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Consciousness and confidence

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ABSTRACT

It is natural to see conscious perceptions as typically bringing with them a degree of confidence about what is perceived. So one might also expect such confidence not to occur if a perception is not conscious. This has resulted in the use of confidence as a test or measure of consciousness, one that may be more reliable and fine-grained than the traditional appeal to subjective report as a test for a perception's being conscious. The following describes theoretical difficulties for the use of confidence as a reliable test for consciousness, which show that confidence is less reliable than subjective report. Difficulties are also presented for the use of confidence ratings in assessing degrees of consciousness, which cast doubt on any advantage confidence might have from being more fine-grained than subjective report. And an explanation is proposed for the wide appeal of using confidence to assess subjective awareness, an explanation that also makes clear why confidence is less reliable than subjective report.

1. Introduction: Conscious vs. nonconscious perception

There are numerous experimental findings that point convincingly to the occurrence of perceptual states that fail to be conscious. One of the most dramatic is blindsight, in which some portion of primary visual cortex is destroyed, resulting in a subject's sincere denial of seeing anything in the affected contralateral hemifield, though forced-choice guessing about a significant range of visual stimuli is highly accurate (Weiskrantz, 1986, 1997). Blindsight subjects evidently detect and discriminate stimuli even though the perceptual states that figure in doing so are not conscious.

Similar findings occur in experimental conditions independent of damage to perceptual systems. Visual stimuli can be masked so that subjects sincerely report not seeing stimuli, though forced-choice guesses (Weiskrantz, 1986) and priming results reveal impressively accurate perceptual processing of those stimuli (Marcel, 1983; Breitmeyer and Öğmen, 2006; Bachmann and Francis, 2014). Priming also provides evidence of remembered information that amnesiac patients deny having (Schacter and Church, 1995), and galvanic skin response reveals recognition of faces that a prosopagnosic patient denies having (Bauer, 1984; Tranel and Damasio, 1988). And transcranial magnetic stimulation (TMS) can produce in normals a condition that resembles blindsight; subjects deny perceptual awareness of stimuli, but priming and forced-choice guesses reveal perceptual processing of the stimuli (Boyer et al., 2005).

Other experimental paradigms generate similar findings; subjects deny awareness of stimuli, though indirect methods provide evidence of perceptual processing of them (Weiskrantz, 1998). The most compelling explanation of these results is that the perceptual states do occur, but they occur without being conscious.

The following discussion considers various theoretical and methodological issues that arise in studying the difference between conscious and unconscious perceiving, focusing on the use of confidence as an indicator that perceiving is conscious. Considerations are adduced that suggest that confidence is not a reliable or theoretically well-founded measure of consciousness.

1.1. Objective measures of consciousness

Some researchers have proposed an objective measure of whether a perception is conscious. On that measure, states as conscious if, but only if, the subject's performance on guessing about a stimulus is above chance (Cheesman and Merikle, 1984, 1986; Eriksen, 1960; Holender, 1986; Dulany, 1997). Cheesman and Merikle (1984, 1986) argue that consciousness priming effects sometimes reveal perceptions that fail on this measure to be conscious. This enables the measure, so defined, to accommodate subliminal perception as failing to be conscious.

But this measure has the odd consequence that perception in blindsight then counts as conscious, since blindsight subjects' forced-choice performance is well above chance. In addition, the only motivation for a measure that counts as conscious states that lead to above-chance performance in guessing is that such states carry perceptual information. And since priming also reveals perceptual information, such a measure reflects a double standard, counting above-chance

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performance on guessing one way and priming another. It is arguably arbitrary to treat the two differently.

So it will be useful to define a modified objective measure of consciousness, on which a state counts as a conscious perception if, but only if, above-chance performance on forced choice, priming effects, or any other reliable test reveals that the state carries perceptual information. This modified objective measure treats above-chance guessing as on a par with priming effects.

But this has a downside, since it precludes any perceptions, properly so called, which fail to be conscious. On this modified objective measure, perceptions in blindsight, masked priming, and any similar conditions are conscious just so long as they reflect perceptual processing of presented stimuli, regardless of subjects' sincere denial of perceiving any stimuli.

Adopting this modified objective measure of consciousness prevents us from explaining subjects' denial that they perceive a stimulus on the otherwise natural hypothesis that the relevant perceptual states fail to be conscious. So we must seek an alternative explanation. Perhaps subjects' denial of seeing anything is due to the stimulus' being so weak that it is difficult to detect or discriminate, though whatever perceptual detection or discrimination does occur would on this modified measure nonetheless be conscious.[1]

The original (Cheesman and Merikle, 1984, 1986) objective measure allows for perceptions that fail to be conscious, but in a way that is arguably arbitrary. Above-chance force-choice guessing and priming effects both reveal the occurrence of perceptual perceptual information independently of a subject's claim to perceive or not. So it is reasonable to see the modified measure as preserving the spirit of the original objective test more successfully than the original test itself. Nonetheless, it is difficult to accept the consequence that all perceptions are conscious.

1.2. Subjective measures of consciousness

It is widely accepted that perception can occur without being conscious, though this is not universally accepted. Phillips (2016) contends that perception is invariably conscious, relying not on considerations connected with any version of an objective measure, but on the particular conception he adopts of what perception is.

But there is another view in the philosophy literature that does rest on considerations that closely reflect those that underlie an objective measure of consciousness. According to Dretske (1993), a psychological state is conscious if, but only if, an individual is conscious of something in virtue of being in that state. Since a psychological state is conscious on this view if one's being in that state results in one's being conscious of something, all that matters is that the state carry some perceptual information in virtue of which one is conscious of the relevant stimulus. But perceptions of which subjects are altogether unaware also carry such information. And subjects will sincerely deny having any perception of which they are wholly unaware. So Dretske's view, like the modified objective mental state, will preclude any distinction between conscious and unconscious perceiving.[2]

The alternative to any type of objective measure is a subjective measure of consciousness. A subjective measure figures in the reliance in blindsight and masked priming on subjects' sincere denials of perceiving the stimulus. This reliance is subjective in that it hinges on a report about whether one subjectively takes oneself to perceive something. A perception count as conscious, then, if a subject sincerely reports perceiving something.

The operative assumption is that if a perception is conscious it is reportable, at least in favorable conditions. In testing for consciousness conditions are set up to be favorable, though reportability may be dramatically diminished for many conscious perceptions in ecologically realistic conditions and in particular experimental setups. Such reliance on reportability of perceiving a stimulus underlies the conclusion that perceptions in blindsight, masked priming, and similar conditions are not conscious. (For a useful review and discussion of the contrast between objective and subjective measures, see Dienes (2004), Seth et al. (2008), and Timmermans and Cleeremans (2015).)

1.3. Reportability and higher-order theories

Reportability is widely regarded as reliable in distinguishing conscious states from psychological states that are not conscious, and is doubtless the experimental test currently most in use. But it is plain that a state's being conscious cannot consist in that state's being reportable. Experimental situations aside, subjects cannot report all their perceptions that are conscious at any particular time. There are vastly too many, and most by far are typically peripheral and fleeting.

But despite that, there is a crucial connection between reportability and consciousness. Sincere report is a reliable indicator of whether a psychological state is conscious because sincere report reveals whether the subject is aware of being in that state. So being reportable is a reliable indicator that a psychological state is conscious.

And being aware of a psychological state is in turn pivotal for consciousness because if an individual is in some psychological state but in no way aware of being in it, the only credible explanation of that lack of awareness is that the state is not conscious. That is the reasoning in blindsight, masked priming, and related conditions. The priming or accurate forced-choice guessing is evidence that the subject did perceive the relevant stimulus; the sincere denial is evidence of the subject's being unaware of doing so.

It follows that a state is conscious only if the individual that is in the state is in some suitable way aware of that state. This is the basis for so-called higher-order theories of consciousness, on which a state's being conscious consists in the occurrence of some suitable awareness of the state (Rosenthal, 2002, 2005; Gennaro, 2004).

Higher-order theorists differ about what type of higher-order awareness of a state is relevant for a state to be conscious. But the reliance on reportability points to a compelling answer. A subject's report of being in a psychological state expresses the subject's higher-order awareness of that state. And reporting a state consists in saying, either verbally or indirectly by some nonverbal means, that one is in that state. So the higher-order awareness that figures in a state's being conscious must be some kind of awareness that one can express by saying that one is in that state.

As a general matter, moreover, saying something expresses some thought that one has. If one says, "It is raining," one's saying that expresses a thought one has that it is raining. Similarly, a report that one is in some psychological state expresses a thought that one is in that state. The higher-order awareness that figures in a state's being conscious is evidently a thought about the state, what we can call a higher-order thought (Rosenthal, 2002, 2005).

Such higher-order thoughts will seldom be conscious thoughts. For a higher-order thought itself to be conscious, there would have to be a further higher-order thought about the second-order thought. And that likely never happens except in deliberate, attentive introspecting, which is rare. Since subjects are seldom aware of any such higher-order thoughts, the appeal to them, and more generally an appeal to any form of higher-order awareness, does not rely on subjective or introspective access to such higher-order states. Higher-order awarenesses are theoretical posits, to be evaluated by appeal to the explanatory success of

[1] Peters and Lau (2015) urge that this occurs some cases, though they do not, as I understand them, completely preclude the possibility of perceiving that genuinely fails to be conscious.

[2] Dretske (2006) proposed to deal with this difficulty by expanding on his view to provide that a perception is conscious only if a subject can cite the fact the subject perceives as a justifying reason for doing something. But citing something as a reason requires being aware of it, in this case being aware of the perceptual justifying reason. So Dretske's (2006) adjustment conflicts with Dretske (1993), since the later treatment implies that a perception is conscious only if one is aware of it.

the theories in which they figure.

In any case, the specific appeal to higher-order thoughts will not be relevant to most of what follows. What is crucial is that on a subjective measure of consciousness, we distinguish conscious from unconscious psychological states by whether the subject is in some suitable way aware of the state.

As noted, reportability is doubtless reliable when experimental conditions are favorable and only a few stimuli are at issue. One can report particular conscious states and perhaps even quite a few, but never anything close to all those that occur in natural scenes. In addition, there are situations in which one is subjectively unsure or even subjectively at a loss about whether a conscious perception has occurred, as when the stimulus is near threshold or there are distractions of various sorts.

It is in part such limitations on subjective reportability that has led some researchers to opt instead for an objective measure, and to seek to explain many cases in which subjects sincerely deny perceiving a stimulus without positing perceptions that fail to be conscious. But because it seems evident that some perceptions do occur without being conscious, that reaction to limitations that affect reportability has struck most theorists as too costly. So many have sought to deal with those limitations by instead tightening up subjective measures themselves.

The most widespread technique for doing so is an appeal to confidence. One can ask subjects to rate their degree of subjective confidence in their own reports of stimuli. But there are questions about whether such confidence ratings can yield results that are any more reliable than subjects' reports of whether they perceived a stimulus.

And there are, in addition, theoretical issues about what confidence ratings actually reveal. The following discussion reviews some of these concerns. The conclusion will be that using confidence ratings as a measure of consciousness faces difficulties that likely cannot be avoided, and that subjective report, despite limitations in some cases, are the more reliable measure of consciousness.

2. Confidence ratings

2.1. Confidence and consciousness

When one consciously perceives something, one typically has some sense of confidence about what one perceives. And that encourages the speculation that all cases of consciously perceiving something carry with them some degree of confidence about the stimulus one consciously perceives.

But perceptions can occur consciously even in the absence of much if any confidence about what is perceived. This happens in conscious peripheral vision, though it may not be obvious without some reflection. It typically seems to one subjectively as though one sees objects in the periphery of one's visual field with great clarity and definiteness, and so one will have confidence about one's perceptions of those objects. But once one attempts to say, without shifting one's gaze to the periphery, what those objects are, one's confidence about the objects falls off dramatically as one moves to the periphery.

Still, consciousness extends well out to the periphery, even though the acuity of parafoveal vision falls off dramatically and rapidly. Once a subject's realizes that, we have a case of conscious vision without much if any confidence about the nature of relevant stimuli, though presumably still some minimal confidence about their presence.[3] And a subject's reflecting on the acuity of peripheral vision is not the only example. Distractors and other factors can result in lack of confidence about what we perceive in other cases as well. Conscious perception does occur in the absence of confidence.

One might contest this. Since visual acuity is low in conscious peripheral vision, perhaps one's level of confidence about what one sees peripherally matches what we actually do see consciously. And similarly with distractions and other factors that one might take to result in conscious perception without confidence; perhaps one's level of confidence in all such cases is proportionate to what one consciously perceives, given the factors that impair perception.

But it difficult to know how to establish that this is so in a way that is independent of any antecedent assumption about a connection between a perception's being conscious and one's having confidence about what one perceives. And unless one can establish this in a way that does not simply beg the question about whether such a connection holds, we have no reason to deny that conscious perception occurs in the absence of confidence.

Plainly one should not rely on introspection to establish a tie between consciousness and confidence or its absence. For one thing, introspective judgments about correlations between such distinct psychological factors are likely to be highly unreliable. And since introspection would in any case apply only when the perceptions are conscious, it says nothing about the unconscious cases.

But even if we could rely on subjects' introspective sense both about when perceptions are conscious and about when one has confidence about perceived stimuli, the appeal to introspected confidence would be superfluous as an indicator of consciousness. Such an appeal would add nothing to subjects' introspective sense about when their perceptions are conscious.

2.2. Confidence and guessing

One could, however, argue for a connection between confidence and consciousness not directly, but by appeal instead to cases in which consciousness is absent. And that is likely what makes the use of confidence as a measure of consciousness so inviting. As noted above, one standard technique for determining that a perception occurs despite subjects' sincere denials relies on forced-choice guessing. If a subject firmly denies being aware of a stimulus but can be induced to say what the stimulus might have been, subjects and experimenters alike regard such remarks as guesses. Subjects insist they have no idea whether a stimulus occurred, that is, no conscious idea, no idea of which they are aware. Indeed, it can be difficult to get subjects to say anything at all about a stimulus when they deny perceiving it (Weiskrantz, 1986, 1998). Still, when these guesses are accurate well above chance, the best explanation is that the subject did perceive the stimulus, but not consciously (Weiskrantz, 1986).

An elegant method is the use by Weiskrantz (1986, 1998) of commentary keys. Subjects press one of two buttons to register a guess about a stimulus, and then press one of a second pair to indicate whether they had any awareness of the stimulus. Subjects thereby indicate in a single trial whether they take themselves to have seen anything and also guess about the occurrence of a stimulus even when they fail to see it consciously.

And guessing has an important connection with confidence. Guessing can occur even when a subject is perceptually aware of a stimulus, but in an unclear or otherwise degraded way. In this case a subject is not confident about the nature of the stimulus, and so must guess. But the forced-choice guessing in blindsight and related cases occurs with total lack of confidence (Cheesman and Merikle, 1984). It is a kind of pure guessing, which occurs only when the subject lacks any confidence at all, as against guessing that occurs when the subject simply is less than fully confident about a stimulus. And since such pure guessing also occurs in the total absence of subjective awareness of a stimulus, it may seem inviting on this basis to posit a connection between total lack of consciousness and total lack of confidence.

That connection rests on the observation when subjects' sincerely report being altogether unaware of a stimulus but nonetheless make

[3] Farther out in the periphery, vision fails altogether to be conscious, and there a subject would presumably have no confidence in either the nature or presence of stimuli. Guesses in those cases might well resemble guesses in blindsight.

highly accurate guesses about it, the best explanation of that accuracy is that they did perceive the stimulus, and the best explanation of their report of being unaware of the stimulus is that this perceiving was not conscious. Guessing in these cases reflects total lack of confidence, which goes with total lack of consciousness.

But the need to guess is wholly irrelevant to the assessment that the perceiving was not conscious. That rests solely on subjects' sincere reports of being wholly unaware of the stimulus. So the association of total lack of confidence with total lack of consciousness does nothing to establish confidence as an indicator of consciousness. The lack of consciousness is shown simply by subjective report.

And there is another difficulty. The guessing that figures in these cases is pure; it is guessing that reflects total lack of confidence about the stimulus. So for confidence to be a useful indicator of consciousness, subjects would have to distinguish total lack of confidence from very slight confidence. It is unlikely that subjects would be more accurate in drawing that distinction than in distinguishing minimal awareness from complete absence of awareness.[4]

So it may be better not to rely on confidence at all, but simply to use subjective report of awareness, taking care to instruct subjects to distinguish minimal visual awareness from its complete absence (Sahraie et al., 1998a, 1998b; see Weiskrantz, 2009), as with Weiskrantz's use of commentary keys.

Pure guessing is useful when combined with subjective report in pointing to perceiving in the total absence of subjective awareness. And whether guessing reflects total lack of confidence about the stimulus is itself a subjective judgment about the perception. But guessing is not always pure in that way; it can occur when a subject has some idea of the nature or occurrence of a stimulus, but simply is not certain. Guessing comes in degrees that reflect degrees of confidence.

And guessing that reflects some diminished degree of confidence might be accompanied by a diminished or degraded subjective awareness of a stimulus. Such diminished subjective awareness, one might hypothesize, would be the best explanation of diminished confidence. So if subjective awareness does indeed come in degrees, gradations of confidence might be useful in assessing such degrees. Degrees of confidence might provide a graduated subjective measure of consciousness that is independent of subjects' reports of how strong or degraded their subjective perceptual awareness is.

So it is important to distinguish two questions. One is whether a perception or other psychological state is conscious, as against simply not being conscious at all. The other is among conscious states, what its degree of consciousness is. The foregoing considerations suggest that confidence ratings are of no use in distinguishing conscious from unconscious states, that confidence adds nothing to what we reliably get from subjective report.

But if we are concerned with degrees of subjective awareness, asking subjects to rate their degree of confidence about a stimulus might provide a useful subjective measure of consciousness that is independent of direct subjective report. No confidence at all would coincide with subjective report in indicating no awareness. But minimal confidence would then indicate very low awareness, and so forth. And perhaps because confidence comes in degrees, ratings of confidence can provide a more refined, and even more reliable, subjective measure than subjective report itself (Norman and Price, 2015).

The primary focus here is conscious and unconscious perception. But the foregoing considerations arguably apply equally well to distinguishing conscious from unconscious psychological states of any sort, whether or not perceptual. One paradigm that involves distinguishing conscious from unconscious for states that are not perceptions occurs in Dienes et al. (1995), in which subjects are asked to judge whether presented strings of characters are grammatical on a particular set of rules. Though such judgments about grammaticality patterns are not themselves perceptions, those judgments do rely on perceptual input that enables significant performance in making such judgments.

But the same considerations apply. A subject's reporting absolutely no confidence about grammaticality is equivalent to the issuing of two reports, one a pure guess about grammaticality, and the other a subjective report that the subject is unaware of making any judgment about grammaticality. Unless we can reliably construe a subject's report as implying a subjective report of being unaware of any relevant judgment, it is not a case of pure guessing at all. A pure guess must at least tacitly involve a subjective report of being unaware of the relevant psychological state. And it is that subjective report that reveals that the state fails to be conscious.

A different type of difficulty arises about the use of confidence ratings as a measure of gradations of consciousness, which is discussed in Section 4.2. Those issues also cast some doubt on the use of confidence ratings, but there the concerns may well apply only to perceptual states, and not to psychological states of all types.

Confidence ratings are not new. They figured in nineteenth-century work (Peirce and Jastrow, 1884), and there has been a resurgence in recent decades (Cheesman and Merikle, 1984, 1986). And confidence ratings do often yield results that conform to subjective reports (Dienes and Seth, 2010a), though testing subjects at once for both confidence and subjective awareness of stimuli has also been known to diminish accuracy in forced-choice testing (Weiskrantz, 1998).

3. Confidence and subjective report

Subjective reports of conscious perceiving can be unreliable when the stimulus is degraded or near threshold; subjects may actually be uncertain in such cases about whether they perceived anything. And subjective report can be biased by various factors such as attention (van Gaal and Fahrenfort, 2008), and even by the cost of subsequent motor response to sensory input (Hagura et al., 2017). In addition, attention may bias subjective report (Rahnev et al., 2011), and subjective report may be biased in other ways (Dienes, 2008). And though subjective report expresses subjective awareness, such expressing is doubtless not perfect, and may not always reflect subjective awareness with total accuracy.[5]

These considerations make it inviting to seek an alternative subjective measure of consciousness, and confidence ratings may seem a good prospect. Because such ratings do typically coincide with subjective report in unproblematic cases, such ratings may help resolve the lack of clarity that sometimes arises for straightforward subjective report (Koch and Preuschoff, 2007).

But confidence ratings are themselves subjective; they are the degree of confidence a subject is aware of having about a stimulus. So when subjective reports are problematic because of bias or because the stimulus is near threshold or degraded, confidence ratings may well be problematic as well, and in the very same ways. Confidence ratings are a more indirect technique for measuring consciousness, but not on that account more reliable. Indeed, since confidence ratings, like direct report, are subjective assessments, even guesses that subjects rate as reflecting no confidence at all may not be more reliable in problematic

[4] One proposal for using confidence to operationalize the absence of conscious awareness is what Dienes et al. (1995) and Dienes (2004) call the zero-correlation criterion of unconscious knowledge, in which there is no correlation between confidence and perceptual accuracy. But we cannot rely on that unless it stands up well in tests against subjective report.

[5] Also, different forms of subjective report can diverge in accuracy. Marcel (1993) strikingly found increasing accuracy for button presses over verbal report and the raising of eyebrows over button presses. Marcel regards all three reactions as types of report. But it is arguable that button presses and eyebrow raisings are not strictly reports of perceptual decisions at all, but instead simply nonverbal expressions of perceptions. That interpretation might help explain the divergence. Since expressing a psychological state likely involves less mediation than reporting it, and so less potential distortion, we can expect button presses and eyebrow raisings to be more accurate than explicit verbal reports. In any case the use and evaluation of such alternative methods calls for care.

cases than direct subjective report of awareness of a perceptual or other psychological state.

Concerns about the subjectivity of confidence to one side, confidence ratings and subjective report of awareness fail to coincide for certain types of stimulus (e.g., Rausch and Zehetleitner, 2016). And Li et al. (2014) have found differences in the brain activity underlying subjective report, on the one hand, and both confidence and objective performance, on the other. This provides reason to expect that confidence ratings and subjective awareness likely reflect different psychological processes, at least to some extent. These considerations cast additional doubt the use of confidence ratings rather than direct subjective report of awareness as a measure of consciousness.

Still, when subjective report may be problematic, as with near-threshold or degraded stimuli, perhaps graded confidence ratings have some advantage. Perhaps there are very low levels of confidence in which consciousness is still absent, though work by Sahraie et al. (1998a, 1998b) casts strong doubt on that. And perhaps fine gradations of confidence will help distinguish total absence of consciousness from merely minimal consciousness. But it is unclear how to assess these possible benefits of confidence ratings in a decisive way except by appeal, once again, to direct subjective report. So it remains unlikely that confidence ratings can have an advantage over subjective report.

There is a possible confusion in comparing subjective report with confidence ratings. As noted earlier, we must distinguish pure guessing, in which subjects have no confidence whatsoever in their guesses, from every other degree of confidence. It is special to pure guessing that by itself it actually implies a subjective report that the subject is wholly unaware of perceiving anything; otherwise it simply would not be a pure guess expressing a total lack of confidence. Any methodologically sound scale for confidence ratings must include a rating that captures pure guessing in this way, and its status as a tacit subjective report must be made clear to the subject.

3.1. Post-decision wagering

In confidence ratings, subject are asked to assess a degree of confidence about a stimulus on a provided scale. And one might question how accurately subjects can assess their degree of confidence on such a scale. They are assessing conscious confidence, that is, confidence that they are aware of themselves as having. So any such assessment will be affected in all the ways subjective report of awareness would itself be affected.

But there is an inviting behavioral test for confidence, which promises to avoid these difficulties. This test relies on the observation that degrees of confidence can be manifested in a subject's willingness to bet. Subjects are asked to bet on a perceptual decision after that decision has been made, with monetary incentives for getting it right. The original study using this technique tested both the blindsight subject, GY, and normals, and found on various trials that wagering reflected conscious awareness of the stimulus, and not mere accuracy of performance (Persaud et al., 2007; Persaud and McLeod, 2008).

The monetary incentive in such post-decision wagering (PDW) arguably can enhance the accuracy of results by providing motivation. But betting has its own complications. As Schurger and Sher (2008) and Dienes and Seth (2010a) independently note, some subjects are loss averse, leading to a reluctance to wager even when it would be advantageous. Those authors also suggest ways to compensate or adjust for loss aversion, Dienes and Seth (2010a) with no-loss gambling and Schurger and Sher (2008) with an adjusted pay-off matrix. But Dienes and Seth (2010a) also show that even with adjustment for loss aversion PDW is no more sensitive than traditional confidence ratings.

It has been argued that results in PDW conform well to subjective reports (Persaud et al., 2007; Dienes and Seth, 2010a), though Overgaard et al. (2010) contest that, arguing that subjective report is optimal. And since PDW presumably reflects subjects' conscious confidence in their judgments about stimuli, this technique is subject to all the methodological and theoretical concerns raised above for ordinary confidence ratings. Despite the motivational factor that makes PDW especially inviting, subjective report likely remains the most reliable, well-motivated, and theoretically sound subjective test for distinguishing between a state's being conscious and its not being conscious.

Persaud et al. (2007) describe PDW as an objective measure of awareness, not a subjective measure. Presumably they characterize it as objective because subjects in effect wager about the presence or nature of the stimulus, or perhaps simply because it is a behavioral test. But it is arguably more accurate to describe the test as a subjective measure, since subjects are directly wagering about their perceptual decisions. They are wagering about their subjective degree of confidence about whether their perceptual decisions are accurate, and that amounts to a wager about the accuracy of their perceptual decision. The perceptual decision comes first, and then they wager on its accuracy. The wager is about one of the subject's psychological states.

One cannot consciously wager about the accuracy of a perceptual decision one makes without being aware of that perceptual decision. So PDW carries with it some awareness of the perception that figured in the relevant decision. PDW is in that way more indirect than straightforward subjective report, just as ordinary confidence ratings are. And that again suggests that direct subjective report of awareness will be more reliable than PDW. The relative directness of the tie that a perception's being conscious has to confidence and to subjective report will come up again in Section 7.2.

3.2. Signal-detection theory

Signal-detection theory (SDT) (Green and Swets, 1966; Cheesman and Merikle, 1986) provides a way to represent how cautious a subject is in particular perceptual decisions involving the detection of a stimulus. Subjects will not always be correct; sometimes they will fail to detect a stimulus, and other times they will err by reporting a stimulus that was not presented. By adopting a more cautious attitude, a subject can avoid the false alarms of reporting a stimulus that did not occur, but at the cost of missing some cases in which a stimulus did. By being bolder, subjects will get more correct hits, but also more false alarms.

SDT describes this in terms of a criterion the subject sets, typically unconsciously, that distinguishes cases in which the subject judges that a stimulus has been presented from those in which the subject judges that it has not. By adjusting the criterion, subjects can have some measure of control over which of the two kinds of error they are likely to make, though experimenters can also encourage a higher or lower criterion.

This way of representing a subject's level of caution in perceptual decisions may seem related to a subject's degrees of confidence. Operating with a lower criterion is being bolder in one's perceptual decisions, which one can take to reflect a more confident attitude in general; a higher criterion involves greater caution, and so a less confident overall attitude about one's perceptual decisions.

But how the SDT criterion is set need not carry over to degrees of confidence in any specific perceptual decision. One can be fully confident about a perceptual judgment made with a high, cautious criterion, and less confident about a judgment made with a bold, low criterion. How the criterion is set does reflect general confidence about one's perceptual decisions in a task, but need not on that account affect confidence about any particular decision. SDT does not help in assessing or representing the confidence level of specific perceptual decisions.

SDT as applied to perceptual decisions also has no special tie to subjective awareness. As applied directly to perceptual decisions, SDT makes its calculations by relying solely on numbers of hits and misses. And that is simply a matter of perceptual accuracy, not subjective awareness. So as with the modified objective measure of consciousness discussed in Section 1.1, SDT applied directly to perceptual decisions cannot help in assessing subjective awareness.

Maniscalco and Lau (2012) have developed an ingenious application of SDT to metacognitive states, instead of to perceptual decisions themselves. (See also Fleming and Lau (2014) and Rahnev et al. (2015).) Because the higher-order awareness that figures in perceptual states' being conscious has a special type of metacognitive aspect (Rosenthal, 2012), this application of SDT may be able to help with subjective awareness. On this higher-order application, one could determine a criterion the subject has set that reflects a degree of caution or boldness in assessing what perceptual states the subject is in. A more cautious higher-order criterion would lead the subject to miss some perceptual states that the subject is actually in, but have fewer false alarms; a bolder higher-order criterion would result in the opposite.

It is inviting then to hold that a lower, bold criterion would result in a greater number of perceptual states being conscious, since one would then more readily count oneself as being in various perceptual states. On a higher, more cautious criterion, fewer perceptual states would be conscious. But we cannot simply assume that the setting of a criterion for a subject's higher-order awareness of perceptual states will reveal which particular perceptions are conscious. We would need independent corroboration, and there seems nothing against which to test the hypothesis except direct subjective report of awareness.[6]

And the need to rely on subjective report is even more pressing. If the setting of a higher-order criterion did turn out to be connected with consciousness, that could establish a connection between a one's holding a bold or cautious attitude towards taking oneself to be in various psychological states, and hence to those states' being conscious. But as with the application of SDT directly to perceptual decisions themselves, setting the criterion high or low may reflect one's general degree of confidence in one's assessment of what perceptual states one is in.

How a higher-order criterion is set cannot, however, speak to degrees of confidence in specific cases of such assessments. We can determine how this higher-order criterion is set for a subject only by appeal to the relative number of hit and false alarms. So the degree of confidence that results from setting one's criterion in a particular way is also relative to a significant number of perceptual decisions, the more the better, and not to any one decision. For individual decisions we must again rely on subjective report.

4. Gradations of confidence and consciousness

Putting aside difficulties in assessing whether a perception or other psychological state is conscious by appeal to confidence ratings, such ratings do provide a fine-grained measure of a subject's degree of confidence. So even if there is reason to doubt that the appeal to confidence can help distinguish conscious mental unconscious states, fine-grained gradations of confidence ratings might be useful in another way. Perhaps subjective awareness itself is a graded phenomenon, not simply present or absent but admitting of degrees (Overgaard, 2015; Windey and Cleeremans, 2015). And if so, one might expect gradations of confidence to help in assessing such degrees of subjective awareness.

Subjective report is typically implemented by asking subjects simply to indicate whether something was perceived. The subject reports that something was perceived or that nothing was. There may be gray areas of uncertainty, but the goal is to make a dichotomous judgment. By contrast, confidence ratings typically allow for a range of degrees of confidence in a perceptual decision. So if consciousness admits of degrees, confidence might do greater justice as a measure than subjective report, at least when subjective report is implemented in a dichotomous way.[7]

Being graded and being dichotomous are not exclusive alternatives, and consciousness is likely both. It is reasonable to hold that every perception or other psychological state is either conscious to some degree or totally lacking in consciousness. Consciousness is in that way dichotomous. But among the states that are conscious, consciousness may well come in degrees, and if so is in that way a graded phenomenon. Dichotomous and graded need not exclude one another. They do so in the case of consciousness only if no gradations occur among the conscious cases.[8]

So if gradations of subjective awareness occur among perceptions that are conscious, confidence ratings may be able to capture those gradations more effectively and in a more fine-grained way than subjective report, at least as subjective report is typically implemented. But even if that is so, the considerations already reviewed suggest that subjective report will do better with the dichotomous assessment of whether a perception or other psychological state is conscious. At that cutoff point, confidence ratings would likely not be robust enough to be reliable, and would in any case add nothing to what we can get from subjective report alone.

4.1. Gradations of consciousness and content

Conscious perceptions and other psychological states doubtless do vary in respect of how conscious they are. The subjective awareness of some states is strong and compels attention, whereas the subjective awareness with other states is minimal and fleeting. The subjective awareness of a perception can be more or less intense, stable, clear, and focused.

But conscious perceptions also vary in the intensity, strength, clarity, and vividness of their perceptual content, independently of their degree of subjective awareness. The content of some perceptions is strong or weak because of the nature of the stimulus; an intense, bright light results both in vivid content and in strong subjective awareness, but those two factors can come apart. An intense, bright light that occurs fleetingly might cause strong perceptual content but weak subjective awareness. And focused attention may result in perceptual content that is intense and clear, whereas distraction may result in diminished strength and clarity of that perceptual content, all independently of the level of subjective awareness of that perception.

Variations of attention can also affect subjective awareness (Rahnev et al., 2011), but they need not. Attention and consciousness are independent (Norman et al., 2013, 2015; van Boxtel et al., 2010), and variations of attention can affect just the content of a perception, leaving unaffected its degree of subjective awareness.

Distinguishing the strength of perceptual content from the strength of the subjective awareness of the perception has a parallel with all other types of psychological state. The content of thoughts, desires, and emotions can vary in respect of intensity, clarity, and vividness independently of variations in the strength of the subjective awareness of those states.

That gradations of subjective awareness can vary independently of gradations in the strength of perceptual content fits well with the higher-order approach to subjective awareness sketched in Section 1.3. On a higher-order approach, a perception is conscious only if one is aware of it in some suitable way. That accommodates the occurrence of perceptions that are not conscious at all, since a perception can occur without one's being at all aware of it. And since the perception is independent of one's subjective awareness of it, it is to be expected that the two will vary independently in respect of strength and related

[6] Scott et al. (2014) report a striking finding of above-chance metacognition despite lack of accuracy of first-order perceptual decisions, which they call blind insight. As Scott et al. note, this finding causes difficulty for such appeals to SDT.

[7] I am grateful to personal communication with Zoltán Dienes that greatly helped clarify my thinking about these issues, and a number of other matters discussed here.

[8] Being dichotomous and being graded would also exclude one another if all perceptions are to some degree conscious, as urged, e.g., by Overgaard et al. (2006, 2008), and states, as in blindsight that appear to be unconscious are really conscious but only to a very minimal degree. But the considerations advanced in section 1.3 arguably show that a subject's sincere denial of being in a psychological state is, at least in typical cases, decisive evidence that the state is altogether unconscious. See also n. 9 below.

features.

But the reason to hold that content and subjective awareness vary independently does not depend on adopting a higher-order approach to consciousness. It relies instead on empirical findings and commonsense observation. Still, a higher-order approach is arguably the best explanation of that independent variation; so such variation provides independent corroboration for the higher-order approach.

4.2. Problems due to consciousness vs. content

The difficulty that can occur in distinguishing gradations of content from gradations of subjective awareness results in a problem for the use of confidence ratings solely as a measure of levels of consciousness. Likely it will be often evident to a subject how intense the content of a perception is and how strong the subjective awareness of that perception; often a subject will be able without difficulty to distinguish in a reliable way intensity of content from intensity of awareness.

But not always. Consider consciously perceiving a red light. The perception can vary in respect of the intensity of content because of variation in the strength of illumination. But keeping that fixed, the perception can also vary in respect of the subjective awareness of the perception. If a subject is attending to the stimulus, distinguishing the two type of variation may be straightforward and reliable. But distraction or top-down cognitive factors may result in its not being obvious to a subject how much of the intensity is due to the content of the perception and how much to the subjective awareness of the perception. Even in optimal conditions of presentation, overall strength of the conscious experience may be due mainly to the light's being more intense, but may instead be due mainly to its being a type of stimulus that one antecedently cares about for some reason. And as perceptual conditions become less optimal, we can expect reliability in subjectively distinguishing the two to fall off, perhaps dramatically.

So a subject's assignment of overall experiential intensity to perceptual content or to subjective awareness is unlikely always to be reliable. And despite the fineness of grain that confidence ratings can offer, such ratings will cannot by themselves distinguish the two sources of overall experiential intensity. Confidence will vary with the overall experiential intensity, clarity, strength, and vividness, whether those factors result from aspects of perceptual content or from the way a subject is aware of the perception.

So even when subjects can distinguish intensity of content from intensity of awareness, confidence will vary with overall intensity, rather than with one or the other of the two contributing factors. Confidence ratings will not exclusively reflect gradations of subjective awareness, and so will not reliably reflect gradations of consciousness. It might seem that by coming in degrees confidence ratings will be preferable to subjective report at least as a measure of gradations of consciousness. But because of the problem about intensity of content vs. intensity of subjective awareness, this is not so. Direct subjective assessment is again to be preferred.

Any subjective technique for distinguishing intensity due to perceptual content from intensity due to subjective awareness will be unreliable in some cases, perhaps in many. So a subjective assessment of gradations of consciousness, as against content, will often be unreliable. But things are even worse for confidence ratings, since confidence is due to overall experiential intensity, clarity, and the like, independent of the distinct contributions of content and subjective awareness.

4.3. The perceptual awareness scale

Subjective report is typically implemented in a dichotomous way, but it need not be. One can instead instruct subjects to assess gradations of subjective awareness. One methodologically promising way of doing so relies on the perceptual-awareness scale (PAS) developed by Ramsøy and Overgaard (2004), which seeks to assess gradations of consciousness in directly subjective terms, rather than indirectly by way of confidence ratings or other measures. (See Sandberg and Overgaard, 2015, for a useful review.)

Subjects are asked to rate the subjective clarity of visual experiences on a provided scale. The goal is to capture levels of subjective awareness intermediate between there being no subjective experience at all and a completely clear experience. Subjects should then be able to distinguish no experience at all from a very dim experience that is difficult to make out, so that such dim experiences will not get counted in assessing perceptual performance in the complete absence of subjective awareness. See Dienes and Seth (2010b) for concerns.

PAS ratings are subjective assessments, and such assessments may sometimes or even often be able to distinguish strength of perceptual content from strength of subjective awareness. And perhaps this will typically be so in standard experimental conditions. But it is unlikely that these assessments will be reliable in all cases of distinguishing those two sources of overall experiential intensity. In particular, as overall experiential intensity diminishes, subjective discrimination between intensity of perceptual content and intensity of consciousness will likely become less reliable, dramatically so as overall experiential strength becomes very low. PAS ratings will not be reliable in all cases in assessing intensity of subjective awareness, as against intensity of perceptual content.[9]

Fazekas and Overgaard (2017) distinguish subjective from representational respects in which conscious visual perceptions admit of gradation. But they understand that distinction in a way different from the distinction drawn here between gradation in respect of content and gradation of consciousness. They construe overall experiential gradation in intensity, precision, and stability, for example, as representational. But those gradations can be due to gradations in perceptual content or to gradations in the way one is subjectively aware of the perception.

Sandberg et al. (2010) argue that PAS ratings are more accurate than PDW, and indeed that PDW is the least accurate among those measures studied. Those arguments are extended by Wierzchoń et al. (2014a). But the foregoing considerations give reason for doubt. Sandberg et al. and Wierzchoń et al. both appeal to correlations with performance, which raises a question about whether the different measures are being compared exclusively in respect of subjective awareness, and not also in part in connection with the content of the relevant perceptual states, independent of subjective awareness.[10]

One might object that it is misguided to distinguish these two sources of subjective intensity. Gradations of consciousness, one might urge, are a matter of variations in overall experiential intensity, whatever the psychological explanation of those variations. And if all that matters to gradations of consciousness is overall subjective intensity, neither confidence ratings nor PAS ratings would face the kind of difficulty described above for capturing gradations of consciousness.

This would be a mistake. Though variation in intensity of the content of a perception and in strength of awareness of the perception both affect overall experiential intensity, only variation that is due to the second source is strictly speaking a gradation of consciousness. It is plain that perceptual content can vary altogether independently of consciousness. Variation in intensity of perceptual content is not gradation of consciousness.

One would think otherwise only on a theory that assimilates perceptual consciousness to the content of the perception, and so fails to

[9] For additional issues about the interpretation of PAS results, see Wierzchoń et al. (2014b).

[10] Overgaard et al. (2008) argue that testing blindsight patient GR using PAS ratings reveals, as dichotomous subjective report does not, that GR's blindsight performance is due not to unconscious vision, properly so called, but to very severely degraded conscious vision. But it is unclear that the PAS procedure used there distinguishes GR's nonvisual sense of correct performance from GR's visual subjective awareness.
On distinguishing unconscious vision from severely degraded conscious vision, see Sahraie et al. (1998a, 1998b).

distinguish subjective awareness of psychological states from the states themselves. On such a theory, conscious perceptions can vary in intensity in one way only, and that is overall experiential intensity. But as noted earlier, theories that do not distinguish subjective awareness from the content of perception have difficulty in accommodating perceptions that simply fail altogether to be conscious.

And theoretical considerations aside, assimilating variations of consciousness to variations in perceptual content does not do justice even to the subjective appearances. In optimal conditions variations in intensity of content of the perception will appear subjectively different from variations in the intensity of the way one is aware of the perception. Perceptual content and subjective awareness are distinct factors, which can vary independently of one another.

5. Confidence without awareness: special cases

There is yet another issue about the appeal to confidence as a measure of consciousness. There are unusual circumstances in which confidence plainly occurs despite total absence of any relevant subjective awareness. The blindsight subject, GY, who has been tested extensively, has confidence in his guesses about stimuli he can detect and discriminate despite his lacking any conscious awareness of those stimuli that is distinctively visual (Weiskrantz, 1997; Sahraie et al., 1998a).

GY does, for some stimuli, report a kind of nonvisual awareness of the stimuli, a nonvisual sense about the nature of the stimulus. But he firmly denies that the sense he has about the stimulus is in any way visual (Weiskrantz, 1997). It is like seeing nothing at all, but nonetheless having an idea about how things are. Similarly for the blindsight subject, DB (Weiskrantz, 2007).

The occurrence of such a nonvisual awareness is what Weiskrantz (1997) has called Type 2 blindsight. Such nonvisual awareness presumably brings with it a reasonable degree of confidence about the stimulus. And experimental work with GY has found that the distinctively nonvisual subjective awareness that GY reports does come apart from confidence (Sahraie et al., 1998a, 1998b).

Because Type 2 blindsight involves a type of nonvisual awareness, it may not seem to be a clear case of confidence in the complete absence of consciousness; the nonvisual awareness is, after all, a type of consciousness. But that nonvisual awareness is not perceptual in any way; it is best seen as a type of cognition. But that cognition concerns the detection and discrimination of visible stimuli. So there is confidence in the absence of any relevant conscious perception. Indeed, it is natural to construe the nonvisual awareness Type 2 blindsight subjects report as itself a type of conscious confidence about the stimulus. Indeed, it is unclear what other type of psychological state that nonvisual awareness might be.

Another subject, TN, suffered bilateral damage to V1 and exhibits clinical blindness over the whole visual field. But he is can nonetheless navigate down a hallway avoiding obstacles placed in his path (de Gelder et al., 2008). There can be no doubt that he felt reasonable confidence in being able to avoid the obstacles.

With Type 1 blindsight, there is no conscious awareness about the stimulus, visual or otherwise (Weiskrantz, 1997). So when Type 1 blindsight subjects remain uninformed about the accuracy of their guesses, they also wholly lack confidence in them. Indeed, as noted earlier, Weiskrantz (1986, 1997) reports unsurprising difficulty in getting some blindsight subjects to guess at all. But once informed about the impressive accuracy of their guesses, it is hard to believe that Type 1 blindsight subjects would not at some point come to have reasonable confidence in those guesses, despite their lack of any awareness about the stimuli, visual or otherwise.

One might urge that whatever confidence Type 1 blindsight subjects come to have in their guesses is not relevant to confidence ratings, since the confidence they come to have would rely on inferences from having been informed how accurate their previous guesses had been. Because their confidence would be consciously mediated by such inferences, one might maintain that it is not conscious confidence of the sort relevant to confidence ratings.[11]

But after Type 1 subjects have had extended experience with guesses that they know to be highly accurate, the confidence they have in their guesses will likely come to seem subjectively independent of observation, inference, and theory. Subjective awareness likely comes apart even here from confidence that seems wholly unmediated.

It might seem that blindsight cases are so exotic that they should not count in evaluating confidence ratings in normals as a measure for consciousness. But any cases in which confidence and consciousness come apart should give us pause. Neural processing of some type evidently subserves confidence without conscious perception in Type 2 blindsight. Without knowing what that neural mechanism is, we should not assume that confidence and consciousness do not also sometimes come apart even in normals.

Confidence ratings rely on conscious confidence, confidence the subject is aware of. And normals do tend not to make conscious judgments about perceptual matters unless they have some conscious perception to rely on. But experimental findings show that unconscious perception sometimes yields performance more accurate than conscious perception (Scott and Dienes, 2010; Raffman, 2011). And that suggests the speculation that normals might, with suitable training or experience, be able to develop confidence about some perceptual matters relying on perception that is not conscious. Anecdotal cases of people making perceptual judgments but being unable to cite any relevant perceptual input encourage such speculation.

Perhaps when confidence about a stimulus is conscious, one's perception of the stimulus typically is as well. But there is no reason to suppose that confidence always occurs consciously. People plainly sometimes have confidence in beliefs, desires, and intentions that remain unconscious, since people sometimes act on those psychological states. And confidence is itself just another type of cognitive state.

Confidence ratings involves subjects' reports of confidence; so the confidence that occurs when ratings are requested will be conscious. Reporting a psychological state, as noted in Section 1.3, expresses an awareness of that state, in virtue of which the state is conscious. So thinking about confidence in terms of confidence ratings may lead to disregarding cases of confidence that are not conscious.

But confidence need not be conscious, and so unconscious confidence can accompany perception. And when the confidence that accompanies perception is not conscious, there would be no reason to expect the perceiving itself to be conscious. Suppose a subject perceives something unconsciously and has unconscious confidence in that perception, confidence that would, despite the perception's being unconscious, manifest itself in guiding action. And suppose that in response to an experimenter's request the subject gives a confidence rating, and on giving it that confidence becomes conscious. It is not obvious that the perception would automatically become conscious as well. Perhaps it would, but that is by no means obvious. This would have to be tested.

6. The tie between consciousness and subjective report

It is clear that confidence ratings work reasonably well in unproblematic cases for assessing subjective awareness. Still, when confidence ratings diverge from subjective report, it is reasonable to let subjective report override confidence ratings (Overgaard et al., 2010; Sandberg et al., 2010). This is so despite whatever gray areas do occur for subjective report. And gray areas aside, subjective report has very

[11] What matters for confidence, or any other psychological state, to be conscious is that one is aware of that state in a way that seems subjectively to be unmediated by theory, observation, and inference. It need not actually be unmediated in those ways; such mediation may occur so long as the subject is unaware of it (Rosenthal, 2002, 2005, 2012).

significant strengths; it does well, for example, when assessed for sensitivity in cases of visual conflict (Questienne et al., 2017).

More important, there seems in the end no way to assess confidence as a measure for consciousness except by measuring it against subjective report. Subjective report is widely regarded as in effect the appeal of last resort. So it is worth asking why subjective report should override confidence ratings whenever the two diverge.

Subjective report has an important theoretical tie to psychological states' being conscious, which is absent for confidence ratings. As noted in Section 1.3, if an individual is in a psychological state but is in no way aware of being in that state, the state simply is not conscious. So a state's being conscious requires at least some awareness of a suitable sort of one's being in that state. Subjective report is in effect the last word about consciousness because such a report expresses awareness that one is in the psychological in question. Subjective report reflects the awareness a subject has of a psychological state when that state is conscious. This is so for psychological states of every sort, not just perceptions. This forges a robust tie between subjective report and a state's being conscious.

There is no similar theoretical tie between a perception's being conscious and one's having confidence in a perceptual decision, though a somewhat more indirect connection will be explored in Section 7.2. Indeed, one may lack such confidence for a variety of reasons wholly unrelated to whether one's perception is conscious and wholly unrelated to its gradation of consciousness.

It is inviting to think that confidence may serve as an indicator of a perception's being conscious because conscious perceptions often result in judgments about what is perceived, and we have confidence in our judgments. Indeed, the making of a judgment partly constitutes confidence that whatever one judges to be the case actually is. But conscious perceptions do not always result in any such judgments, and indeed typically do not unless the perception is in some way salient. Experimental procedures for confidence ratings may conceal that, that whatever perception occurs in confidence ratings is automatically taken to be salient.

Confidence ratings must rely on confidence that is itself conscious; as noted in Section 5, subjects must be able to report the confidence that figures in such ratings. But confidence can occur without being conscious, as with the confidence we have in acting on unconscious belief, doubts, desires, and intentions. Since the connection noted above between perceiving, judgment, and confidence holds even when all three fail to be conscious, a subject could unconsciously perceive a stimulus and form an unconscious judgment about it. And that unconscious judgment would constitute unconscious confidence about the relevant perceptual matters. There is no tie between confidence and consciousness like that which holds between consciousness and subjective report.

And there is a theoretical consideration that points to an indirect and potentially unstable tie between confidence and a perception's being conscious. Confidence is in effect a judgment about the stimulus, not about the perceptual state itself. And a perception is not conscious unless a subject has some suitable awareness of having that perception. Confidence is perforce a step or more away from the awareness in virtue of which a perception is conscious. How those steps get bridged in typical cases is explored in Section 7.2.

7. Confidence, utility, and higher-order awareness

7.1. Utility

The desire to explain consciousness by appeal to there being some useful function to psychological states' being conscious may enhance whatever temptation there is to see a connection between consciousness and confidence. It is not obvious what utility a psychological state's being conscious adds to the utility that state would have even if it failed to be conscious.

But confidence has considerable utility; the more confidence one has about some information the more likely one is to act rationally and reason well on that basis of information. So if a psychological state's being conscious automatically resulted in confidence about relevant matters, or even did so with reasonable frequency, there would be clear utility to that state's being conscious.

The foregoing considerations suggest that conscious perceptions do not automatically result in confidence about what is perceived, and also that since confidence itself need not be conscious, a perceptions can result in confidence even when those perceptions are not conscious. And though judgments and many other cognitive states in effect embody confidence a degree of confidence about whatever the cognitive states are about, that is altogether independent of those states' being conscious.

In any case, the quest for some utility that attaches specifically to a state's being conscious is likely a misguided motivation for the view that a state's being conscious typically leads to confidence about whatever that state represents. There is reason to doubt that a psychological state's being conscious does add any significant utility (Rosenthal, 2008, 2012, §5) there are empirical findings that raise doubts as well (e.g., van Gaal et al., 2008).

The utility of being in any psychological state is due to the causal connections that state has with other states, and with behavior. And the causal ties that carry utility hinge in turn on that state's perceptual or cognitive content. And representational content is independent of whether the state is conscious; conscious and unconscious states can have the very same content. Whether seeing or hearing something is useful depends on the state's perceptual content, and the context in which it occurs. Similarly for beliefs and desires; what utility they have if any depends solely on their conceptual content.

Being conscious, by contrast, is a property that all conscious states have in common independently of their perceptual or cognitive content. Since states with different content are useful in different ways and conscious states all share the property of being conscious, it is unclear what utility a state's being conscious could contribute. The state's utility would be determined by its content, not by whether it is conscious.

Because so many psychological states are conscious in the human case and so many conscious states have considerable utility, it is tempting to assume that utility always goes with consciousness. That is unfounded. Even if most useful states are conscious, that would not show that their utility is due to their being conscious. Consciousness and utility might, instead, be due simply to a common cause, as with barometer readings and impending weather. Enhanced neural signal strength is a credible candidate for such a common cause; it likely results both in a psychological state's being useful and also in its being conscious, but without there being any direct or other connection between them.

The states we are subjectively aware of as having utility are all conscious, but that offers no support for any tie between consciousness and utility. When states are not conscious, we are not subjectively aware of them at all; so we are not subjectively aware of them as having utility. And many states that are not conscious doubtless also have considerable utility, despite not being conscious.

The assumption that there is some tie between consciousness and utility likely lends considerable appeal of the neuronal global-workspace theory (Dehaene and Naccache, 2001), on which a psychological state is conscious if its content is available for processing by a number of cortical subsystems. States whose content is thus available would have considerable utility, but it is unclear why such global availability would have any bearing on whether the relevant states are conscious.

And there are counterexamples in both directions. Peripheral visual states are often conscious, but likely not available for processing by many if any subsystems. And unconscious beliefs and desires often do affect many subsystems. It is likely that global availability and consciousness, like consciousness and utility more generally, are again due

to a common cause, such as robust signal strength, without being associated in any more direct way.[12]

7.2. Higher-order awareness

But there is another explanation of the temptation to hold that consciousness and confidence go together, which does not rely on utility and so may seem to hold more promise. As noted in Section 1.3, if there is compelling evidence that a subject perceives something or is in some other psychological state but the subject sincerely denies that, the natural conclusion is that the psychological state occurs without being conscious. And since the best explanation of sincere denial is that the subject is unaware of being in the state, a state counts as conscious only if the subject is in some suitable way aware of being in that state.

Being aware of something, moreover, typically carries a measure of confidence about that thing. In the perceptual case, one is aware that one perceives something. So the higher-order awareness that figures in a perception's being conscious typically carries with it a measure of confidence that one has that perception. And perhaps one's being confident that one has a perception brings with it, typically even I not invariably, a measure of confidence that the perception is accurate.

And confidence that a perception is accurate is confidence about the stimulus that the perception represents. On this line of reasoning, the confidence that a higher-order awareness that one perceives something typically brings with it confidence about the stimulus itself. The higher-order awareness in virtue of which a perception is conscious often leads to confidence about the relevant stimulus.

As noted in Section 1.3, the role of verbal report in indicating that a psychological is conscious is reason to hold that the higher-order awareness in virtue of which a psychological state is conscious is a thought that one is in that state, a higher-order thought. And that strengthens the previous line of thought. Having a thought that something is the case does not merely bring along a measure of confidence that it is the case; it actually constitutes a measure of confidence to that effect. So if higher-order thoughts explain what it is for a psychological state to be conscious, confidence that one is in the relevant state will be automatic. Higher-order thoughts forge an even tighter tie with confidence.

So a psychological state's being conscious will result in a measure of confidence about one's being in that state, which will in some cases lead to confidence that the state is accurate, in the perceptual case, confidence about the stimulus. This connection rests on a higher-order approach to what it is for a perception or other psychological state to be conscious. So if this reasoning does help explain the tendency for confidence about a stimulus to accompany a perception's being conscious, it also provides useful independent corroboration for higher-order theories.

But this explanation of why confidence does often accompany a state's being conscious also shows why confidence about a stimulus will not always coincide with a perception's being conscious. One might be confident that one perceives something but altogether lack confidence about what one perceives, say, because the perception is unclear or degraded or strikes one as being in some way illusory or unreliable. Or one might be confident about having a perception but lack any confidence whatsoever about that perception's being accurate (Dienes and Perner, 2004; Dienes and Seth, 2010c).

And in special cases confidence about a stimulus can occur with no confidence whatsoever about any perceptual state. Type 2 blindsight subjects can have confidence about a stimulus without any confidence that pertains to the perception itself, and in unusual circumstances such cases might even occur in normals. Though such cases are nonstandard, they show that whatever psychological mechanism results in confidence about a stimulus need not rely on any higher-order awareness of the relevant perception. Higher-order awareness is plainly not the only route to confidence about a stimulus. Confidence about a perception and confidence about the relevant stimulus need not coincide.

When they do coincide, confidence about the perception will arguably be due in typical cases to the higher-order awareness in virtue of which the relevant perception is conscious. But the confidence that results from such a higher-order awareness cannot be any more reliable than subjective report, since subjective report is a direct verbal expression of the higher-order awareness itself.

There are, moreover, factors that can and sometimes do interfere with the connection between a higher-order awareness and confidence about the stimulus. Such factors can also affect the tie between higher-order awareness and subjective report, but interference there is far less likely. Subjective report is the natural and immediate expression of one's awareness of perceiving something. So there can be little to favor confidence over subjective report as a measure of consciousness, at least with perceptions, and very likely with psychological states generally.

[12] Koizumi et al. (2015) present findings that cast doubt on there being any robust connection between perceptual confidence and cognitive control (see also Odegaard et al., 2017). Because Koizumi et al. accept a tie between consciousness and confidence, they see their results as also undermining a robust connection between consciousness and cognitive control. Since cognitive control is one way in which psychological may have utility, the foregoing concerns fit well with this conclusion about consciousness and cognitive control, though without relying on any tie between consciousness and confidence.

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