Unity in the Scientific Study of Intellectual Attention

Abstract:

I argue that using information from a cognitive representation to guide the performance of a primary task is sufficient for intellectual attention, and that this account of attention is endorsed by scientists working in the refreshing, n-back, and retro-cue paradigms. I build on the work of Wayne Wu (2014), who developed a similarly motivated account, but for perceptual attention rather than intellectual attention. The way that I build on Wu's account provides a principled way of responding to Watzl's (2011, 2017) challenge to Wu, according to which Wu's style of account is unintuitively broad. The fact that I find unity in the practice of science puts us in a position to resist the claim that scientists studying intellectual attention frequently failing to study the same thing.

Keywords: Attention; Cognition; Stimulus-Independent Thought

1. Introduction[1]

Despite a recent surge of philosophical interest in attention, there remain deep and enduring disagreements about what sort of thing attention really is.[2] Wayne Wu (2014), in response to this problem, has helpfully proposed that we should identify a merely sufficient condition for attention that everyone, or at least a significant portion of the community, could agree on. Wu identifies, in particular, a sufficient condition for *perceptual* attention rather than every kind of attention.[3] According to Wu, using information from a personal level perceptual representation of an object in order to guide the performance of an experimental task is sufficient for perceptual attention to that same object.[4] Wu bases this sufficient condition on an analysis of how psychologists study perceptual attention. On his view, analysing their experimental designs shows that his sufficient condition is something that they endorse.

Having a sufficient condition for all the varieties of attention would allow us, as a community of researchers, to ask and answer questions about perceptual attention without needing to make divisive metaphysical commitments about its nature at the outset of any given investigation. This is an appealing goal that should be of interest to

[2] See Watzl 2011b for a discussion of some recent proposals.
[3] In the same text, Wu's primary goal is to argue in favour of a view about the nature of attention and the relationship between attention and actions in general. But that is not the view of his that I discuss in this paper. For critical discussion of this other view, see Jennings & Nanay (2014), Buehler (2018a) and Buehler (2018b).
[4] A sufficient condition is, roughly, a statement about one state of affairs whose truth would be sufficient for the truth of a statement about another related state of affairs. For example, if you think that knowledge just is justified true belief, you might think that the truth of "Subject S knows that P" is a sufficient condition for "Subject S believes that P". Or, for another example, if perceptual processing is a kind of mental processing, you might think that "Process X is a perceptual process" is a sufficient condition for "Process X is a mental process".

anyone who studies perceptual attention or some of the phenomena that attention is arguably closely linked with, such as agency and consciousness.[5]

This paper moves us towards having that more general sufficient condition on hand by taking two steps – bringing intellectual attention into the conversation and addressing a challenge that Sebastian Watzl (2011a, 2017) has raised for Wu's style of account, according to which the account of attention is significantly out of line with ordinary intuitions about attention.

On the view that I develop, only *some* of the uses of information from personal level representations of objects to guide the performance of a task are sufficient for intellectual or perceptual attention: the uses of information that are for the sake of guiding the performance of an agent's *primary* tasks rather than her *secondary* tasks. I use the notion of "cognitive resources" and a "task-relevant set" of cognitive resources to explain the distinction between primary and secondary tasks. Cognitive resources are mental resources that agents can bring to bear in the performance of tasks. The task-relevant set of cognitive resources for a task are the cognitive resources that an agent could gainfully allocate to the performance of the task. A task is primary for an agent if she allocates all or most of the resources in the task-relevant set to the performance of the task. I discuss these concepts, and the evidence that they underlie scientific inferences about attention, in fuller depth in the second section of the paper.[6]

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[5] See, e.g., Wu (2011a, 2011b, 2014) and Mole (2017) for discussions of the relationship between attention and agency, and Watzl (2011a) and Smithies (2011) for discussions of the relationship between attention and consciousness.
[6] Buehler (2018b) argues that various specific selection for action based accounts of attention will "overgenerate" cases of attention. The selection for action based sufficient condition for intellectual attention that I consider in this paper is not one that Buehler considers, and moreover does not seem to face the problem of overgeneration. In fact, as this account is based on responding to the objection raised by Watzl (2011a, 2017) to Wu, it is an account designed to solve the problem of overgeneration (to be specific, the kind of overgeneration suggested by Watzl's counterexamples).

2. Intellectual Attention

According to Wu, when a subject uses information from a personal-level perceptual representation of *X* to guide performance of an experimental task, what that subject is doing is sufficient for perceptual attention to *X* (Wu 2014 pp. 80-82). In that sufficient condition, "personal level" plays an important role by ensuring that the uses of information that are sufficient for attention are personal level uses of information. Personal level information and processes are information available to, and processes performed by, agents, rather than information that is available to a mere part of an agent, or a process that is performed by a mere part of an agent (I take this specific way of understanding the distinction from Wu 2014 p.13, see Dennett 1969 for an earlier discussion of the distinction).[7]

Paradigmatic personal level phenomena include things like deliberating and acting, and paradigmatic subpersonal phenomena include things like the regulation of cerebral blood flow. Intuitively, attention and the uses of information that are sufficient for attention seem like personal level phenomena. For instance, using information from a visual representation of an apple to guide the grasping of an apple itself seems personal level, and moreover seems sufficient for attention, which also seems personal level. Both of those seem to be more like deliberating and acting than like the regulation of cerebral blood flow.

Watzl (2017) has recently offered substantial arguments, which go beyond my intuitive point above, in favour of the contention that attention should be categorized as a personal level phenomenon, rather than a subpersonal phenomenon (although Watzl argues that we should use the term 'subject' rather than 'person'). Watzl argues that at

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[7] Here I make the assumption that all persons are agents.

the subpersonal level, the neural realizations of attention are diverse enough that attempts to identify what attention consists in at the subpersonal level will fail (2017 pp. 27-34).

In fact, there is relatively wide agreement among contemporary metaphysicians of attention that attention seems to be located at the level of agents or persons, rather than at the level of parts of agents, or parts of persons. Despite their varying disagreements about how to analyze attention, Mole (2011), Smithies (2011), Jennings (2012), Wu (2014), and Watzl (2017), for instance, all share the commitment that attention is a personal level mental phenomenon. Burge, before the appearance of those works that focus on the nature of attention in particular, also made the point that attention seems like a personal level phenomenon (2010 p. 372; his specific way of articulating this was to say that directing the attention is something we attribute to 'individuals').

The view that I defend in this paper differs from Wu's sufficient condition in two ways: first, it refers to intellectual attention rather than perceptual attention, and second, it invokes the notion of a primary task. Unlike Wu, I do not think that any kind of use of information to guide the performance of a task is sufficient for attention. On the view I argue for in this paper, a wide range of scientists studying intellectual attention using the n-back paradigm, the retro-cue paradigm, and the refreshing paradigm all believe that when a subject uses information from a cognitive representation of X to guide the performance of a primary task, what that subject is doing is sufficient for intellectual attention to X. Going forward, I will sometimes call this "my sufficient condition" or "the sufficient condition for intellectual attention".

Before we go on, there are two important notes to make about the idea of a "cognitive representation" and a "primary task".

In this paper, by "cognitive" I mean "stimulus-independent" (See Burge 2010 p. 378, and Beck 2012 p. 586, for discussions of this demarcation between the perceptual and the cognitive, also Beck 2017). On this way of thinking, stimulus-independent mental representations do not require active causal links with the objects that they are about in order to continue to exist. So, for example, a visual representation of an apple is stimulus-dependent, while a representation of an apple in memory is stimulus-independent.[8] For instance, seeing an apple requires an active causal link with some nearby apple, and therefore the representations involved in that seeing are stimulus-dependent. By contrast, thinking about an apple that you saw yesterday does not require such an active link with that apple, and therefore the representations involved in that thinking are stimulus-independent.

Second, as I mentioned in the introduction, shifting from "experimental task" to "primary task" marks a significant disagreement between Wu and myself about how scientists study attention. Wu believes, roughly, that scientists studying attention believe that as long as a subject is using information to guide a task performance, then that subject is attending. But I will argue that a closer analysis of the practice of science shows that scientists have a more careful view, according to which the manner in which the task was performed should enter into our considerations. Specifically, I'll argue that scientists treat uses of information that subserve "primary tasks" as sufficient for attention, and that primary tasks are tasks that subjects are taking seriously through allocating all or

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[8] Here I distinguish between perception and cognition in the same way that I do in Fortney (2018). Analysing cognition in terms of stimulus-independence correctly categorizes the paradigm cases of cognition and perception that we discussed in the introduction, which is one point in favour of the analysis. Additionally, as we will see later in the paper, it is a way of understanding the demarcation that seems to be in line with the way that many scientists studying intellectual attention seem to understand the demarcation.

most of the relevant cognitive resources to the performance of the task. (the idea of a primary task is explained in more depth below.)

2.1 The empirical support

First I will provide a partial account of how Wu motivates acceptance of his sufficient condition for perceptual attention. Then I will give the argument for accepting my sufficient condition for intellectual attention. In short, Wu's argument for accepting his sufficient condition for perceptual attention is that it seems to be implicitly presupposed by many psychologists when they come to conclusions about perceptual attention, and, moreover, that explicitly endorsing the sufficient condition that psychologists implicitly presuppose would be a good idea (Wu 2014 pp. 38-39).

The latter claim is where the most interesting argumentative work is being done. What motivates this claim is, I take it, that one obvious route to finding a *relatively uncontroversial* sufficient condition for attention is to identify a sufficient condition for attention that a large group of theorists *already accept*. Part of what motivates the former claim is Wu's analysis of the inferences that psychologists make when studying perceptual attention in three research paradigms: dichotic listening, visual search, and spatial cueing. In short, an acceptance of his sufficient condition seems to underlie many of the inferences these psychologists make when they move from observations of behaviour to conclusions about the distribution of participants' perceptual attention.

But, even more importantly, Wu's thought is that such a method of justification for their inferences provides a unifying explanation of the inferences of psychologists who work in several different research paradigms. Unifying explanations of this kind are valuable because they reveal that – although these psychologists might, on the surface, *appear* to use the word "attention" in different ways – a large group of them are actually using the word in the same way when they come to conclusions about attention (see Wu

2014 pp. 270-271). Endorsing such a theory of attention, therefore, goes along with being able to explain why we have good reason to resist the claim that the scientific study of attention is relatively disunified.

In the rest of this section, I'll first explain how Wu argues that psychologists working on visual search seem to endorse his sufficient condition. Then I will go on to explain how work in a variety of experimental paradigms motivates the empirical sufficient condition for intellectual attention.

In the visual search paradigm, participants are instructed to press a button as soon as they see a pre-specified "target" object on a computer screen that is also displaying some "distractor" objects (here I follow Wu's summary of the paradigm; see Wu 2014 pp. 19-21). Psychologists seem to take these subjects' responses, via button pressing, as evidence that the subjects have perceptually attended to the target objects. Wu takes this to be a sign that the psychologists implicitly endorse his sufficient condition, because the subjects that perform the task seem like they are using information from perceptual representations of target objects to guide the performance of their task of button pushing. According to the sufficient condition for perceptual attention, such a use of information is sufficient for perceptual attention to the target objects (Wu 2014 pp. 38-39).

We can now move to the empirical support for the claim that psychologists implicitly endorse my sufficient condition. I'll discuss the inferences made by psychologists working in the "refreshing paradigm", the "retro-cue paradigm", and the "*n*-back paradigm". I will argue, like Wu, that it seems like an implicit acceptance of the sufficient condition would justify the inferences some psychologists make about attention on the basis of the observed behaviours of their subjects. The posit that they implicitly accept the sufficient condition for intellectual attention, therefore, provides a

unifying explanation of what justifies the conclusions that this diverse set of psychologists comes to about intellectual attention.

In a simple version of the refreshing paradigm, participants are exposed to a series of slides displaying words, one at a time, interspersed with the occasional slide that displays a single black dot instead of a word. They are instructed to read aloud the words on the slides, and to think of ("refresh") and say the previous word they saw when they are exposed to a black dot. This is what a series of slides in the refreshing paradigm looks like:
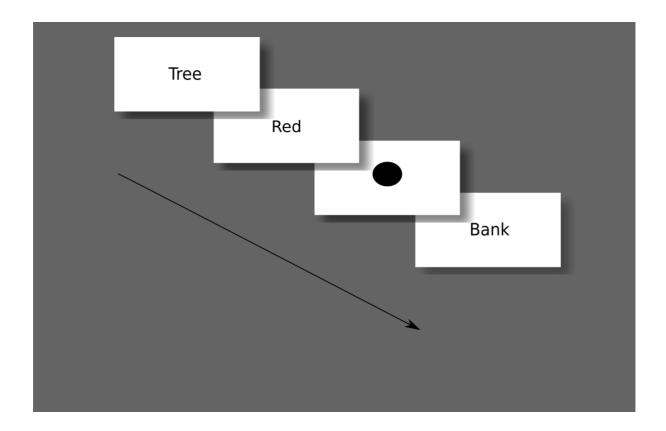

Figure 1: The Refreshing Paradigm

Psychologists seem to think that, when subjects respond to the black dots by saying the previous word that they were exposed to, they have intellectually attended to the

previous word that they saw.[9] The sufficient condition for intellectual attention clearly provides one explanation of the way in which that thought could be justified. It seems like, in this paradigm, participants must have used information from cognitive representations of the previous word they had seen to guide their performance of the "respond to a black dot" task. According to the sufficient condition, if they also treated this task as primary, that is sufficient for intellectual attention to the previous words they saw.[10] My argument that in general, psychologists only analyse the tasks of participants who treat experimental tasks as primary, comes in the following section of the paper.

Secondly, in a simple version of the retro-cue paradigm, participants see a slide with four differently coloured Xs on each slide, each in a different corner of the slide. The participants then see a slide which either has a cue that points to where one of the Xs used to be (call this the informative condition) or a neutral cue that points in all four directions (call this the neutral condition). Then, on the final slide, a coloured X is presented. Participants press a button indicating whether an X of that colour had been present on the initial slide.   Here is an example of what a series of slides from the informative condition of retro-cue paradigm looks like:

[9] Here I describe the simplest version of the refreshing paradigm in the same way as I do in Fortney (2018) . See Johnson et al. (2002 p. 64) for this task, and Johnson et al. (2005 p. 340) for the explicit assertion that 'refreshing' (which is required by responding to the dot) entails attention. For more work in the refreshing paradigm see, e.g., Raye et al. (2002), Chen & Cowan (2009), Higgins & Johnson (2009), and Johnson et al. (2013). See Fortney (2018) also for an explanation of how this study might bear on the study of whether the phenomenology of conscious cognition can be structured by attention.

[10] Here is an objection to this line of thought: participants in the refreshing paradigm use their "iconic memory" to respond to the dots, and iconic memory counts as a variety of perceptual representation. In the refreshing paradigm, however, words and dots were presented for 2,250 ms, and there were 500ms gaps between presentations of words and dots, which suggests that iconic memory was not at work in the refreshing paradigm (Higgins and Johnson 2009 p. 167). These durations exceed recent investigations into the duration of iconic memory (Rensink 2017).
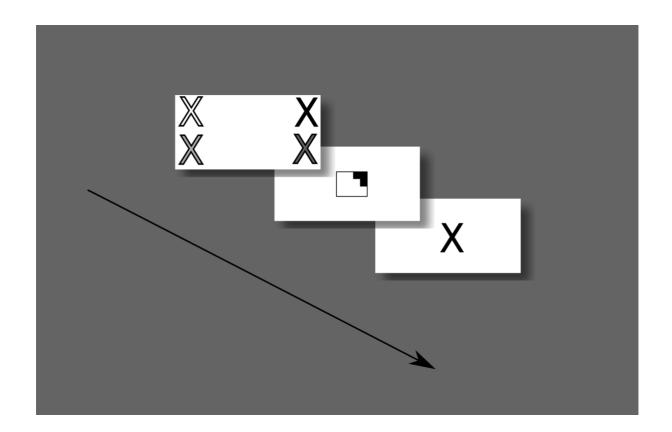
Figure 2: The Retro-Cue Paradigm

In this paradigm, it turns out that participants respond more quickly in the informative condition than in the neutral condition. Psychologists seem to take this to be evidence that the participants attended to the cued X in response to the cues.[11] The sufficient condition for intellectual attention, again, provides one justificatory route from the participants' observed behaviours to the psychologists' conclusions. It seems like participants, in responding to a cue, must have used information from a cognitive representation of the initial slide to guide their performance of the "make sure to remember the cued X" task (a subtask in the overall task of "responding correctly to the query that will eventually come"). By the sufficient condition, if they were also treating

[11] See, e.g., Astle et al. (2012) p. 149 for the task and p. 151 paragraph 4 for the inference. See also Griffin & Nobre (2003), Lepsien et al. (2005), Matsukura et al. (2007), and Makovski et al. (2008), for more examples of work in the retro-cue paradigm.

this task as primary, that is sufficient for intellectual attention to the cued region of the initial slide.

Lastly, consider the *n*-back paradigm. Participants in the *n*-back paradigm see a series of letters one by one. The task is to press a button when the *n*-th back letter in the series is identical to the letter that they are currently viewing (call such a letter a "target letter"). The set of slides below is an example some slides from the 3-back condition – for expository purposes, the "target letters" are outlined rather than solid. The idea is that a participant looking at any of the outlined letters ought to press a button to indicate their awareness that the outlined letters are identical to the letters on the third slide back.
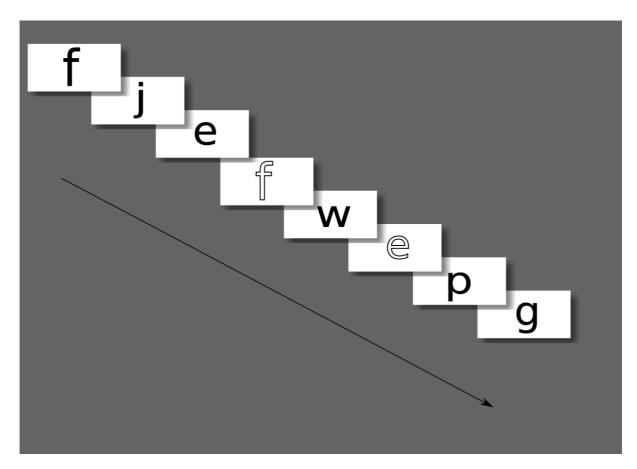

Figure 3: The n-Back Paradigm

Participants complete the *n*-back task more rapidly and accurately in the 1-back condition than in the other conditions. Many psychologists explain this discrepancy

between reaction times by saying that in the 1-back condition, participants can respond as quickly as they do because they were already attending to the previously seen 1-back letter, and can immediately compare it to the currently seen letter. By contrast, for participants in the 2-or-more-back condition, some additional processing of some sort (e.g. retrieval from memory) must go on before participants can attend to a previously seen letter so as to compare it to a currently seen letter.[12]

Again, the sufficient condition for intellectual attention shows us how the observed behaviours of the participants can be used to justify the psychologists' conclusions. It seems like participants in the 1-back task must have used information from their cognitive representations of previously seen letters to complete the 'respond to 1-back target letters' task. Similarly, it seems like participants in other versions of the task must have used information in just the same way after doing some extra work first (on the view of many psychologists working with the *n*-back paradigm, this extra work is bringing the letters to mind, or remembering them). By the sufficient condition, if the participants were also treating their tasks as primary, those two ways of responding to target letters are both sufficient for intellectual attention to target letters.

The sufficient condition for intellectual attention therefore appears to be endorsed by a wide variety of psychologists working in a variety of different research paradigms. Moreover, the sufficient condition gives a unifying explanation of these psychologists' conclusions; i.e., it allows us to say that these psychologists are all actually talking about the same phenomenon, despite outward variation in the details of what

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[12] See McElree (2006 pp. 188-190) for this inference. For more examples of work in the n-back paradigm, see Dobbs & Rule (1989), Cohen et al. (1994) & (1997), Smith & Jonides (1997).

they have to say about what "attention" means. This is a compelling pair of reasons to endorse the sufficient condition for intellectual attention.[13]

That being said, the evidence above is compatible with *two* theses about intellectual attention rather than just the thesis I mean to defend in this paper: one according to which scientists believe that *any* use of information from a cognitive representation to guide the performance of a task is sufficient for intellectual attention, and another according to which scientists believe that the use of information from cognitive representations to guide performance is sufficient for intellectual attention only when the performance is performance of a primary task. The latter sufficient condition is the topic of this paper. In the next section of the paper I argue that a closer analysis of the practice of the study of attention reveals that scientists endorse this latter idea.[14]

3. Varieties of Selection

Sebastian Watzl has argued that selecting an object, in general, seems insufficient for attention, and so we should not try to explain attention in term of selection for action (Watzl 2011a pp. 154-55). I agree with his first move, but think instead that his

[13] My own sufficient condition is a consequence of Wu's thesis about what's necessary and sufficient for attention, and so he would endorse it (Wu 2014). But what I have done is provide alternative, and less controversial grounds, for my sufficient condition than Wu's thesis about attention – I have relied *just* on my analysis of the practice of science rather than a broad and controversial thesis about the metaphysics of attention.

[14] Through my analysis of recent empirical work on intellectual attention, I have argued that a wide range of psychologists studying intellectual attention all endorse a particular sufficient condition for intellectual attention. I am, therefore, roughly in agreement with a diverse range of theorists including Mole (2011), Jennings (2012), and Watzl (2017), all of who have the goal of conceptualizing attention in a monistic way. That is, we all believe that a wide range of cases of attention have one thing in common (what we disagree about is what that one thing really is). This approach is different from the pluralistic approach of Taylor (2015, 2017), who has argued that attention is in fact many things rather than one thing. Taylor also argues that some psychologists, like Carrasco (2011), are pluralists about attention (Taylor 2017 p. 936). This approach is also different from the approach of Anderson (2011), who says that there is no such thing as attention. In this paper I develop a novel monistic view of the metaphysics of attention, but do not argue for the merits of a monistic approach in general.

observation should cause us to refine my sufficient condition for intellectual attention rather than to abandon it. In this section and the next I will explain how to do so.

According to Watzl, it seems like we can attend to a conversation, and during that conversation, pick up a cup and take a sip from it, while never attending to the cup. Similarly, it seems possible that while you attend to a conversation, you might think about the cup, but that you could manage to do so without the cup actually engaging your attention – the thinking might have occurred merely at the "back" of your mind. But picking up the cup, and thinking about the cup, *do* require using information from a personal level representation of the cup to guide the performance of a task, so my sufficient condition for intellectual attention and Wu's sufficient condition for perceptual attention say that both of those uses of information to guide the performance of a task are sufficient for attention. In general, endorsing the sufficient conditions comes along with a difficulty in explaining what it could be to perform a task without, in so doing, attending to some object.

It is possible to argue that Watzl's counterexamples should not actually motivate us to change our theory of attention. One method of replying to counterexamples like these is to say that the sufficient condition for intellectual attention is driven by the practice of science, and not whatever intuitions about attention the folk might be unfortunate enough to have. On this way of thinking, all Watzl's cases show us is that a consequence of the best theory of attention is that we should try to revise some of our intuitions about attention.

But this should seem like a misguided method of reply, as long as one pays careful enough attention to the science. Alan Allport, a psychologist that Wu credits with being one of the first adherents of the view that attention is tightly connected with selection for

action, would probably agree with Watzl's basic critical claim. [15] Allport believes, for instance, that when you reach for an apple, you might only attend to the apple, even though you might use information from other perceptual representations to help guide your task performance (Allport 1987 pp. 396-97). This fact at least complicates the claim that deference to the practice of science gives us a reason to resist refining the sufficient conditions. Indeed, what it suggests is that a *closer* analysis of the practice of science will reveal that what scientists *actually* endorse is a refined version of the sufficient conditions.

And it *does* seem independently plausible to suggest that there is an inattentive mode of cognition. Consider, to illustrate this point, Christopher Mole's description of a devoted but tired scholar:

> His reading of the book before him is prompted by genuine interest, but having spent the whole day trying to ignore the pangs of hunger, the children in the next room, and the radio that is playing downstairs, he is no longer able to concentrate. His reading is prompted by interest, but it is not attentive. (Mole 2011 pp. 48-49).

Mole's description of this case seems apt: there seems to be an inattentive mode of thought as well as an attentive mode of thought, and the scholar is failing to engage in the attentive mode of thought.

How, then, should we square this information with the fact that the psychologists I discussed in the second section of this paper seemed to endorse the unrefined sufficient condition for intellectual attention? On my view, they believe that selecting objects to guide the performance of tasks that we take seriously are sufficient for attention, while other varieties of selection are insufficient for attention. Here is some representative

[15] See Wu 2014 pp. 76-83 for Wu's interpretation of Allport.

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textual evidence:

> Participants were instructed to respond within 300 ms of the tone. They were informed that responses longer than 300 ms were too long and that responses faster than 120 ms were anticipations. (McElree 2001 p. 8)

> Items were presented at a 2.5-s rate (2 s on, 0.5-s interitem interval), and response times were collected via voice key. Responses were recorded on audiotape; trials in which the voice key was triggered by erroneous responses, coughs, or other extraneous sounds were discarded. (Johnson et al. 2002 p. 4)

These notes about their practices of discarding data are present in almost every study of McElree's and Johnson's that makes use of the refreshing paradigm or the *n*-back paradigm. In general, Johnson and her colleagues are not interested in studying incorrect task performances, and McElree and his colleagues are not interested in task performances that take longer than 300 ms.

What seems to explain this practice is that these psychologists were not interested in studying task completions of participants that were not taking the task very seriously. Why might they be interested only in the task completions that participants took seriously? A natural explanation is that these psychologists presupposed that uses of information to guide the performance of a task that a participant was not taking seriously would be *insufficient* for attention. Johnson's thought seems to be that the refreshing task is so easy that if you got it wrong you could not have been doing it attentively, while McElree's and Wagers' thought seems to be that if you take longer than 300ms to respond

to their tasks, then you are not doing it attentively.[16]

This fact about how these scientists discard data also shows us what is mistaken about a move that Wu makes while developing his sufficient condition for perceptual attention into a complete account of the metaphysics of attention – a move that I mentioned in the introduction above. When, in an early formulation of his sufficient condition for perceptual attention, Wu argues for dropping the word "experimental" from the phrase "experimental task" he says:

> It seems unduly narrow, however, to restrict the notion of a task in the sufficient condition to these specific experimental paradigms. After all, in performing these tasks, subjects do the sorts of things they do all the time: they say things, look, listen, and produce responsive movements. While psychologists have focused on a specific set of tasks in investigating attention, there is nothing special about the tasks that give psychologists special access to attention. (Wu 2014 pp. 83-84)

The problem with that line of thought is that experimental tasks *are* special, but not in virtue of being a particular kind of task, like listening to something or looking for something. The thing that is special about experimental tasks is the manner in which they are performed. They performed in a serious manner, not a slapdash manner.

Psychologists that study attention set up experimental tasks and analyze them in such a way that the participants tend to take their tasks seriously, and these psychologists strive to only analyze the behavior of participants that take their tasks seriously. When

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[16] c.f. Wu's remarks on participants performing experimental tasks poorly: "Obviously, when subjects are not doing the task, say when they twiddle their thumbs or continuously get things wrong, this is evidence that they are not appropriately selecting the relevant target and are being inattentive." (2014 p. 39). It probably is the case that many instances of discarded data are to be explained by the participant not having done the task. But it's important to note that in the cases I discuss in this part of the chapter, the inattentive participants *did* complete the tasks – they just didn't complete them according to a fairly exacting standard. If the participants hadn't actually completed the task, then we would not have evidence that psychologists think that uses of information to guide a certain range of task performances are insufficient for attention.

they analyze the task performances that they're interested in, they seem to behave as though task completion is sufficient for attention, but that's because – in advance – they have curated the set of task completions that they are analyzing and discussing. *That* is why simply dropping the word "experimental" from one of the sufficient conditions for attention would be a mistake.

What all of this suggests is that we should amend the sufficient condition for intellectual attention, by instead saying that when a participant uses information from a cognitive representation to guide the performance of a task that she is taking seriously, then she is intellectually attending to the object that the representation is about. In the next section of the paper I'll explain, in less casual terms, what we should mean by "taking a task seriously".

3.1 Primary and Secondary Tasks

In what follows, I'll adopt Christopher Mole's conception of "task", which aims to be a "regimentation of common-sense usage rather than … an innovation" (Mole 2011 p. 52). Here is how Mole introduces the concept of a task:

> A subject's 'tasks', as these are to be understood here, are the things that the subject is in the business of doing and that she is active with. To specify the tasks in which an agent is engaged, we adopt the agent's point of view on her own activities. Normal human tasks are things such as making a cup of tea, following a conversation, or looking for the car keys. They are activities with natural descriptions of a sort that the subject would typically accept as a description of her goal…. 'What task is this agent performing?', when asked outside the lab, may admit of many answers, some of which are only vaguely true. (Mole 2011p. 52).

The problem cases that we have discussed so far have all involved agents engaged in various kinds of tasks, e.g. following a conversation, picking up a cup, thinking about a cup, thinking about a letter, and thinking about a word. These are all what Mole called

"normal human tasks", and when we adopt the point of view of the subjects in Watzl's thought experiments, or in the psychologists' *actual* experiments, we can come to conclusions about what tasks the subjects seem to be engaged in.

Another aspect of Mole's account of tasks is that agents can allocate various amounts of their cognitive resources to the tasks that they perform (Mole 2011 p. 53). For Mole, cognitive resources are personal level mental states or processes, like visual states, or ideas, rather than sub-personal mental states, like, e.g. a representation of hormone levels in the pituitary gland. Consider, for example, the task of sneaking across a room without being seen by the people that are inside it. There are various cognitive resources that an agent might be able to bring to bear on the performance of that task – e.g., her visual awareness of obstacles in the room, or her ideas about how to distract the people inside of the room, and so on.

We can use Mole's idea that people can allocate varying amounts of cognitive resources to the performance of a task in elucidating what it is to take a task seriously. Just as it is ordinary to explain a person's behavior through saying that they are engaged in a particular task, it is ordinary to explain a persons' behavior in virtue of the fact that they are engaged in an important, or "primary" task, and a less important, or "secondary" task. Here is a more precise way of getting at the idea of "primary" and "secondary" tasks. For an agent A and a task T:

> (i) Call the cognitive resources that A could gainfully allocate to the performance of T the "task-relevant cognitive resources for T". If A allocates all or most of the task-relevant cognitive resources for T to the performance of T, then T is a primary task for A.
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> (ii) If A is performing T but T is not a primary task for A, then T is a secondary task for A.

Here is an example of that will help demonstrate how this analysis works. Suppose that

for *A*, the task-relevant cognitive resources for summing 1+1 are 10% of her total

cognitive resources, and that the task-relevant cognitive resources for playing the

clarinet are 50% of her total cognitive resources, and that the task relevant cognitive

resources for summing 1+1 are a proper subset of the task-relevant cognitive resources

for planning what to have for dinner. These are some verdicts that my analysis would

make about *A*'s potential ways of allocating her cognitive resources to these two tasks:

> (i) *A* could allocate 10% of the task-relevant set for summing 1+1 to the task of summing 1+1, and 10% of the task-relevant set for playing the clarinet to playing the clarinet, and in so doing make both tasks secondary tasks for herself.

> (ii) *A* could allocate 90% of the task-relevant set for summing 1+1 to the task of summing 1+1, and 90% of the task relevant set for playing the clarinet to playing the clarinet, and in so doing make both tasks primary tasks for herself.

> (iii) *A* could allocate 90% of the task-relevant set for summing 1+1 to the task of summing 1+1, and 10% of the task-relevant set for playing the clarinet to playing the clarinet, and in so doing make both the former task a primary task for herself, and the latter task a secondary task for herself.

> (iv) *A* could allocate 10% of the task-relevant set for summing 1+1 to the task of summing 1+1, and 90% of the task relevant set for playing the clarinet to playing the clarinet, and in so doing make the former task a secondary task for herself, and the latter task a primary task for herself.

The distinction between primary tasks and secondary tasks puts us in a position

fully appreciate my sufficient condition for intellectual attention, according to which uses

of information that are for the sake of a *primary* task are the uses of information that are

sufficient for attention:

> **Sufficient Condition for Intellectual Attention:** Subject *S* intellectually attends to *X* if *S* cognitively selects *X* to guide performance of some *primary* task.

I think that this sufficient condition does a good job of capturing our intuitions about

attention. Consider the intuitions about attention that we have when we consider the four

cases above:

> (i) *A* could allocate 10% of the task-relevant set for summing 1+1 to the task of summing 1+1, and 10% of the task-relevant set for playing the clarinet to playing the clarinet, and in so doing make both tasks secondary tasks for herself. As a consequence, her performance of both tasks is slapdash. In so doing, her uses of information to guide the performances of both tasks seem *insufficient* for attention. (And as long as we assume that *A* is not engaged in any other tasks across this span of time, then *A* had no primary tasks across this span of time).

> (ii) *A* could allocate 90% of the task-relevant set for summing 1+1 to the task of summing 1+1, and 90% of the task relevant set for playing the clarinet to playing the clarinet, and in so doing make both tasks primary tasks for herself at the same time. As a consequence, her performance of both tasks is excellent. In so doing, all of her uses of information to guide the performances of either task seem *sufficient* for attention.

> (iii) *A* could allocate 90% of the task-relevant set for summing 1+1 to the task of summing 1+1, and 10% of the task-relevant set for playing the clarinet to playing the clarinet, and in so doing make both the former task a primary task for herself, and the latter task a secondary task for herself. As a consequence, her performance of the former task is excellent and her performance of the latter task is slapdash. In so doing, her uses of information to guide the performance of the former task seem *sufficient* for attention, and her uses of information to guide the performance of the latter task seem *insufficient* for attention.

> (iv) *A* could allocate 10% of the task-relevant set for summing 1+1 to the task of summing 1+1, and 90% of the task relevant set for playing the clarinet to playing the clarinet, and in so doing make the former task a secondary task for herself, and the latter task a primary task for herself. In so doing, her uses of information to guide the performance of the former task seem *insufficient* for attention, and her uses of information to guide the performance of the latter task seem *sufficient* for attention.

The fact that my sufficient condition does a good job of capturing our intuitions about

attention is a reason that speaks in favour of endorsing it[17]. Secondly, my sufficient condition is motivated by the way that Johnson et al., McElree, and Wagers seem to understand intellectual attention. Thirdly, this sufficient condition does not face the intuitive problems brought up by Watzl (2011a, 2017), as I am about to argue.[18]

Before we go on, here is an important note about the role that cognitive resources play in my theory of attention. My claim is that when we make tasks primary for ourselves, we are attending, and that what makes a task primary is the way we have allocated cognitive resources to that task. This claim is about the metaphysics of attention rather than the epistemology of attention, and does not imply that we should typically base our conclusions about whether a subject has attended on the basis of evidence that directly concerns the distribution of cognitive resources. Usually, it makes sense to try to figure out whether people are making a task primary and attending through analysing the qualities of their task performances rather than through analysing their distribution of cognitive resources. This is just what psychologists do, as I argued above. Philosophers of mind that adopt my theory of attention should do the same.

Here is an example of how to do that based on Barbara Montero's recent analysis of chess playing while summing numbers (Montero 2019). Montero describes an informal experiment she ran, in which master-ranked chess players played "lightning"

[17] Note that making a task primary for oneself does not *necessarily* mean that one will do a good job at it: that depends on one's competence and potentially other background factors. In the cases above, for simplicity, I assume that the the subject is competent at all the tasks in question.

[18] Like Mole (2011) I use cognitive resources to explain attention, but I make very different use of them. Mole argues that the use of "background" resources, that a subject does not put to the performance of a task and could not be gainfully put to the performance of a task, are relevant to whether a subject attends in performing that task (Mole 2011 p. 51). According to Mole, if some of the background set of resources is in use for some additional purpose, even while what I call the entire-task relevant set of cognitive resources is allocated to the performance of a task, then what he calls "cognitive unison" has been broken and a subject is not attending in performing that task. Taylor (2015) has persuasively argued that this is an unintuitive result for Mole's theory of attention. My account of attention, according to which the background set of cognitive resources is irrelevant to attention, does not generate such a result.

chess (in which chess players must make their moves very quickly) against other master-ranked opponents. Crucially, just one player per game had to sum numbers. Summing single digit numbers did not seem to significantly impact their performance, while summing double-digit numbers seemed to significantly worsen their performance.

Here is how Montero describes the report of one player, after he performed the more difficult version of the experiment

> He performed the addition correctly—though at one point pausing for around five seconds before giving an answer—but he lost the game and was not at all pleased with his performance. In response to my question 'How do you feel you did?" he replied: "What do you mean, how do I feel? How do you think I feel? I'm playing an IM [international master] while adding double-digit numbers. I'll tell you how I feel: I'm going to go back to the cabin right now and slit my wrists.' ... his perception was that adding the numbers significantly interfered with his performance. (Montero 2019 p. 388)

Here, the chess player is complaining that he could not perform at his best because summing the double-digit numbers prevented him from doing so (unlike summing the single-digit numbers). My account of attention says that on account of his good performance in the single digit condition, we can conclude that the chess player was making chess playing primary for himself, and therefore attending to chess playing. This is an example of a judgment about attention that we can make which does not rely on the direct observation and individuation of cognitive resources.

4. Solving Watzl's problem

In his challenge to selection-for-action theories of attention, Watzl presented two cases where a subject was engaged in two tasks at the same time, and in which the subject seemed to be using information to guide the performance of both tasks, and yet not really attending to the object involved in one of the tasks. The first case was being engrossed in a conversation while picking up a cup without attending to the cup, and

the second was being engrossed in a conversation while thinking about a cup, without attending to that cup.

What we're now in a position to appreciate is that Watzl's problem cases are under-described. He tells us that the subject succeeded in simultaneously following the conversation and picking up the cup, and succeeded in simultaneously following the conversation and thinking about the cup. But he didn't specify the *manner* in which the subject allocated cognitive resources to those two tasks, and differences in that manner of allocation can lead to very different intuitive verdicts about how the subject deployed her attention – intuitive verdicts that my refined sufficient condition for intellectual attention help us straightforwardly predict.

Imagine, for example, that the task-relevant set of cognitive resources for picking up the cup or thinking about the cup comprised 20% of the subject's total cognitive resources, and that the task-relevant set of cognitive resources for following the conversation comprised 90% of the subject's total cognitive resources, and that 10% of the subject's total cognitive resources were elements of both of those task-relevant sets. Imagine further that the subject allocated 100% of the task-relevant set for following the conversation to following the conversation, and 50% of the task-relevant set for thinking about the cup or picking up the cup to either of those two tasks.

The refined sufficient condition for intellectual attention, unlike the unrefined sufficient condition, does not identify the uses of information to guide the performance of the thinking about the cup as sufficient for attention.[19] An analogously modified

19 I am assuming that in the case under discussion, the subject was using information from cognitive representations to guide her thought about the cup. But it does seem possible for us to use information from both perceptual and cognitive representations to guide our thought about certain objects.

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version of Wu's sufficient condition for perceptual attention predicts that the uses of information to guide the performance of picking up the cup would not be sufficient for attention. Therefore, this is the kind of resource allocation that seems to underlie Watzl's intuitive verdict about the case.

But it is worth pointing out that things could have gone differently in such a dual-tasking case. Imagine, for example, that the task-relevant set of cognitive resources for picking up the cup or thinking about the cup comprised 10% of the subject's total cognitive resources, and that the task-relevant set of cognitive resources for following the conversation comprised 90% of the subject's total cognitive resources, and – most crucially - that there was no overlap between the task-relevant sets of cognitive resources.

In this sort of case, the subject could have allocated 100% of the task-relevant cognitive resources for both of her tasks to her performances of both those tasks. And in this sort of case, we have the intuition that the subject's uses of information to guide the performances of *both* of her tasks *are* sufficient for attention, because in this case the subject is dual-tasking just as well as she single-tasks. So refining the sufficient condition solves Watzl's problem. If a subject is engrossed in a conversation, but making some thought about a cup a secondary task for herself, the refined sufficient condition does not predict that her uses of information in service of that latter task are sufficient for intellectual attention (because it remains silent on such cases).

5. Additional Objections from Watzl

One of the main contributions of this paper was to respond to the objection of Watzl (2011a, 2017) that using information to guide the performance of a task does not

seem sufficient for attention. Watzl (2017) raises further objections for the idea that we should explain attention in terms of selection for action, i.e., in terms of using information to guide the performance of a primary task (here I give my way of thinking of selection, which is narrower than Wu's). There is no space here in which to address all of Watzl's further objections, but we can close with seeing what is wrong with two of the briefer ones, one about the temporal shape of attention, and one about degreed attention.[20] My way of addressing the temporal shape of attention is available to any selection for action theorist, as the temporal shape objection rests on a misinterpretation of the term "selection". My way of addressing degreed attention is particular to my way of understanding selection, in terms of using information to guide primary tasks rather than secondary tasks.

Watzl's argument about temporal shape goes roughly like this: Attention and selection have different temporal shapes. Attention is an ongoing, uncountable process, whereas selection is a dated event. Therefore, we cannot explain attention in terms of selection (Watzl 2017 p.111). This argument fails because it trades on an ordinary understanding of selection rather than selection as it is defined by selection for action theorists. I consider selection to be "using information from a personal level representation to guide the performance of a primary task", and Wu also construes selection in terms of persons using information. On this way of thinking, using information is an ongoing, uncountable process, just like attention. The problematic

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[20] For further discussion of how to reply to these objections to the selection for action account, see Wu (2018).

commitment that Watzl attributes to the selection for action theorist is not a commitment that the selection for action theorist ever had.

Watzl also claims that degreed attention poses a challenge to the selection for action theorists: "Selection does not seem to come in degrees. Either you are selecting something or you are not; you are not selecting one thing more than another." (Watzl 2017 p.112) On my view, if we wish to use "attention" in a degreed way rather than an all-or-nothing way, we can answer the question "To what degree did the agent attend to that object?" through citing the degree to which the subject made the relevant task performance a primary task performance for herself. If, e.g., a subject allocates 20% of the cognitive resources in the task-relevant set to the performance of a task we could say that, in using information from various objects to perform the task, she attended to those objects to a low degree. If, by contrast, the subject allocates 100% of the cognitive resources in the task relevant set to the performance of the task, we can say that she attended to the relevant objects to a high degree. This method of reply is available to me rather than other selection for action theorists because I use the concept of a task relevant set of cognitive resources to help explain attention.

6. Conclusion

In this paper, I've accomplished a few interrelated goals through arguing that using information from a cognitive representation to guide the performance of a primary task is sufficient for intellectual attention.[21] First, my discussion helps bring intellectual attention into view as a philosophical phenomenon; in recent years, most sustained philosophical work on attention has been on perceptual attention. Second, I've put theorists in a position to defend the idea that there is unity in the scientific study of attention. Third, I've given theorists like Wu, who explain attention in terms of selection for action, the resources to reply to critics like Watzl, who claims that such accounts are too broad.

[21] The sufficient condition I endorse in this paper is, of course, compatible with pluralism about attention, as long as there turns out to be some other well-supported sufficient condition for intellectual attention (Taylor 2015 & 2017 argues for pluralism about attention in general). For instance, suppose that mind-wandering is best conceptualized as unguided attention, and that at least some of the unguided attention that constitutes mind-wandering is the intellectual variety of attention (See Irving 2016 for this definition of mind-wandering). If both of those assumptions are right, as well as my arguments in favour of my task-based sufficient condition, then we would have reason to endorse the claim that there are two fairly different varieties of intellectual attention, that can be identified in terms of different sufficient conditions.

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