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(UN)CONSCIOUS PERSPECTIVAL SHAPE AND ATTENTION GUIDANCE IN VISUAL SEARCH

A reply to Morales, Bax, and Firestone (2020)

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16.1   Introduction

Philosophers and perceptual psychologists have long pondered the spatial character of our perceptual experiences. According to dominant versions of 'perspectivalism,' an important aspect of our visual perceptual experience is perspectival and two-dimensional, reflecting the 2D patterns of sensation that hit the retina.[1] Thus, 'perspectivalists' hold that the 2D perspectival shape (p-shape) of a circular coin seen at an angle (i.e., the 2D ellipse projected by its outline) is presented[2] in visual perceptual experience. According to 'anti-perspectivalism,' by contrast, perceptual experience reflects only the conclusions that the perceptual system comes to about the 3D spatial arrangements of perceived objects. Thus, anti-perspectivalists hold that the p-shape is not presented in visual perceptual experience but, rather, is inferrable from it.

While perspectivalism is popular among philosophers and psychologists, several philosophers have argued against it (Briscoe 2008; Hopp 2013; Schwitzgebel 2006; Smith 2005). Neither side, however, has based their respective views on experimental findings (for discussion, see Schwenkler and Weksler 2019).

Against this backdrop, Morales et al. have presented (2020) and defended (2021; Morales 2021; Morales and Firestone 2023) a study which attempts to resolve the debate between perspectivalism and anti-perspectivalism experimentally. In their experiments, subjects were asked to find an elliptical coin seen face-on in a search task that included a distracting circular coin seen either face-on or at an angle (see Figure 16.1). They found that the presence of the rotated coin, with its similar elliptical p-shape, increased the average response time (RT) in finding the ellipse, when compared with the presence
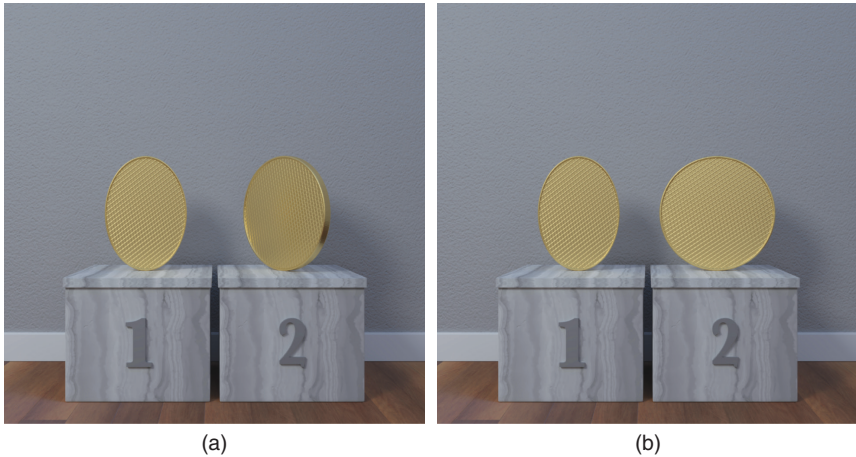
FIGURE 16.1   Stimuli from Morales et al.' (2020) Experiment 1. The task is to locate the elliptical coin (at location 1 in both). (a) An example of a critical trial. (b) An example of a non-critical trial.

of the face-on coin, with a circular p-shape. Thus, finding the elliptical coin was more difficult when the circular coin was seen at an angle than when it was seen face-on. To explain this effect, Morales et al. hypothesized that the elliptical p-shape is a 'shared aspect of the appearance' of an elliptical coin seen face-on and a circular coin seen at an angle. That is, their shared p-shape constitutes a phenomenal similarity[3] between the two objects. Therefore, they argue that p-shapes are presented in perceptual experience, so perspectivalism is true.

In a recent article, Morales and Firestone (2023, 2) explain their reasoning as follows:

> Consider that it is harder to find a red square among red triangles than to find a red square among blue triangles (as reflected in slower search times). The canonical explanation of this pattern is that, even though red squares and red triangles look very different in some respects, they also share some aspect of their appearance (namely, their colour). This shared aspect makes them harder to distinguish—especially under time pressure—than pairs of stimuli that do not share this or other aspects of their appearance (here, red squares and blue triangles). We reasoned that the same logic could hold here, if head-on ellipses and rotated circles look similar in a way that head-on ellipses and head-on circles do not.

We will call this sort of explanation 'the phenomenal similarity explanation.' This chapter presents an alternative explanation of the Morales et al. (2020)

results. We propose that the difference in RT observed in the study can also be explained by pre-attentive guidance by unconscious representations (in what follows, just 'unconscious, pre-attentive guidance'). To be clear, we will not claim that the Morales et al. results can *only* be explained in this way. Rather, we will show that this explanation is both possible and at least as plausible as the one from phenomenal similarity. An explanation from unconscious attentional guidance is consistent with anti-perspectivalism. Therefore, we argue that the results presented in Morales et al.'s study cannot support perspectivalism over anti-perspectivalism.[4] More broadly, our arguments weigh against what Morales and Firestone (2023) claim is a 'canonical' explanation pattern in perceptual psychology. We thus conclude that more caution is needed when inferring from search tasks to claims about perceptual experience.

The chapter proceeds as follows: Section 16.2 summarizes the perspectival shape debate and the role that experimental evidence could play in it. We then describe the Morales et al. (2020) experiments and their phenomenal similarity explanation. Section 16.3 presents our alternative explanation in terms of unconscious pre-attentive guidance. Section 16.4 compares the two explanations and argues that our alternative is at least as strong as the phenomenal similarity explanation.

16.2   The p-shapes debate and the phenomenal similarity explanation

The Morales et al. (2020) experiments contribute to a longstanding debate regarding the spatial character of perceptual experience. The British Empiricists argued that the direct objects of our perceptual experiences are the two-dimensional patterns of light which stimulate the retina. From these 2D representations, they claimed, we *infer*, rather than directly perceive, the existence of a 3D world. However, vision science has challenged this view by showing that three-dimensional shape, depth, and distance directly contribute to our visual representation of the environment. A plausible conclusion is that 2D retinal stimulation is transformed into 3D visual representations *before* conscious experience, such that the direct objects of our visual perceptions are purely three-dimensional. However, philosophers continue to debate whether some remnant of this 2D picture is, as Morales et al. (2020) put it, "retained" in perceptual experience or if these perspectival elements are replaced, without remainder, by 3D representations.

It is important to clarify the subtle debate over p-shapes by contrasting it with three related but undisputed facts about visual perception. Consider Figure 16.1 again. No one disputes that both coins in 16.1a fill similar regions of the distal scene (when each is viewed centrally) and that they generate similar patterns of stimulation on the retina, which are both elliptical. Thus, all parties agree that there is an important similarity in the *input* conditions

caused by the coins in 16.1a, and no one denies (at least not explicitly) that this similarity in input produces registrations of p-shapes *somewhere* in the visual system.[5] Finally, all agree that we can notice and report about p-shapes, which implies that representations of p-shapes are consciously accessible. But this does not entail that they are part of *conscious perception*. For example, the anti-perspectivalist Robert Briscoe (2008) has suggested that we can recreate a p-shape by *imagining* creating a 2D plane that perfectly occludes a target 3D object, and, based on this imagining, that we can notice p-shapes (Briscoe calls this superposition of a mental image over a perceived scene 'make perceive'). The difference between the perspectivalist and anti-perspectivalist, then, is not about the input conditions, not about whether there is a similarity between representations of the coins in 16.1a somewhere in the visual system, and not about whether representations of p-shapes are consciously accessible. The difference is that the perspectivalist asserts, while the anti-perspectivalist denies, that p-shapes are part of *perceptual experience*.

Accordingly, Morales et al. regularly remind us that their target is conscious perceptual experience. On all but one page of their 2020 article, they speak of our visual or conscious 'experience,' they say that a tilted coin "retain[s] an elliptical appearance" (Morales et al. 2020, 14873), that their findings are "inconsistent with introspective reports that a rotated circular coin 'looks… not elliptical at all'" (ibid, 14881). They also emphasize this issue in their most recent paper on the matter, claiming that their studies show that the tilted coin "looks elliptical," meaning it "share[s] [an] aspect of its appearance with an elliptical coin" (Morales and Firestone 2023, 1), and so on. In a recent discussion, Cheng et al. (2022, 2) similarly observes that Morales et al.'s experiments "are designed to address the traditional philosophical question we know of from British empiricism, which centered on the way things look."

It is against this background that we should consider the scientific import of the Morales et al. study. In a recent critique of the Morales et al. study, Burge and Burge (2022) seem to suggest that it is both obvious and broadly accepted by vision scientists that p-shapes are part of perceptual experience:

> [P]erceptual states often support two shape-awarenesses. A rotated distal circular shape appears circular in one sense, while it appears elliptical in another. The elliptical appearance corresponds to the elliptical retinal projection of the rotated circular shape. Few vision scientists would deny [this].
>
> (Ibid, 7)

And they further suggest that this fact has been established experimentally:

> … we are commonly aware of some elliptical shape corresponding to the projection cast by a rotated dinner plate. When people are asked to report

retinally projected shape, they are often biased, reporting compromises between retinal and distal shape (see data in Cohen and Jones 2008; Thouless 1931; 1932).

(Ibid, 8)

But we are unaware of any discussion in the vision scientific literature that clearly distinguishes between the possibilities discussed above. Thus, we should be hesitant to ascribe perspectivalism or its negation to individual vision scientists. Moreover, the examples that Burge and Burge (2020) cite do not establish that a rotated dinner plate looks elliptical. Instead, they show that, when asked to choose the projected shape of an object (such as a rotated dinner plate), out of several possibilities, participants choose more or less the correct shape, with a bias towards the 3D shape. But, as we've emphasized, both sides of the debate acknowledge our ability to make accurate (or slightly biased) reports regarding p-shapes. To reiterate, such reports may as easily derive from visual 'make-perceive' (Briscoe 2008), or some similar mechanism, as they could from visual experience itself.

Thus, Morales et al. propose the first direct empirical test of whether we perceive p-shapes.[6] They reason that "if rotated circular objects … truly exhibit a representational similarity to distally elliptical objects … then they should impair visual search for those objects… In other words, if a subject must locate a distally elliptical object, they should be 'distracted' by a rotated circle whose projection matches the shape of their target in ways that would cause response-time (RT) differences" (Morales et al. 2020, 14874). Thus, they conducted a series of experiments in which subjects were told to find an elliptical coin, seen face-on, from a search array that also included either a circular coin seen face-on or a circular coin seen at an angle (see Figure 16.1). They found that subjects were distracted by the presence of the rotated coin (vs. the presence of the face-on coin), increasing the average time it took to find the ellipse. They concluded that the tilted coin shares a 'perspectival similarity' with the elliptical target and thus that p-shapes are part of the phenomenal character of perceptual experience.

The offered explanation appeals to a *phenomenal similarity* between the perceptual experience of an elliptical coin and the perceptual experience of a rotated circular coin.[7] We will show that there is an alternative, equally viable explanation of the experimental results that does not require phenomenal similarity and thus is compatible with anti-perspectivalism.

16.3   The explanation from unconscious pre-attentive guidance

We propose a new explanation for the experimental results from pre-attentive attentional guidance by outlining a multi-stage model of attentional processing and highlighting the specific stages in which the two competing explanations

occur. We then demonstrate how the second of these stages, the 'guidance stage,' can explain the findings of Morales et al.'s study and provide evidence that pre-attentive attentional guidance can operate at an unconscious level. Through the integration of these various pieces of evidence, we present an explanation for the observed phenomena which is consistent with anti-perspectivalism (see Figure 16.2).

Our explanation is based on the widely accepted idea that attentional processing in visual search occurs in multiple stages. One model that captures this consensus is the four-stage model proposed by Eimer (2014). To illustrate, imagine trying to find the small, oblique, blue oval in Figure 16.2. In the 'preparation' stage, before search, an 'attentional template' is employed, which biases the visual system to respond more strongly to certain features, such as the colour blue. In the 'guidance' stage, at the initiation of search, these attentional templates are used to guide the selection of potential target candidates in the visual scene. For example, quickly scanning Figure 16.2, the visual system eliminates any red objects as potential targets. Importantly, this guidance stage operates in parallel. In the 'selection' stage, you proceed serially through the remaining candidates to find the target object. For each candidate, you then use your knowledge of the target's characteristics to identify it—this is the 'identification' stage.
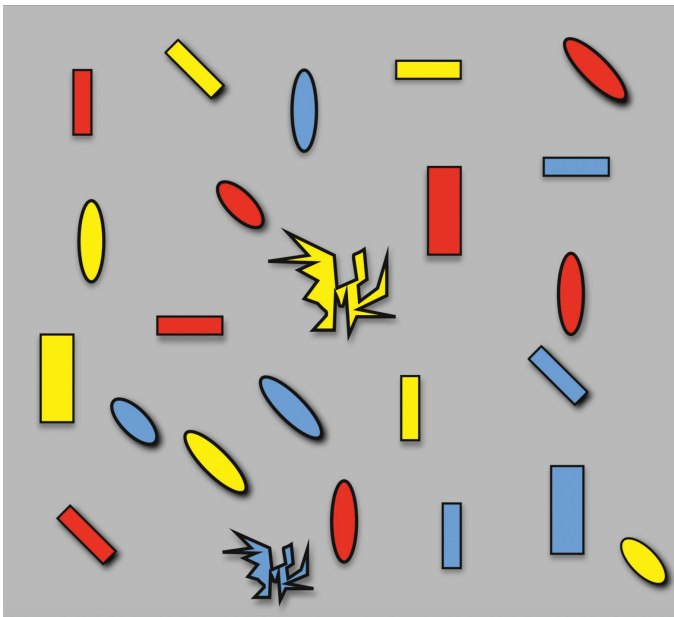

FIGURE 16.2   From Wolfe (2010). The task is to find the small, oblique, blue oval. Each of these pieces of information is deployed in parallel to rapidly reduce the search space.

The four-stage model allows us to articulate the difference between our explanation and Morales et al.'s. Whereas the latter posits an attentional effect during conscious, serial search (i.e., in the last two stages), we posit an effect in pre-attentive parallel guidance (i.e., the second stage), and argue that such guidance can occur unconsciously.

Pre-attentive attentional guidance is a heavily studied aspect of visual search. As Wolfe (1998, 33) notes, "all searches require the deployment of attention to the target and ... different tasks vary only in the degree to which they can use parallel processes to guide the deployment of attention." The idea that the guidance stage operates in parallel is reflected in the fact that search is more time efficient than would be expected of serial search (Wolfe 1998, 2014). Moreover, the benefits of pre-attentive guidance are observed in goal-driven searches (presumably due to the deployment of attentional templates in the first stage). Discussing Figure 16.3, Wolfe writes:

> [I]f you search for the letter T, then you will need to attend to each item until you stumble on the target. However, if you know that the T is green, then ... you will only (or, at least, preferentially) attend to the green items ... Your search for a letter will be guided by the orthogonal information about
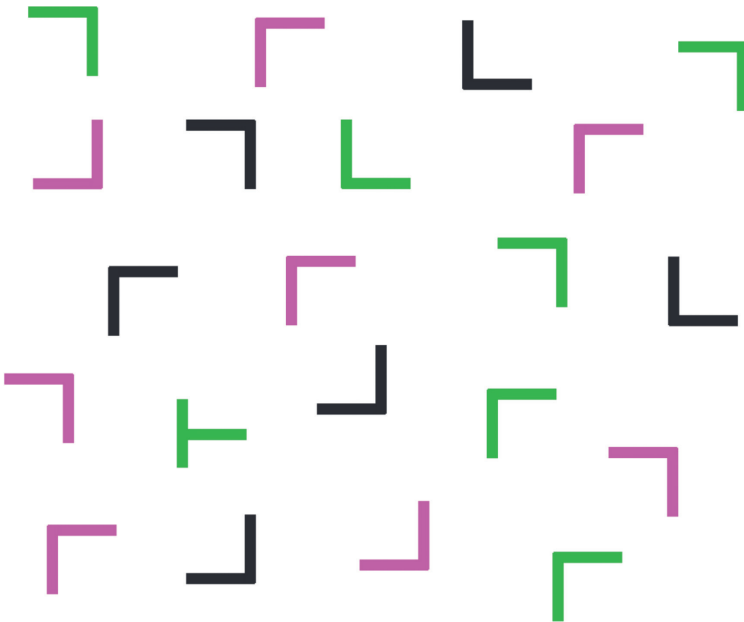

FIGURE 16.3   From Wolfe (2020). The task is to find the capital 'T.' This task is made much more efficient by the information that the target is green.

its colour. As a consequence, although there are 21 items in the display, the effective set size … will be 7, the number of green items.

(Wolfe 2020, 541–542)

How does pre-attentive guidance explain the difference in RTs observed in the Morales et al. (2020) experiments? The idea is that (1) p-shapes are employed in the guidance stage to screen potential targets; (2) in the critical trials, in which the circle is seen at an angle, but not the non-critical trials, in which the circle is seen face-on, both the target and distractor have the same p-shape, leading to their being chosen as potential targets; thus (3) subjects must process both target and distractor during selection and identification in the critical trials, but not in the non-critical trials, resulting in longer average search times in the critical trials.

Note that the above is merely a particularly simple account of how pre-attentive guidance could explain the results. For example, it assumes that the selection of candidate targets is binary, either selected or not selected. But similar reasoning applies even if we see the guidance stage as assigning a likelihood estimate to each object in the scene for being the target. So long as serial search proceeds approximately in order of estimated likelihood, the same general explanation would apply.

Our explanation assumes that p-shapes are employed in pre-attentive guidance. Why should we think that p-shapes are used in the guidance stage instead of, as the phenomenal similarity explanation holds, in the selection and identification stages? As this experiment is the first, to our knowledge, that directly tests the perceptual influence of p-shapes, we do not have independent evidence to confirm that p-shapes are employed in guidance instead of selection and identification. However, given that guidance occurs relatively early in visual processing, and that full-fledged 3D representations are thought to be relatively late in visual processing, our view is the more conservative one. Therefore, since the explanation from pre-attentive guidance better aligns with current thinking about the transformation of 2D to 3D representations in visual processing, it plausibly enjoys a higher prior probability than the phenomenal similarity explanation. See section 16.4.1 for further discussion.

Our explanation holds that elliptical p-shapes, but not circular p-shapes, are employed to filter potential targets in the guidance stage. Why think this? As previously noted, there is evidence that an individual's top-down goals influence guidance. Given that the subject's goal in the experiment is to find a 3D ellipse and that 3D ellipses have 2D elliptical p-shapes, it is plausible that if guidance operates over p-shapes, subjects in the Morales et al. experiments will be guided towards 2D elliptical, but not 2D circular, objects. Additionally, there is evidence that our top-down goals influence processing as early as the lateral geniculate nucleus (LGN), which is an early waypoint in visual processing (O'Connor et al. 2002; Alitto and Usrey 2008). The LGN

is early enough in visual processing to have remnants of 2D representational structure while also being a likely location for pre-attentive guidance to take place (Eimer 2014). Thus, if the top-down goal of finding the 3D ellipse influences the guidance stage, it is plausible that it does so by selecting objects with 2D elliptical p-shapes.

Having shown that attentional guidance can explain the Morales et al. results, we now show that it can operate unconsciously. Putting these claims together, we will have demonstrated that Morales et al.'s results can be explained by unconscious perceptual representations, and thus are consistent with anti-perspectivalism.

One popular framework for studying unconscious perception is backward-masking. It has been shown that when two stimuli are presented in quick succession, the latter stimulus can (under certain conditions) effectively 'mask' the former from being consciously perceived (Breitmeyer, 1984). Nonetheless, it is widely reported that backward-masked cues can capture attention, causing RT differences on subsequent search tasks (e.g., Ansorge and Neumann 2005; Ansorge et al. 2009; Ansorge et al. 2011; Woodman and Luck 2003). For example, Ansorge and Neumann (2005) presented subjects with a prime consisting of two empty rectangles, with one flanked by filled rectangles (see Figure 16.4). After a brief inter-stimulus interval, the cue was replaced by a search task which effectively masked the prime, making it unconscious. In the search task, subjects were asked to report the location of a square flanked by lines (the prime consisting of an empty rectangle flanked by filled rectangles resembles the target of the task, namely an empty square flanked by lines). In Experiment 1, replicating results of Neumann and Klotz (1994), the
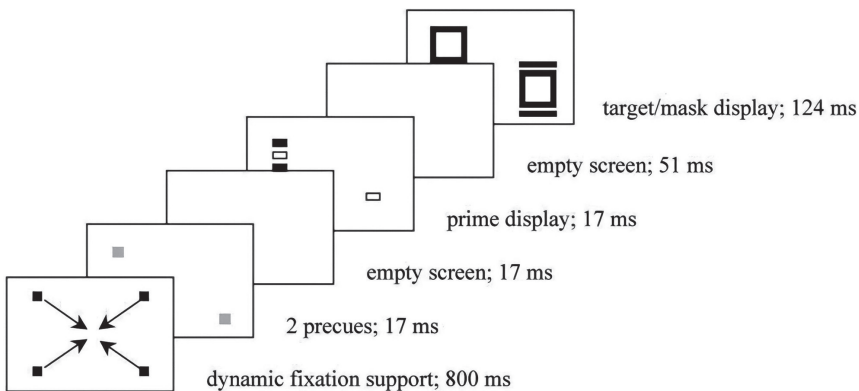

target/mask display; 124 ms

empty screen; 51 ms

prime display; 17 ms

empty screen; 17 ms

2 precues; 17 ms

dynamic fixation support; 800 ms

FIGURE 16.4 From Ansorge and Neumann (2005). The design of Experiment 1. The prime display (the fourth panel) is effectively masked by the search display (the sixth panel). The search task is to find the square flanked by lines.

masked-prime influenced RTs on the search task, facilitating search when the prime and target were in the same location and inhibiting search when they were in different locations. Thus, while not consciously perceived, masked-cues can explain RT differences in search tasks.

Importantly for our purposes, Ansorge and Newman found (in their Experiments 2 and 3) that when the instructions were changed in a way that made the prime irrelevant to the task, the priming effect disappeared. This establishes that the priming effect is dependent on the subject's top-down search goals. Thus, their experiments directly confirm that unconsciously perceived cues can influence RTs on a search task in a goal-contingent way. Lamy et al. (2015) and Travis et al. (2019) reported similar results in a continuous flash suppression paradigm.

Thus, unconscious representations can guide attention in a goal-contingent way. Since the Morales et al. results can be explained by goal-contingent attention guidance, it follows that this guidance can be performed by unconscious representations. Therefore, an explanation of the results does not rely on the claim that p-shapes are consciously perceived. Thus, the results do not support perspectivalism over anti-perspectivalism.

We will conclude this section by noting an additional, independent kind of evidence against the inference that Morales et al. employ in favour of perspectivalism. They claim that, because it is harder to identify the target in the critical trials, 3D circles seen at an angle must bear some *phenomenal similarity* with 3D ellipses seen face-on. That phenomenal similarity would apparently have to involve their p-shape. As quoted in the introduction, Morales and Firestone (2023, 2) explicitly draw an analogy with the case of colour similarity:

> Consider that it is harder to find a red square among red triangles than to find a red square among blue triangles (as reflected in slower search times). The canonical explanation of this pattern is that, even though red squares and red triangles look very different in some respects, they also share some aspect of their appearance (namely, their color).

This analogy is particularly fitting for the inference that we would like to challenge, as there is evidence from research into colour perception that performance in a search task is only loosely related to phenomenal similarity. Lindsey et al. (2010) asked subjects to search for a desaturated (e.g., light purple) target in an array that also included both white and saturated (e.g., purple) distractors (see Figure 16.5). They found that subjects were much faster at finding a light red target among red and white distractors than with any other colour combination, despite all desaturated colours being rated as equally phenomenally similar to their saturated counterparts. The authors suggest that "guidance of visual search for desaturated colours is based on

FIGURE 16.5 Two examples of a search array from Lindsey et al. (2010). The task is to find the desaturated coloured item.

a combination of low-level color-opponent signals that is different from the combinations that produce perceived color" (Lindsey et al. 2010, 1208).

One might assume that the difficulty of a search task is directly proportional to the phenomenal similarity between the target and distractors, holding other factors such as the size of the array constant. But the Lindsay et al. study directly refutes this assumption. Despite the fact that, for example, desaturated green is as phenomenally similar to green as desaturated red is to red, it is significantly easier to locate desaturated red in an array of red distractors than it is to locate desaturated green in an array of green distractors. The authors' explanation of this effect, similar to our own, is that task performance is instead influenced at the guidance stage, early on in visual processing.

This finding thus highlights an issue with which we began this chapter. Morales and Firestone (2020) claim that a 'canonical' explanation pattern in perceptual psychology attributes difficulty in search to a similarity in appearance. But there are factors other than phenomenal similarity which can impact search performance. Thus, where Morales and Firestone ask us to accept their inference based on its adherence to a typical explanation pattern, we suggest that we re-evaluate this explanation pattern partly due to its reliance on this problematic inference.

16.4   Comparing the explanations

In the previous section, we established that unconscious pre-attentive guidance can explain the Morales et al. results. In this section, we evaluate and reject three arguments that phenomenal similarity nonetheless offers a *better* explanation.

16.4.1 Parsimony

One might argue that Morales et al. results suggest that perspectivalism is more parsimonious than anti-perspectivalism. That is, while anti-perspectivalism must posit both unconscious (perceptual or pre-perceptual) p-shape representations to explain the Morales et al. results and post-perceptual, conscious p-shape representations to explain our ability to report p-shapes, perspectivalism requires only p-shapes in conscious perceptual experience.

However, this criticism is misleading, as the explanation from pre-attentive guidance only requires the existence of p-shape registrations relatively early in visual processing, which both sides acknowledge. By contrast, the phenomenal similarity explanation requires either that these early registrations are themselves phenomenally conscious (which would be very controversial) or that there are, in addition, phenomenally conscious p-shape representations further along in perceptual processing. Morales et al. appear to hold the latter view in claiming that p-shapes are 'retained' in conscious experience.

Thus, assuming that the latter view is the preferred option for the perspectivalist, it seems that perspectivalism and anti-perspectivalism are on par in positing conscious p-shape representations beyond those of the early visual system. Further, there's nothing *in principle* more parsimonious about positing those representations in vision as opposed to, for example, in post-perceptual imagination. Thus, neither account of the Morales et al. results is more parsimonious than the other.

16.4.2 Long duration of exposure

Pre-attentive guidance is quick, occurs early in visual processing, and the representations over which it operates (including, on our interpretation, representations of the relevant p-shapes) are likely short-lived. Therefore, we must consider Morales et al.'s Experiment 6, whose stated aim is to rule out the influence of such short-lived representations. Reflecting on Experiments 1–5, they write that

> one possibility is that perspectival shapes have an influence only on the very earliest stages of visual processing, and only for a very short time. In other words, it might be that the rotated circular coin looks like an ellipse only very briefly, and that this very brief elliptical appearance slows behavioral responses only when those responses are themselves issued very rapidly.
>
> (Morales et al. 2020, 14877)

To address this concern, they required subjects to view the coins for a full second before revealing the numbers (1 or 2) corresponding to each coin and allowing them to issue a response. They point out that:

One second is, even by the most conservative estimates, far more than enough time to form a full-fledged 3D representation of an object. So, requiring at least this much time to pass ensured that subjects' visual systems would have fully processed the coins' 3D shapes before they could even begin preparing their responses—which, in turn ensured that whichever response they did end up giving would reflect a representation of shape that was "complete."

<div align="right">(Ibid., 14877)</div>

Despite this, they found very similar results to those in the original experiment.

We'll admit we're unsure what to make of this experiment. One second is indeed sufficient time to generate a complete representation of the scene. But it is also enough time for that representation to enter visual working memory, and for anti-perspectivalist explanations, such as Briscoe's (2008) 'make-perceive,' to operate. The motivation for the original experiments, we thought, was to rule out such explanations.

The results are also surprising because RTs in the original experiments were substantially less than 1s (around 500–550ms) with very high accuracy (97% across conditions). Given this, one would expect subjects to identify the target, just as they did in the original experiments, in about 500ms and then simply wait to determine which number corresponded to this target. But Morales et al. continued to find a significant RT difference between critical and non-critical trials even after 1s of delay. To explain these results, Morales et al. suggest that either subjects are re-evaluating the scene (which, they suggest, could be determined by tracking further eye movements) or there is some kind of continued interference by the p-shape, in a way similar to the Stroop effect or Garner interference (Morales et al. 2020, 14877).

We don't see how either interpretation supports an explanation from phenomenal similarity over its rival. If subjects re-evaluate the scene, such that we observe new eye movements toward it, then any low-level effect, including pre-attentive guidance, can be reinitiated. If there is a continued interference by p-shapes, then either pre-attentive guidance is continually reinitiated (after all, the stimulus is still there, and the subjects are still looking at it), or guidance representations may persist throughout this interval. Just because something occurs early in the visual system does not mean it cannot continue to have effects over a longer duration.

More fundamentally, interpreting this study as ruling out an effect early in the visual system commits a common mistake when thinking about vision. You might think that what the visual system does is take a snapshot of the perceptible scene, process that snapshot, and then employ the resulting conscious representation until such a time as the representation must change. If this were the case, then any influence of the early visual system would indeed be short-lived. But this is not how the visual system works. It generates and updates representations dynamically, constantly reassessing its inputs. Even if

representations in the early visual system are short-lived, they may continue to have an influence as long as the stimulus that generates them persists. In the present case, since the subjects continued to look at both the target and distractor over the 1s interval, any influence of low-level p-shapes on search behaviour must persist over that interval. We thus fail to see how this experiment can control for such effects.

16.4.3 Effect size

In correspondence on *The Brains Blog*, Morales has suggested that the robust and "anything but subtle" effect (around 70ms difference in average RT between critical and non-critical trials) in his experiments cannot be explained by an unconscious effect like pre-attentive guidance (Morales 2021). However, effect sizes in backward-masked attention capture experiments vary depending on the inter-stimulus interval (ISI) between cue and target. For example, Ansorge and Neumann (2005) reported similar effects to Morales (around 70ms difference in RT between congruent and incongruent trials), while Webb et al. (2016) found varying effect sizes depending on the ISI, ranging from 5 to 75ms differences between congruent and incongruent trials.

In the Morales et al. experiment, p-shapes were present throughout the trial, together with the target, and were not masked by any other stimulus. Therefore, we cannot directly compare these results with studies that include masking followed by an ISI. What we *can* conclude, however, is that unconscious pre-attentive guidance is *capable* of producing the effect size observed in the Morales et al. experiments. We thus see no argument that the effect size is too large for such an explanation.

16.5 Conclusion

We have argued that pre-attentive guidance by unconscious representations explains the Morales et al. (2020) results at least as well as the phenomenal similarity explanation. Thus, since the former is consistent with anti-perspectivalism, the experiments fail to support perspectivalism. More generally, unconscious, pre-attentive guidance can, at least in principle, explain any RT difference on search tasks. Thus, such experiments cannot directly inform on the character of conscious perceptual experience. More caution is needed when reasoning from such experiments to claims about perceptual experience.

Authors' note

The authors contributed equally to this work.

Acknowledgements

Notes

1   Some defenders of perspectivalism, such as Green and Schellenberg (2017), claim that perceptual experience is perspectival, but not two-dimensional. However, our aim in this chapter is merely to address Morales et al.'s argument for the more dominant position that 2D p-shapes are presented in experience. We thus set such views aside.

2   Lande (2018), who is a perspectivalist, holds that perspectival shape is not *presented* in perceptual experience but instead is a matter of the *structure* of perceptual experience. We will ignore this complication as it matters neither for the Morales et al. experiment nor to our argument.

3   The term 'phenomenal similarity' is our own. Morales et al. use the term 'representational similarity,' which, at face value, is weaker. But, as we explain in Section 16.2, it's clear that they have the stronger notion in mind.

4   For the purposes of our argument, we grant what other critics have denied: that Morales et al. establish that p-shapes are represented in the visual system (beyond the retina). And we grant that this conclusion has not been established before. But we deny that, on its own, this finding has any bearing on the perspectivalism/anti-perspectivalism debate, as both sides can happily acknowledge this. What matters for the debate is whether p-shapes are part of conscious perceptual experience, and we deny that Morales et al. establish this stronger conclusion. In personal communication, Firestone has argued that their results add an 'arrow [to the] perspectivalist's quiver,' since they establish that p-shapes are employed (at least) in pre-attentive guidance, a stronger claim than the claim that p-shapes are represented somewhere in the visual system (beyond the retina). But while we grant that Morales et al.'s results are successful in establishing this claim (and plausibly uniquely so), we doubt that any anti-perspectivalist is charitably interpreted as denying it. In short, we do not think these results shift the landscape of reasonably held positions in the debate, nor our credences in either position. Having said that, we think that it might be possible to build on the Morales et al. results in order to obtain new evidence that would significantly impact the perspectivalism/anti-perspectivalism debate. For example, if it is found experimentally, against what we suggest here, that subliminally presented coins at an angle do not have a distraction effect similar to the one Morales et al. found (unlike some other kinds of subliminally presented stimuli), this plausibly should raise our credence in perspectivalism.

5 To be clear, this issue is rarely discussed by anti-perspectivalists at all, as their concern is about the nature of conscious experience. See endnote 6 for relevant discussion.

6 Earlier, Schwenkler and Weksler (2019) developed a different, and more complex empirical test, but without running it. It involved measuring interference between reporting on p-shapes and a working memory task that is carried out at the same time (for discussion see Cheng 2022). Before that, Kelly (2008) presented preliminary results of a study showing that tilted coins do not prime judgments about 2D ellipses. Schwenkler and Weksler (2019) argue that (*pace* Kelly) these results do not support anti-perspectivalism.

7 To reiterate our point in endnote 5, the term 'phenomenal similarity' is ours, but clearly reflects Morales et al.'s writing.

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