

# What About The Children?

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Patrons: Sir Michael Morpurgo, Rebecca Abrams, Sir John Timpson, Dame Sarah Storey.



## RESEARCH SUMMARY

### **Exploring the neural basis for paternal protection: an investigation of the neural response to infants in danger**

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Parental protection is essential for children, as parents provide shelter, ward-off hostility and protect children from harm. As with many other intuitive behaviour patterns, this type of anticipating and responding to a child in danger is likely to be rooted in neural systems that have previously been found to be associated with other forms of parental care. Like caring, different strategies of protection of an infant have been suggested to lead to different developmental outcomes. From an evolutionary point of view parental protection, along with a newborn's innate need to seek a responsive attachment figure, is crucial for survival. Using a combination of functional magnetic resonance imaging and multi-informant reports, Anna van 't Veer and her colleagues have produced a longitudinal study that explores the neural basis for paternal protection. In their paper, fathers' neuronal responses to situations that threaten their own infant, or an unknown infant, are examined both before and after the birth of their first child

As babies are vulnerable for a fairly long time it is likely that parents have evolved adaptive responses to infant-threatening situations such as accidents. Little research has been carried out on the mechanisms of parental protection, which is surprising as the parent's active engagement in protective behaviour may be a valuable marker for parent-child bonding and later child development. Studies in animals suggest the following great advantage that a sense of security and protection during early life can offer: that is, the ability to develop social bonds later in life, which can then maximize reproductive success. In humans close relationships signal that the world is a safe environment where you are protected, and where distress alleviation functions are regulated. The importance of parental protection becomes particularly noticeable when it is absent. For example, child maltreatment is associated with impaired cognitive and emotional functioning later in life.

Parenting is rooted in the brain structures that are involved in emotional processing, which enables parents to automatically detect and respond to cues and structures involved in social understanding, which in turn allows parents to understand their infant's needs. Much of what is already known about the parental brain comes from studies with mothers, but recent studies have suggested that fatherhood also is associated with both structural and functional changes in the brain. For example, grey matter volume increases in first-time fathers in the areas of the brain associated with reward, affiliation and processing of infant stimuli. The amount of time fathers spend

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caring for their child correlates with connectivity in the brain. This suggests that fathers' brains attune to their caring role, and that similar brain regions may be involved when fathers perceive a threat to their child.

Large areas of the brain are activated when expectant fathers view videos of infant-threatening situations versus neutral situations. Expectant fathers show more brain activation when their own, rather than an unknown, infant is endangered. Threat processing was related to everyday protective behaviour, suggesting that fathers-to-be who protect their unborn child, (i.e. the mothers-to-be) also tend to show a stronger neural response to their own infant in threatening situations. Observing infant-threatening situations elicits activation in areas of the brain previously characterised as part of a parental care network: these facilitate both the processing of emotional information and simulating the affective states of others. Infant-threatening situations also elicit more activation in the amygdalae, suggesting that fathers attribute greater emotional significance to these situations. It is possible that a role of the amygdala in protective behaviour is to identify potential threats, from which action can be taken to ensure a child's safety. The effect of threat is modulated by infant familiarity. Perceiving a threat to one's own child also activates areas of the brain which are involved in the preparation of motor responses.

Once a father's child is born, the modification effect of familiarity did not differ except for the one part of the brain which is associated with cognitive control and execution, which was dampened. It is possible that once a child is born it may take the father less cognitive effort to imagine their child in threatening situations. Or, possibly, responses may have been dampened because fathers were already familiar with responding.

The inclination to protect children can be seen as a form of prosocial behaviour, but to date it has received little attention. Future research could examine protection in fathers, mothers and non-parents to find similarities and differences in the underlying processes. It may be particularly useful to examine how individual differences in protective behaviour relate to personality and the people involved, and whether there is an underlying continuum with insensitive parenting and neglect. Further investigations could try to discover how normal protective behaviour relates to over-protective parenting; the latter is assumed to influence a child's development negatively. By furthering knowledge on the psychological and neurobiological dimensions of paternity, this type of work could have important implications for developmental, behavioural and societal aspects of parenting.

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