Pain, Perception, and the Sensory Modalities: Revisiting the Intensive Theory

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Abstract. Pain is commonly explained in terms of the perceptual activity of a distinct sensory modality, the function of which is to enable us to perceive actual or potential damage to the body. However, the characterization of pain experience in terms of a distinct sensory modality with such content is problematic. I argue that pain is better explained as occupying a different role in relation to perception: to indicate when the stimuli that are sensed in perceiving anything by means of a sensory modality exceed a significant level of intensity. Viewing the system underlying pain experience as an integral and functionally integrated feature of all the senses provides a new perspective on the diverse forms of pain, what it is like to experience pain and the contrasting natures of pain and pleasure.

> *The intensive theory and the sensory theory stood in opposition to one another, and they both stood in opposition to the traditional pleasure-pain theory which represented pain as an affective quale. In the decade between 1886-1896, these different opinions clashed and a three-cornered controversy ensued, the like of which has never before, nor since, appeared in the scientific literature.* (Dallenbach 1938, p.337)

1. *Introduction*

Towards the end of the nineteenth century, three views of the nature of pain vied for general acceptance. Most philosophers and some like-

minded psychologists, citing the affective character of the experience of pain, endorsed the traditional view that pain should be understood in relation to pleasure. The *pleasure-pain theory* can be traced back to Plato and Aristotle, who held that pleasure and pain are opposing passions of the soul. Apart from the presence of opposing affects, the theory received support from the apparent contrast between pleasure and pain, on the one hand, and perceptual experiences, on the other: experiences of pleasure and pain seem distinct from the perceptual experiences of the five traditional senses – vision, audition, touch, taste and smell – in that they are not associated with any obvious sensory organs, nor do they have objects comparable to the familiar sensible qualities, nor are they caused by any distinctive physical stimuli. Unlike the pleasure-pain theory, the *intensive theory* of pain acknowledged a link between pain and perception, holding that the experience of pain is due to the intensity of the stimulation to which the specific nerve fibres of the five sensory modalities are at times subjected. The *sensory theory*, by contrast, held that the experience of pain is realized by a system of dedicated nerve fibres, which should thus be regarded as constituting a distinct sensory modality.

It is generally accepted that the sensory theory, rather than the intensive theory, had the empirical evidence on its side. Initial support for the presence of a system of dedicated nerve fibres underlying pain came in a number of forms: the mapping of punctiform areas of the skin, each of which is only sensitive to a single sort of stimulation associated with warmth, cold, pressure or pain; the independent impairment of the systems underlying the detection of those four stimuli; and the different

action of anaesthetics on those systems. More recent research has confirmed that experiences of pain are realized by a variety of receptor types, *nociceptors*, which are distinct from the receptor types underlying warmth, cold and pressure, and which have their own pathways to dedicated pain centres in the brain.

While it is plausible that the presence of a separate system underlying pain, physiologically comparable to those of the other senses, is necessary for the individuation of a sensory modality, it is implausible that this is sufficient.[1] For it has also to be established that *nociception* compares to the paradigm senses in other relevant respects.[2] The recent attention of philosophers, many of whom are sympathetic to the sensory theory, has tended to focus on the features of pain that would seem to set it apart, such as its essential privacy (a pain can only be felt by one person), its subject-dependence (the being of a pain depends on its being felt), its incorrigibility (one cannot be wrong about the pains that are felt) and, of course, its affective nature.[3] My focus here will be different.

There are general conditions other than the presence of a distinct physiological system that, in the case of the paradigm sensory modalities, need to be met for the instantiation of a sensory modality, or

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[1] In the more recent philosophical literature Pitcher (1970, p.372), Newton (1989, p.572), Hall (1989, p.644) and Aydede (2009, p.559) all cite the presence of a dedicated neural system as evidence for the presence of a distinct sensory modality. All but Aydede also use this as support for the view that nociception is perceptual.

[2] As the editors have pointed out to me, the use of 'nociception' in the literature is sometimes confusing. Here I am using the term to refer to the physiological system, in part composed of nocioceptors, that responds to intense stimulation and typically gives rise to the experience of pain. As such, I am in this paper proposing an account of the function of nociception, and thereby of the nature of the experience of pain to which it gives rise.

[3] Pitcher (1970) and Tye (1995a) provide characteristic responses regarding the first three putative differences; see Aydede (2009) for a counter-argument. See section four for more on the affective nature of pain.

so it is generally thought. In §2, I set out some of the challenges faced by the sensory theory of pain when individuation conditions for the sensory modalities are applied to nociception, and especially when a satisfactory account of the distinctive informational content of pain experience is sought, given the presence of significantly different types of pain. In §3, I motivate an alternative account; this can be thought of as an updated version of the intensive theory. According to this account, the primary function of pain experience is to indicate when the stimuli that are sensed whenever anything is perceived by means of a sensory modality exceed a significant level of intensity. In this model, the nociceptive system is construed as an integral and functionally integrated feature of all the sensory modalities. In viewing pain experience in the way that it does, the intensive theory provides a new perspective on the variation in types of pain. But the intensive theory does more than this. It also sheds light on what it is like to experience pain and the contrasting natures of pain and pleasure; the former topic is discussed in §4, the latter in §5.

2. *Pain and the Individuation of the Senses*

It is a truism about perception that it has modes. Almost as uncontroversial is that every act of perception is necessarily the act of a mode of perception. After all, what could an instance of perception be that was not also an instance of a mode of perception? Hence, in order for nociception to be perceptual, as the majority of sensory theorists claim it to be, it is reasonable to think that it must be a mode of

perception.[4] And, if nociception were a sensory modality, one would expect it to satisfy the sort of conditions that serve to individuate the senses.

It is a matter of lively debate at present how exactly we should construe the constitution and individuation of the senses.[5] But there are some candidate conditions that it is generally agreed form a plausible starting point. Whether there is a distinct sensory modality depends on whether: (1) there are experiences that have a general character and content that simultaneously unifies them and distinguishes them from other kinds of experiences, (2) the experiences have a separate class of physical stimuli as their causes, and (3) the experiences are facilitated by a distinctive sensory organ and connected physiological system.[6] Vision and hearing are paradigmatic senses in so far as they can be distinguished by reference to each of these conditions. What it is like to experience the colours and shapes of things and to experience the sounds things make, and what the respective types of experiences are about, give a unity to visual experiences and to auditory experiences, and serve to distinguish vision and hearing. The way in which some of our experiences are caused by electromagnetic waves of a specific range

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[4] A minority of sensory theorists deny that nociception is perceptual. They nevertheless take it to be sensory, i.e. having sensory content, and mediated by a distinct sensory modality. So the objections raised in this section also apply to them. In a recent discussion, Corns (forthcoming) notes how, on some views, pain is construed as being perceptual but mediated by one of the standard senses, e.g. touch, rather than a distinctive sense. In my view, construing pain in this way just makes the task of motivating the perceptual approach more difficult for those that seek to do so.

[5] See Macpherson (2011) for a sample of classic and contemporary contributions.

[6] These conditions were first set out by Grice (reprinted in Macpherson (2011)). Of central concern for Grice in his paper was whether character and content should count as separable conditions. Grice also gives his reasons to think that pain does not involve a sense. These are that pain is not greatly variegated except in intensity and location, there is no standard procedure for getting a pain, and many types of object can cause pain.

and other experiences are caused by pressure waves of a specific range serves equally to distinguish vision and hearing, as does their being differentially enabled by eyes and associated visual systems and ears and associated auditory systems.[7] Matters may be somewhat more complex for the other sensory modalities in some respects. It is harder to differentiate the senses of smell and taste by reference to some of these conditions, and there is disagreement over whether touch should be divided into distinct senses on their basis. These issues, however, are minor in comparison to the difficulties associated with individuating a sense of nociception. For nociception would seem not to satisfy *any* of these conditions.

Given that different types of receptors and connected neurological systems have been associated with nociception, a distinct sensory modality can only be individuated by reference to other distinguishing yet unifying features. In the case of human vision, for example, where there are different kinds of visual receptors (rods and three types of cones) and the optical systems connected to them have different functional roles (for representing colour, shape, movement, etc.), the different receptor types and connected systems can all be identified as visual both by reference to an associated common experience type (of multicoloured located objects), and by reference to a common stimulus type (electromagnetic radiation). However, it is commonly held that nociceptive experiences form a heterogeneous group (stabbing, burning, throbbing, etc.), the only feature that unites them all being their affective

[7] This is not to deny the significant role that is played in perceptual experience by cross-modal processes. But these processes presuppose the presence of distinct senses.

quality. The problem here is that although this may enable the differentiation of nociceptive experiences from other perceptual experiences, it does not do so in the same way as that by which the non-affective experience types associated with the paradigm sensory modalities are differentiated from each other. Furthermore, one cannot fall back on a common stimulus type that is the cause of pain experiences to unify them because there is no common stimulus type. Indeed, evidence indicates that at least some nociceptors (the so-called *polymodal nociceptors*) are stimulated by a variety of different physical stimuli.

These difficulties could perhaps be addressed if the content of nociception – what nociceptive experiences are about – were of a unifying nature. But identifying a unifying content for nociception turns out to be just as problematic. For the types of pain that occur would seem to be different from each other in content in a way that is quite unlike any differences in content found in any of the other sensory modalities.

The tendency has been to overlook this problem in the recent literature. Consider two statements of the putative content of nociceptive experiences that are representative of what sensory theorists claim:

> [...] to be aware of a pain is to perceive – in particular, to feel, by means of the stimulation of one's pain receptors and nerves – a part of one's body that is in a damaged, bruised, irritated, or pathological state, or that is in

> a state that is dangerously close to being one or more of these kinds of states. (Pitcher 1970, p.372)

> [N]ociception conveys a rather narrow range of information, since its receptors are pretty much limited to the following kinds of things: whether the bodily damage is merely imminent, is actually occurring, or is left over from past wounds; what its location is; what type of damage it is (burn, cut, bruise etc.); and how bad it is. (Hall 1989, p.645)

These descriptions are consistent with the common practice of classifying pain as either (i) transient, (ii) acute or (iii) chronic (Loeser & Melzack 1999). Transient pain occurs when damage to the body is imminent. Damage need not occur. Indeed, transient pain would seem to have the function of making us avoid imminent damage. Transient pain is associated with noxious stimuli, such as excessive thermal or pressure stimuli. When they impinge on a part of the body we typically take evasive action before damage occurs. Acute and chronic pains occur when the body is actually damaged. Acute pain is typically brought about when the pain receptors are activated following injury to body tissue, e.g. a cut to the finger. Chronic pain is caused by injury or disease where the body's healing mechanisms cannot return it to the normal state, e.g. loss of body part, scarring, or damage to the nervous system.

The sensory theory, as exemplified by the above quotations, glosses over the differences between the forms of pain, and focuses on the putatively common content: the states or properties of parts of the body that can be characterized in terms of damage. It is by reference to damage – a common feature – that the diverse kinds of pain are

conflated, and the individuation of a distinct sensory modality is motivated. However, one difference between the putative contents of the diverse types of pain should not be ignored.

It is generally accepted that the content of the perceptual experiences of the various sensory modalities involves features, such as colour, sound, texture, odour and taste, that are immediately perceived and that are currently instantiated, occurring or present, depending on whatever the appropriate category is to which they belong – state, property, event or object.[8] If other so-called 'higher-level' properties feature in the content of perceptual experience, then they feature in addition to these more basic contents of perceptual experience. According to the above quotations, the perceptible feature that should be added to this list in the case of nociception is damage. However, while damage is a feature that is instantiated, occurring or present in acute and chronic pain, and thereby may be immediately perceived, it is neither immediately perceived nor instantiated, occurring or present in transient pain. Indeed, as already noted, transient pain contributes to the prevention of damage to the body.

The significance of the problem raised by the difference in apparent content of these types of pain, when content is construed in terms of damage, can be appreciated by considering those sensory theories that seek to explain the character of nociceptive experience by reference to the content of experience. For given a difference in content

[8] For present purposes, I am neutral on the issue of how best to understand content, whether perceptual experience relates us to how things are (the relational approach), or represents how things are (the representational approach), and the various ways in which content may then be understood within these approaches.

one would expect a difference in character. But there is no obvious difference in character that distinguishes the different types of pain apart from their duration. Indeed, in the case of transient pain there is no damage to be represented.

Consider one account. Similar considerations will apply, *mutatis mutandis*, to non-representationalist approaches. According to reductive representationalism, the best way to explain the character of nociceptive experience is by reference to content, which can itself then be further explained in terms of natural properties. But if qualitatively identical pain experiences could be associated with a disjunction of contents, as above, a direct challenge to the general approach would be laid down. Michael Tye, who has been one of the foremost proponents of the reductive representationalist approach, claims that a type of perceptual experience represents what it does in virtue of a relation of causal co-variation holding between that type of state and a property. Consequently he holds that a type of perceptual experience cannot be representationally related to a disjunction of properties; a disjunction of properties cannot be the cause of an experience, only either of the disjuncts can be its cause (Tye 1995b, p.195). So it is hardly accidental that he just cites actual damage to the body in his explanation of the content of pain: pains "represent correctly if, and only if, they are caused by bodily damage" (Tye 1995a, p.229). But without an explanation for why transient pain should not be classed as a type of pain, his proposal and those of other sensory theorists leave unexplained a class of experiences that are normally classified as pain experiences because they

share phenomenal character with experiences that are caused by damage to the body.

Sensory theorists might look for a feature that is common to all types of pain. The alternative feature that is sometimes mentioned is disorder or disturbance: a part of the body is disordered or disturbed when damage is imminent, taking place or left over after healing. There are, however, problems with expanding the content of nociception in this way. Disorder or disturbance is, in this context, such a vague notion that adopting it runs the risk of providing, if not an empty explanation, at least an appreciably weakened one. More significantly, merely citing disorder or disturbance in a part of the body as the content of all these nociceptive experiences fails to provide the distinct explanations that the presence of these different types of pain seems to require.

Indeed one of the main tests of any theory of pain is how fully it explains the presence of the different types of pain that there are. Given that this task remains unresolved when nociceptive experiences are construed as arising from the perceptual activity of a distinct sensory modality, an alternative approach is called for. Rather than a return to the traditional pleasure-pain account, I want to revisit the intensive theory of pain, generally considered to have been falsified by the empirical evidence, and offer some reasons to think that it has not been falsified and, furthermore, that it provides the resources for a more viable account of pain in its diverse forms.

3. *The Intensive Theory of Pain*

The intensive theory, as originally formulated, claimed that the experience of pain is to be explained by the intensity of stimulation to which the specific nerve fibres of the various senses are, on occasion, subject. Given the correlation between the experience of pain and intensity of stimulation, and also between the varieties of pain (stabbing, burning, throbbing, etc.) and the experiences characteristic of the sensory modalities, there was some basis for the theory. The intensive theory seemed to be undermined when it was established that pain experiences are realized by a physiologically distinct system. However, this finding only falsifies one aspect of the original theory. The theory can be restated without it. Just as, in the case of the sensory theory, the distinctiveness of a physiological system is insufficient for the constitution of a distinct sensory modality, so the susceptibility of the specific nerve fibres of the distinct sensory modalities to respond to the intensity of stimulation by giving rise to experiences of pain is unnecessary for the intensive theory. What is essential to the intensive theory, according to the account outlined in this section, is not how pain is realized but the role it plays.[9]

The function of the paradigm sensory modalities, roughly stated, is to process information from the specific stimuli to which they are receptive in order to inform us about related properties of other things. Vision processes information from electromagnetic waves in order to

[9] This is not to deny that there are likely to be good evolutionary reasons for a separate physiological system underlying nociception.

inform us about the colour and brightness of the things we see around us. Audition processes information from pressure waves in order to inform us about the pitch and loudness of the sounds we hear around us. However, as already noted, nociception contrasts with paradigmatic sensory modalities in being receptive to several different types of stimuli and nociceptive experiences contrast with paradigmatic perceptual experiences in having diverse causes. These differences indicate that it is not the primary function of nociception to process information from physical stimuli in order to inform us about related properties of something else, as it is of the paradigmatic senses. The intensive theory holds that nociception detects a single aspect of the various types of physical stimuli themselves; its main claim is that the role of nociception is to inform us when the physical stimuli that are sensed in perceiving anything by means of a sensory modality exceed a significant level of intensity. The physiological system that realizes experiences of pain, on this account, is an integral and functionally integrated feature of the various senses.

Pain experiences are not to be classified as perceptual, according to the intensive theory, because such experiences do not have the function of facilitating a presentation or representation of the objects, events and properties that are the causes of those experiences. This is not to say that pain experiences do not carry information or content. For they inform us that the sensory stimuli, which, when less intense, are used to inform us of the perceptible features of things (and sometimes, as in the case of touch, even of the perceptible stimuli themselves), have exceeded a threshold of intensity. In short, the intensive theory contrasts

with the sensory theory in the role that it assigns to the experience of pain. To use a term introduced by Kathleen Akins, pain experiences are *narcissistic*, only informing us about the stimuli insofar as they are relevant to our well-being.[10]

To appreciate the way in which nociception is related to the senses, consider a particular case: how nociception is functionally integrated with thermoreception (heat perception). Our experience of heat and cold is realized by two kinds of thermal receptor: warm thermoreceptors and cold thermoreceptors. Warm receptors respond with increasing intensity as energy gain causes the temperature of the skin to rise above its normal range of 30-36° C; this causes heat sensations of a corresponding increase in intensity. Cold receptors respond with increasing intensity as energy loss causes the temperature of the skin to fall below its normal range; this causes cold sensations of a corresponding increase in intensity. For this and other reasons it is plausible to think that heat and cold sensations represent the thermal energy that is transferred to and from parts of the body, respectively.[11] At about 44° C and about 18° C the responses of the thermal receptors sharply decrease, and we no longer feel heat and cold sensations; at these temperatures, the intensity of thermal stimulation causes two different types of nociceptors to respond, and as a consequence our experience of heat pain and cold pain. This degree of coordination

[10] Akins (1996). Akins introduces the term to describe thermal sensations. I disagree with her account of thermal sensations (see next paragraph); a thermal sensation does tell us something about the thermal stimulus itself. I think the term much more appropriate for pain sensations, the function of which is to tell us about the relevance stimuli have for us.

[11] For a fuller defence of the claim that heat perception involves the representation of energy exchanged as opposed to other candidate contents, such as skin temperature, see Gray (2013).

indicates that these types of nociceptive experiences have the role of warning us when excessive amounts of thermal energy are exchanged, and thereby that they are integral to and integrated within the function of the sense (or senses) that we use to perceive heat and cold.

It is understandable why these sorts of transient nociceptive experiences have been construed as informing us of imminent damage to a part of the body. For, if we allow the physical stimuli to continue to impinge on the body, they will damage it. And it may be natural to form the belief that a part of the body is in danger of being damaged from the presence of transient pain. But a distinction should be drawn between the role of such nociceptive experiences and the content of any beliefs we may form on their basis. The role of these nociceptive experiences is to signal when the intensity of a stimulus has become too great.

If the functional integration of nociception with the sensory modalities is most obvious in the case of thermoreception, the primary function of which is to monitor the amount of energy exchanged between subjects and their environments, similar patterns can, nevertheless, be found in other sensory modalities by focusing attention on the detection of stimulus intensity. The pressure receptors underlying touch and audition are able to discriminate the intensities of physical stimuli within a limited range of stimulus intensities. When the upper limit is reached, the same types of physical stimuli as cause tactile and auditory experiences cause nociceptors to respond. Again, given that part of the function of touch and hearing is to detect the amount of pressure energy impinging on the body, it is natural to construe the role of indicating when the amounts of pressure energy become excessive as

a feature incorporated into the function of the respective sensory modalities.[12]

Given that the intensive theory is based on an account of transient pain, the main challenge to the model is whether it can explain acute and chronic pain, where pain is caused by damage and not by the intensity of physical stimuli. This challenge should, however, be no more difficult to meet than the challenge of explaining the experiences that may arise when other component features of the sensory systems are damaged. When other kinds of experiences are caused by impairment to visual or auditory receptors, such as photisms or tinnitus, it is usual to think of those sensory receptors as malfunctioning, and the experiences they give rise to as misperceivings of some sort. In that the damage caused to the body that gives rise to nociceptive experiences invariably involves damage to the nociceptors themselves, it would follow that they are not functioning as they have originally been designed to function. According to the intensive theory, the primary purpose of nociception is to detect physical stimuli that are excessively intense; it follows that when the nociceptors are actually damaged by excessively intense physical stimuli, and there are no longer any intense stimuli present, the resulting experience of pain is akin to a misperceiving elsewhere in the sensory modalities. Strange as it may sound, on the present proposal, many experiences of pain are comparable to photisms and tinnitus.

Sensory theorists cannot respond by claiming that nociception is unusual among the senses in requiring its receptors to be damaged for

[12] Evidence also indicates that bright light causes pain responses. Moreover, since nociceptors are also receptive to chemical stimuli, there is reason to think that the intensive theory can be extended to smell and taste.

its proper function.[13] For this would be at odds with the function of undamaged nociceptors. Indeed, only the intensive theory is able to provide a comprehensive explanation for the variety of pain types. Whereas it is it clear how a selective advantage would be conferred by being aware of when physical stimulation passes a certain threshold of intensity, it is often unclear why being aware of damage should confer a selective advantage, such as the occurrence of chronic pain that is caused by irreparable damage. But it is easy to see why chronic pain should occur if it is the upshot of damage to the nociceptive system the primary function of which is to signal the occurrence of intense stimuli. Moreover, an evolutionary explanation for the selection of a system having the function of preventing damage to the body can be extended to include secondary benefits that arise when the acute pain caused by damage to a part of the body draws attention to the damage and thereby enables the protection of that part of the body from further damage. However the reverse is harder to motivate; it is difficult to see how an explanation for the selection of a system that has the function of indicating damage can be extended to include secondary benefits that arise from the indication of excessively intense stimulation.

It would be remiss not to mention another class of nociceptors the function of which it appears hard for the intensive theory to explain. The so-called *silent nociceptors* have received little attention in philosophical accounts of pain. As the name suggests, under normal circumstances silent nociceptors do not respond to stimuli of any sort.

[13] In this context one might speculate whether damage to the nociceptors, rather than causing them to respond, could have prevented them from responding.

They are activated by chemical signals that are generated by bodily inflammation. Since it is damage to the body that causes silent nociceptors to respond, their role might seem to be best explained by the sensory theory. Silent nociceptors, so the sensory theory might claim, detect damage, thereby allowing us to protect the damaged part of the body. Yet even in this case the intensive theory has a competing explanation. It can accept that silent nociceptors only function when a part of the body is damaged. But it can also maintain that silent nociceptors are those receptors for which the threshold at which stimuli are detected as being of a significant level of intensity is only activated following damage, and then set at a level at which stimuli of otherwise normal intensity trigger a nociceptive response. That is to say, when a part of the body is inflamed, nociception indicates that even normal stimuli have an intensity that is significant.

In sum, given that the intensive theory provides an apt explanation of the several different types of pain that there are, it deserves more attention than it has received. But the intensive theory offers more than this. For it not only serves to explain the function of pain, it provides an opportunity to think about the phenomenal character of pain in a different way.

4. *Why Feeling Pain Does Not Feel Like Perceiving*

According to the sensory theory, pain is experienced when we perceive damage to the body by means of nociception just as we have

characteristic perceptual experiences when we perceive things by means of the systems underlying the other sensory modalities. But if nociception represents in the same way as other sensory modalities, one would expect the qualitative character of nociceptive experiences to be explicable in the same way as the character of visual, auditory, tactile, thermal, olfactory and gustatory experiences. There is, however, an obvious difficulty: experiencing pain does not feel like perceiving in these ways. The experience of pain has a distinctive affective nature; to experience pain feels bad in a way that the visual or tactile experience of the damaged or disturbed part of the body that causes pain does not. As a consequence, experiencing pain is often sufficient to motivate behaviour, whereas the visual or tactile experience of the damaged part of the body requires the additional presence of background beliefs, desires and perhaps other mental states to motivate behaviour.

Sensory theorists have adopted a variety of responses to account for nociception's affective nature. Common to them is that the experience of pain is constituted by two components: (a) a sensory component (about a feature of the body) and (b) some other component that explains pain's affective nature. According to the *desire view*, "when [animals] engage in that form of sense perception, they want to stop doing so, they wish they were not doing so" and "[t]o have some spontaneous inclination of this general "anti"-kind is to experience the perceptual act (or state) as unpleasant or worse" (Pitcher 1970, p.380). The *imperative view* claims that a pain in a part of your body "should be viewed as also telling you not to use that bodily part, in which case all pains would contain an imperative component along with the descriptive

in their intentional content" (Hall 2008, p.354); it is the presence of the imperative content that, so it is claimed, explains the motivational force of pain and its negative feel.[14] For the *dislike view* the affective features of pain are constituted by "an immediate reaction of dislike" to the representation of bodily damage (Tye 1995a, p.229). And the *evaluative view* holds that the affective features of pain can be explained by the experience not only representing to the subject the disturbance of a part of the body but also "representing the disturbance as *bad* for him in the bodily sense" (Bain 2013).

Despite each of these contrasting accounts of the second component of pain explaining certain aspects of pain, there is also much to contest in their details, as the proponents of the different views have themselves already made clear. However, the intensive theory offers a different and more general challenge. For, in providing an alternative account of the role of pain and its relationship with perception, according to which the experience of pain is not constituted, even partially, by the perceptual representation of features of the body, it questions the main reason for pursuing a dual-component strategy, which was to account for how nociceptive experiences could be perceptual experiences yet also be unlike other perceptual experiences in important respects. If nociceptive experiences are not perceptual experiences of features of the body, there is no longer the original motivation for a dual-component strategy.

Indeed the intensive theory gives rise to a natural explanation of the affective nature of pain. In order for nociception to be able to make

[14] Klein (2007) defends the imperative view but not a dual-component approach.

us aware of when and where the physical stimuli that impinge on the body are too intense, it must enable experiences that are distinct from the normal perceptual experiences of the sensory modalities in a way that is dissimilar from the way each mode of perceptual experience is different from each other. The distinctive way in which such experiences must be different can be narrowed down further. They have to be unlike in such a way that they motivate us to remove the stimuli that are too intense. That way is for the experience of pain caused by excessively intense stimulation to feel bad.[15] Hence the distinctive way in which the experience of pain feels bad, and the way in which it motivates behaviour, are just what are to be expected from an experience that has the role of warning us of excessively intense physical stimuli.

What is more, this explanation does not require two components. In holding that the role of pain is to indicate when and where the stimuli that are sensed in perceiving anything exceed a significant level of intensity, or are *too* intense, the intensive theory holds that the representation of the excessive intensity of physical stimuli can simply be the representation of their negative significance. That is to say, excessively intense physical stimuli need not themselves constitute the content of experience; only the significance that they have for us needs to be represented.[16]

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[15] Hence we can go further to explaining why function gives rise to experiences with a specific qualitative character, *pace* Levine (1993), in the case of pain. Indeed, it would seem that the intensive theory has implications for understanding the metaphysics of experience more generally.

[16] Such a view runs counter to the perceptual and representational approaches that seek to explain character of experience in terms of content represented. The present model acknowledges an irreducible qualitative aspect to nociceptive experiences but nevertheless situates this within a functional explanation.

The present explanation of what it is like to feel pain and why it motivates behaviour is an explanation of the affective character of transient pain. Since the intensive theory explains acute and chronic pain by reference to transient pain, what it is like to feel acute and chronic pain can also be explained by reference to what it is like to feel transient pain. However, since the explanation of acute and chronic pain derives from the dysfunction of the nociceptors, one might not expect the same correlation between the negative feel of pain and its motivational nature as is found in transient pain. And this is indeed what one finds. When nociception is fulfilling its proper function, e.g. when an intense stimulus causes pain, the negative feel of transient pain correlates with its motivational powers, causing one to remove the part of the body from the stimulus. When nociception is not functioning in this way the correlation begins to fail. Acute pain, which is experienced when one's body is temporarily damaged, e.g. when one's finger is cut, often fails to motivate any particular response on its own; the response that transpires typically presupposes additional background beliefs about what has happened and desires about what should happen. At least in this respect, an experience of acute pain is more like a typical perceptual experience, such as the visual or tactile perception of the damage, than transient pain. It may be this that has encouraged the view that pain is perceptual and the subsequent need to provide some further explanation for its affective and motivational features. But, if the present approach is correct, this is misguided. Chronic pain, which is experienced when the body is permanently damaged, often does not

motivate behaviour at all; one just has to live with it. So it is that although pain may always feel bad, only sometimes is it bad to have.

There are a couple of loose ends to tie up. In support of the claim that nociception is a functional system that is integrated into the overall function of the different sensory modalities, it was noted how pain experiences seem to belong to different varieties – burning pain (of the hot and cold variety), stabbing pain, throbbing pain, etc. – that related to the different sensory modalities. But, if there are such distinct varieties of pain, these might seem only to be explained by the presence of distinct sensory contents in addition to affective components. There is, however, an alternative explanation. We draw the distinctions between varieties of pain by reference to our perceptual experience of the intense but not yet excessively intense stimuli to which a perceptual modality is sensitive. For example, we construe one kind of pain as burning pain because of the perceptual experience of intense heat that precedes the experience of pain. More generally, we distinguish varieties of pain because of the prior perceptual experiences of intense stimulation that typically precede them, and therefore provide their background. In short, we tend to draw distinctions between varieties of pain not because pains have distinct sensory components but because pain is an integrated feature of the different sensory modalities.

The other loose end relates to whether the intensive theory has the resources to explain a pair of well-documented dissociation cases that seem to provide evidence for the dual-component approach. Chronic pain can be relieved by morphine, or at least, some sufferers of chronic pain report that they no longer mind it. It has been argued that

this shows how the affective component of pain has become dissociated from the sensory component through the action of the morphine (Aydede 2000). It is hard to deny that morphine modifies the overall experience of pain. But patients also maintain that the pain itself feels just as bad as before. So a competing explanation, consistent with the intensive theory, is available: the dissociation is not between affective and sensory components of pain itself but between the affective nature of pain and the affective response we have to it. When pain is more than merely transient, when it is bad to have, it is something that displeases us and, as the action of morphine makes manifest, often intensely so.

There is, however, another dissociation case involving transient pain for which this response seems inadequate: pain asymbolia (Grahek 2007). Pain asymbolics report that they can feel excessively intense stimulation, such as when they are burnt or pricked. So, according to how pain is characterized by the intensive theory, it can be inferred that they are experiencing pain. Yet, in contrast to morphine cases, asymbolics deny that their experiences have any negative feel. Here, therefore, the dissociation cannot be between the affective nature of pain and our affective response to it; it would seem to be between the affective and sensory components of pain. But even here there is an alternative explanation. It is that the threshold at which stimuli cause pain is raised in asymbolics such that stimuli that previously exceeded the threshold and triggered the experience of pain no longer do so. Asymbolics still think of their experiences in terms of pain because they remain very intense. As is the case with comparable anomalies where the use of a concept is extended beyond what is normal, opinions are likely

to be divided on whether asymbolics are right to continue to describe their intense experiences, which are caused by what used to cause pain, as instances of pain.

5. *Why Pain and Pleasure are not Opposites*

In advocating the view that the primary function of the experience of pain is to indicate when the physical stimuli sensed in perceiving things are too intense, the intensive theory also challenges the pleasure-pain theory of pain which views pain as the opposite of pleasure. For, if the intensive theory provides the correct picture of pain, pain and pleasure are unlike in ways that go beyond merely being opposites. However, as one might now expect, they are not unlike in quite the way claimed by the sensory theory.

Pain is typically regarded as the opposite of pleasure in the minds of ordinary folk because pain's negative affective character opposes pleasure's positive affective character. This perceived opposition may be reinforced by the way that pain is typically disliked and avoided whereas pleasure is typically liked and sought. Such a characterization is endorsed in the more theoretical context of the pleasure-pain theory, as one of its chief advocates at the end of nineteenth century put it: "the bond between the two is never questioned. The ground for this lies in the fact that the two appear to arise in consciousness as disparate parts of a

continuum. One fades away into the other." (Marshall 1889).[17] However, for pleasure and pain to be properly regarded as opposites, they would have to be opposites not merely in a continuum of affective character but also in functional role. Yet the intensive theory suggests they are not. Whatever the function of the experience of pleasure, it is not the opposite of indicating the excessive intensity of physical stimuli.

To get a better grasp of the contrasting roles of pleasure and pain, consider what the sensory theory has to say about them. Murat Aydede, in responding to an earlier debate premised on the assumption that only sense-data or behavioural dispositions are candidate explanations for pleasure and pain, argues that these choices preclude an apt explanation for the contrasting natures of pleasure and pain. He argues that, although pleasure and pain have opposing affective aspects, pleasure is properly construed as having only a non-sensory affective character, whereas pain is properly construed as a sensation, having both a non-sensory affective character and a proprietary sensory content, at least in the case of physical pleasure and pain. According to Aydede, when we eat chocolate ice cream or smell our favourite perfume (both examples of physical pleasures), the experience of pleasure we have is a non-sensory affective response to sensations derived from the gustatory and olfactory sensory modalities. But when we burn or cut a part of the body (both examples of physical pain), the experience of pain we have is

[17] However, as the early proponents of the pleasure-pain theory found, agreement on a more fine-grained characterization of the pleasure-pain continuum was harder to come by. Some claimed that pleasure and pain are the fundamental modes of mental life from which all forms of mentality derive. Others held that pleasure and pain are *sui generis* modes of mental life brought into consciousness indirectly via sensation, emotion and intellection. While others argued that pleasure and pain are *quale* that may arise with all mental phenomena.

produced by a distinct sensory modality and involves a non-sensory affective response to the sensory contents partially constitutive of pain itself. He summarizes his position thus:

> My claim is that the primitive affective reaction involved in an overall experience in which we receive pleasure from certain sensations proper is as much a feeling episode as the hurting, awful qualitative component of a total pain experience which is itself the reactive dimension of pain in the same primitive sense. A total experience of pain has its own specialized underlying sensory mechanisms, pleasure doesn't: rather it seems to be a general purpose mechanism reacting (certainly in subtly different ways) to relevant sensations proper in different (sub)modalities, apparently, without discriminating among them. (Aydede 2000, p. 558)

In both pleasure and pain Aydede understands the non-sensory affective responses in terms of psychofunctional properties that set parameters for behavioural responses.

The three views with which we started can now be compared and contrasted in the following way. First, the sensory theory and the pleasure-pain theory agree that the affective aspects of pleasure and pain can each be explained as the opposite of the other. The principle disagreement between the two theories concerns the contents to which these affective components are directed; the sensory theory, but not the pleasure-pain theory, claims that pain experiences have proprietary contents, typically damage to a part of the body. Second, the intensive

theory concurs with the sensory theory regarding the presence and significance of the specialized receptors underlying the experience of pain; the intensive theory diverges from the sensory theory in the account it gives of their functional role. Whereas the sensory theory holds that the specialized receptors have the function of determining proprietary perceptual or sensory contents, the intensive theory assigns the specialized receptors the role of detecting when and where the stimuli detected by the sensory modalities become excessively intense. Finally then, the intensive theory concurs with the pleasure-pain theory in holding that neither pleasure nor pain has proprietary sensory contents as their constituents. However, this is as far as the agreement extends. For, in explaining the functional role of the nociceptive system as it does, the intensive theory does not think of it as one might think of the system underlying pleasure, as a general purpose mechanism reacting to the sensations of other sensory modalities; it thinks of the nociceptive system as a mechanism the specific function of which is to react to the intensity of stimuli detected by the sensory modalities.

In addition to the support set out in the previous sections, the intensive theory has the advantage over the other theories in being able to explain a further striking difference between the experience of pleasure and pain. When the intensity of a physical stimulus causes the threshold of pain to be crossed, the experience of pain indicative of the excessive intensity of the physical stimulation typically becomes the centre of attention. For instance, the pain caused by something excessively hot tends to eclipse the sensation of heat, and the pain caused by a sharp object tends to eclipse the tactile sensation. By

contrast, in the case of pleasure, it is perceptual experiences and their contents that we typically take pleasure in. When we taste a favourite food or smell a favourite scent, we take pleasure in the taste and the scent. There would be no pleasure without the experience of what we take pleasure in. According to the intensive theory, this contrast is easily explained: the nociceptive system has a specific function related to the intensity of physical stimuli; the pleasure system has a more general function related to features other than the intensity of what we perceive.

The difference in the way in which the experience of pain and pleasure relate to the perceptual experiences of the various sensory modalities suggest that pleasure should not be opposed to pain; it should be opposed to displeasure. For just as we take pleasure in certain things that we experience, so we find displeasure in other things that we experience. It is displeasure that, like pleasure, seems to be "a general purpose mechanism reacting (certainly in subtly different ways) to relevant sensations proper in different (sub)modalities". Opposing pleasure and displeasure, rather than pleasure and pain, would also explain how it possible for pain, which is typically experienced as unpleasant, to cause a positive affective response. Pleasure and displeasure involve opposing affective responses to the experiences we have. By contrast, pain is an integral and integrated feature of the sensory modalities that we use to perceive the world, which is required because the world, in making the diversity of forms of perception

possible, also harbours the possibility of causing harm by similarly varied means.[18]

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[18] I am grateful to the editors for their advice relating to an earlier version of this paper.

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