



# Vividness as a natural kind

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## Abstract

Imaginings are often characterized in terms of vividness. However, there is little agreement in the philosophical literature as to what it amounts to and how to even investigate it. In this paper, we propose a natural kind methodology to study vividness and suggest treating it as a homeostatic property cluster with an underlying nature that explains the correlation of properties in that cluster. This approach relies on the empirical research on the vividness of mental imagery and contrasts with those accounts that treat vividness as an explanatory primitive and with those that attempt to provide a definition. We apply the natural kind methodology to make several substantive (but also provisional) claims about the vividness of mental imagery. First, we will argue that it forms a homeostatic property cluster, in that it is reliably correlated with, but not defined by, some properties, such as the level of detail, clarity, perception-likeness and intensity. In arguing for this claim, we also show how the cluster can be modified in the light of empirical research by complementing it with a correlation between vividness and familiarity. Second, we will argue that these correlations can be explained by an underlying property at the architectural level; i.e., the availability of stored sensory information for the elaboration of a mental image.

**Keywords** Imagination · Mental imagery · Vividness · Natural kinds

## 1 Introduction

It is a popular view in philosophy that sensory imaginings recreate or simulate perceptual experiences. It is not a coincidence, for instance, that visualization is conceptualized as “seeing with one’s mind’s eye”. The extent to which imagination feels lifelike and forceful is often expressed in terms of *vividness* or vivacity. Those imag-

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“The verb imagine can indeed take adverbs on its own. The most notable one is vividly.” (Vendler 1979, p. 164).

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inings that are especially vivid may consume one's attention to the extent that they interfere with one's engagement with the real world, but they are also a source of intense pleasures for many people.

At least since Hume, vividness has had its place in philosophical theories about the mind. Nowadays, it is also a recognized feature of mental imagery in psychological research where subjective estimates of vividness are a common staple. Although it is acknowledged that vividness is subjective and difficult to measure, it nevertheless has been posited as one of the central features of a generated mental image (Pearson et al. 2001, p. 1).

It is noteworthy, however, that there is no consensus as to what being vivid exactly amounts to. In philosophy, there haven't been many attempts to provide an answer (with some exceptions, which we will discuss in Sect. 2.2). What is more, it is even an open question what the right kind of methodology for studying vividness is. In this paper, we will propose that vividness can be fruitfully studied with the natural kind methodology: i.e., by treating it as a homeostatic property cluster with an underlying nature.

In order to demonstrate the fruitfulness of the natural kind approach, we actually use this methodology and make several substantive (but also provisional) claims about vividness. First, we will argue that there are good reasons to think vividness forms a homeostatic property cluster, in that it is reliably correlated with, but not defined by, some properties, such as the level of detail, clarity, perception-likeness and intensity. Second, this reliable correlation can be explained by an underlying property at the architectural level; i.e., the availability of stored sensory information for the elaboration of a mental image.

The paper is structured as follows. In Sect. 2, we will introduce the natural kind methodology and how it has been applied to mental phenomena. We then consider existing accounts of vividness in the philosophical literature and how the natural kind approach relates to them. In Sect. 3, we will analyze the cluster of features that the vividness is associated with and argue that the relation between them and vividness is correlation, not necessity or identity. Then, in Sect. 4, we will look more closely at the empirical research on vividness and argue that the data we have so far supports the hypothesis that the underlying mechanism of vividness, which is responsible for the cluster, has got something to do with the availability of sensory information for image construction. Finally, some concerns about vividness-as-availability will be addressed in Sect. 5.

We should also note in advance that our focus is on vividness as it applies to *mental imagery* which is a type of mental processing that simulates/recreates the content of perceptual experiences in the absence of sensory stimulation, by representing sensory appearances of objects and events (Currie 1995; Pearson et al. 2015; Nanay 2015; Stokes 2019). Although we mostly address visual imagery, we fully acknowledge that mental images that are of other modalities can be vivid as well.<sup>1</sup> We will also talk about

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<sup>1</sup> The vividness of auditory imagery will be mentioned when we discuss experiments by Baddeley and Andrade in Sect. 4.2. For further research on auditory vividness, see Zvyagintsev et al. (2013). It is also important to note that our account according to which vividness consists in the availability of sensory information is in a good position to account for imagistic vividness of different modalities because the relevant information is not modality-specific.

*sensory imaginings* by which we have in mind imaginative *attitudes* that have mental imagery as their contents.<sup>2</sup> Arguably, there are also other attitudes which can involve mental imagery, such as episodic memory and possibly others (see Langland-Hassan 2015). Whenever an attitude has imagistic content, it can also be more or less vivid in the imagistic sense, but they are vivid in virtue of the mental imagery that they involve, not in themselves.

## 2 Preliminary issues

In this section, we clarify our project of studying vividness with the natural kind methodology. We first explain the “natural kind methodology” (Sect. 2.1) and then the “vividness” (Sect. 2.2).

### 2.1 Natural kind methodology

By the “natural kind methodology” of studying *X*, we mean the idea of studying *X* with the guiding hypothesis<sup>3</sup> that *X* forms a homeostatic property cluster. This method relies on the homeostatic property cluster account of natural kinds (Boyd 1991, 1999). The homeostatic property cluster theory has two main ideas. First, members of a natural kind (e.g., water) instantiate a property cluster, a set of properties that are reliably (but not necessarily) co-instantiated (e.g., liquidity, transparency, odorlessness, drinkability, etc.); “There is a family *F* of properties which are contingently clustered in nature in the sense that they co-occur in an important number of cases” (Boyd 1999, p. 143). Second, there is an underlying mechanism or process (e.g., H<sub>2</sub>O) which explains why the properties tend to be co-instantiated by the members of the kind; “there are underlying mechanisms or processes which tend to maintain the presence of the properties in *F*” (Ibid.).<sup>4</sup>

We are not the first to appeal to the natural kind approach to mental and psychological phenomena (see Taylor 2020 for an overview as well as critical discussions). Nicholas Shea (2012) discusses language deficits as examples. Varieties of symptoms of language deficits fell into several groups. One group involves non-fluent agrammatical speech (but not language comprehension problems). Another group involves language comprehension problems (but not non-fluent agrammatical speech). It turned out that these two clusters of symptoms correspond to two underlying causal mechanisms; the first cluster corresponds to the deficits in the left ventrolateral prefrontal

<sup>2</sup> In the philosophical literature, the term “mental imagery” has been sometimes used to denote the attitude of imagining, instead of content, which has arguably generated various confusions (Arcangeli 2019).

<sup>3</sup> Whether *X* actually forms a homeostatic cluster or not will only be clarified after we actually study *X* with the natural kind methodology. If the methodology works well, then we can reasonably conclude that *X* forms a homeostatic property cluster.

<sup>4</sup> There are various alternative theories of what constitutes a natural kind in the literature (Slater 2015; Franklin-Hall 2015; Magnus 2012), as there are views that are skeptical about natural kinds as such (Ludwig 2018; Brigandt 2020). Addressing these accounts is not within the scope of this paper. However, someone who is more sympathetic to any of them instead of Boyd’s can read us as defending a view that vividness is a Boydian kind, i.e., a homeostatic property cluster.

cortex (Broca's area) and the second cluster corresponds to the deficits in the left posterior temporal cortex (Wernicke's area).

Richard Samuels (2009) argues that the dual system theory of reasoning (Stanovich 1999, Evans 2008) can be understood in terms of the natural kind methodology. Some reasoning processes instantiate a cluster of properties, Type-1 properties, such as being unconscious, being implicit, requiring low effort, being automatic, being rapid, etc. while other reasoning processes instantiate another cluster of properties, Type-2 properties, such as being conscious, being explicit, requiring high effort, being controlled, being slow, etc. Type-1 properties and Type-2 properties form reliably (but not necessarily) correlated property clusters. And some underlying mechanisms explain the fact that Type-1 properties tend to be co-instantiated as well as the fact that Type-2 properties tend to be co-instantiated.

Among others, our approach to vividness is closely related to Nicholas Shea and Tim Bayne's (Bayne 2018; Shea 2012; Shea and Bayne 2010) natural kind approach to consciousness. This approach is ambitious and controversial (e.g., Phillips 2018 for some critical discussions). Our project is much less ambitious (and, hopefully, less controversial); we claim only that vividness, rather than (phenomenal) consciousness in general, forms a homeostatic property cluster.<sup>5</sup> We do not take a stand on the issue of whether (phenomenal) consciousness in general forms such a cluster.

Shea and Bayne make it explicit that natural kindness comes in degrees (see also Taylor 2020).

For a physical property to be a natural kind is a matter of degree, depending upon how broad and various are the properties over which it supports inductions. The natural kind methodology is appropriate no matter where consciousness falls on this spectrum.[...] The more kind-like consciousness is, the easier will be the task of finding nomological clusters of properties connected to it. Correlatively, if being conscious supports only a very narrow range of inductions then the methodology we recommend will be correspondingly more difficult, even if being conscious is a perfectly natural property. (Shea and Bayne 2010, pp. 471–472).

We follow this idea in our discussion of vividness. The more kind-like vividness is, the easier will be the task of finding nomological clusters of properties connected to it. We hypothesize that vividness is kind-like at least to a significant degree, and thus it will not be difficult to find a nomological cluster of properties connected to it. When we say that vividness is a natural kind, or likely to be a natural kind, we mean that vividness has, or is likely to have, a high degree of kind-likeness.

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<sup>5</sup> Interestingly, even Shea and Bayne do not seem to presuppose that phenomenal consciousness in general forms a homeostatic property cluster. They write; "the natural kind methodology requires only that there are natural kinds corresponding to what we pre-theoretically think of as determinates of phenomenal consciousness, such as perceptual experience, visual experience, and so on" (Shea and Bayne 2010, p. 476).

## 2.2 Vividness

### 2.2.1 Vividness of imaginings, vividness of perceptions

David Hume repeatedly uses the notions such as “vivacity”, “force”, etc. in *A Treatise of Human Nature* and *An Enquiry Concerning Human Understanding*. In the beginning of Book I of *Treatise*, and well as in Sect. 2 of *Enquiry*, he distinguishes “impressions”, which include perception and sensation, from “ideas”, which include imagining and memory, in terms of the degree of force and vivacity. An idea, which has weak force and vivacity, is the faint copy or duplicate of an impression, which has strong force and vivacity.

Hume’s discussion suggests the following understanding of vividness; first, vividness is a property that is applicable to perception (e.g., perception of a red apple on the table) and imagining (e.g., imagining of a red apple on the table, or recalling a red apple on the table), and second, the degree of vividness is greater in the former than the latter (and possibly, third, perception and imagining are distinguished primarily because of the difference between them in terms of vividness). Let us call this the “Humean conception” of vividness, and vividness thus understood “Humean vividness”. Philosophical discussions of vividness tend to be about Humean vividness (e.g., Kind 2017; McGinn 2004; Sinhababu 2017).

Humean vividness can be distinguished from what we call “imagistic vividness”, which is attributed to imagination (including recollection), not to perception. Some of your imaginings can be more vivid than others. And, there could be individual differences; some people might have particularly vivid imaginings compared to others (Cui et al. 2007).<sup>6</sup> Imagistic vividness seems to be the main target of the empirical research where the research is primarily about the vividness of imagery (e.g., Cornoldi et al. 1991; Pearson Rademaker and Tong 2011; Andrade et al. 2014; Baddeley and Andrade 2000; Fulford et al. 2018). Our primary focus is on imagistic vividness rather than Humean vividness.<sup>7</sup>

What is the relationship between Humean vividness and imagistic vividness? We take this to be an empirical issue. With the natural kind methodology, we can think of several possibilities. One possibility is that Humean vividness does not capture a natural kind. This will be the case if it turns out that perceptual vividness and imagistic vividness correspond to two distinct homeostatic property clusters (or that one of them does not correspond to any such cluster at all). Another possibility is that Humean vividness does capture a natural kind because there is only one homeostatic property cluster which subsumes both imagistic vividness and perceptual vividness.

Shea (2012) discusses a similar issue. The natural kind approach to consciousness might reveal two independent clusters, corresponding to access consciousness and

<sup>6</sup> Research on individual differences in imagery vividness goes way back (see Sheehan 1966). Interestingly, much of the questionnaire data in imagery research regarding vividness is arguably reflective of an individual’s *ability* to token vivid imagery, and not so much about the vividness of the occurrent imagery that they are asked about in the task context. See also Sect. 4.1.

<sup>7</sup> Some philosophers have also attributed vividness to mental states without sensory content, such as propositional attitudes (Stecker 2011) or intellectual seemings (Bengson 2015). Since non-sensory vividness is not a form of imagistic vividness, it falls out of the subject matter of this paper.

phenomenal consciousness respectively. (In this case, phenomenal consciousness and access consciousness can come apart.) Or, alternatively, the natural kind approach might reveal one cluster. (In this case, phenomenal consciousness and access consciousness will never come apart.) Shea proposes using causal modelling techniques to investigate whether there is only one cluster or two clusters for consciousness.

As we will see, with respect to vividness, we are inclined toward the first option, i.e., that Humean vividness does not constitute a natural kind because imagistic vividness and perceptual vividness are too disunified to form a single cluster. That being said, since we accept that natural kindness comes in degrees, this conclusion will be only tentative. We come back to this issue later.

### 2.2.2 Defining vividness

Hume does not define what “force” or “vivacity” actually is. He only says: “I believe it will not be very necessary to employ many words in explaining this distinction [between impressions and ideas]. Every one of himself will readily perceive the difference betwixt feeling and thinking. The common degrees of these are easily distinguished” (Hume 1739/2007, p. 7). For Hume, “force” or “vivacity” is something clear and obvious, with no need of explicit definition or explanation.<sup>8</sup> More recently, Neil Sinhababu (2017) follows Hume and appeals to “vividness” without explicit definition or explanation.<sup>9</sup>

For other philosophers, vividness is not so clear nor obvious. In a recent paper, Amy Kind (2017) investigates the nature and definition of vividness. She considers possible definitions (definitions in terms of clarity, the amount of detail, brightness, color intensity, etc.) and rejects all of them, ending up with a kind of skepticism about the theoretical usefulness of vividness; “the notion of vividness is poorly understood; perhaps even worse, it seems recalcitrant in the face of analysis. To make philosophical progress on our understanding of imagination, then, we would thus do best to retire our reliance on this notion entirely” (Kind 2017, p. 49).

We agree with much of what Kind says about vividness, in particular about the failure of defining vividness in terms of necessary and sufficient conditions. In fact, the homeostatic property cluster approach to X opposes the idea of defining X in terms of necessary and sufficient conditions. As Boyd notes, the homeostatic property cluster theory gives “counterexamples to the claim that—at least on an ideal rational reconstruction—natural kinds must be defined by necessary and sufficient conditions” and “the requirement that natural kinds have such definitions is to be diagnosed as a holdover from traditional empiricist conceptions of linguistic precision which must be abandoned once it is agreed that kind definitions must conform to the (sometimes messy and complex) causal structure of the world” (Boyd 1991, pp. 142–143).

But the natural kind methodology can add a positive twist to Kind’s argument against defining vividness. Kind is correct that the clarity, the amount of detail, etc.

<sup>8</sup> Interestingly, however, he is not so optimistic about his discussion of belief, where he does appeal to “force” and “vivacity” among other similar notions. This is rather puzzling: he seems to be happy with “force” and “vivacity” when it comes to the distinction between impressions and ideas, but he is not when it comes to the distinction between belief and “fiction” or “fancy”.

<sup>9</sup> For vividness in Sinhababu’s theory, see Miyazono (2018) as well as Sinhababu’s (2018) response.

do not define vividness; nonetheless they might be statistically correlated with it. (For example, liquidity, transparency, odorlessness, etc. do not define water, but they are statistically correlated with it.) And there might be an underlying mechanism that explains the correlation. (For example, the clustering of superficial water properties is explained by the chemical structure of H<sub>2</sub>O.)<sup>10</sup>

Kind does not consider the natural kind approach, but she does discuss something similar.

COMBO: Imaginative vividness consists in a combination of relevant features, with at least some of them rising above a certain threshold (Kind 2017, p. 45).

Kind does not rule out COMBO but still remains skeptical because it is not informative enough. It does not specify exactly which features are combined in what way. We agree with Kind on this issue too, but this is something expected from the viewpoint of the natural kind methodology. One cannot give the details of what properties are included in the cluster, and how strongly they are correlated, from the armchair. These are empirical issues (e.g., Shea 2012; Shea and Bayne 2010), for the same reason that it is an empirical issue what properties are included in the water-cluster, and how strongly they are correlated. The role of natural kind methodology is to guide empirical research on these issues.

In the next two sections, we are going to demonstrate how this methodology can be put to work by giving a provisional account of imagistic vividness as a natural kind.

### 3 Cluster

What is the relevant cluster that is associated with vividness? The following features are what we take to be significantly correlated with vivid imagery.<sup>11</sup>

#### 3.1 Detail

One popular understanding of vividness is in terms of richness of detail. Vivid images are presumably distinguishable from non-vivid images by the greater amount of fine-grained information that their content contains (D'Argembeau and Van der Linden 2006, p. 347; Gaesser, Horn and Young 2015, p. 566; Gaesser and Schacter 2014, p. 4417). For instance, someone's mental image of a birthday party tends to be more vivid than their mental image of a uniformly colored ball moving through empty space. While the content of the latter is sparse, the content of the former is rich, representing a plethora of various items. Other ideas in the vicinity are that vividness is related to the determinacy of a representation in that vivid images are more determinate than

<sup>10</sup> This is in line with Runge et al. (2017, p. 2) who express their aim: "the crucial issue is not what "vividness really means," but rather, to what extent our subjective measures of imagery vividness work; namely, whether they measure the intended core latent attribute of inner conscious experience that comes with having visual mental images."

<sup>11</sup> We leave aside the proposal that vivid images are distinguishable from non-vivid images by representing intense colors (cf. Kind 2017, p. 45) because it ties vividness too strongly to visual modality and does not account for colorless but vivid mental images.

non-vidid images (cf. Kind 2017, pp. 42–43) or that they are unsaturated (McGinn 2004, p. 25), and that vivid representations, unlike non-vidid ones, concern particular objects and situations (Miyazono 2018, p. 76). Both can be seen as ways of cashing out what the level of detail exactly amounts to: the more determinate a content is, the more fine-grained detail it includes, and representations of particulars usually capture more information than representations of abstracta.

### 3.2 Clarity

Vividness is also associated with the clarity of a representation (Pearson et al. 2013, p. 7; cf. Kind 2017, p. 46). What this exactly amounts to is difficult to say, but it is supposed to contrast with blurriness and the lack of well-defined contours. Clarity suggests high resolution: the colors represented by clear imagery are bright and the outlines of the represented figures are sharp. If an image is clear, it should carry information that enables its possessor to assign to it an unambiguous meaning. Clarity also seems to be related to the level of detail and determinacy because less clear images arguably convey less detailed and more indeterminate information than clearer images. A feature, closely related to clarity, is that vivid images are more coherent (Gaesser Horn and Young 2015, p. 566).

### 3.3 Perception-likeness

Third, vividness of a mental image is often associated with the idea that an agent who has the image feels as if they were actually experiencing the represented thing or event (Gaesser, Keeler and Young 2018, p. 182; Pearson et al. 2013, p. 7). Vivid images have the power to invoke in their holders a sense of (virtual) presence of what they represent. This idea is also suggested by the use of the term “lifelike” when people speak about vivid images: the latter seem to approximate perceptual encounters in real life. While objects of perception are generally felt by perceivers as being present to them (Matthen 2005, p. 305), objects of imagery, while generally lacking a presentational quality, can feel as if they have it when the imagery is vivid enough. Presumably, there are occasions when vivid imagery can be so life-like that one fails to discriminate it from genuine perception (for a classic study on this, see Perky 1910). But even if this happens only rarely, the correlation between vividness and the sense of presence seems quite robust. For instance, there is some data which suggests that the ability to token vivid imagery correlates with the sense of presence in virtual reality (Iachini et al. 2019).

### 3.4 Intensity

Finally, some authors have tied vividness of imaginings to their experienced intensity (Jajdelska et al. 2010; Campeggiani 2019). Vivid images are more intensely felt than non-vidid images. One could argue that intensity actually boils down to the perception-likeness, in that an image is intense just in case its holder feels as if they were in a perceptual relation with what the image represents. That being said, intensity also



manifests itself in motivational and affective effects that vivid images have (more on that in the next section), in contrast with non-vivid images, and this aspect seems at least conceptually separable from perception-likeness.

In line with the natural kind approach, we take it that none of the four features defines vividness (see also Kind 2017) and it is up to further empirical investigation to clarify how strongly they are correlated.<sup>12</sup> There is already some data which indicates that vividness and the level of represented detail can disassociate. In a recent study by Sawczak et al. (2019), the participants were invited to vividly imagine helping a person in response to reading a vignette about them and then probed about their willingness to help and their empathic concern. It turned out that while willingness to help was mediated by vividness of the imaginings, the level of internal details of the imagined scenario did not drive this. Vividness and detail also seem to be realized by different neural structures. In the study by Thakral et al. (2020), the participants were asked to imagine future events in response to object cues, to rate the vividness and to estimate the level of detail of their imaginings. Univariate analysis of fMRI data indicated that the activity in the hippocampus was uniquely sensitive to vividness while the activity in the lateral parietal cortex was sensitive to detail.

These findings are consistent with the idea that the level of detail typically correlates with the degree of vividness but undercut the idea that there is a necessary connection between the two, or that one can be identified with another. Although we are not aware of any studies that have specifically investigated whether also the other three features can dissociate from vividness, we assume that this is likely to occur. Yet the path is open to consider if there is an underlying mechanism that is responsible for the features. In the next section, we are going to look at the present state of the empirical research on mental imagery and what can be inferred from it about the nature of vividness.

## 4 The nature of vividness

### 4.1 Vividness as a functionally relevant property

In the last section, we analyzed the cluster of properties that are associated with vividness. The next question is whether there exists an underlying mechanism that is responsible for the cluster. There are good reasons to think that there is such a mechanism because if we look at the research on mental imagery then the data suggests that the subjective estimates of vividness track a psychological property that plays a robust functional role in human cognition.

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<sup>12</sup> As an anonymous reviewer pointed out, Kind argues that, intuitively, the level of detail is irrelevant for vividness (Kind 2017, 44). Kind's claim can be read in two ways. First, according to the weak reading, the correlation between the degree of vividness and the level of detail is not perfect. There are some cases in which the degree of vividness and the level of detail dissociate (for example, imagining an empty classroom can be more vivid than imagining a classroom that is filled with students). The weak claim is perfectly consistent with our natural kind approach, according to which vividness and the level of details are reliably, but not necessarily, co-instantiated. Second, according to the strong reading, vividness is not even statistically correlated with the level of detail. The strong claim, which is not compatible with ours, is not very plausible because, as we pointed out above, empirical research suggests that vividness and detail do tend to correlate.

Before going on to describe the role that vividness plays, a methodological clarification is in order. In probing vividness, it has been quite common to rely on subjective estimates of imagery vividness by using off-line questionnaires like VVIQ (Vividness of Visual Imagery Questionnaire) (Marks 1973) and its revised version, VVIQ-2 (Marks 1995). There have also been similar questionnaires developed for other modalities (Zatorre et al. 2010; Andrade et al. 2014). The validity of questionnaires like VVIQ and VVIQ-2 has been challenged, however. Runge et al (2017) conducted a meta-analysis of studies that used VVIQ on the one hand and those that used trial-by-trial vividness ratings (VR), which records participants' immediate judgments of vividness, on the other, and compared them with behavioral/cognitive and neural measures. Considerably larger effect sizes were observed in the case of VR than in the case of VVIQ, suggesting that VR is a statistically more reliable measure. Arguably VVIQ and VVIQ-2 do not measure the vividness of a mental image but an individual's ability to produce such images (D'Angiulli et al. 2013, p. 1). If that is the case, VVIQ and VVIQ-2 are primarily intersubjective and not intrasubjective measures. It is therefore safer to focus on the data that can be gleaned from trial-by-trial self-reports,<sup>13</sup> although questionnaire data need not be dismissed entirely, given that it indicates how prone an individual is to token vivid imagery.

So, what roles does the property that is tracked by vividness judgments play?

First, vividness interacts with affect. Imagery has more causal impact on emotions than verbal information (Pearson et al. 2015, p. 598), and vividness seems to be one modulating factor (Holmes and Mathews 2010, p. 352). For instance, non-clinically dysphoric persons experience less vivid imagery than non-dysphoric subjects and this difference accounts for the affective differences between the two groups (Tiba and Manea 2018). In addition, vividness of positive imagery seems to predict an optimistic attitude toward the future (Ji et al. 2017). Conversely, emotional outlook has an influence on how vivid imagery one has. For instance, depressed individuals are generally less capable of producing vivid future-oriented imagery (Holmes et al. 2016), while those with an anxiety disorder tend to imagine negative events more vividly (Morina et al. 2011). This corresponds well to the ordinary conception of vividness: we take it that it is a commonplace to associate higher levels of vividness with a stronger affective charge.

Second, the vividness of an image also contributes to its motivational force. For instance, in the context of prosocial motivation, increasing the vividness of scene imagery of a helping event increases the actual willingness to help (Gaesser, Keeler and Young 2018). Also, vividness of consummatory imagery in the context of food cravings is substantially correlated with the strength of those cravings (Kavanagh et al. 2005, p. 452).

Other relevant data regarding the causal significance of vividness come from research on the effect of imagery on binocular rivalry. In their study, Pearson et al. (2011), investigated how imagining a visual pattern can bias our perception in the case of binocular rivalry. The imagined pattern was perceived as dominant, especially when it was reported to be vivid by the subjects. This result was replicated by Bergmann

<sup>13</sup> Trial-by-trial self-reports were relied on by studies such as D'Angiulli et al. 2013; Gaesser, Keeler and Young 2018; Gaesser and Schacter 2014; Bergmann et al. 2016; Dijkstra et al. 2017; Pearson et al. 2011.

et al. (2016, p. 3847). It seems, then, that the more vivid the imagery is, the more it can bias the perception that follows it (Pearson and Westbrook 2015, p. 280).

Given these effects that vividness has, it is plausible to think that it is a real psychological property. This yet does not amount to an account of its nature, of course. To say that it is tracked by vividness judgments and that it has particular effects on affect, motivation, and perception is not yet to say what its underlying nature is. So, in what follows, we will propose a more fleshed-out account.

## 4.2 Vividness-as-availability

In order to understand what the underlying nature of vividness could be, we should consider what the most promising model of vividness, suggested by empirical research, is. We take it that such a model needs to account for an important datapoint, uncovered by empirical research. A number of studies have indicated that an important factor that positively contributes to the estimated vividness of an image is the extent to which the subject is familiar with its content.<sup>14</sup> First, imagistic episodic memories are generally rated as more vivid than imagistic representations of future or counterfactual events that one has not experienced (Szpunar 2010, p. 148). This suggests that things and properties that people have experienced before are more vividly represented than those that are unfamiliar (see Robin and Moscovich 2014). Also, variation in vividness between different imaginative states depends considerably on the familiarity of its content-constituents. For instance, in the already mentioned study by Gaesser, Keeler and Young (2018), the vividness of mental imagery of helping events turned out to be higher when the spatial context of the imagined event was familiar to the participants (see also Arnold McDermott and Szpunar 2011). Future scenarios that are imagined in familiar settings are rated as more vivid than those imagined in unfamiliar settings (Schacter et al. 2012, p. 679; D'Argembeau and Van der Linden 2012, p. 1198). Positive significant correlation between familiarity ratings and vividness scores was also observed in an incidental recall task (Lefebvre and D'Angiulli 2019, p. 9). Incidental recall occurs when a person is asked to recall something which they did not expect to, and it constitutes a paradigm example of an experience that is usually deemed to be vivid.

It seems, then, that the positive correlation between vividness ratings and familiarity with the content is yet another feature that should be included in the cluster that is associated with vividness and that an account of the nature of vividness should explain why familiarity tends to correlate with higher vividness ratings. Again, as with other features in the cluster, not all vivid imagery has to involve familiar content-constituents, but there seems to be a statistically significant correlation. One noticeable difference between familiarity and the rest of the cluster is that the former is not something that is established by intuitive judgments or introspection, but by empirical research. This accords with the natural kind approach, which allows for revisions of and additions to the cluster in light of new data (see Bayne and Shea 2010, p. 470).

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<sup>14</sup> Familiarity with some content does not necessarily involve a feeling of familiarity that has been postulated by some authors (e.g., Russell 1921; Audi 1995).

If vividness correlates with familiarity, then this suggests that the former is not so much dependent on the occurrent features of the content itself (i.e., whether content is detailed or clear) but on the extent to which the subject is able to access and manipulate it. The key is availability: more familiar episodic information is more readily available for the construction of mental images of future and counterfactual sensory scenarios than unfamiliar information because more of it has been stored and consolidated over past experiences. That vividness of an image is dependent on the availability of the sensory information it contains is supported by two cognitive models of vividness.

In their 2000 study, Baddeley and Andrade (B&A in short) tested several hypotheses. Their first two experiments confirmed their prediction, according to which perceptual processes and their imaginative counterparts compete for cognitive resources, in that vividness of visual imagery decreases when one has to perform a visuo-spatial task and the vividness of auditory imagery diminishes when one counts aloud (Baddeley and Andrade 2000). Load on modality-specific working memory thus reduces the vividness of the image of that particular modality. B&A took this to suggest that vividness depends on the amount of sensory information that can go into the content of the image.

These results might leave an impression that vividness can be identified with the level of occurrently represented detail. This is misleading, however. This would be accurate if they maintained what they called the “simple hypothesis” according to which vividness just concerns the richness of content in working memory during image construction (Ibid., 128). However, in the next three experiments they also investigated the involvement of long-term memory in imagery vividness by testing the extent to which vividness ratings were affected by whether items to be imagined were meaningful or nonsensical, static or dynamic, ordinary or bizarre. In all three cases, there was a positive correlation between the first feature of a pair and vividness. On the assumption that meaningfulness, stasis and ordinariness allow for better retrieval of information from long-term memory, the experiments confirmed the prediction that vividness is partially a function of the availability of information in long-term memory (Ibid., 137). They then proposed another, more complex, hypothesis according to which “vividness judgment reflects a judgment of the richness of the current image combined with an estimate of the additional sensory information that *could be* incorporated, should the task requirements change.” (Ibid. 141, my italics). The second hypothesis is in a position to account for the correlation between vividness and familiarity, on the assumption that familiar information is more available in the long-term memory than unfamiliar information.<sup>15</sup>

This model still seems to assume that high level of occurrently represented detail is necessary for vividness.<sup>16</sup> Given the dissociation data that was presented in Sect. 3, this assumption is problematic. Fortunately, a more recent availability-based model of vividness, which lacks this assumption, was defended by D’Angiulli et al. (2013) who investigated experiences of incidental recall. They proceeded as follows. First, at the image generation phase, they asked the participants to generate a mental image in response to a noun cue. Then, 30 min later, at the free incidental recall phase, they were

<sup>15</sup> B&A also notice the link between vividness and familiarity (Ibid).

<sup>16</sup> To be fair, B&A are not fully clear on that matter, but this at least seems to be an admissible interpretation.

asked to recall the cues from the previous phase. The recall for cues that generated less vivid imagery was delayed when compared to cues that were associated with more vivid imagery. Since better performance at incidental recall is an indication that sensory traces in long-term memory are better accessible to the subjects, they inferred that vividness judgments reflect an index of stored memory trace availability in long-term memory (D’Angiulli et al. 2013, p. 2).<sup>17</sup> Given the dissociation data regarding the degree of vividness and the level of detail, we tentatively propose that D’Angiulli’s model is better supported by evidence than B&A’s. It supports a conception of vividness which understands vividness in terms of the level of availability of sensory information from long-term memory for the construction and manipulation of imagery in working memory.<sup>18</sup> The relevant manipulation may involve inspecting, rotating, restructuring and reinterpreting of an image, or synthesizing different images (for an overview of these operations, see Pearson 2013, p. 4).<sup>19</sup> Only when the information is sufficiently available to the imagery construction mechanism can the latter successfully perform those operations.

Does this connection between vividness and long-term memory preclude the possibility of vivid mental images of something unfamiliar? For instance, when one sees a novel shape, which one has not encountered before, and is then asked to imagine it, couldn’t the image of this shape be vivid?<sup>20</sup> We see a number of ways in which our account allows for the vividness of such images. First, in this particular example, one saw the shape before imagining it. Thus, it is possible that traces of it have already been stored in the long-term memory. Second, the image can be vivid when the “material” from which an unfamiliar shape is constructed is at least partially constituted by stored sensory information about previously experienced shapes. It is plausible that unfamiliar shapes can also be composed of familiar elements. Third, the example might not concern imagistic vividness at all, because one could argue that one is instead having a vivid afterimage. And the case can be made that the vividness of afterimages is not a type of imagistic vividness. Instead it is a form of Humean vividness (see Sect. 5.4).

Admittedly, vividness-as-availability is only a schematic account of vividness and does not provide any details as to how the availability is exactly implemented, but here the aim was just to propose a view of vividness that shows some concrete benefits of adopting the natural kind approach. First, this approach enables us to revise the cluster that is associated with vividness by complementing it with the correlation between vividness and familiarity and second, it allows us to point toward an underlying mechanism, namely, the availability of sensory information.

<sup>17</sup> Interestingly, d’Angiulli et al. did not find a significant relationship between imagery being static and it being vivid (D’Angiulli 2013 et al. p. 7).

<sup>18</sup> As a reviewer rightly points out, a counterintuitive consequence of this model is that a mental image is vivid in virtue of something that is external to the image itself, i.e., information in the long-term memory. We acknowledge the counter-intuitiveness but are ready to bite the bullet and take it to be yet another surprising discovery about vividness. As we argued above, the natural kind approach allows, and is even conducive to, revisions of the intuitive conception of vividness.

<sup>19</sup> Pearson et al. do not consider inspection as a form of manipulation. However, given that mental images are endogenously generated structured bundles of sensory information, the inspection is different from inspecting regular external objects.

<sup>20</sup> We thank an anonymous reviewer for this example.

### 4.3 How vividness-as-availability explains the cluster

If vividness reflects the availability of sensory information, we can also explain why vivid mental imagery has the features that are associated with it. Take the richness of detail first. Although the level of detail that is occurrently represented is not essential to vividness, the present view of vividness is in a position to explain why vivid imagery generally represents a greater amount of detail than non-vivid imagery. It is plausible to think that the amount of detail that an image occurrently represents depends on the amount of information that the image-construction mechanism has access to. After all, if the access is lacking or inhibited, the mechanism can't incorporate much information into the image and can only generate images with sparse and schematic contents. Since vividness-as-availability predicts that the more vivid an image is, the better access to sensory-information it has, this also means that vividness tends to correlate with the amount of represented sensory detail.<sup>21</sup> Importantly, vividness-as-availability does not necessitate a high amount of detail because it isn't guaranteed that the accessible information actually gets incorporated in the image. But this is what is to be expected if the amount of represented detail is not the defining feature of vividness.

Vividness-as-availability also has resources to explain why vivid images are usually taken to be clearer than non-vivid images. Due to higher availability of sensory information, one has more resources at one's disposal to fill in the boundaries of imagined objects and represent them at a higher level of resolution. Again, as with the level of detail, clarity is not guaranteed because the mechanisms that generate the image might not use the accessible information.

Further, vividness-as-availability can also explain why vivid images are more life-like and more similar to actual percepts than non-vivid images. In a sense, given its phenomenology and the fact that it involves the processing of sensory imagination, all sensory imagery is perception-like (Pearson et al. 2015, p. 590). However, vivid imagery is *more* perception-like than non-vivid imagery because it simulates the way in which objects in the environment behave as on-line sources of information. If a mental image is vivid for the subject, they can expect the imagined object to reveal different sensory aspects if they were to inspect or manipulate it in their mind's eye. The availability of sensory information provides one with an anticipatory sense that there is more to explore in the image than it is immediately given. In virtue of this, a vivid image can simulate a degree of phenomenal presence that a non-vivid image cannot.<sup>22</sup>

Finally, vividness-as-availability has a potential to explain why vivid imagery is more intensely felt than non-vivid imagery. When someone tokens vivid mental imagery of some object or scenario, more information is available to the working

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<sup>21</sup> Since we have assumed that (relative) determinacy and particularity as features of vivid imagery belong together with level of detail, vividness-as-availability explains them in a similar way: the content of vivid images tends to be represented more determinately because the image-construction mechanism has more fine-grained sensory information available to it, and vivid images can convey a sense of particularity by creating an impression of sensory fullness.

<sup>22</sup> Compare this with the idea that in visual perception, the phenomenal presence of perceived objects includes the co-presence of their rear sides (Smith 2010, p. 735). In virtue of the accessibility of sensory information in vivid imagery, the latter arguably can simulate both the presence and co-presence of imagined objects.

memory in which the image is sustained and manipulated. Since working memory constitutes a global workspace in which representations are made accessible to a wide range of mechanisms, including affective/evaluative and motivational ones (see Carruthers 2015, Ch. 2), vivid imagery engages those mechanisms to a greater degree than non-vivid imagery and is thereby more intensely felt by the agent.

We don't pretend to have provided the final word on what the best explanation for the features in the cluster is. It is possible that some of the features will eventually be explained by something other than vividness-as-availability. If that turns out to be the case, there will be a reason to differentiate between at least two clusters instead of one. We leave this possibility open. In the next section, we will consider some more immediate concerns with vividness-as-availability.

## 5 Concerns

### 5.1 Relation to consciousness

One possible objection to vividness-as-availability concerns the relationship between vividness and consciousness. It is intuitive to think that vividness characterizes mental images that are phenomenally conscious. Not all mental states are conscious but presumably all vivid mental states are conscious. But since vividness-as-availability does not say anything about consciousness, it seems that it allows for unconscious vivid imagery. This is probably counter-intuitive to many people.

One possible response to this objection is to claim that although non-imagistic mental states can be unconscious, mental imagery is always conscious, from which it follows by necessity that vivid mental imagery is always conscious. According to this proposal, vivid mental imagery is always conscious just because it is a form of imagery. This response, however, is not very plausible because the existence of unconscious mental imagery is empirically well-established (see Nanay 2018; Phillips 2014). We therefore reject this response.

Another way to respond is to embrace a particular account of consciousness which would predict that vivid imagery is always conscious. For instance, there are theories according to which conscious mental states are those that are globally broadcast and thereby made accessible to a range of cognitive and affective systems (Baars 1988; Dehaene and Naccache 2001). If a theory along these lines is correct, then it is possible to argue that all vivid imagery is conscious because in virtue of tokening it one makes sensory information available to be globally broadcast. We take it to be a live possibility that a global broadcast model of consciousness is correct. However, we do not want to commit ourselves to a particular theory of consciousness, at least not in the context of this paper. Is there a way of responding to the objection without making such a commitment?

We think there is. One can accept that vividness-as-availability might be consistent with there being unconscious vivid imagery (although it doesn't entail it either) but one can nonetheless deny that admitting this is as damaging to vividness-as-availability as it may seem. In fact, most theories of vividness, also definitional ones, leave open the possibility of unconscious vivid mental imagery. For instance, if vividness of an

image is defined in terms of the level of represented detail, this doesn't exclude the possibility of vivid unconscious images because the latter can presumably be also rich in detail. What makes a mental image vivid and what makes it conscious are separate questions and an account of vividness does not have to explain what makes imagery conscious.

It also deserves repeating here that the natural kind approach need not respect all intuitions regarding vividness. If it turns out that the best theory of consciousness implies, in conjunction with vividness-as-availability, that unconscious imagery can be vivid, then this is an acceptable consequence according to the natural kind approach.

## 5.2 Vividness and privileged access

One could develop the previous objection in an epistemic direction and argue that the possibility of unconscious vivid imagery is inconsistent with the putative privileged access that a person has to their mental states. This is an issue with natural kind approaches to the mental more broadly because we presumably do not have such access to whether the underlying basis of the homeostatic property cluster is present or not (Shea and Bayne 2010).

However, at least with respect to vividness, we do not have to assume a strong version of privileged access in the first place. Neither whether a mental image is vivid nor what makes it vivid is entirely transparent to the agent. For instance, that bizarre images tend to be experienced as less vivid is counterintuitive to most people when they are explicitly asked about it (Baddeley and Andrade 2000, 140). That being said, our account is consistent with the idea that agents have privileged access to the vividness of their mental images in that only they, and not others, are in a position to make trial-by-trial vividness reports which serve as evidence for vividness. At least from the perspective of reliabilism, such self-reports, by being highly reliable, are indicative of such access. Self-reports, at least a considerable sub-set of them, are weighted highly as evidence for vividness. Admittedly, if privileged access is understood in terms of a special kind of introspective justification, which is in turn understood in terms of what one can consciously access, our account is at best agnostic about this kind of access because we have left open the possibility that there can be unconscious vivid imagery. But it is not within the scope of this paper to argue for or against a particular account of self-knowledge.

## 5.3 Imagistic vividness and perception

As noted in introduction, the focus of this paper has been on the comparative vividness between different imaginings. But what about perceptual vividness? According to the Humean conception, percepts can also be vivid. In fact, they are supposed to be generally *more* vivid than imaginings (Stokes 2019, p. 6; Kind 2001, p. 94; Carruthers 2015, p. 186). However, if vividness is understood in terms of the availability of sensory information for the manipulation of self-generated mental imagery, it seems that perception cannot be vivid (or non-vivid) because it does not consist in the manip-



ulation of imagery in the first place.<sup>23</sup> Rather, perception consists in the processing of incoming sensory information from the environment. Given that vividness is commonly attributed also to perceptual states, does this mean that vividness-as-availability is problematic due to its limited application?

We do not think that this is overly problematic because we are on solid grounds to judge that percepts are not vivid in the same way as mental images are. Already the fact that empirical research on vividness has focused on mental imagery in particular indicates that vividness of imagery is a distinctive phenomenon that is investigated without the assumption that it also applies to perception. Another reason is that vividness characterizes a functional role of imagery that percepts do not have. This role was pointed out by Gilbert Ryle, who argued in his *The Concept of Mind* that the term ‘vividness’ indicates a person’s ability to use their knowledge of what the imagined object looks or would look like.

Indeed, this should be obvious, if we consider that our picturing of something must be characterisable as more or less vivid, clear, faithful and accurate, adjectives which connote not merely the possession but the use of the knowledge of how the object pictured does or would really look. (Ryle 2009 [1949], p. 242).

Imaginative activities are second order while perception is first order, in that the former involve using knowledge that one has gained on the basis of perception and using it in contexts where the perceptual relation to what is imagined is absent. Vividness concerns the extent to which one is able to use that knowledge. Therefore, if vividness characterizes perception, it does it differently from when it characterizes imagination.

#### 5.4 Imagistic vividness and the Humean conception

But what to make of the claim that perception tends to be more vivid than sensory imagination? If vividness is not attributable to perception, then it cannot be the case that perception is more vivid than imagination. But it surely seems to make sense and is even plausible to say that perception is more vivid. Indeed, this claim is one of the central components in the Humean conception.

As a response, we suggest that the claim can be meaningful and true, insofar as availability is understood in a looser sense, not limited to the sensory information in the long-term memory, but to any usable sensory information. In this looser sense, corresponding to the Humean conception, perceptual states generally have more access to sensory information than imagistic imaginings, in that sensory information is not (only) available to them from long-term memory but in the environment. Therefore, if we expand the scope of what the availability of sensory information amounts to, it can characterize perception as well and also accords with the intuition that perception is more vivid than mental imagery.

One concern about this suggestion is that vividness in the loose sense is *too* loose. Vividness as availability of sensory information for image manipulation set relatively strong constraints on the functional profile of vivid mental states and distinguished

<sup>23</sup> This depends on one’s theory of perception, of course.

them from states that were not. Vividness in the Humean sense relaxes these constraints. It relaxes them on the input side because availability in the case of perception now also includes environmental information, and on the output side because perceptual processes do not actively manipulate mental images in the sense of inspecting, rotating, restructuring, reinterpreting and synthesizing. This gives a reason to think that the Humean conception does not pick out a natural kind because it does not allow robust inductive inferences about the mental states that it characterizes. Keep in mind, however, that natural kinds come in degrees, which means that less unified clusters can still count as natural kinds. (Shea 2012, p. 327). We thus do not take a definitive stand on this issue. Either way, the more flexible concept, corresponding to the Humean conception, at least legitimizes the attribution of vividness both to perceptual and imaginative states, independently of whether it refers to a natural kind or not.

## 6 Conclusion

In this paper, we argued that vividness, although resistant to definition, can be fruitfully studied as a natural kind. At least when we concentrate our attention to the vividness of mental imagery in particular, converging evidence suggests that it is grounded in the level of availability of sensory information. When mechanisms that process a mental image have access to a range of sensory information, the image tends to have the cluster of properties that are associated with vividness: richness of detail, clarity, perception-likeness, and intensity. In line with the natural kind of approach, it is possible that vividness-as-availability will eventually have to be decomposed into more fine-grained kinds. But, given the present state of evidence, vividness seems to be in a good shape to be employed in theorizing about the mind.

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