one informed by an iconic representation of the enemy. The spatial layout of the iconic representation enhances a skilled defense. This is also true for positive

[19] Although this paper focuses on iconic representations in the visual modality, it is plausible that emotions prioritize sensory representations over discursive representations in other sensory modalities. For instance, imagine hearing unsettling noises in the next room, making you nervous. Now imagine that you receive information that these sounds are not coming from someone in the room next door, but from a loudspeaker playing a recording. If the sounds continue, knowing that it is a recording will probably not completely stop the nervousness. In this case, the information about the source of the sound and the absence of a real threat will be representationally silent in the representation of the sound. According to the Iconic Prioritization Hypothesis, the emotion will prioritize the sound and not the discursive knowledge that there is nothing to be nervous about.

emotions; when someone makes us laugh, we want to smile in their exact direction to communicate and promote interaction.

In sum, by prioritizing the iconic format over the discursive format, emotions respond primarily to raw material obtained from immediate perceptions and first-hand experiences. Furthermore, the iconic format structures information in a spatial layout optimal for executing emotional action tendencies. Considering the economic constraints imposed upon cognitive processing, particularly in emotional contexts where swift responses are paramount, a limitation privileging iconic input aligns seamlessly with the adaptive function of emotions.

### 4.2 Iconicity and theories of emotional causation

At this juncture, it is pertinent to consider how the Iconic Prioritization Hypothesis aligns with theories of emotion. To do so, we must first distinguish between theories addressing the constitutive nature of emotions and those concerning emotion causation. The former involve ontological claims about emotions—for instance, whether they are feelings, evaluations, or motivational states (Scarantino and De Sousa 2021)—while the latter focus on the mechanisms and representations involved in the emotion-eliciting process (Moors 2010).

The Iconic Prioritization Hypothesis does not address the constitutive nature of emotions—that is, what emotions are. The Hypothesis concerns the factors and computations involved in the etiology of emotions, rather than their ontology. Consequently, the Hypothesis primarily engages with theories of emotion causation. For this reason, it is *a priori* compatible with most philosophical emotion theories, including

cognitive theories of emotion. For instance, it is compatible with theories proposing that emotions are judgments structured as propositional representations (e.g., Lyons 1980; Solomon 1976). This compatibility exists because the Hypothesis does not mandate that affective processing—which primarily takes iconic representations as input—must output its products in a specific format. A cognitive process can primarily take inputs in one format and produce outputs in another.

The Iconic Prioritization Hypothesis is also compatible with constructivist theories claiming that emotions arise through the categorization of low-level sensations, such as basic hedonic feelings or feelings of arousal, made meaningful through cognitive interpretation. For example, Psychological Constructivism (Barrett 2006, 2017; Gendron, Lindquist, *et al.* 2012; Lindquist 2013) posits that emotions are constructed from more basic psychological components, including affect, valence, and various physiological and autonomic responses. Iconic prioritization in emotion is compatible with this framework, as the prioritization of iconic input might occur during the triggering of low-level sensations, subsequently influencing emotion categorization.[20]

Regarding theories of emotion causation, it should be noted that the Iconic Prioritization Hypothesis can be integrated with contemporary theories that confer a pivotal role to cognition, such as appraisal theories. The claim that inputs in the iconic format are the primary drivers of emotion does not preclude other secondary drivers from having a causal role in emotion (see §3.2 on the interplay between discursive and iconic

[20] I thank an anonymous referee for highlighting the need for future research to specify at what stage of emotional processing iconic prioritization and the representational silence of specific pieces of information occur. This suggestion aligns with contemporary philosophical debates on representational formats, which also encourage examining affect at different representational levels of emotion (Burge 2022: 508). Exploring the specific mechanisms by which format plays a role in theories of emotion will be a crucial step in evaluating the consistency of the Iconic Prioritization Hypothesis with these theories. Due to space constraints, a thorough exploration of these mechanisms is beyond the scope of this paper.

information). For instance, the Iconic Prioritization Hypothesis is compatible with appraisal theories that adopt an extensive definition of cognition (Moors 2013; Scherer, Schorr, and Johnstone 2001). This includes dual-mode appraisal theories, according to which emotions can be either rule-based or associative and encompass diverse formats of representations serving as inputs (e.g., Clore and Ortony 2000; Smith and Kirby 2000; Smith and Neumann 2005). In these accounts, rule-based mechanisms operate on propositional representations, while associative modes act on perceptual representations (Leventhal and Scherer 1987; Smith and Kirby 2001).

Tension arises, however, between the Iconic Prioritization Hypothesis and theories claiming that emotions are exclusively elicited by representations in a discursive-like format (for instance, by judgments of the stimulus the emotions are about, as suggested by Lyons 1980). If discursive-like representations are the initial and primary causes of emotions, these theories face the challenge of explaining why discursive-like information on probabilities, statistical victims, and intentions in omissions is not adequately considered in the elicitation and regulation of emotions. For instance, they must explain the limited role of deliberation in mobilizing donations toward statistical victims (Small, Loewenstein, and Slovic 2007). If emotions take discursively represented information as input, why do these discursive pieces of information play a limited role? Theories suggesting that discursive representations are equally capable of sparking emotional responses will need to provide an explanation for the phenomena discussed in §3. In the absence of such an explanation, these phenomena remain puzzling irregularities within our cognitive functions in these theoretical frameworks.

In connection with that, further research on the Iconic Prioritization Hypothesis can shed light on the connections between emotions and rationality (De Sousa 1990, Scherer 2011), that is, emotion's ability to respond to other evidence-sensitive evaluative

processes (Teroni 2007, Scarantino and De Sousa 2021). The prioritization of iconic input in emotion might be in tension with accounts emphasizing the cognitive rationality of emotions. Such views emphasize that emotions are responsive to reasons and tend to be based on well-grounded, accurate inference from available information. However, if emotion is preferentially sensitive to information represented iconically, this might make emotions responsive in a way that departs from rationality, given that iconic representations need not be on better epistemic grounds than discursive pieces of information not iconically represented.

In sum, the Iconic Prioritization Hypothesis is only in tension with theories that assign an almost exclusive role to discursive-like representations in the emotion-eliciting process. Otherwise, the hypothesis is a priori compatible with a wide range of metaphysical theories of emotion and most theories of emotion causation.

### 4.3 Consequences for empirical research: Decision-making tasks and imaginability

Adopting the Iconic Prioritization Hypothesis could significantly reshape the approach to conducting research in decision making involving emotions. Its acceptance underscores the significance of the role iconic representations in evoking emotional responses, which, in turn, impact decision-making processes. Consequently, research methodologies would need to be reevaluated and potentially redesigned to account for these effects, enabling a more nuanced understanding of emotion-driven decision-making.

In traditional decision-making tasks, the anticipated outcomes are usually monetary (e.g., the Ultimatum Game, see Thaler 1988; the Dictator Game, see Engel 2011). It is

reasonable to suppose that these monetary outcomes are anticipated in an abstract way, without the involvement of imagistic representations of future scenarios. However, if the iconic format has a privileged role in causing emotions and, in turn, emotions influence our decisions, it would be appropriate for outcomes in decision-making tasks to be represented in this format. This would better approximate our real-life choices, in which we frequently represent the possible outcomes of our decisions via mental imagery (Nanay 2016).

Take the following case. The other day, a friend went to the casino and decided to bet 220 euros. After losing them, another friend told him, 'That's a dinner at *Disfrutar*.' *Disfrutar* is the best restaurant in town. By converting the monetary value (not iconically represented) into a value that could be (an experience), the bettor immediately replied, 'Don't put it like that! If I had seen it that way, I would not have bet the money.' Advertisers are aware of this effect. Sweepstakes promoted by brands more frequently advertise concrete prizes (vacations, luxury cars) than the monetary equivalent of such prizes (Loewenstein 1996). They do so even though, from a normative stance, the monetary prize should be preferred by potential participants (the money allows them to buy the car but also to choose something else!). The concreteness and imaginability of the prize are relevant mediators in the decision to participate in the sweepstake.[21]

By promoting the anticipation of an imagistically pallid outcome (money), several decision-making tasks might be neglecting a format of representation that is a crucial intermediary in day-to-day decision making. Experimental tasks that incorporate iconic representations will facilitate the inclusion of emotions in laboratory settings, thereby

[21] In a similar vein, the literature on framing effects underscores the crucial role of integrating emotional processes into models of decision-making. (De Martino, Kumaran, *et al*. 2006).

influencing decisions in a manner that more closely approximates real-world scenarios. Moreover, if the iconic format is indeed favored by emotions, adjusting individuals' cognitive styles—which may variably depend on mental imagery—could serve as an effective strategy to regulate these emotions. Finally, if emotions prioritize iconic representation, which inherently omits certain information, we can anticipate that aphantasic individuals—if they truly are incapable of visual mental imagery—would make more optimal decisions. Given that they make less use of the iconic format, they will not silence relevant information when considering possible scenarios.

If the Iconic Prioritization Hypothesis is on the right track, monetary decision-making tasks that overlook the intermediary role of iconic representations are bypassing a crucial factor influencing decisions. Given this hypothesis underscores the iconic format's pivotal role in triggering emotions, and acknowledging that emotions profoundly shape our decisions, it is essential that experimental designs in decision-making research accommodate this format by incorporating imaginable outcomes. By integrating such imaginable outcomes into experimental designs, we could achieve a more in-depth and realistic understanding of the intricacies of decision-making process in natural contexts.

## 5. Conclusions

Research shows that emotions can influence decisions and judgment against background information in ways that demand further explanation. In this paper, I have reviewed phenomena in which, under the influence of emotion, we tend to overlook relevant and available information about a situation. I have proposed a clear hypothesis that explains which kind of information is disregarded by our affective system by appealing to 1) the representational silence of information in the iconic representation of a target event and 2) the prioritization of information in the iconic format by emotions (i.e., the Iconic

Prioritization Hypothesis). These tenets jointly provide a plausible explanation as to why information on large numerical counts, probabilities, and intentions is neglected in the elicitation and regulation of emotions, leading these emotions to subsequently bias our decisions and judgments. Further investigation into the Iconic Prioritization Hypothesis will help us understand the mechanisms underlying emotional responses. By doing so, we will deepen our understanding of the interaction between the format of our mental representations and our emotional landscape, thereby shedding light on how these factors collectively shape our judgments and behaviors.

**Acknowledgements**

For their conversation, inspiration and comments I would like to thank Marc-Lluís Vives, Bence Nanay, Joshua Shepherd, Steven Sloman, Stephen Gadsby, Assaf Weksler, Jeremy Pober, William Hornett, Andrea Blomkvist, E.J Green, Kevin Lande, Ben Henke, David Barack, Brett Karlan, Kris Goffin, Julian Bacharach, Francesco Marchi, Joshua Myers, , Fabrice Teroni and Julien Deonna,. I am also grateful to the audiences at the ESPP 2023 Conference in Prague, the Thumos Seminar (University of Geneva), and the Conference on Mental Imagery at the Centre for Philosophical Psychology (University of Antwerp, 2024).

**Funding Information**

This publication is based on research supported by the Templeton World Charity Foundation, Inc. (funder DOI 501100011730) under the grant https://doi.org/10.54224/32583, and a postdoctoral scholarship funded by the project 'Emotion and Mental Imagery', conducted jointly between the University of Antwerp

(Centre for Philosophical Psychology) and the University of Geneva (Swiss Centre for Affective Sciences).

**ORCID**

Andrea Rivadulla-Duró. ORCID ID: 0000-0001-5182-4593

**References**

Barrett, Lisa Feldman (2006) 'Solving the emotion paradox: Categorization and the experience of emotion', *Personality and social psychology review* **10**: 20-46. doi: 10.1207/s15327957pspr1001_2

Barrett, Lisa Feldman (2017) *How emotions are made: The secret life of the brain.* Pan Macmillan.

Baron, Jonathan and Ilana Ritov (2009) 'Protected values and omission bias as deontological judgments'. *Psychology of learning and motivation* **50**: 133-167. doi: 10.1016/S0079-7421(08)00404-0

Bergen, Benjamin K, Shane Lindsay, Tennie Matlock, and Narayanan, S (2007) 'Spatial and linguistic aspects of visual imagery in sentence comprehension', *Cognitive science* **31**: 733-764. doi: 10.1080/03640210701530748

Block, Ned (2018) 'If perception is probabilistic, why does it not seem probabilistic?', *Philosophical Transactions of the Royal Society B: Biological Sciences* **373**: 20170341. doi: 10.1098/rstb.2017.0341

Block, Ned (2023) *The border between seeing and thinking.* Oxford University Press.

Bostyn, Dries H and Arne Roets (2016) 'The morality of action: The asymmetry between judgments of praise and blame in the action–omission effect', *Journal of Experimental Social Psychology* **63**: 19-25. doi: 10.1016/j.jesp.2015.11.005

Burge, Tyler (2022) *Perception: First form of mind.* Oxford University Press.

Blanchette, Isabelle and Anne Richards (2010) 'The influence of affect on higher level cognition: A review of research on interpretation, judgement, decision making and reasoning', *Cognition & Emotion* **24**: 561-595. doi: 10.1080/02699930903132496

Carey, Susan (2009) *The Origin of Concepts.* Oxford University Press.

Clarke, Randolph (2014) *Omissions: Agency, metaphysics, and responsibility*. Oxford University Press.

Clore, Gerald L and Andrew Ortony (2000) 'Cognition in emotion: Always, sometimes, or never?', in Richard D. Lane and Lynn Nadel, eds., *Cognitive neuroscience of emotion*: 24-61. Oxford University Press.

Costello, Fintan and Paul Watts (2014) 'Surprisingly rational: Probability theory plus noise explains biases in judgment', *Psychological Review* **121**: 463–480. doi: 10.1037/a0037010

Dawes, Alexei J, Rebecca Keogh, Sarah Robuck, and Joel Pearson (2022) 'Memories with a blind mind: Remembering the past and imagining the future with aphantasia', *Cognition* **227**: 105192. doi: 10.1016/j.cognition.2022.105192

De Martino, Benedetto, Dharshan Kumaran, Ben Seymour, and Raymond J. Dolan (2006) 'Frames, biases, and rational decision-making in the human brain', *Science* **313**: 684-687. doi: 10.1126/science.1128356

De Sousa, Ronald (1990). *The rationality of emotion.* MIT Press.

Dretske, Fred I (1981). *Knowledge and the flow of information.* MIT Press.

Engel, Christoph (2011) 'Dictator games: A meta study', *Experimental economics* **14**: 583-610. doi: 10.1007/s10683-011-9283-7

Ernst, Marc O and Martin S Banks (2002) 'Humans integrate visual and haptic information in a statistically optimal fashion', *Nature* **415**: 429-433. doi: 10.1038/415429a

Feldman, Gilad, Lucas Kutscher, and Tijen Yay (2020) ‘Omission and commission in judgment and decision making: Understanding and linking action-inaction effects using the concept of normality’, *Social and Personality Psychology Compass* **14**: e12557. doi: 10.1111/spc3.12557

Fodor, Jerry A (2007) ‘The revenge of the given’, in Brian P McLaughlin and Jonathan Cohen, eds., *Contemporary Debates in Philosophy of Mind*: 105–116. Blackwell Publishing.

Frijda, Nico H (1986) *The emotions.* Cambridge University Press.

Frijda, Nico H and Batja Mesquita (1994) ‘The social roles and functions of emotions’, in Shinobu Kitayama and Hazel R Markus, eds., *Emotion and culture: Empirical studies of mutual influence*: 51–87. American Psychological Association.

Gendron, Maria, Kristen A Lindquist, Lawrence Barsalou, and Lisa Feldman Barrett (2012) ‘Emotion words shape emotion percepts’, *Emotion* **12**: 314-325. doi: 10.1037/a0026007

Green, E J and Jake Quilty-Dunn (2021) ‘What is an object file?’, *The British Journal for the Philosophy of Science* **72**: 665-699. doi: 10.1093/bjps/axx055

Greenberg, Gabriel (2023) ‘The iconic-symbolic spectrum', *Philosophical Review* **132**: 579-627. doi: 10.1215/00318108-1069755

Greene, J. D., Sommerville, R. B., Nystrom, L. E., Darley, J. M., and Cohen, J. D. (2001). ‘An fMRI investigation of emotional engagement in moral judgment’, *Science* **293**: 2105-2108. doi: 10.1126/science.1062872

Greene, Joshua and Jonathan Haidt (2002) ‘How (and where) does moral judgment work?’, *Trends in cognitive sciences* **6**: 517-523. doi: 10.1016/S1364-6613(02)02011-9

Hausch, Donald B, Victor S Y Lo, and William T Ziemba (2008). 'Introduction to Utility Preferences of Racetrack Bettors', *Efficiency of Racetrack Betting Markets* **2008**: 39-40. doi: 10.1142/6910

Hayashi, Hajimu (2015) 'Omission bias and perceived intention in children and adults.', *British Journal of Developmental Psychology* **33**: 237-251. doi: 10.1111/bjdp.12082

Holmes, Emily A and Andrew Mathews (2005) 'Mental imagery and emotion: A special relationship?', *Emotion* **5**: 489−497. doi: 10.1037/1528-3542.5.4.489

Holmes, Emily A and Andrew Mathews (2010) 'Mental imagery in emotion and emotional disorders', *Clinical psychology review* **30**: 349-362. doi: 10.1016/j.cpr.2010.01.001

Hopkins, Robert (1995) 'Explaining depiction', *The philosophical review* **104**: 425-455. doi: 10.2307/2185635

Horberg, Elisabeth J, Christopher Oveis, and Dacher Keltner (2011) 'Emotions as moral amplifiers: An appraisal tendency approach to the influences of distinct emotions upon moral judgment.' *Emotion Review* **3**: 237-244. doi: 10.1177/1754073911402384

Jamison, John, Tijen Yay, and Gilad Feldman (2020) 'Action-inaction asymmetries in moral scenarios: Replication of the omission bias examining morality and blame with extensions linking to causality, intent, and regret', *Journal of Experimental Social Psychology* **89**: 103977. doi: 10.1016/j.jesp.2020.103977

Jenni, Karen and George Loewenstein (1997) 'Explaining the identifiable victim effect', *Journal of Risk and uncertainty* **14**: 235-257. doi: 10.1023/A:1007740225484

Ji, Julie L, Stephanie Burnett Heyes, Colin MacLeod,, and Emily A Holmes (2016) 'Emotional mental imagery as simulation of reality: Fear and beyond—A tribute to Peter Lang', *Behavior Therapy* **47**: 702-719. doi: 10.1016/j.beth.2015.11.004

Ji, Julie L, Fionnuala C Murphy., Ben Grafton, Colin MacLeod, and Emily A Holmes (2022) 'Emotional mental imagery generation during spontaneous future thinking: relationship with optimism and negative mood', *Psychological research* **86**, 1-10. doi: 0.1007/s00426-021-01501-w

Kahneman, Daniel and Amos Tversky (1982) 'The psychology of preferences', *Scientific American* **246**: 160-173. doi: 10.1038/scientificamerican0182-160

Kahneman, Daniel and Amos Tversky (1979) 'Prospect theory: An analysis of decision under risk', *Econometrica* **47**: 363-391. doi: 10.1017/CBO9780511803475.003

Kosslyn, Stephen M (1994) *Image and Brain: The Resolution of the Imagery Debate.* The MIT Press.

Kosslyn, Stephen M, William L Thompson, and Giorgio Ganis (2006). *The case for mental imagery.* Oxford University Press.

Kulvicki, John (2014) *Images.* Routledge.

Kunda, Ziva (1990) 'The case for motivated reasoning', *Psychological bulletin* **108**: 480-498. doi: 10.1037/0033-2909.108.3.480

Landman, Janet (1987) 'Regret and elation following action and inaction: Affective responses to positive versus negative outcomes', *Personality and Social Psychology Bulletin* **13**: 524-536. doi: doi.org/10.1177/0146167287134009

Lee, Seyoung, and Thomas Hugh Feeley (2016). The identifiable victim effect: A meta-analytic review. *Social Influence* **11**: 199-215. doi: 10.1080/15534510.2016.1216891

Lee, Andrew Y, Joshua Myers, and Gabriel Oak Rabin (2023) 'The structure of analog representation', *Noûs* **57**: 209-237. doi: 10.1111/nous.12404

Lerner, Jennifer S, Ye Li, Piercarlo Valdesolo, and Karim S Kassam (2015) 'Emotion and decision making', *Annual review of psychology* **66**: 799-823. doi: 10.1146/annurev-psych-010213-115043

Leventhal, Howard, and Klaus Scherer (1987) 'The relationship of emotion to cognition: A functional approach to a semantic controversy', *Cognition and Emotion* **1**: 3-28. doi: 10.1080/02699938708408361

Lindquist, Kristen A (2013). 'Emotions emerge from more basic psychological ingredients: A modern psychological constructionist model', *Emotion Review* **5**: 356-368. doi: 10.1177/1754073913489750

Loewenstein, George (1996) 'Out of control: Visceral influences on behavior', *Organizational behavior and human decision processes* **65**: 272-292. doi: 10.1006/obhd.1996.0028

Loewenstein, George, Elke U Weber, Christopher K Hsee, and New Welch (2001) 'Risk as feelings', *Psychological bulletin* **127**: 267-286. doi: 10.1037/0033-2909.127.2.267

Loewenstein, George., and Jennifer S Lerner (2003) 'The role of affect in decision making' in Richard J Davidson, Klaus R Scherer, and H Hill Goldsmith, eds., *Handbook of affective sciences*: 619–642. Oxford University Press.

Lyons, William (1980) *Emotion.* Cambridge University Press.

Mandelbaum, Eric and David Ripley (2012) 'Explaining the abstract/concrete paradoxes in moral psychology: The NBAR hypothesis.', *Review of Philosophy and Psychology* **3** :351-368. doi: 10.1007/s13164-012-0106-3

Marr, David (1982) *Vision.* W.H. Freeman.

Meir, Irit (2010). 'Iconicity and metaphor: Constraints on metaphorical extension of iconic forms', *Language* **86**: 865-896. doi: 10.1353/lan.2010.0044

Miller, Gregory A, Daniel N Levin, Michael J Kozak, Edwin W Cook, Alvin McLean, and Peter J Lang (1987) 'Individual differences in imagery and the psychophysiology of emotion', *Cognition and emotion* **1**: 367-390. doi: 10.1080/02699938708408058

Miller, Ryan and Fiery Cushman (2013) 'Aversive for me, wrong for you: First-person behavioral aversions underlie the moral condemnation of harm', *Social and Personality Psychology Compass* **7**: 707-718. doi: 10.1111/spc3.12066

Moors, Agnes (2010) 'Theories of emotion causation: A review.', *Cognition and emotion* **23**: 625-662. doi: 10.1080/02699930802645739

Moors, Agnes (2013) 'On the causal role of appraisal in emotion', *Emotion Review* **5**: 132-140. doi: 10.1177/1754073912463601

Moulton, Samuel. T and Stephen M Kosslyn (2009) 'Imagining predictions: mental imagery as mental emulation', *Philosophical Transactions of the Royal Society B: Biological Sciences* **364**: 1273-1280. doi: 10.1098/rstb.2008.0314

Nanay, Bence (2016) 'The role of imagination in decision-making', *Mind and Language* **31**: 127-143. doi: 10.1111/mila.12097

Nesse, Randolph M (1990) 'Evolutionary explanations of emotions', *Human nature* **1**: 261-289. doi: 10.1007/BF02733986

Nichols, Shaun and Joshua Knobe (2007) 'Moral responsibility and determinism: The cognitive science of folk intuitions', *Noûs* **41**: 663–685. doi: 10.1111/j.1468-0068.2007.00666.x

Nisbett, Richard E and Lee Ross (1980) *Human Inference: Strategies and Shortcomings of Social Judgment*. Prentice-Hall.

Pearson, Joel, Thomas Naselaris, Emily A Holmes, and Sthephen M Kosslyn (2015) 'Mental imagery: Functional mechanisms and clinical applications', *Trends in Cognitive Sciences* **19**: 590–602. doi: 10.1016/j.tics.2015.08.003

Pautz, Adam (2020) 'The puzzle of the laws of appearance', *Philosophical Issues* **30**: 257-72. doi: 10.1111/phis.12184

Prelec, Drazen (1998) 'The probability weighting function', *Econometrica* **66**: 497-527. doi: 10.2307/2998573

Quiggin, John (1982) 'A theory of anticipated utility', *Journal of economic behavior and organization* **3**: 323-343. doi: 10.1016/0167-2681(82)90008-7

Quilty-Dunn, Jake (2016) 'Iconicity and the format of perception', *Journal of Consciousness Studies* **23**: 255-263.

Regier, Terry and Yang Xu (2017) 'The Sapir-Whorf hypothesis and inference under uncertainty', Wiley Interdisciplinary Reviews: *Cognitive Science* **8**: e1440. doi: 10.1002/wcs.1440

Ritov, Ilana and Jonathan Baron (1990) 'Reluctance to vaccinate: Omission bias and ambiguity', *Journal of Behavioral Decision Making* **3**: 263–277. doi: 10.1002/bdm.3960030404

Rozin, Paul, Linda Millman, and Carol Nemeroff (1986) 'Operation of the laws of sympathetic magic in disgust and other domains', *Journal of personality and social psychology* **50**: 703-712. doi: 10.1037/0022-3514.50.4.703

Rozin, Paul and Carol Nemeroff (1990) 'The laws of sympathetic magic: A psychological analysis of similarity and contagion', in James W Stigler, Richard A Shweder, and Gibert Herdt, eds., *Cultural psychology: Essays on comparative human development*: 205–232. Cambridge University Press.

Scarantino, Andrea and Ronald de Sousa (2018) 'Emotion'. in Edward N Zalta, ed., *The Stanford Encyclopedia of Philosophy. Stanford University*. https://plato.stanford.edu/archives/sum2021/entries/emotion/>.

Schacter, Daniel L, Roland G Benoit, and Karl K Szpunar (2017) 'Episodic future thinking: Mechanisms and functions', *Current opinion in behavioral sciences* **17**: 41-50. doi: 10.1016/j.cobeha.2017.06.002

Schelling, T. C. (1968). 'The life you save may be your own', in Samuel B Chase, ed., *Problems in public expenditure analysis*: 127-162. The Brookings Institution.

Scherer, Klaus R (2011) 'On the rationality of emotions: or, When are emotions rational?', *Social Science Information* **50**: 330-350. doi: 10.1177/0539018411411018

Scherer, Klaus R, Angela Schorr, and Tom Johnstone (eds.) (2001) *Appraisal processes in emotion: Theory, methods, research.* Oxford University Press.

Shepard, Roger N (1978). 'The mental image', *American Psychologist* **33**: 125–137. doi: 10.1037/0003-066X.33.2.125

Siegel, Susanna (2022) 'How can perceptual experiences explain uncertainty?', *Mind & Language* **37**: 134-158. doi: 10.1111/mila.12348

Sinnott-Armstrong, Walter (2008). 'Abstract + Concrete = Paradox', in Joshua Michael Knobe and Shaun Nichols, eds., *Experimental Philosophy*: 209-230. Oxford University Press.

Slovic, Paul, Melissa L Finucane, Ellen Peters, and Donald G MacGregor (2004) 'Risk as analysis and risk as feelings: Some thoughts about affect, reason, risk and rationality', *Risk Analysis* **24**: 311-322. doi: 10.1111/j.0272-4332.2004.00433.x

Slovic, Paul and Ellen Peters (2006) 'Risk perception and affect', *Current directions in psychological science* **15**: 322-325. doi: 10.1111/j.1467-8721.2006.00461.x

Slovic, P (2007) '"If I look at the mass I will never act": Psychic numbing and genocide.', *Judgment and Decision making* **2**: 79-95. doi: 10.1017/S1930297500000061

Small, Deborah A, George Loewenstein, and Paul Slovic (2007) 'Sympathy and callousness: The impact of deliberative thought on donations to identifiable and statistical victims', *Organizational Behavior and Human Decision Processes* **102**: 143-153. doi: 10.1016/j.obhdp.2006.01.005

Smith, Craig A, and Leslie D Kirby (2000) 'Consequences require antecedents: Towards a process model of emotion elicitation', in Joseph P Forgas (ed.), *Feeling and thinking: The role of affect in social cognition*: 83-106. Cambridge University Press.

Smith, Craig A, and Leslie D Kirby (2001) 'Toward delivering on the promise of appraisal theory', in Klaus R Scherer, Angela Schorr, and Tom Johnstone, eds., *Appraisal processes in emotion*: 121-138. Oxford University Press.

Smith, Eliot R, and Roland Neumann (2005). 'Emotion processes considered from the perspective of dual process models', in Paula M Niedenthal, Lisa Feldman Barrett, and Piotr Winkielman, eds., *Emotion and Consciousness*: 287-311. The Guilford Press.

Solomon, Robert C (1976) *The passions: Emotions and the meaning of life.* Doubleday.

Sunstein, Cass R (2003) 'Terrorism and probability neglect', *Journal of Risk and Uncertainty* **26**: 121-136. doi: 10.1023/A:1024111006336

Speed, Laura J, Lynn S Eekhof, and Maroles Mak (2024) 'The role of visual imagery in story reading: Evidence from aphantasia', *Consciousness and Cognition* **118**: 103645. doi: 10.1016/j.concog.2024.103645

Spranca, Mark, Elisa Minsk, and Jonathan Baron (1991) 'Omission and commission in judgment and choice', *Journal of experimental social psychology* **27**: 76-105. Doi: 10.1016/0022-1031(91)90011-T

Teroni, Fabrice (2007) 'Emotions and formal objects', *Dialectica* **61**: 395-415. doi: 10.1111/j.1746-8361.2007.01108.x

Thaler, Richard H (1988) 'Anomalies: The ultimatum game', *Journal of economic perspectives* **2**: 195-206. doi: 10.1257/jep.2.4.195

Toribio, Josefa (2011). 'Compositionality, iconicity, and perceptual nonconceptualism', *Philosophical Psychology* **24**: 177-193. doi: 10.1080/09515089.2011.558836

Tye, Michael (2002) 'Representationalism and the transparency of experience', *Noûs* **36**: 137– 151. doi: 10.1111/1468-0068.00365

Weksler, Assaf (2023) 'Perception and Disjunctive Belief: A New Problem for Ambitious Predictive Processing', *Australasian Journal of Philosophy* **102**: 448-464. doi: 10.1080/00048402.2023.2251035

Wicken, Marcus, Rebecca Keogh, and Joel Pearson (2021) 'The critical role of mental imagery in human emotion: insights from fear-based imagery and aphantasia', *Proceedings of the royal society B* **288**: 20210267. doi: 10.1098/rspb.2021.0267

Witte, Kim and Mike Allen (2000) 'A meta-analysis of fear appeals: Implications for effective public health campaigns', *Health education & behavior* **27**: 591-615. doi: 10.1177/109019810002700506

Zilker, Veronika, and Thorsten Pachur (2022) 'Nonlinear probability weighting can reflect attentional biases in sequential sampling'. *Psychological Review* **129**: 949–975. doi: 10.1037/rev0000304