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Article

Empirical Support for Perceptual Conceptualism

Nicolás Alejandro Serrano

Facultad de Filosofía y Letras, Instituto de Filosofía "Dr. Alejandro Korn",
Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET),
Universidad de Buenos Aires (UBA), Buenos Aires, C.P. 1870, Argentina; naserrano@filo.uba.ar

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Abstract: The main objective of this paper is to show that perceptual conceptualism can be understood as an empirically meaningful position and, furthermore, that there is some degree of empirical support for its main theses. In order to do this, I will start by offering an empirical reading of the conceptualist position, and making three predictions from it. Then, I will consider recent experimental results from cognitive sciences that seem to point towards those predictions. I will conclude that, while the evidence offered by those experiments is far from decisive, it is enough not only to show that conceptualism is an empirically meaningful position but also that there is empirical support for it.

Keywords: conceptual content; perception; perceptual experience; grounded cognition

1. Introduction

There is an ongoing debate in the philosophy of mind and in the philosophy of cognitive science regarding the type of content of perceptual experience. In particular, the debate centers on a comparison between the kinds of content of perceptual experiences and other cognitive states, such as beliefs. Conceptualist authors like McDowell [1–3], Brewer [4,5], or Kalpokas [6] claim that perceptual experiences and beliefs have the same type of conceptual content. On the other hand, nonconceptualist authors like Peacocke [7–11], Bermúdez [12–14], or Heck [15] deny such claim and hold that perceptual experience has a different type of content, a nonconceptual type of content.

While there are many reasons for holding each of these positions, ranging from explaining nonlinguistic animal behavior and experience (e.g., [11]), to understanding human agency and free will (e.g., [1]), certain aspects of self-consciousness (e.g., [13]), or offering a correct characterization of certain phenomenological aspects of experience (e.g., [1,2,10,11]), some of the most prominent reasons for endorsing either conceptualism or nonconceptualism have to do with the nature of justification. More precisely, such reasons have to do with the requirements that the content of perceptual experience must meet if it is to be considered as a valid reason for justifying our beliefs about the world.

At times, this focus on the normative aspect of the debate can raise doubts regarding the empirical relevance of its main positions, and whether or not conceptualism in particular can be considered empirically meaningful. These doubts can actually be fostered by McDowell's own remarks, both in *Mind and World* and other texts. For example, while he explicitly maintains that nothing he says is contrary to what cognitive science may have to say about perception, language or cognition, he doesn't seem to take a "complementary" stance towards empirical research either. Instead, McDowell apparently aims to make his conceptualist position rather independent from the ongoing development of empirical science. Consider, for example, the following quote from *Mind and World*:

> I am not saying there is something wrong with just any notion of non-conceptual content. It would be dangerous to deny, from a philosophical armchair, that cognitive psychology is an intellectually respectable discipline, *at least so long as it stays within its proper bounds* (. . .). But it is a recipe for trouble if we blur the distinction between the respectable theoretical

> role that non-conceptual content has in cognitive psychology, on the one hand, and, on the other, the notion of content that belongs with the capacities exercised in active self-conscious thinking—as if the contentfulness of our thoughts and conscious experiences could be understood as a welling-up to the surface of some of the content that a good psychological theory would attribute to goings-on in our cognitive machinery. [1] (p. 55, my emphasis)

McDowell attributes this "welling-up" picture to the personal/subpersonal distinction [16,17], a distinction he has criticized in the past:

> The 'sub-personal' account of a sensory system, which treats it as an information-processing device that transmits its informational results to something else inside an animal, cannot adequately characterize what its sensory systems are for the animal (as opposed to what they are, metaphorically speaking, for the internal parts that receive the results of the information-processing): namely, modes of sensitivity or openness to features of the environment—not processors of information, but collectors of it. [18] (p. 197)

McDowell has also been rather explicit in previous texts about his rejection of certain kind of empirical explanations for cognitive phenomena:

> Hypothesized mechanisms are not the way to save from behaviorist attack the indispensable thought that all is not dark within. We get no authentic and satisfying conception of the mind from either of these philistine extremes. [19] (p. 181)

So there are at least some reasons to think McDowell may consider his conceptualism to be independent from the advances of empirical research. Be this as it may, I believe that such a stance doesn't necessarily follow from adopting the conceptualist view of perceptual experience. Even if it is the case that McDowell is not interested in the underlying mechanisms for perception and cognition, we can reject McDowell's claim that empirical inquiry is not relevant to the conceptualism/non-conceptualism debate if we can give an empirical interpretation of the conceptualist position. In order to support this claim I will try to show, in Section 2, that conceptualism can be read as an empirically meaningful position, such that certain empirical predictions can be inferred from it. Then, in Sections 3–5, I will examine recent experiments in cognitive science that seem to corroborate those predictions. I will conclude, in Section 6, that conceptualism is not only meaningful from the perspective of empirical inquiry, but that it also has empirical support.

2. An Empirical Reading of Perceptual Conceptualism

There are at least two main theses that define perceptual conceptualism. First and foremost, that conscious states of perceptual experience have conceptual content. This means that during perceptual experience, the subject is presented with the kind of content that can be used in the formation and justification of beliefs [1] (p. 26). While this does not necessarily imply that conscious perceptual states are some kind of belief, it does mean that the content of such perceptual states can become the content of beliefs. Secondly, and directly tied to the first thesis, conceptualism holds that the conceptual capacities of the subject play a crucial role during the early stages of perception. I say "early" because both conceptualists and nonconceptualists would accept that we use our conceptual capacities for so-called "post-perceptual processes" such as object recognition. However, conceptualism makes the stronger claim that our conceptual capacities play a constitutive role during perception. Both of these theses are expressed in the following quote:

> [W]hen we enjoy experience conceptual capacities are drawn on in receptivity, not exercised on some supposedly prior deliverances of receptivity (...). In experience one finds oneself saddled with content. One's conceptual capacities have already been brought into play, in the content's being available to one, before one has any choice in the matter. The content is not something one has put together oneself, as when one decides what to say about something. [1] (p. 10)

Now, both the processing of perceptual information as well as the nature and neurological basis of our conceptual capacities are among the main topics of research in cognitive science. Because of this, I believe that both of these theses can be read in an empirically meaningful way. First, conceptual content is usually understood as the content of propositional attitudes, such as beliefs, hopes and desires [1,4,5]. So, we can understand that a perceptual state has conceptual content if it represents its content in the same way as these typical conceptual states. Therefore, the first conceptualist thesis could be empirically understood as holding that the way consciously-perceived perceptual information is represented in the brain is similar to the way that conceptual information is represented. Second, if we understand that our conceptual and perceptual capacities are the product of underlying neurobiological mechanisms, then the second conceptualist thesis could be empirically understood as holding that: the processes and mechanisms responsible for our higher cognitive and conceptual capacities also play an important role during the early stages of perceptual information processing.

Understanding conceptualism along these lines would allow us to endorse its main theses, make certain empirical predictions from them, and search in the relevant scientific literature for confirmation or disconfirmation of such predictions. Importantly, doing this would not necessarily imply a reduction of normative relations (such as justification) to causal relations, or as McDowell would put it, confusing the "realm of law" with the "space of reasons". While it will not be directly addressed in this paper, distinguishing between both of these logical spaces is among the chief normative reasons for endorsing conceptualism (see [1,2]). Yet, I believe that conceptualism can be understood in the way proposed here while keeping both logical spaces as distinct as desired. The only thing that needs to be assumed is that, whatever cognitive capacities we possess that enable us to engage in the aforementioned normative relations, they are dependent upon our biological mechanisms. On the same line, it could be argued that in order for conceptualism to be an empirically meaningful position, we need to assume that subpersonal and personal states share a same notion of content. However, I don't believe this to be necessary either. Rather, as long as we assume that personal level contents are dependent upon subpersonal contents, we can use evidence of similarities and interactions between cognition and perception at the subpersonal level in order to bring some degree of support to the thesis that there are corresponding interactions and similarities at the personal level[1].

I believe that there are, at least, three empirical predictions that can be inferred from the conceptualist position. These predictions are the kinds of things we should expect to find in the lab if conceptualism would happen to be true. As we will see shortly, the empirical evidence I will be considering in favor of some of these predictions is indirect, at best. Because of this, my aim here is far from giving an "empirical proof" that conceptualism is actually true. Rather, I simply intend to show that the debate between conceptualists and nonconceptualists does not need to be completely isolated from empirical science. Empirical evidence, even if it is indirect, can offer support for the positions in dispute. And, as I will try to show in the following sections, recent experimental results and research programs seem to offer support for the conceptualist position in particular.

First, if it is true that perceptual experience has conceptual content and if it is true that our conceptual capacities are responsible for making such conceptual content available to us in experience, then it is to be expected that subjects with different conceptual repertoire show a difference in the contents of their perceptual experience. Some caveats need to be introduced. First, the difference in the "conceptual repertoire" of the subjects needs to be relevant to the perceptual experience at hand. A subject knowing what a *wakizashi* is seems to be completely irrelevant for his perceptual experience of a fruit basket, and could be expected to play no role on the content of that experience. Second, the content of other people's perceptual experience isn't the kind of thing that can be directly observed. In this regard, and as mentioned before, evidence in favor of this prediction will have to be indirect. However, as we will see in Section 3, the experimental results of Winawer et al. [20] and

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[1] I thank an anonymous reviewer for raising this issue.

Gonzáles-Perilli et al. [21] seem to show that subjects with different color concepts experience subtle differences in their conscious perception of color.

Second, if it is true that our conceptual capacities play a constitutive role on perception, then we should expect to find evidence of conceptual influences on the early processing of perceptual information. This prediction focuses on the subpersonal level of perception, unlike the first that focused on the personal level. Nonetheless, caveats similar to those raised earlier apply here, with the addition of a few others. In particular, conceptualists endorse the "passive" aspect of perception, in the sense that the perceiving subject does not voluntarily decide what content his perceptual experience will have. As McDowell puts it, the subject is "saddled with content". As such, we should expect to find conceptual influences on perception that are preconscious and partly responsible for what will be consciously experienced. Evidence of post-perceptual conceptual influences, such as those at play when disambiguating a rabbit-duck figure, will not make the cut [22]. Ideally, the conceptual influences we find in the early stages of perceptual processing should account for the differences in experienced content mentioned in Section 4. As we will see in Section 5, the follow-up research of Thierry et al. [23] and Forder et al. [24] on [20] may do exactly that.

Third, and finally, it is important to remember that conceptualism is at its core a position about kinds of content. Specifically, it is a position about a similarity between the kinds of contents of perceptual states and higher cognitive states (e.g., beliefs). Because of this, if conceptualism is understood empirically, we should expect to find strong similarities between the neural mechanisms responsible for representing conceptual and perceptual information[2]. A rather direct way in which we could find this is if those mechanisms would happen to greatly overlap. As we will see in Section 5, fMRI and electrophysiological evidence seems to point precisely towards this scenario (e.g., [27–30]).

3. Conceptual Repertoire and Perceptual Content

If perceptual experience has conceptual content, and if our conceptual capacities play a role in making such content available to us, then it is to be expected that subjects differing in their conceptual repertoire show a certain degree of difference in the content of their perceptual experience. Since the content of perceptual experience is not the kind of thing that can be accessed from a third-person perspective, empirical evidence in favor or against this prediction will have to be indirect at best. However, recent empirical studies have tried to tackle this issue. In this section I will address two of them, the studies from Winawer et al. [20] and Gonzáles-Perilli et al. [21] regarding color perception and categorization.

Winawer et al. studied cross-linguistic color perception with the intention of testing whether a subject's native language has an influence on their perception of color. As the authors point out, the idea that language can affect perception has a long history in cognitive psychology going back to Whorf [31]. However, most of the experiments actually made in order to test this idea suffer from what Pinker [32] summarizes as two design problems: they either depend heavily on nonperceptual cognitive capacities, such as memory, or involve ambiguous instructions. In both cases, even if the experiments happen to show cross-linguistic differences in perceptual tasks, the results of such tasks can be explained by linguistic influences on memory or on instruction disambiguation. What sets Winawer et al. experiment apart is that the authors explicitly tried to address Pinker's criticisms by designing a task that was neither dependent on memory nor had ambiguous instructions or success conditions.

The study consisted in an objective color discrimination task. Subjects were shown three color squares arranged in a triad and asked to select, as quickly as possible, which of the two color squares

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2 Here I'm omitting the possibility that a certain kind of content could be multiply realized by different kinds of neural mechanisms [25,26]. If perception and cognition would happen to have distinctly different neural mechanisms, the expected similarity should be found in the way such mechanisms represent information (for example, by sharing a similar neural code). I thank an anonymous reviewer for raising this issue.

below was perceptually identical to the square on top. The color squares remained in sight until the subject gave an answer, in order to avoid memory dependency. Instructions were meant to be simple and each trial had a single correct answer, in order to avoid ambiguity. All squares were blue in color, ranging from light blue to dark blue. Finally, the color discrimination task was performed under three conditions: without any interference, with verbal interference and with spatial interference.

Subjects were divided in two groups, one of them consisting of native English speakers and the other of native Russian speakers. Interestingly, Russian, unlike English, makes an obligatory distinction between lighter blues ("*goluboy*") and darker blues ("*siniy*"), while lacking a generic word for all shades of blue. At the end of the experiment, a "linguistic color boundary" was set for each subject by asking her to classify all the color chips used during the experiment as either light blue/*goluboy* or dark blue/*siniy*. This allowed the authors to classify the trials as "within category" when all the color chips in the stimuli fell on the same side of the subject's color boundary, or as "cross-category" if the stimuli included both a light blue/*goluboy* and a dark blue/*siniy* color chip.

Experimental results showed a category advantage for Russian speakers on cross-category trials compared to within-category ones, meaning that "Russian speakers were faster to discriminate two colors if they fell on different linguistic categories in Russian" [20] (p. 7783). Furthermore, this category advantage was most pronounced on the more difficult discriminations (i.e., those with colors closer to the subject's linguistic boundary). In addition, while spatial interference did not affect the category advantage, verbal interference not only eliminated the advantage effect but also resulted in a category *dis*advantage on cross-category trials. On the contrary, English subjects tested with the same stimuli did not show any category advantage under any condition.

According to the authors, these results suggest "language-specific distortions in perceptual performance arise as a function of the interaction of lower-level perceptual processing and high-level knowledge system (e.g., language) online, in the process of arriving at perceptual decisions." [20] (p. 7784). This would have a direct, while maybe subtle, effect on the way the perceiving subject experiences the aforementioned differences in color, which would explain the differences in performance during the color discrimination task. As the authors suggest, "the critical difference in this case is not that English speakers cannot distinguish between light and dark blues, but rather that Russian speakers cannot avoid distinguishing them: they must do so to speak Russian in a conventional manner" [20] (p. 7783).

Conceptualism, as it was interpreted in Section 2, predicts that subjects with different conceptual repertoire will show a difference in the contents of their perceptual experience. Russian and English speakers seem to have such conceptual difference, as is shown by their respective use of the terms "*goluboy*"/"*siniy*" and "blue". This difference in their color concepts seems to be correlated with a difference in performance during a conscious and objective perceptual discrimination task. If Winawer et al. interpretation of their own results is right, this difference in performance could be considered as indirect evidence of a difference in the experienced perceptual content of Russian and English speakers. Furthermore, the fact that only verbal interference affected this difference in performance suggests that the category advantage effect observed in Russian speakers is indeed the product of an online conceptual influence on perception, and not the product of some other general factor regarding their native language or perceptual system.

In this regard, the main objective of Gonzáles-Perilli et al. [21] is, precisely, to determine the extent to which the possession of color concepts (instead of some other general property of the native language) is the cause of these advantage effects. In order to do this, the authors replicated Winawer et al. experiment using two different Spanish-speaking populations: Uruguayans and Spaniards. As the authors point out, Uruguayans have 12 basic color terms while Spaniards have 11, with the difference among them being the way they categorize shades of blue. Uruguayans, like Russians, make an obligatory distinction between dark blue ("*azul*") and light blue ("*celeste*"). Interestingly, while Spaniards also use the term "*celeste*", they do not use it neither as a basic nor as a monoleximic term. Instead, they use it as part of the the compound form "*azul celeste*", making *celeste* a sub-category of *azul* (blue) instead of its own basic color category.

Results showed that "while both groups presented categorical effects in [their reactions times], the effect was strongest for Uruguayans on the more difficult 'near' trials. Furthermore, only the Uruguayans were significantly more accurate at cross-category comparisons" [21] (p. 6). An important difference between the subjects of Gonzáles-Perilli et al. and Winawer et al. is that while neither Spaniards nor English speakers have a basic color term for light blue, Spaniards do have (unlike English speakers) two *non*-basic color terms for light blue ("*azul celeste*" and "*azul cielo*"). Because of this, some degree of categorical effect in the Spaniard subjects is to be expected. However, since their lack of a basic color term for light blue is their only relevant difference with the Uruguayans, these results also seem to support the idea that the possession of this 12th basic color term (and concept) is what explains the Uruguayans significant difference in accuracy. Because of this, I consider Gonzáles-Perilli et al. study to further support the conceptualist prediction that subjects with different conceptual repertoire will show a difference in the contents of their perceptual experience.

4. Conceptual Influence on Early Perceptual Processing

Studies like [20,21] seem to show that a difference in conceptual repertoire affects performance on conscious perceptual discrimination tasks. However, it could be argued that this is not because (as the authors claim) the way the subjects experience colors is "sharpened" by their possession of certain linguistic color categories. Instead, these results could be due to the influences of linguistic categories on post-perceptual processes of color discrimination. In order to further support the claim that the possession of certain color concepts actually influences the content of perceptual experience, it is necessary to show that such influences affect perceptual (instead of post-perceptual) processes. And this ties directly to the second prediction that can be inferred from an empirical interpretation of the conceptualist position: that we will find evidence of conceptual influence on the early processing of perceptual information.

The main objective of Thierry et al. [23] is to test at what stage of perceptual processing does the linguistic influence observed in studies like [20,21] take place. In order to do this, they recorded the event related potentials (ERP) of two groups of subjects during a basic oddball shape discrimination task. In this kind of tasks, subjects are presented with a sequence of identical stimuli, with a deviant stimulus appearing infrequently among them. Subjects were divided in two groups, one composed of native English speakers and the other composed of native Greek speakers. Greeks, like Russians and Uruguayans, have a distinct basic color term for light blue ("*ghalazio*") and dark blue ("*ble*"). The stimuli consisted in colored dots, and were divided in four blocks: (1) a sequence of light blue, with a deviant dark blue, (2) a sequence of dark blue, with a deviant light blue, (3) a sequence of light green, with a deviant dark green and (4) a sequence of dark green, with a deviant light green. The latter two blocks were intended as control blocks, since neither Greek nor English makes an obligatory distinction between light and dark green. Finally, the deviant stimulus varied its shape half of the time between a regular dot and a square. This is important since subjects were asked to attend to the shape of the stimuli, not to the color, meaning that only 50% of the deviant stimuli were actually target stimuli for the observers.

Deviant stimuli in oddball detection tasks are known to elicit a visual mismatch negativity (vMMN), a visual equivalent of the auditory negativity mismatch. Since this vMMN is elicited independently of the direction that attention is being focused, it is usually considered to be automatic and preattentive [33,34]. All four blocks of tests elicited the expected vMMN with their respective deviant stimuli. However, the results showed that not all vMMNs were equal: Greek subjects showed a significantly greater vMMN effects in blocks 1 and 2 when compared to blocks 3 and 4. On the contrary, English subjects did not show a significant difference in their vMMN between blocks. Furthermore, Greek and English subject showed similar vMMN on blocks 3 and 4. Also, since subjects were attending to the shape (and not color) of the stimuli, this vMMN seem to be elicited independently of whether color discrimination is relevant to the task, or not. As the authors explain "The vMMN findings show a greater distinction between different shades of blue than different shades of green in Greek participants, whereas English speakers show no such distinction. To our knowledge, this is the first demonstration of a relationship between native language and unconscious, preattentive color discrimination rather than simply conscious, overt categorization." [23] (p. 4568).

In order to further support this claim the authors also searched for differences in P1, the first positive peak elicited by visual stimuli over the parietoocipital regions of the brain. P1 takes place around 100 ms after the subject is exposed to the visual stimulus, while conscious perception of a stimulus is usually considered to take around 250 ms. Results here also showed differences between Greek and English participants. Most notably, Greek-speaking subjects showed a difference in the amplitude between light and dark blue stimuli that was absent in the English subjects. Also, the variance in both latency and mean amplitudes of the individual P1 peaks was substantially greater in the Greek participants. If it is assumed that the Greek's linguistic distinction between *ghalazio* and *ble* implies the possession of different concepts for light and dark shades of blue, these results seems to further support the conceptualist prediction that the early processing of perceptual information will be affected by the concepts possessed by the subject. In this regard, the authors conclude that "We therefore demonstrate that language-specific distinctions between 2 colors affect early visual processing, even when color is task irrelevant" [23] (p. 4569).

Recently, authors like Forder et al. [24] have also tried to determine how early in perceptual processing linguistic influences take place. Forder et al. used two groups of native British-English-speaking subjects who differed in color term use. This was meant to isolate any potential influences that color term use could have on perception from other influences that could be due to more general cognitive, cultural or linguistic factors. It has been previously shown that the boundary between green and blue color categories can vary across English speakers [35]. Forder et al.'s study used three colors, a green, a blue, and a boundary color in between the two, during an oddball shape detection task. The selected boundary color was such that one group of participants reliably named it green, while the other reliably named it blue. Subjects were asked to focus on a fixation dot and respond when it changed its shape. Because of this, subjects were explicitly attending to the shape, and not the color, of the dot. Stimuli were presented as pairs of colored squares, with the boundary color used as the standard stimuli, and the green and blue colors used as deviants.

Trials were classified as same- or cross-category trials, depending on how the individual subject consistently named the standard stimuli[3]. So, for each subject that considered the standard to be "blue" (blue namers), trials that included a standard and a blue stimuli were considered as same-category, while those including a standard and a green stimuli were considered as cross-category. The opposite was true for the subjects that reliably named the standard stimuli as "green" (green namers). ERPs were then measured in three conditions: those elicited by same-category, cross-category, and standard trials (i.e., those lacking a deviant stimuli).

Forder et al.'s results not only confirmed those of [23], but also added new and relevant information. A category effect was found in P1, 100 ms after stimulus onset, for both blue namers and green namers. Importantly, it does not seem possible to explain this effect by some visual property of the stimulus (instead of by the way the perceiving subjects categorize color). This is because, as the authors point out:

> Note that this is not simply an effect of hue on P1 because the stimuli were deliberately grouped by category rather than by hue (the same- and different-category hues were different for the two groups of observers who differed in color naming). [24] (p. 10)

This means that the same hue that elicited a category effect on the green namers *did not* elicit a category effect on the blue namers. Since the only relevant difference between the two groups was their use of the terms "green/blue", it could be argued that these category effects were due to the

[3] In order to determine this, a further color naming task was performed in which each subject had to indicate if the color of each stimuli was either green or blue.

different extensions that each group gave to the color concepts associated with those terms. In line with this interpretation, while all deviant (i.e., nonboundary color) stimulus elicited a vMMN in P1, as was expected, the vMMNs elicited by cross-category deviants were significantly greater than those elicited by same-category deviants.

In sum, both [23] and [24] found evidence of linguistic influences on early perception, particularly on early color processing. Such influences seem to be tied to color term use, specifically to the way the subjects categorize different hues of color. If it is assumed that color term use and color categorization depend upon color concepts, then these studies seem to support conceptualism in that they show evidence of conceptual influences on the early processing of perceptual information. However, by itself, such influence is compatible with the contents of perceptual experience being non-conceptual[4]. In the following section, I will consider evidence in favor of the first conceptualist thesis: that perception and cognition share a same type of representational content.

5. Perceptual and Conceptual Content

The experiments previously mentioned show that the conceptual system affects both early perceptual and late post-perceptual processes. This is certainly compatible with perceptual conceptualism, and to be expected if such a position were to be true. Thus, the experiments mentioned in the previous sections bring empirical support to the conceptualist claim. However, this position's main thesis is about the type of content that perceptual and higher cognitive states have. If conceptualism happens to be true, we should expect to find strong functional or anatomical similarities between the neural mechanisms responsible for representing conceptual and perceptual information. In this section I will focus on the "grounded approach" (e.g., [27,28,30,37–40]), an ongoing empirical research program that was initiated after finding evidence that conceptual and perceptual representations shared some of their underlying neural mechanisms.

Recent fMRI studies have shown that conceptual processes elicit activity in brain regions responsible for representing features in modality-specific systems (see [28,30] for reviews). Continuing with the case of color, early studies showed that conceptual processes associated with color properties elicit activity in a region of the fusiform gyrus in ventral temporal cortex anterior to the region in the occipital cortex associated with perceiving colors. Early evidence of this effect was observed during a variety of conceptual tasks, including word production [41], color imagery generation [42], and color-word synaesthesias in response to heard words [43]. Later studies showed that activity in the color-selective cortex extended downstream from occipital cortex to the fusiform gyrus in ventral posterior temporal cortex during perceptual discrimination tasks [44]. Furthermore, that same region was also shown to be active when subjects retrieved information about object-associated colors during a verbal, property-verification task [45]. Importantly, this last study not only showed that regions active during perceptual and conceptual tasks regarding color were anatomically close, but rather that they partly overlapped.

Evidence from electrophysiological recording and stimulation studies also seems to indicate some degree of overlap between the neural mechanisms responsible for representing perceptual and conceptual information. Murphey, Yoshor & Beauchamp [46] identified a site in the fusiform gyrus that responded preferentially when viewing a particular blue-purple hue of color. The location of this region happens to correspond closely to a region active during previous studies on color information retrieval, as well as to the region active during [45] color perceiving and color information retrieving tasks.

According to the grounded conception of concepts, this and other results (see [47,48] for reviews) points toward what Anderson [29] and Barsalou [30] call the "neural reuse" of modality-specific brain resources during conceptual processes. According to these authors, "reusing a modality-specific

[4] For an argument in favor of conceptual cognitive penetrability over nonconceptual processes, see [36]. I thank an anonymous referee for pointing this possibility.

pathway during conceptual processing simulates the kind of processing that this pathway performs during perception, action, and/or internal states" [30] (p. 1130). Importantly, this reutilization of neural resources would not be a tangential aspect of how our conceptual systems store and retrieve conceptual information, but rather the main way in which such tasks are performed. Regarding this, Barsalou comments that:

> All of these approaches assume that the conceptual system is nonmodular. Rather than having separate systems for modality specific and conceptual processing, a common representational system is assumed to underlie both. According to this view, conceptual processing relies heavily on modality-specific simulations to represent categories. [40] (p. 250)

Or, as Martin [28] summarizes: "the grounded cognition position maintains that the neural substrate for conceptual, perceptual, and sensory processing are all part of a single, anatomically broad system supporting both perceiving and knowing about object-associated information" (p. 981). This could turn to be favorable for perceptual conceptualism insofar as it implies that "the same types of representations underlie perception and conception" [40] (p. 250).

It should be pointed that Barsalou [30,40] makes a considerable effort to explain that his position does not entail a reduction of the cognitive to the perceptual, and that while conceptual processes do partly reuse modality-specific pathways, the neural basis of concepts also seems to include specific neural hubs (especially when dealing with abstract features). So, "although perception and conception are similar in this framework, they are not identical". One of the key differences between conception and perception being that "whereas bottom-up mechanisms dominate the activation of modality-specific systems during perception, top-down mechanisms dominate during conception" [40] (p. 250).

At first glance, this could seem problematic for the conceptualist position. However, it is important to remember that, while conceptualism claims that both perceptual and higher cognitive states share a type of content, it does *not* claim that perceptual states are indistinguishable from higher cognitive states. As it was mentioned previously, McDowell [1] considers perceptual processes to be mostly "passive" in opposition to the more "active" nature of higher cognitive processes. Whereas in cognition the subject has a certain degree of control over what contents she entertains, in perception the subject is simply "saddled with content" [1] (p. 10). This is a picture that could fit rather well into Barsalou's bottom-up/top-down distinction.

Something similar could be said about the extent of the "neural reuse" claim. While authors like Anderson [29], Barsalou [30,40] and Martin [28] agree that the neural substrate for conceptual processing partly overlaps with that of perceptual processing, neither author considers them to be exactly identical. This should be hardly surprising, as concepts and percepts are not being equated, nor being reduced in one way or another. Barsalou [30] is very explicit about how "other mechanisms beside sensory-motor representations are essential for explaining concepts" (p. 1124, see also [38]), especially regarding abstraction, multimodal integration, and the performance of basic conceptual tasks such categorization, type-token binding, productivity, and concept composition (see [30,40]). In a similar vein, conceptualism does not claim that percepts and concepts are identical, but rather that they share the same type of content. This could be empirically interpreted as meaning that they share a same way of representing information.

Finally, it could be objected that while conceptualism focuses on the content of perceptual experience and higher cognitive states, the grounded approach focuses on the format of their representations instead[5]. In this regard, the grounded approach is a rejection of the idea that concepts are represented in an amodal format (e.g., [49,50]). Thus, it could be argued that the evidence in favor of the grounded approach only shows that perception and cognition share a representational

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[5] I would like to thank Sabrina Haimovici and Abel Wajnerman for raising this issue.

format, but not necessarily a same type of representational content. However, it should be pointed out that evidence in favor of the grounded approach usually stems from the performance of certain conceptual tasks that elicit activity in modality specific-pathways (e.g., [45]). These tasks are usually considered to depend on conceptual content (rather than exclusively on format) and seem to be carried out by the reuse of perceptual representations. Thus, grounded authors like Prinz [51] consider that, since these representations can be used to solve certain conceptual tasks in a "stand-alone manner", they possess crucial aspects of conceptual content such as reference, "cognitive" or "narrow" content, and compositionality.

In sum, despite the mentioned differences between concepts and percepts, the neural reuse hypothesis (and the grounded approach to concepts in general) claims that perceptual and conceptual information is represented using the same neural resources. Since representations in modality-specific pathways seem to be reused to perform content-based conceptual tasks, it seems adequate to consider that both perceptual and conceptual representations share a certain type of content[6]. Thus, it could be argued that the evidence supporting the grounded approach also brings support to the empirically understood conceptualism insofar as it is in line with its third prediction. That is, that the way perceptual information is represented in the brain is similar to the way that conceptual information is represented.

6. Conclusions

The main goal of this paper has been to show that perceptual conceptualism can be understood in an empirically meaningful way. In this regard, the position can be understood as the claim that perceptual and conceptual information are represented in a similar way in the brain, and that the mechanisms responsible for conceptual processes also play an important role during the early stages of perception. I have tried to show that understanding conceptualism in this way can be useful, insofar as it allows us to infer certain empirical predictions and search in the current scientific literature for confirmation or disconfirmation of them. Thus, recent experimental studies in color perception [20,21], conceptual influences on early perception [23,24], and the way conceptual and perceptual information is represented in the brain [27–30] all seem to show the kind of results that we should expect to find if conceptualism would happen to be true. While this evidence is far from decisive and these results cannot be considered as an "empirical proof" of conceptualism, they seem to show that this position can actually be empirically meaningful. In addition, these results also give empirical support to perceptual conceptualism.

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[6] It could be argued that the tokening of concepts in cognition also activates non-conceptual imagistic content, or that cognition and perception employ some form of "hybrid" representational format. However, in order for such nonconceptual representations to avoid being spurious, they should be able to play a relevant role in high-order conceptual processes (e.g., categorization). This would imply that such nonconceptual representations should have the same properties that allow conceptual representations to partake in conceptual processes. Which would, in turn, raise doubts about their putative nonconceptual status. In order to see further developments of this type of argument, see [52] and Haimovici's argument against Machery's offloading hypothesis (in this issue). I thank an anonymous reviewer for raising this issue.

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