

# FETAL PAIN: AN INFANTILE DEBATE

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## ABSTRACT

*The question of whether a fetus can experience pain is an immense challenge. The issue demands consideration of the physical and psychological basis of being and the relation between the two. At the center of this debate is the question of how it is that we are conscious, a question that has inspired the writing of some of our most brilliant contemporary philosophers and scientists, with one commentary suggesting surrender.<sup>1</sup> In my earlier review I attempted to draw together the various strands of thinking that had attacked the question of fetal pain and relate them back to the bigger question of consciousness.<sup>2</sup> In their vituperative response, Benatar and Benatar bite off my finger before looking to where I am pointing.<sup>3</sup> I will examine each of their criticisms*

<sup>1</sup> N. Block, O. Flanagan, G. Guzeldere. *The Nature of Consciousness: Philosophical Debates*. 1997. Massachusetts. MIT Press; D.J. Chalmers. Facing up to the Problem of Consciousness. *Journal of Consciousness Studies* 1995; 2: 200–219; D.J. Chalmers. *The Conscious Mind*. 1996. New York. Oxford; F. Crick. *The Astonishing Hypothesis: The Scientific Search for the Soul*. 1994. New York. Simon & Schuster; A.R. Damasio. *Descartes' Error: Emotion, Reason, and the Human Brain*. 1994. New York. Avon Books; D.C. Dennett. *Kinds of Minds: Towards an Understanding of Consciousness*. 1996. New York. Basic Books; D.C. Dennett. *Darwin's Dangerous Idea. Evolution and the Meanings of Life*. 1995. New York. Simon & Schuster; G. Edelman. *Bright Air, Brilliant Fire: On the Matter of the Mind*. 1992. London. Penguin Books; S.A. Greenfield. *Toward a Science of Consciousness: Journey to the Centers of the Mind*. 1996. New York. W.H. Freeman & Company; J. Horgan. *The End of Science: Facing the Limits of Knowledge in the Twilight of the Scientific Age*. 1996. Keweenaw, Wisconsin. Abacus; R. Penrose. *The Emperor's New Mind Concerning Computers, Minds, and the Laws of Physics*. 1989. New York. Vintage; R. Penrose. *Shadows of the Mind*. 1994. New York. Vintage; S. Pinker. *How the Mind Works*. 1997. New York. Norton; J. Searle. *The Rediscovery of the Mind*. 1992. Massachusetts. MIT Press; T. Shallice. *From Neuropsychology to Mental Structure*. 1988. Cambridge. Cambridge University Press. In *The End of Science*, Horgan suggests the problem of consciousness to be intractable.

<sup>2</sup> S.W.G. Derbyshire. Locating the Beginnings of Pain. *Bioethics* 1999; 13: 1–31.

<sup>3</sup> Amongst other comments, Benatar and Benatar accuse me of generating false impressions, using unnecessary technicalities and confusing the

*and attempt to redirect the readers' interest towards examining the subjectivity of pain and the mediating links between physiology and experience.*

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## THE DEFINITION OF PAIN

The focus on subjectivity combined with the recognition of pain as a multidimensional phenomenon leads me to defend continued use of the IASP definition of pain that Benatar and Benatar refer to.<sup>4</sup> Benatar and Benatar agree that any definition of pain should capture the 'subjective experiential experience of pain' but object to my inclusion of emotion as part of the pain experience. A painful experience devoid of all emotional content is difficult to imagine and Benatar and Benatar concede the point when they talk of 'the raw unpleasant feel of pain' – how can the feel be unpleasant but not generate negative emotion?<sup>5</sup> The argument that emotion is beyond the unpleasant feel of pain seems a peculiarly contrived idea.

I would maintain that pain is an amalgam of cognition, sensation and emotion. As a rather rough analogy, the mix of red, blue and yellow paint gives brown but a mix of red and yellow gives orange. Changing the amount of blue will modulate the brown color, in the same way that changing the emotional input will modulate painful experience, but eliminating the blue means no longer having brown just as eliminating emotion means no longer having pain.

Debate regarding the contents of the pain experience, however, is less important in the current context than the basic fact that pain is a subjective experience. Benatar and Benatar rightly draw the distinction between nociception, the biological correlates of a noxious insult, and pain, the subjective experience. Pain can accompany nociception only in minds that are capable of subjectivity. Until we are able to decipher how it is that biological processes might give rise to subjective experiences then the relation between nociception and pain will remain uncertain and our interpretations crude.

readership. Thus Benatar and Benatar manage not only to be discourteous to me but also the previous editors of *Bioethics*, the reviewers of my original manuscript and those gentle readers who were, presumably, confused and misled.

<sup>4</sup> S.W.G. Derbyshire. The IASP definition captures the essence of pain experience. *Pain Forum* 1999; 8: 106–109.

## ARE THERE GOOD REASONS FOR INFERRING FETAL PAIN?

Benatar and Benatar reconsider the data I provided in my original review regarding neuronal anatomy, neural function, neurotransmitter and hormone response and behavioural response. Evidence that there is a complete connection from the periphery through the spinal cord and into the thalamus and the cortex from about 28–30 weeks gestation is repeated but interpreted as constituting ‘contributory evidence’ for the experience of pain. The suggestion that pain cannot be interpreted as the consequence of a dedicated line system is brushed aside too easily.<sup>6</sup> The point of my discussion regarding the pain centre was to illustrate both the complexity of the underlying neurology for pain experience and the necessary psychological architecture. It is my contention that only once both are developed can we talk of pain experience.<sup>7</sup>

It is, of course, a question of judgement as to when one considers the neurological and psychological development to be sufficiently complete to support an experience of pain. A fair review of all the available evidence suggests that there is, at least, still as much neurological development to be completed after birth as has already been completed during gestation.<sup>8</sup> The psychological development

<sup>5</sup> There are reports of the emotional content of pain being dramatically reduced with opiate analgesia, e.g., R. Kupers, H. Konings, H. Adriansen, J. Gybels. Morphine Differentially Affects the Sensory and Affective Pain Ratings in Neurogenic and Idiopathic Forms of Pain. *Pain* 1991; 47: 5–12, and with many psychosurgical procedures, especially cingulotomy and frontal lobotomy, see A.J. Bouckoms. Psychosurgery. In: *The Textbook of Pain*. 1989. P.D. Wall and R. Melzack, eds. Churchill Livingstone. Kent, UK: 666–676, for review. In these instances the subjects suggest that they still feel the pain but it no longer bothers them and they can happily ignore it. It is debatable whether these experiences can really still be considered pain, which is usually experienced as distressing and intrusive.

<sup>6</sup> There is perhaps more controversy regarding this than Benatar and Benatar and other readers might suppose. A particularly lively exchange appeared in *Pain*: P.D. Wall: Pain in the Brain and Lower Parts of the Anatomy [letter; comment], *Pain* 1995; 62: 389–391; A.D. Craig, E.T. Zhang, M.C. Bushnell, A. Blomqvist. Reply to P.D. Wall [letter; comment], *Pain* 1995; 62: 391–393.

<sup>7</sup> Benatar and Benatar suggest an unfortunate analogy with sexual maturation. While it is true that reproduction is matured by adolescence there is more to sexuality than reproduction and one would perhaps be amused by a suggestion that the fetus could have sexual thoughts simply because it had a mature reproductive system.

<sup>8</sup> Benatar and Benatar argue that it is uncertain what these further developments mean with regard to the functional capacity for pain. I agree but would add that it is just as uncertain what the earlier developments mean. Their analogy with vision throws up the same problems. That there is maturation of the neuronal visual system explains why it is that neonates can respond to visual stimuli but that does not demonstrate conscious appreciation of those stimuli

is beyond vast, involving a shift from a fundamental egocentricity through to a comprehension of language, other minds and an abstract representation of self that has the capacity to discern and express the pain and excitement of living.

The relationship between this neurological and psychological development remains poorly understood but to probe that relationship, albeit indirectly, I reviewed the evidence for neuronal function. Benatar and Benatar observe that all the measures of central function, including EEG, EP's and PET, provide no direct evidence of the capacity for feeling pain. This is true but it is a criticism that can also be leveled against all the evidence so far provided as justification for interpreting fetal pain.

Benatar and Benatar's suggestion that SEP data do not provide any indication of the underlying neuronal function is simply incorrect.<sup>9</sup> While it is true that variation in SEP latency can be attributed to differences in myelination, decreases in the first negative component of the waveform (so-called N1) were interpreted by Klimach and Cooke as reflecting the maturation of the central pathway and not merely maturation of the peripheral nerves.<sup>10</sup> Hrbek and colleagues reviewed the evidence from EP research in animals and concluded: 'Immature responses differ in shape, in longer latency and greater fatigability from responses in mature animals.'<sup>11</sup>

any more than a response to noxious stimulation demonstrates conscious experience of pain.

<sup>9</sup> When assessing EP data it is normal to record the latency of the various components, their peak amplitude and the overall morphology (shape) of the waveform. The EP data was discussed by Burgess and Tawia in their earlier review: J.A. Burgess and S.A. Tawia. When Did You First Begin to Feel it? – Locating the Beginning of Human Consciousness. *Bioethics* 1996; 10: 1–26. Benatar and Benatar are correct that the SEP largely reflects the response of the A $\beta$  fibres and not A $\delta$ , although some A $\delta$  involvement is likely when using an electrical or heat stimulus, but this is somewhat irrelevant. Both these fibre systems project into the somatosensory system and the somatosensory responses to painful and non-painful somatic stimulation show largely differences in degree than in quality: R.C. Coghill, C.N. Sang, J.M.A. Maisog, M. Iadorola. Pain Intensity Processing Within the Human Brain: A Bilateral Distributed Mechanism. *Journal of Neurophysiology* 1999; 82: 1934–1943; A.C.N. Chen, L. Arendt-Nielsen, L. Plaghki. Understanding of Human Pain in the Brain Through Topographic Mapping and Quantification of Laser-evoked Potentials. *Pain Forum* 1998; 7: 196–200.

<sup>10</sup> V.J. Klimach. and R.W.I. Cooke. Maturation of the Neonatal Somatosensory Evoked Responses in Preterm Infants. *Developmental Medicine and Child Neurology* 1988; 30: 208–214 (see especially the comments from the bottom of page 212).

<sup>11</sup> A. Hrbek, P. Karlberg and T. Olsson. Development of Visual and Somatosensory Evoked Responses in Pre-term and Newborn Infants.

Specifically addressing the N1 component of the SEP in pre-term infants below 30 weeks gestational age, the authors commented that 'the slow negative wave is an electrical response of very poorly developed and differentiated *cortical* cells and structures',<sup>12</sup> (emphasis added). Later changes in the SEP suggest maturation of the somatosensory cortex. This later development is of evident importance but, as I argued previously, the differences in the SEP pattern of a newborn compared with a child and an adult suggest more than simply differences in degree.

The neural generators of the SEP response observed by Klimach and Cooke are suggested to be in or around the somatosensory and primary motor regions and become increasingly coherent after 30 weeks gestation. This is consistent with the appearance of sophisticated and localized behavioural response to noxious stimulation after 30 weeks as described by Craig and colleagues in several reports<sup>13</sup> and summarised by Benatar and Benatar. These reactions of the fetus and early neonate to noxious stimulation can thus be directly correlated with the increasing maturity and organisation of the somatosensory and motor system. However, to correlate these responses with increasing conscious appreciation, as Benatar and Benatar suggest, reaches beyond the data. Anticipatory and reactive activities are at the heart of most adaptive behaviours that can be observed throughout much of the organic world and do not imply the intervention of volition or awareness but simply reflect the fact that evolutionary adaptation detects regularity and selects for ordered behaviour.<sup>14</sup> Even insects are able to show evidence of highly ordered behaviour that to the casual observer might be suggestive of planning and conscious intention.<sup>15</sup>

*Electroencephalography and Clinical Neurophysiology* 1973; 34: 225–232 (see the first paragraph of the abstract).

<sup>12</sup> *Ibid.*, see page 230.

<sup>13</sup> K.D. Craig, M.F. Whitfield, R.V.E. Grunau, J. Linton and H.D. Hadjistavropoulos. Pain in the Preterm Neonate: Behavioural and Physiological Indices, *Pain*, 1993; 52: 287–299; B.J. Stevens, C.C. Johnston and L. Horton. Factors that Influence the Behavioural Pain Responses of Premature Infants. *Pain* 1994; 59: 101–109; C.C. Johnston, B. Stevens, K.D. Craig and R.V.E. Grunau. Developmental Changes in Pain Expression in Premature, Full term, two- and four-month-old Infants. *Pain* 1993; 52: 201–208.

<sup>14</sup> Far more sophisticated behaviour than that described by Benatar and Benatar is regularly observed in the animal kingdom without any necessary acceptance of mental states: C.M. Heyes. Anecdotes, Trapping and Triangulating: do Animals Attribute Mental States? *Animal Behavior* 1993; 46: 177–188; J. Vauclair. Mental States in Animals: Cognitive Ethology. *Trends in Cognitive Sciences* 1997; 1: 35–39.

<sup>15</sup> K. Von Frisch. *The Dance Language and Orientation of Bees*. 1967. Cambridge. Harvard University Press.

## CONSCIOUSNESS

Those who advocate that a fetus can experience pain are arguing that the fetus has a subjective experience. They do this despite the fact that the behavioural, anatomical, functional, hormonal and all of the other data brought to bear on this question cannot be used to directly infer conscious experience. The exact opposite point, that none of the data directly undermines the claim of fetal pain, is equally valid. We are all arguing by inference. Given this, I am curious as to why the null hypothesis, that the fetus does not experience pain, is pushed aside with such cavalier disregard. I suspect the acceptance of fetal pain has more to do with the entirely understandable desire to protect the very young and an unconstrained tendency to anthropomorphise. It remains to be demonstrated, however, that adherence to the belief in fetal pain will be of any clinical benefit to the unborn<sup>16</sup> and the tendency to anthropomorphise should surely be condemned as a shoddy way to proceed with rational inquiry.

The nature of consciousness is not easily described<sup>17</sup> but I would suggest it must involve a representational process that distinguishes the observer.<sup>18</sup> We are not simply aware of pain, in all its raw glory as

<sup>16</sup> Those who advocate the use of analgesia for the fetus recognise that such procedures need to be balanced against the potential long and short-term risks for both the fetus and mother: V. Glover, N.M. Fisk. Fetal Pain: Implications for Research and Practice. *British Journal of Obstetrics and Gynaecology* 1999; 106: 881–886. To this author's knowledge, no trials have yet demonstrated the benefit of analgesic drugs during fetal surgery or instrumental delivery. The danger of subverting the promise of effective, preventative fetal therapy through misguided adherence to the possibility of 'fetal pain' is alluded to in Benatar and Benatar's final paragraph.

<sup>17</sup> 'As with most words, it is not possible to give a definition of 'consciousness' in terms of necessary and sufficient conditions, nor is it possible to define in the Aristotelian fashion by way of genus and differentiation.' Searle, *op-cit.*, note 1, pp. 83; 'Everyone has a rough idea of what is meant by consciousness. It is better to avoid a *precise* definition of consciousness because of the dangers of premature definition.' Crick, *op-cit.*, note 1, p. 20; 'What is daunting about consciousness is that it does not seem to be a matter of behaviour. It just *is*-winking on with the light, multiple and simultaneous in its modes and objects, ineluctably ours.' Edelman, *op-cit.*, note 1, p. 111.

<sup>18</sup> C.D. Frith. Consciousness, Information Processing and the Brain. *Journal of Psychopharmacology* 1992; 6: 436–440. Frith suggests the frontal cortex to play a major role in coordinating the different components of consciousness that may be represented or mediated by a system involving the anterior cingulate cortex. The middle frontal gyrus increases glucose metabolism 6-fold in the first 3 months after birth, the increase is 10-fold by 9 months and 11-fold by 18 months. The anterior cingulate cortex increases glucose metabolism 3-fold in

Benatar and Benatar suggest, rather we are aware of ourselves being in pain. This meta-representation, representation of a representation, is what I have called consciousness<sup>19</sup> and it is dependent upon the simultaneous functioning of many different parts of the brain.<sup>20</sup> Benatar and Benatar object that this conception is far too narrow but they provide no real evidence for their broader conception of consciousness, only an appeal to community consensus and 'common-sense'. Were it so straight-forward we would not be having this debate. Consciousness defies common-sense interpretation and the issue cannot be decided via a vote count of the community or any other group.<sup>21</sup>

Gerald Edelman has suggested that there exists a 'primary consciousness', the capacity to organise sensory experiences into a coherent scene, which he calls the 'remembered present', prior to the higher-order reflective consciousness to which I refer.<sup>22</sup> Edelman's view has considerable similarities with the schematic processing described by Leventhal as a pre-conscious function.<sup>23</sup> Perhaps there is a grey area here between reflective awareness and pre-reflective awareness. It remains to be explained, however, how it is that a 'remembered present' can exist without any of the structure of a 'remembered past' being available. At the very least it should be

the first 3 months, 4-fold in the first 9 months and approaching 5-fold by 18 months: H.T. Chugani and M.E. Phelps. Maturational Changes in Cerebral Function in Infants Determined by <sup>18</sup>FDG Positron Emission Tomography. *Science* 1986; 231: 840–843.

<sup>19</sup> In this I agree with Freud who suggested that if we were not conscious of being conscious, then we would be unconscious of consciousness, which is an absurdity: S. Freud. *The Ego and the Id*. 1923. London. The Hogarth Press. This suggestion necessarily generates equivocation regarding the meaning of consciousness and threatens degeneration into infinite regress but I believe these problems highlight the incomplete nature of the theory rather than undermining the importance of reflectivity *per se*. See also D.C. Dennett, *op-cit.*, note 1, for further discussion.

<sup>20</sup> *Op. cit.* note 18.

<sup>21</sup> I have attacked common-sense interpretations of pain elsewhere, including my earlier review, as rapidly degenerating into a tautology that explains pain as the response to painful stimulation: S.W.G. Derbyshire, note 4; S.W.G. Derbyshire. Analgesic and Anaesthetic Procedures are Being Introduced Because of Shoddy Sentimental Argument. *British Medical Journal* 1997; 314: 1201.

<sup>22</sup> G. Edelman, *op-cit.*, note 1.

<sup>23</sup> H. Leventhal. A Perceptual-motor Theory of Emotion. *Advances in Experimental Social Psychology* 1984; 17: 117–175; H. Leventhal and K. Scherer. The Relationship of Emotion to Cognition: A Functional Approach to a Semantic Controversy. *Cognition and Emotion* 1987; 1: 3–28.

evident that a pain experience existing prior to the huge psychological development, described in my past review, will necessarily be a shallower experience, lacking reflection, abstraction and a social or historical dimension. To put it simply, the 'experience' will lack content, if indeed it has any content at all. If this is the case, and I believe there is no honest way of avoiding such a conclusion, then why call this experience pain? Rather than exaggerate the psychological and neurological development of the fetus it would be better to characterise the 'experience', presenting a theory of what it is and what to do about it, on its own terms.

## CONCLUSION

As for much of the fetal pain literature, Benatar and Benatar have dodged the bullet on the relation between the physiological and behavioural responses to noxious stimulation and the psychological experience of pain. They prefer, instead, to shoot the messenger who would like to examine the mediating links between these fields of inquiry. The outward behaviour of the fetus in the presence of noxious stimulation that Benatar and Benatar describe as compelling evidence for the experience of pain are certainly important and likely form part of the prerequisites for emotional development and the unfolding of human experience. Saying that those behaviours are indicative of pain, however, is a moral blunder that draws a false equivalence between observer and observed by assuming that the process of development is already complete.<sup>24</sup>

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<sup>24</sup> Due to a lack of space I have not commented on the study by Giannakouloupoulos *et al* [X. Giannakouloupoulos, W. Sepulveda, P. Kourtis, V. Glover and N.M. Fisk. Fetal Plasma Cortisol and  $\beta$ -endorphin Response to Intrauterine Needling. *Lancet* 1994; 344: 77–81]. CRH levels in the fetus have been shown to be three to four-fold lower than that of maternal plasma: R.L. Emanuel, B.G. Robinson, E.W. Seely, S.W. Graves, I. Kohane, D. Saltzman, R. Barbieri, J.A. Majzoub. Corticotrophin Releasing Hormone Levels in Human Plasma and Amniotic Fluid During Gestation. *Clinical Endocrinology* 1994; 40: 257–262. I apologise for not providing this reference in my last review. The reference to the study of fear conditioning in rats was in support of my comment that the hippocampus develops more slowly than the amygdala suggesting that the lower hormonal response indicates less development of the hypothalamic-pituitary adrenal axis than implied. I would like to thank the editors of *Bioethics* for allowing me the opportunity to respond to Benatar and Benatar.