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Reexamining Opioid Receptors as Evidence of Conscious Pain States

*Brandon Long**

Department of Biological Sciences, J.P Scott Center for Neuroscience, Mind and Behavior, Bowling Green State University, Bowling Green, OH, USA

Abstract

Pain researchers have relied on the inadequate evidence of the presence of opioid receptors in organisms as evidence of conscious pain through an argument by analogy. The argument by analogy proceeds in two ways. The analogy by function looks at organisms with similar functioning pain systems to humans and supposes that similar functionality indicates similar mental states, like conscious pain. This fails with opioid receptors because opioid receptors are part of the pain inhibitory system, and there is as of yet no reason to think that the pain inhibitory system is required for a conscious pain experience. The analogy by conservation is a marginally better evidential criterion, but ultimately is largely inadequate. The analogy by conservation proceeds by observing that opioid receptors are conserved between humans and some species. As opioids are part of the pain system, this analogy suggests that the conservation of opioid receptors means that other neurophysiological structures important for conscious pain are conserved as well. However, this point of evidence only points at other evidence which can be independently investigated. Thus opioid receptors fail to be useful evidential criterion for conscious pain states.

Keywords

Pain, Consciousness, Animal pain, Opioid receptors

Introduction

Many pain researchers draw the line at invertebrates in investigating what organisms experience conscious pain. One method of addressing the problem of other minds is by way of reasoning by analogy [1]: Humans experience pain, therefore organisms exhibiting closest neurophysiological and behavioral similarities to humans are likely to experience conscious pain. Robust behavioral evidence indicates that insects don't limp or guard their wounded limbs, and even seem perfectly content with performing casual tasks while being damaged severely [2]. However, as behavior is an evolved reaction, it could simply be the case that insects simply evolved different reactions to certain kinds of painful stimuli due to human-like behavior simply provided no fitness advantage[a]. If insects that guarded or limped on injured limbs were predated at higher rates than those that didn't, then it makes intuitive sense to suppose that limping may have failed to evolve in insects. Or perhaps the need for the behavior did not exist to begin with.

We should be open to the possibility that conscious pain states may exist in organisms that display behavior that appears incongruous with the possession of conscious pain states. For, we can observe these incongruous behaviors in organisms we believe have conscious pain states, as chimpanzees can seem unconcerned at some severe injury [3]. The unresolved question of what the behavioral evidence tells us has led to the examination of comparative neurophysiology between humans and insects. This has also met with mixed results. The neurophysiological results--specifically the presence of opioid receptors--tell us less about conscious pain states than some researchers think, as I will argue. A reevaluation of the evidential basis of opioid receptors is needed to accurately characterize which organisms likely experience and do not experience pain, an aim of great neuroscientific and philosophic importance.

The presence of opioid receptors in organisms has been

[a]Conversely, insects do show some behavior, or a lack of behavior, that is not fitness enhancing. This provides doubt for using insect behavioral evidence to support conscious pain in insects.

***Corresponding author:** Brandon Long, Department of Biological Sciences, J.P Scott Center for Neuroscience, Mind and Behavior, Bowling Green State University, Bowling Green, OH, USA

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used as evidence--at varying levels of evidential basis--for the existence of conscious pain states [4,5]. Some authors have expressed skepticism of opioid receptors as evidence for conscious pain states [6,7], but nonetheless use them as a point of tenuous evidence. Others have listed opioid receptors as being one of the many biological facets that taken individually are not enough to constitute evidence for conscious pain states [8], but when taken holistically could. This places facets that are likely universally necessary for conscious pain states (a central nervous system[b]) on equal evidential footing as non-universal and specific structures like opioid receptors. A centralized processing location such as a central nervous system is almost certainly necessary for conscious pain, while there are many ways to inhibit nociceptive signaling other than opioid receptors. Thus, using opioid receptors as evidential criterion for conscious pain is likely unwarranted, and may lead to inaccurate assumptions about which organisms can and cannot experience pain. However, the presence of opioid receptors is not devoid of evidential content, and here will be a clear spelling out of their evidential basis.

Argument by Analogy Poor Evidential Criteria for Opioid Receptors

The two main lines of reasoning behind using opioid receptors as evidence for conscious pain are both analogies, one of function and the other by conservation. "Conserved" here means neurophysiological structures that share genetic homology to human ones, as the analogy proceeds by linking human neurophysiological structures to other organisms to determine some likelihood of conserved mental state. The functional analogy argument proceeds by arguing that organisms with non-conserved yet functionally similar neurophysiology likely have similar mental states. Opioid receptors that are functionally similar yet not conserved are still functional evidence of similar pain inhibitory systems. The pain inhibitory system is a distinct element apart from the pain system [9]. While the pain inhibitory system may be useful for organisms with pain systems, using it as evidence for a conscious pain system is so tentative that it is nearly insignificant. The argument by conservation proceeds by arguing that evolutionarily conserved neurophysiological mechanisms hint at other conserved states within that system. This is particularly important, as we are concerned with evidence that can weigh in on the question of conscious pain.

Working by analogy from human pain states, where opioids do in fact relieve pain, and drawing conclusions about what conscious states may be conserved from the presence of opioid receptors in other organisms has several problems. I argue that the argument by functional analogy is a poor one, and the argument by conservation is perhaps only marginally better evidential criterion for conscious pain.

The first broad problem for the functional analogy is that opioid receptors typically dampen neuronal firing of existing neurons. For this to evolve, there must be an existing nociceptive system in place for such a system to evolve onto. Perhaps the opioid system could have antedated its analgesic functions, but it remains an analytic truth that nociceptive ability must antedate analgesic capabilities. While it seems the opioid system is highly conserved in the vertebrate kingdom [10], it is not theoretically impossible to have a pain experience without the system that dampens it--or perhaps have a different system by which to do so, other than opioid receptors. We have no reason to believe that the evolution of opioid receptors necessarily must evolve in a system that has conscious pain. Through induction we have found that the organisms we most suspect to be able to experience conscious pain have opioid systems. However, inductions like these are inadequate to make a theoretical conjecture that opioid systems have some functional importance for conscious pain. For this the argument of conservation does marginally better.

Conserved neurophysiological structures do indeed hint at the likelihood of conserved mental states because of their function. For indeed, if we found a creature with identical pain and brain mechanisms as a human, we would declare that this organism can likely experience conscious pain. However, the functional analogy of opioid receptors does not apply to conscious pain because it is tangential to conscious pain itself, as it is part of the pain inhibitory system. Unless it can be shown that pain inhibitory systems are required for conscious pain, the argument of functional analogy falls into the argument by conservation.

In other words, unless the pain inhibitory systems' function can be shown to be connected to conscious pain, then all conserved opioid receptors are simply evidence of conservation of a system evolved on top of the pain system. Indeed, we could think of many reasons why an inhibitory system may be functionally necessary for a conscious pain state. However, we cannot be certain of this. We can be certain, however, that central nervous systems are.

Whether an organism has opioid receptors, or indeed, any pain inhibitory system, may be of secondary concern to the matter of conscious pain states, even when they are absent. The absence of opioid receptors does not indicate the nonexistence of a conscious pain state in an organism, but it does provide evidence for a lack of conservation in the pain system, which is evidence against conscious pain states because we know humans have conscious pain states and have opioid receptors. However, the lack of opioid receptors is tenuous evidence as it is neither necessary nor sufficient to rule out a conscious pain state.

Argument by Conservation Marginally Better Evidential Basis

Conserved opioid systems can be used as evidence for conscious pain because the conservation points to the potential of having homologous mental states-conscious pain. In other words, conserved opioid receptors are evidence for conscious pain because they are a conserved factor in the pain system that suggests the conservation of other

[b]This is not to suggest that there is only one specific way to have a central nervous system suitable for the experience of pain.

neurophysiological structures, and therefore mental states. This is of a higher evidential basis than the analogy of function--because pain modulation can't prove conscious pain states. Conserved opioid receptors point exteriorly to other factors that are more important in the question of conscious pain than pain inhibition, that is, neurophysiological structures required for consciousness. However, this is tenuous because the inductive fact that humans experience conscious pain and evolved a robust opioid system that inhibits pain is not sufficient evidence for this. Conversely, the presence of non-conserved opioid receptors is not sufficient evidence for the existence of conscious pain states as it mostly rests on the analogy by function. Therefore, listing opioid receptors as one of many holistic evidentiary points for conscious pain [5] along with necessary evidential points is misleading.

Varner's evidential points are: Those nociceptors are present and are connected to a central nervous system, and that they respond to damaging stimuli similarly to humans, and that opioid receptors are present and indeed do perform an analgesic role as observed in humans [5]. I take Varner's figure 2.3 to be indicating that the non-conserved endogenous opioids present in insects are one of the 6 evidential points for conscious pain. For the reasons mentioned, this is not best practice, as the functional aspect is under question, and the conservation aspect relates to other neurophysiological structures. Others acknowledge the tenuous evidence of opioid receptors, but keep them on evidential lists for conscious pain states [6,7], likely because of the analogy by conservation, which is a mistake, as evidence that merely points elsewhere should be discarded in favor of looking in exactly the place the evidence points at. Even if we modify the evidential criterion from "presence of opioid receptors," to "presence of a pain inhibitory system," this remains a problem for the reasons already mentioned.

As we already discussed, the opioid system's nociceptive inhibitory function comes after the nociceptive system. Further, we have no reason to think that opioid receptors are required for conscious pain. Therefore, we must reject the analogy of function for opioid receptors as evidence for conscious pain. The analogy by conservation holds, but only tenuously, and points to evidence outside of the fact of conservation. Conversely, the absence of opioid receptors can no more tell us about the existence of a conscious pain state than can the lack of a rooster's call tell us about the rising of the sun. Unless a pain inhibitory system is required for conscious pain, opioid receptors should not be used as an evidentiary criteria for conscious pain outside of the fact of conservation, which is also inadequate.

Evidence of important second order processing networks as seen in the human brain stands as the keystone without which all other evidence collapses. As it remains an empirical question exactly what kinds of neural networks are important for a conscious pain state, researchers have grasped falsely at other, less valid, evidence.

Conclusions

In all, we see how tangential much evidence provided for conscious pain really is when it is not in reference to the conservation of that state. Facts about the pain inhibitory system that don't have to do with the ability to experience pain, like the ability to modulate pain in the case of opioid receptors, are tangential to the question of conscious pain. They do, however, contribute to the possibility of a conserved conscious pain state, but this is not in reference to their function, but similarity to human systems where we are sure of the conscious experience of pain. These facts are secondary to the main fact of consciousness, and no theory of their necessity for conscious pain exists. If such a theory could be crafted, it would be able to make discernments in neurophysiology of the pain inhibitory systems in organisms conscious and not conscious. We should in fact remain open to the possibility that organisms can have a conscious experience without similar (or any) pain inhibitory systems. The main piece of evidence for conscious pain should in fact be evidence for consciousness and robust pain systems integrating affective data into such a system.

Conflict of Interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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