end of life care. I suspect that in the UK, most neonatologists would agree that their management of terminal care may sometimes hasten an inevitable death, but few of us would know to what extent our practices or those of our colleagues were related to our attitudes to death and dying.

Barr's paper shows us that in relation to neonatal death and dying, doctors'

fear, or lack of it, matters. It matters because it can influence clinical judgments. Recognising this influence is an important aspect of self-knowledge, and there is a case to be made for all of us to be more open about it.

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Correspondence to: Dr M P Ward Platt, Ward 35, Royal Victoria Infirmary, Newcastle upon Tyne NE1 4LP, UK; m.p.ward-platt@ncl.ac.uk

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Infant-directed speech vs adult-directed speech

From mother's mouth to infant's brain

Marilyn Augustyn, Barry Zuckerman

Perspective on the paper by Saito *et al* (see page 113)

It is well documented that newborns and even fetuses know their own mother's voice: non-nutritive sucking¹ and fetal heart rate increase² in response to the mother's voice compared with the voice of a stranger. Even with this recognition by the infant, one observes that parents adjust their speech to their infants by exaggerating sounds and pitch as well as their facial expressions, opening their mouths wider and raising their eyebrows. This is called infant-directed speech in the article by Saito *et al*³ in this issue, formerly referred to as "motherese" or "parentese". Although no one "teaches" parents to speak like this to their infants, it is omnipresent and even children as young as four years across all cultures speak like this to infants.^{3–4} If infants know their mother's voice as these and previous researchers posit, why do mothers speak like this to their infants? The answer in part lies in observing parent-child interaction.

It is only in response to these exaggerated sounds and facial expressions that parents or other adults gain an infant's focused attention—widening of the eyelids, dilation of the pupils, a softening of the face associated with a fixed gaze on the parent. If parents speak in their regular adult voice or as described by Saito *et al*, adult-directed speech, infants do not attend. Thus parents learn by trial and error, usually very quickly, that modifying

their voice and facial expressions is needed to get the infant to pay attention to them.

What is fascinating about the study by Saito *et al* is that their findings of increased blood flow to the frontal area of the brain provide neurophysiological evidence to support the above behavioural observations: infants discriminate speech patterns and infant directed communication affects and stimulates the brain. It also raises questions about why infant-directed speech is so attractive to the developing brain. The common explanation is that because infants process visual and auditory information at a slower rate, parents exaggerate face and voice so it fits what infants are able to process. The investigators also point out that the greater activation of the frontal lobe by infant-directed speech compared with adult directed speech and white noise may have important implications for later emotional expression and self-regulation.

This hypothesis is supported by results of a recent study of Romanian orphans that showed, through special imaging studies, that the volume of connections between the frontal lobe and areas of emotional functioning is less in those orphans from deprived environments compared with normal controls.⁵ It is perhaps in this latter area that the most fascinating questions arise: does the amount and type of language an infant hears influence their eventual ability for emotional regulation?

What about the effect of different types of ongoing verbal communication between parent and child? Positive expressions of emotions are commonly connected to verbal exchanges when parents read aloud to children. Could reading aloud to children foster emotional expression and self-regulation in addition to learning language? This study does not add definitive evidence but does utilise interesting technology to push open a bit the door to our understanding the role of specific types of parent and child communication, brain development and behaviour later in life. Let the exploration continue!

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Authors' affiliations

Marilyn Augustyn, Barry Zuckerman,
Department of Pediatrics, Boston Medical Center, Boston University School of Medicine 5, Boston, Massachusetts, USA

Correspondence to: Dr M Augustyn, Boston Medical Center, 91 East Concord Street, Boston, MA 02118, USA; augustyn@bu.edu

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