The Case for Zombie Agency

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Abstract: In response to Mole 2009, I present an argument for zombie action. The crucial question is not whether we are zombie agents but to what extent. I argue that current evidence supports only minimal zombie agency.

Recent empirical work suggests that unconscious vision guides and controls much of our bodily actions. We are accordingly zombie agents (Koch and Crick 2001). While many have been willing to accept this zombie picture as part of accepting David Milner and Melvyn Goodale's (1995) influential account of the human visual system, Christopher Mole (2009) has trenchantly argued against it by questioning a common interpretation of the empirical evidence. Here I respond to Mole's case. I argue that we must separate two issues: (1) whether Milner and Goodale's functional account of human vision is correct and (2) whether there are zombie actions. While I agree with Mole that the empirical case for Milner and Goodale's account is more contentious than philosophers acknowledge, I argue that a case can be made for zombie agency.

The empirical evidence at issue is *dissociation* evidence showing that a subject deploys information *p* to control behavior, yet when queried explicitly in some way whether *p,* the subject denies it or assents to incompatible information. Goodale and Milner (1995) draw on this and other evidence to argue for a specific hypothesis about the function of the two anatomically separate cortical visual streams in humans: the dorsal stream directly guides action, the ventral stream generates conscious vision.[1] The

[1] Milner and Goodale (2008) allow for some unconscious vision in the ventral stream.

crucial point for our purposes is not the anatomy but the division of visual function between distinct systems.

Dissociation evidence has also been used to argue for the existence of zombie action, but what is this zombie picture? Any zombie action thesis implies that there are unconscious subject-level visual states that control behavior. Andy Clark (2001) has contrasted zombie action with what he calls the assumption of experienced based control (EBC):

> Conscious visual experience presents the world to the subject in a richly textured way, a way that presents fine detail…[and] is, in virtue of this richness, especially apt for, and typically utilized in, the control and guidance of fine-tuned, real-world activity (2001, 496).

Clark (2007) also later targeted what Wallhagen (2007) termed *EBC(gen):* conscious visual experiences typically control and guide gross aspects of action (e.g. general direction).[2] But is there any evidence for some level of zombie action in real-world, mundane activity?

Let us state the minimal zombie action thesis for relevant subject level visual representational states and mundane actions:

> *The Minimal Thesis:* Some visual representations that directly control and guide mundane bodily actions are unconscious.

[2] In terms of the two streams, the question is whether the ventral stream directly informs action. Clark informs me that he now allows for more direct influence in action by the ventral stream, as advocated by Schenk and MacIntosh (2010).

The emphasis on mundane actions is to leave open cases such as sleepwalking as possible instances of zombie action. What is more difficult to establish, as Mole can be taken to argue, is the Minimal Thesis for mundane behavior such as visually guided grasping of objects. A stronger form of zombie action is this:

> *The Strong Thesis:* Most of the visual representations that directly control and guide mundane bodily actions are unconscious.

Finally, consider:

> *The Total (Zombie Action) Thesis*: All mental representations that control and guide mundane bodily actions are unconscious.

Philosophical zombies, creatures devoid of consciousness, are agents per the Total Thesis. The empirical evidence suggests we are closer to philosophical zombies than we might think.

What is the relation between the zombie theses and claims about the function of the two visual streams? Mole's discussion begins with a claim of Goodale and Milner's: 'the visual system that gives us our visual experience of the world is not the same system that guides our movements in the world' (Goodale and Milner 2004, p. 3). Milner and Goodale thus deny what we can call:

> *The Same System Thesis*: the visual system that gives us our visual experience of the world is the same system that guides our movements in the world.

There is, however, a reading of the Same System Thesis that makes it trivially true, namely that the visual system as a whole yields visual experience and visual guidance. The claim they deny is better stated as the *Same Representation Thesis*: the type of visual representation that serves thought and awareness also serves to directly control action (Milner and Goodale 2008, p. 775). However, as Mole follows Milner and Goodale on the Same System Thesis, I do so here as well.

Mole holds that the zombie picture follows from the denial of the Same System Thesis (2009, p. 1002). He then comments on two claims:

> The claim we want to make in denying the zombie-action picture is not that the system that gives us our conscious experience must make a causal contribution to the guidance of movement. The claim we want to make is that movement control and conscious experience are the work of one and the same system (p. 1002).

The first claim concerns the causal role of consciousness in action; the second is the Same System Thesis. Mole affirms the latter against zombie action, but this is puzzling. A zombie action thesis affirms some form of epiphenomenalism regarding consciousness, so it is precisely a version of the first claim Mole mentions that is needed to contradict the zombie picture. Indeed, we cannot deny the zombie action picture by affirming the Same System Thesis because that thesis is compatible with the Strong and Minimal theses. For example, if phenomenal properties were epiphenomenal, consciousness would be inefficacious with respect to agency even if it were to result from the same visual system that guides action.

Mole assumes that zombie action theorists will argue for their account on the basis of the falsity of the Same System Thesis, but this route is problematic. While the falsity of the Same System Thesis plausibly entails the Minimal Thesis, it does not entail the Strong Thesis because it leaves open the possibility that the two systems in question causally interact and thus that conscious representations might significantly influence action. Indeed, given anatomical connections between the dorsal and ventral streams (Merigan and Maunsell 1993), there is likely informational exchange between them. Moreover, recent work suggests that the ventral stream does have *direct* influence on action (Schenk and MacIntosh 2010). For our purposes, the critical issue is this: given that the denial of the Same System Thesis entails only the Minimal Thesis, zombie action theorists need a different route to any stronger thesis. There are good reasons, then, to extract the issue of zombie agency from the issue of visual stream function.

Does empirical work support either the Strong or Minimal Thesis? One strategy to establish the Strong Thesis is to generalize from cases supporting the Minimal Thesis. Mole argues against two such cases: the Ebbinghaus Illusion and the visual agnosic patient, D.F. On the former, Mole directs his criticisms at Aglioti et al. (1995) and Haffenden and Goodale (1998) whose work initiated a cascade of studies on action under illusion suggesting that while conscious vision succumbs to illusion, vision in action resists illusion. I do not think Mole 2009 presented the best argument for the Minimal Thesis, so I will provide a better argument derived from the Ebbinghaus study of Haffenden and Goodale 1998. There are caveats worth discussing regarding the experiment, but I set these issues aside.[3] As readers of Mole 2009 will be familiar with this case, it will facilitate extracting an argument that can be generalized to other dissociation cases. The crucial point is that careful attention to the experimental details matters for constructing an adequate argument.

Haffenden and Goodale presented subjects with a version of the Ebbinghaus Illusion similar to that depicted in Figure 1 where the central disks were equal in size and could be grasped. Under illusion, the disks look different in size: the disk that looks smaller is surrounded by the large annulus; the disk that looks larger is surrounded by the small annulus.

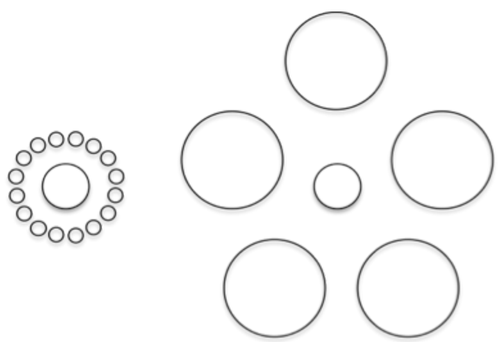

Figure 1: The Ebbinghaus Illusion with equally sized central disks that appear different in size.

Subjects were tasked with grabbing one of the central disks with thumb and index finger. At a certain point during reaching for the disk (consistently about 70% of the distance to the target), the distance between thumb and index finger assumes its maximum width, the *maximum grip aperture*. In general, the magnitude of the maximum grip aperture during

[3] For systematic criticisms, see Smeets and Brenner (2006) and Franz and Gegenfurtner (2008). For recent illusion studies, see Stöttinger et al. 2010 and Ganel et al. 2008 on the Ponzo illusion. It has also been shown that the motor system adjusts for changes in target position even if the subject denies any such changes (Prablanc and Martin 1992). The form of argument presented below can be adapted for these cases.

reach is linearly related to the size of the reach target (Jeannerod 1984) and is taken to reflect the content of the action-guiding visual representation of target size.[4]

Subjects were asked to perform two tasks. In *Task 1*, subjects reached for and grasped a central disk with thumb and index finger, and the maximum grip aperture was measured. In *Task 2*, subjects used thumb and index finger first to give a manual estimate (a *report*) of the diameter of the target disk before reaching to grab it. In this second task, the size of the manual estimate was measured. The assumption is that maximum grip aperture in Task 1 reflects vision in action; manual report in Task 2 reflects conscious vision.

Three further features in both tasks will be relevant to my discussion. First, all tasks were completed in the dark (so-called *open loop conditions*). Prior to executing either task, subjects held a button that kept the lights on. On releasing the button to reach for the target or to estimate its size, the lights would go off. Movements were completed in the dark without further visual information. Thus, the visual representations that guide reach in Task 1 and report in Task 2 can only be based on what is visible prior to the lights going off. Second, data was analyzed only from *trials* (instances of each task) where subjects experienced the illusion, namely where the central disks looked different in size. Third, the presentation of the disks was counterbalanced: in half the trials, the disk that looked smaller would be the reach target, in the other half, the disk that looked larger would be.

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[4] Haffenden et al. (2001) later concluded that in certain configurations of the central disk target and the surrounding annulus, the annulus is seen as an obstacle and influences maximum grip aperture. In these cases, maximum grip aperture is not a function of just target size. In the experiment to be described, maximum grip aperture is constant between the two different annuli (see Figure 2A).

When maximum grip aperture was measured during Task 1, there was no statistically significant difference between reaching for a disk that appeared smaller in size and reaching for a disk that appeared larger in size (Figure 2A). However, manual reports of the apparent size of the disks, scaled with the illusion. The estimates were larger when the disks looked larger, smaller when the disks looked smaller. The observed difference in report was statistically significant (Figure 2B).

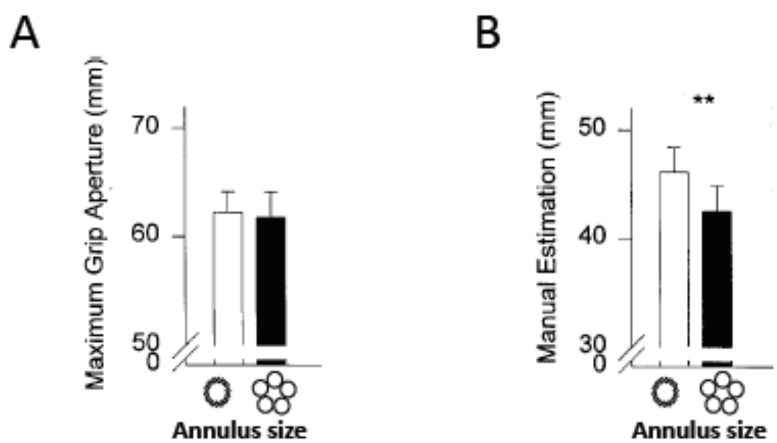

Figure 2: (A) Measurements of maximum grip aperture during reach reveal no statistically significant difference between reaching for disks surrounded by a small annulus which look larger (white bar) and reaching for disks surrounded by a large annulus which look smaller (black bar). (B) Measurements of manual estimates reveal a statistically significant difference between manual reports in the two conditions ($p < 0.05$) suggesting susceptibility to apparent rather than actual size of the central disks. Adapted from Haffenden and Goodale (1998, p. 128; with permission of MIT Press).

To argue for the Minimal Thesis, I must establish that the visual representation guiding reach and the visual representation guiding manual report each represented the target disk as a *different* size. The first premiss in my argument for the Minimal Thesis is that the visual representations guiding reach represented the target disk as some constant size x in every trial. The basis for this claim is that maximum grip aperture was not significantly different across trials in Task 1 regardless of whether subjects grasped the central disk surrounded by the small annulus or that surrounded by the large annulus (Figure 2A). The argument does not require that these visual representations of target size were accurate but only the weaker claim that they were constant in the size they represented the disk to have.

Now the second premiss: in some of the trials, it is plausible that the subject's conscious visual states, those guiding manual report, represented the target disk as size y where y≠x. That is, the conscious visual state probed in Task 2 represented the disk as of a different size than the size represented by the action guiding visual representation in Task 1. Why think this? Assume otherwise for *reductio*: in every case, the target disk was always consciously seen as size x. Thus, the conscious visual state responsible for manual report and the visual state responsible for guiding reach both represented the target disks as the *same* size, namely x.

But recall the experimental design: in half the cases, the disk that looked smaller was the target, in the other half, the disk that looked larger was. Our current assumption is that in every trial, the conscious visual representations of the target disks that guide report represented those disks as constant size x. But if this were so, we should observe constant grip size in Task 2 where the subject manually reports the apparent size of the disk before completing the reach. Yet the estimates of disk size in manual reports were sensitive to illusion (Figure 2B): estimates were larger when the disk appeared larger and smaller when the disk appeared smaller. Therefore, the conscious representations of the target disk size were not in every case as x. Some represented the disk size as y where y≠x.

I have argued that at the time of initiating the reach, the representations controlling reach represented the disk as size x and that in some cases, the representations underlying conscious vision represented the disk as size y where y≠x. Here then is an argument for the Minimal Thesis focusing on the time of initiating the reach, *t,* when the subject also experiences the illusion:

1. At *t,* the visual representation controlling reach represents the disk as size x.
2. At *t*, the conscious visual representation controlling report represents the disk as size y where y≠x.
3. Assume for *reductio* that the representation in (1) is conscious.
4. So at *t,* there is a conscious visual representation of the disk as size x and one representing the same disk as size y.
5. So, there is a conscious visual representation of the disk as size x and size y.
6. If the subject visually consciously represents *o* as F and G, then *o* looks F and G.
7. So, the disk looks both size x and y (y≠x).
8. But the disk does not look that way.
9. So, the visual representation guiding reach in this task is not conscious.

One might object that Tasks 1 and 2, the bases of premisses 1 and 2, are done at different times (this is Mole's temporal indexing objection, Mole 2009, section 1.2). That is correct, but the question is whether we are warranted to attribute to the subject the two representations at the time in question. A challenge in empirical psychology is to design experiments such that comparison across temporally distinct tasks is valid, and this is achieved by keeping as many of the experimental conditions constant as possible. In Tasks 1 and 2, viewing conditions were the same, the same displays were deployed, and reach and grasp of target disks were completed in the dark. At the time of initiating movement in both tasks, it is plausible that subjects attended to the size of the target disk, either to extract information for reach or report. Finally, the trials analyzed were those where the subject was experiencing the illusion, presumably involving representations probed in Task 2. I suggest that there is *prima facie* support for the temporal index in premisses 1 and 2.[5] As the first two premisses can be adapted to other dissociation cases, careful attention to the empirical details is needed in adapting the argument.

Some might question the inference to (5), but many philosophers hold that if there are two conscious visual representations at a time and the subject is psychologically normal, then there is an overarching phenomenal state that unifies the contents of the two conscious representations. Such states are *phenomenally* unified (Bayne and Chalmers 2003).

One might object that both sizes of the disk are represented in conscious vision, but we fail to notice one of the sizes and so fail to notice the contradictory content. Yet, where it is claimed that *p* is consciously represented but not noticed, it should be possible under specific conditions of attention to notice the relevant content. Consider a case where some argue that we can deploy attention so as to bring out contradictory content, as in the following Müller-Lyer figure:

[5] A better approach might have been to measure both manual estimates and maximum grip aperture *in the same task,* say Task 2.

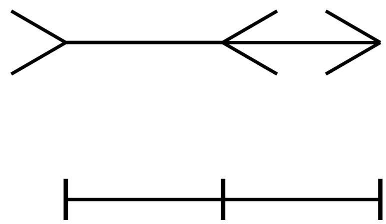

Figure 3. Modified Müller-Lyer figure with cue (distance bars). Courtesy of Jeroen Smeets

If I attend to the totality of the figure in the right way, perhaps I can both see the difference and the sameness of the segments of the top line simultaneously. But I experience contradictory content only due to the presence of the additional cue.[6] There is no such cue in the Ebbinghaus Illusion. Perhaps by withdrawing attention from the annuli, I can see the two internal disks veridically as the same and also, again by deploying attention appropriately, see them illusorily as different but not at the same time. Careful attention does not reveal contradictory content.

Mole will reply that we don't notice uncanny contradictory content because the different sizes are presented under different modes of presentation. To be plausible, the objection must specify what these modes are, and Mole appeals to 'embodied demonstratives' of the disk size, demonstratives available on the basis of making a gesture where shaping one's hand to grasp a disk gives one access to *this* (gestured) width. This is an important insight, but the response is not available in the Haffenden and Goodale experiment given the open loop condition (the lights go out when the reach is initiated). The relevant visual representations have to be in place prior to moving one's hand, and *fortiori* prior to shaping them so as to provide the embodied demonstrative.

[6] A referee suggests that the bisected line allows us to see that each end arrow is equidistant from the central fin but this is different from seeing the two lines as the same length. There is then no *explicit* contradiction.

Hence, Mole's embodied demonstratives come too late in the process to explain the absence of noticeably uncanny content in vision. Accordingly, it is plausible to affirm (8). (6) can be adjusted as necessary to include a condition for attention.

My goal has been to identify the best form of argument for the Minimal Thesis that has wide application. For example, it can be applied to work with the patient D.F. D.F. suffers from visual form agnosia (she cannot experience form), yet shapes her hand to the actual dimensions of simple objects in grasping (for example, a square block). A striking feature of her experience, which is difficult to describe, is that she visually experiences the texture and colour of objects yet cannot experience their form or size. Accordingly, her reports of size are at chance (Goodale et al. 1991). How to characterize this gap in what she sees is difficult, but we might try the following: D.F. visually experiences objects as textured and coloured but also as lacking determinate form or size. Consequently, she can only guess as to the latter.

Adapting the first two premisses above, it is plausible that as she acts, (1) D.F. is in a visual state that controls her grasp and represents the width of the block as x but (2) D.F. is in a conscious visual state that represents the block as having texture and colour but as lacking a determinate width. Incorporating this to the argument above, it follows that if the representation in (1) is conscious (for *reductio*), then the object should look to D.F. to have a determinate width (x) but also as not having one. But the object, I presume, does not look that way to her. This supports the truth of the Minimal Thesis in D.F.'s grasping of simple shapes.

Mole, however, would dispute this. He emphasizes that D.F. can consciously experience fine-grained spatial content via embodied demonstratives. For example, D.F.

can experience precise spatial properties by using her body in the context of pantomiming a bodily action. Indeed, I have been told that this is an increasing problem in devising experiments with D.F. as she uses such resources. Such experience, however, is likely tactile, proprioceptive, or motor but not visual. To challenge the argument for the Minimal Thesis, Mole must establish that (a) the relevant embodied experience controls D.F.'s behavior. Moreover, Mole argues that (b) the experience is visual. I do not think that Mole has established either.

On (a), consider D.F.'s reaching for a square block and her shaping her hand appropriately for that target. Is an embodied representation of size causally involved in controlling the formation of a grip in this way? The bodily gesture in question seems to be what makes the relevant demonstrative available so the latter can't explain the formation of the gesture. Furthermore, the embodied demonstrative that accurately represents the width of the block is available only on contact with the object, namely at the end of action. If a grip of *that* size is needed to fix the referent of the embodied demonstrative yet that grip comes at the end of action, then it cannot control the action. Mole has failed to establish (a).

Mole's argument that the relevant experience is visual is too quick. He considers whether the experience might be proprioceptive but notes work of Schenk and Milner (2006) where D.F. can report at better than chance the shape of an object (rectangle or square) only when she initiates a reaching movement towards the object. This is true even as she calls out her answers before her body actually moves, so there is no proprioceptive feedback. Mole concludes that as 'it is not a proprioceptive difference…it is hard to see what else it could be except a visual difference' (Mole 2009, p. 1008).

There are other possibilities. As Benjamin Libet (1983) was perhaps the first to measure (see replication by Haggard et al. (1999)), the experience of bodily movement can occur *prior* to the movement (what Libet labeled 'M'). This experience might involve some form of motor imagery as part of motor preparation that provides information about object forms (see Jeannerod 1995).[7] Alternatively, the experience might arise from corollary discharge, the motor signal that aids on-line control (Wolpert and Ghahramani 2000). Whatever the source of this experience, its onset can precede movement. If so, some form of non-visual experience prior to D.F.'s actual movement might be the basis of her better than chance judgments about form. As he has not ruled this out, Mole has not established (b).

In response to Mole, I have provided an argument for the Minimal Thesis that has wide application, but what of the Strong Thesis? Its proponents need evidence such as the Ebbinghaus Illusion *and much more besides* with normal subjects. The extant cases seem insufficient to establish the Strong Thesis. Moreover, even on Milner and Goodale's account, there is reason to doubt certain forms of the Strong Thesis. They note (2008) that the ventral stream is involved in action control when programming the force of one's fingertips in lifting objects, when one introduces a delay in response, when one is acting in an awkward, unfamiliar way, or perhaps even in cases where one is using one's left hand.[8] Schenk and McIntosh (2010) point out that depth and distance computation in the ventral stream are likely components of normal action and that:

[7] A referee points out that Dijkerman and Milner (Gelman and Stern 2006) invoke motor imagery to explain D.F.'s acquired ability to copy the orientation of lines fairly accurately.

[8] I am grateful to an anonymous referee for emphasizing this.

> [t]he evidence points toward ventral stream involvement at all levels of action planning and programming, leaving only fast online updating of movements, and possibly some implicit forms of obstacle avoidance, as a potentially 'pure' dorsal task (p. 55; Milner and Goodale (2010) strongly disagree, p. 66).

We have yet to see a compelling empirical argument for the Strong Thesis. Support for it requires detailed arguments from multiple cases. Accordingly, it is currently off-key to speak of zombie agents, for this suggests that the Strong Thesis is true when the current dissociation evidence supports only a version of the Minimal Thesis. Still, the Minimal Thesis entails zombie action, but in a canny sense: an agent, when acting, is in a variety of states that contribute in complex ways to controlled and automatic features of action. Some of these states are conscious; some are not. Normal action involves the seamless integration of the agent's registering of information regarding the world, conscious or not.[9]

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