

Behavior not indicative of pain in stressed babies

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In stressed newborn babies, behaviour alone is not a reliable way of assessing pain, according to new UCL and UCLH research.

The study, published today in *Current Biology* and funded by the Medical Research Council UK, found that hospitalised newborns, who are already stressed by their environment have a much larger pain response in their [brain](#) following a routine clinical skin lance than non-stressed babies. But this is not matched by an equivalent increase in their pain behaviour.

This disconnect between the behaviour of newborn babies under [stress](#) and their [brain activity](#) in response to pain has not been shown before and suggests that stress is an important factor in influencing how babies perceive and react to pain.

"We see that an increase in pain related brain activity in hospitalised babies is not always accompanied by an increase in typical pain behaviour, such as body movement and facial expressions. This leads us to question the use of behaviour alone as a way of assessing infant pain, especially in a stressful environment. In adults, stress can increase [pain experience](#) and our findings suggest that this is also true for babies," explained study lead, Dr Laura Jones (UCL Neuroscience, Physiology & Pharmacology).

"We know that repeated painful and stressful experiences in early life can negatively impact on the development of the central nervous system and our results suggest that controlling the [stress levels](#) of hospitalised infants may not only reduce their pain but also contribute to their healthy development."

Researchers simultaneously measured the behaviour and brain activity of 56 newborn babies before and after a clinically necessary heel prick in their first days of life, while also monitoring their stress.

In the babies with the lowest stress levels, brain activity and behaviour were associated with each other in that greater brain activity

corresponded to a longer period of crying and/or grimacing. In the babies with the highest stress levels this association was broken: greater brain activity was not necessarily matched by a more marked behavioural response.

"These results are important for people who care for newborn babies. Behaviour such as crying or facial responses is widely used as a measurement of a baby's pain experience. Pain scores used for babies are based on these observations, because babies can't speak. While these methods are very useful, our findings suggest that they may not be appropriate for babies who are already stressed. We need to explore better ways to monitor pain, reduce stress and tailor our interventions accordingly," added co-author, Dr Judith Meek (University College London Hospitals NHS Foundation Trust).

The researchers measured the background level of stress in the babies using two approaches - heart rate variability and the level of cortisol in saliva. Each baby had a different level of stress due to natural variability in the population and their environments prior to the test.

During the test, brain wave patterns were tracked using electroencephalography (EEG) and behavioural changes, including facial expressions, and physiological changes were scored using a standard method called the premature infant pain profile (PIPP).

Two thirds of infants show a characteristic brain wave pattern for pain and a similar proportion display typical pain [behaviour](#) and a moderate pain score. The results show that the amplitude of the pain evoked brain waves was greater in [babies](#) with high stress compared to those with low stress.

"This work arose from a collaboration between scientists and clinical investigators. Our basic laboratory studies in the biology of pain

processing in the developing nervous system have led to new discoveries about the formation of pain connections in the human infant brain. In the future, we plan to explore other environmental factors, such as maternal interactions, that may influence how our brains process [pain](#) at the beginning of our lives," added Professor Maria Fitzgerald, co-author and head of the UCL research group.

More information: 'Nociceptive cortical activity is dissociated from nociceptive behavior in newborn human infants under stress' *Current Biology* (2017). [DOI: 10.1016/j.cub.2017.10.063](https://doi.org/10.1016/j.cub.2017.10.063)

Provided by University College London

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