RESEARCH SUMMARY

Gender-bias in the sensory representation of infant cry
Devaraju, D.S., Gnanateja, G.N., Kumar, U.A. and Maruthy, S. (2018)
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Many women who are breast-feeding find that just hearing their babies crying can cause their milk to begin to flow. This is an extreme form of the so-called 'let-down reflex', in which milk flows in response to suckling. It is, however, only one instance of a physiological response to infant crying that seems to be stronger and more defined in any women – regardless of whether they are, or have been, mothers of small children – as compared to men. This natural gender bias in the response to a baby's crying has been tested neurologically; the cry is found to activate a wider network of neurons in the brains of women than it does in those of men.

The extent to which this difference between the genders is encoded in the parts of the brain that respond directly to sound, and the extent to which it arises more indirectly from an intellectual or emotional response, is not yet fully known. A group of researchers led by G. Nike Gnanateja in the All India Institute of Speech and Hearing, Mysore, India set out to investigate this through a study of the way in which the sound is processed in the brain.

It is possible to study the brain's response to sounds directly through an analysis of frequency following responses (FFRs). These are signals that are generated in the brainstem and cortex in immediate response to a sound, that mimic the frequency pattern of that sound, and that can be recorded by placing electrodes on the scalp. The similarity between the FFR and the sound stimulus that caused it can be used to assess how efficiently the brain processes sound. In this study, Gnanateja and his co-workers compared the FFR induced by an infant cry in male and female subjects.

They noted that any difference in FFR between the genders that does arise may be caused by a general difference in auditory responses between males and females, rather than one that is specific to the sound of a crying infant. Known differences between average FFRs in males and females have been noted, and these arise naturally from anatomical differences, particularly in the size of the head. The researchers therefore tested their results to see whether differences in head circumference, used as a measure of head size, could explain any differences observed between male and female FFRs. To eliminate any difference that could arise from learned experience, only individuals who had no children of their own and who had limited exposure to small children were recruited into the study. Finally, the response to an infant cry was compared to the response to a pure tone of a similar frequency. Any difference between the genders that remains after all these factors have been allowed for is likely to be due to a gender-specific physiological response to this particular sound alone.

The cry stimulus chosen was a short (roughly quarter-second) sound segment cut from a recording of a baby crying that had been downloaded from a public repository. This cry had a fundamental frequency of 400 Hz (close to the G above Middle C) and it was therefore compared to a pure tone with this frequency. Sixteen men and fifteen women were each fitted with an audiometer and exposed to two continuous runs of sound, each comprising 2000 copies of the cry stimulus, and two continuous runs of 2000 copies of the pure tone. The FFRs were obtained by fitting electrodes to the participants' scalps and recording an EEG (electroencephalogram) of the electrical activity in the brain during exposure to each stimulus. The head circumference of each individual was measured before the sound exposure took place.

The average FFR to each stimulus for each individual was calculated from the two identical runs and analysed using a set of statistical tools that had been optimised for studying the brain's initial response to complex sounds. Both the stimuli – the cry and the pure tone – were processed in a similar way for easier comparison. A correlation coefficient was calculated for each participant and stimulus. This was a number between 0 and 1 that was higher, the greater the similarity between the stimulus and its response. The lag between stimulus and response, which indicates the speed of the neural response to the sound, was also measured, and a plot of the magnitude of the signal against frequency recorded in each case. As expected, there was a peak in each response at the 'base frequency' of the signal, close to 400 Hz.

When the male and female participants were compared, the mean FFR to the infant cry from the female brains was more intense, particularly at frequencies close to that fundamental frequency and its first two harmonics (800 and 1200 Hz). No significant differences appeared to arise from differences in head size alone. Female subjects also responded more intensely to the pure 400 Hz tone than males, but this difference was less significant than the difference in responses to the baby's cry. There was little difference between the genders in either the correlation between the stimuli and responses or the lag times.

Gnanateja and his co-workers suggest that their results, when taken together, show that there is a significant difference between the genders in the intensity of the initial neural response to a baby's cry. This is not replicated in the speed or precision of that response, or, indeed, in any aspect of the response to a pure tone of similar pitch. It also appears to be unrelated to the anatomical differences between average males and females. They suggest that this intense neurological response may predispose a woman to respond more sensitively to a baby's obvious needs, even if she is not related to that infant, but that further work will be needed to confirm the findings.

Dr Clare Sansom

What About The Children? (WATCh?): Company No. 5252973 - Reg. Charity No. 1108816 **Address**: Feldon House, Chapel Lane, Newbold on Stour, CV37 8TY
Website: http://www.whataboutthechildren.org.uk **Email**: enquiries@whataboutthechildren.org.uk **Telephone**: 0845 602 7145