How do hormones affect human parenting behaviours?

Jessica Lagerlöf
Populärvetenskaplig sammanfattning av Självständigt arbete i biologi 2013
Institutionen för biologisk grundutbildning, Uppsala universitet

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What do you need to survive? Food, ok. Air to breathe, ok. But only this is not enough for you to live well and develop all characteristics of a social functioning human being. Your parents are crucial for both your survival and development, especially during your first years. Parenting behaviours are species specific. Human parents are one of few mammalian species where both females and males take care of the young. Hormones are molecules known to influence behaviours, but which ones are important for human parenting behaviours? And do these hormones give rise to different or similar parenting behaviours in men and women?

Mum is comfort and dad is play?

A general picture of human parenting is that a crying child wants to go to mum, whereas a child ready to play prefers dad. This generalization does not have to be that wrong. Studies have shown that parents seemed to offer infants different experiences and practice in social interactions. When women played with their new-born child they preferred to synchronise their vocalizations and face expressions and used more affective touch than the fathers. During mother-child play the child showed low to moderate positive arousals with a few peaks of exuberance and high energy. Men's play included more exposure to toys and physical play. The father-child interaction showed a more frequent pattern of positive arousal that became more frequent as the play continued. Even though the parents played with their child in different ways both sexes showed equal levels of parent-infant synchrony. This means that both men and women seem to be equally capable of matching micro shifts in infant's affect. So which are the hormones influencing parenting behaviours?

Oxytocin – influence much more than labour and lactation

Oxytocin is a peptide hormone mostly known for its effects in the onset of labour and lactation in women. But this is not the whole truth. Oxytocin has shown to be important for complex social behaviours, such as attachment, trust and generosity. It also seems to be able to decrease stress. The role of oxytocin in human parenting is a popular focus of many recent studies analysing how men and women play with their infant.

Oxytocin increases both mothering and fathering behaviours. It is associated with women's attachment and "checking-behaviour" (i.e. repeatedly check if the sleeping baby is okay). In fathers a behaviour named affect synchrony is uniquely predicted by oxytocin. Affect synchrony is how synchronous the father's behaviour is to the infant's in terms of gaze, vocalization and touch. Both parents have shown a higher degree of triadic synchrony with increasing oxytocin concentrations. This behaviour integrates physical and affectionate contact between the two parents while they concurrently have close contact with their infant.

Two additional behaviours which have shown positive correlation to oxytocin are affectionate and stimulatory parenting. Affectionate behaviour refers to positive affect, motherese vocalization (high-pitched, sing-song vocalization) and affectionate touch (hugging, kissing, stroking). This behaviour is positive correlated with the mother's oxytocin concentrations. Stimulatory behaviour includes object presentation, proprioceptive touch (changing infant position in space) and stimulatory touch (i.e. presenting objects). Oxytocin levels in fathers are positive correlated to this behaviour. Even though both parents engaged in affectionate and stimulatory parenting behaviour in the same proportion of time, oxytocin was only correlated to one of these behaviours in men and women. Today researchers can only speculate in why oxytocin concentrations correlate to specific parenting behaviours. One explanation could be that the infant prefer different behaviours from the mother and the father. The behaviour which gives the parent most reward may be the one that is correlated to the oxytocin level. This is because a connection between the oxytocin system and the reward system of dopamine has been indicated in some studies. Other hormones are not as well studied as oxytocin when it comes to human parenting behaviours. But one hormone alone do not influence the whole spectra of behaviours, so which ones are thought to be its companions?

What is a hormone?

Hormones are the body's second messengers; they travel around in the blood or in the extracellular fluid to regulate physiological functions and gene expression. Their main functions are to regulate development, metabolism, growth, reproduction and behaviour. Hormones indirectly affect behaviours by increase the probability for a specific behaviour to occur.

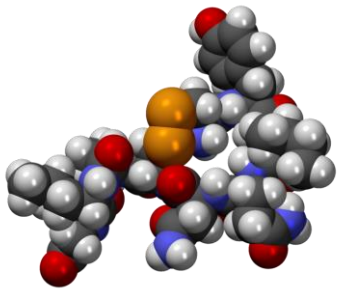

Figure 1. The oxytocin molecule.

Prolactin – influence paternal behaviours?

The most known function of prolactin is its role in the production and release of mother's milk. This is though an incomplete picture because this peptide hormone is involved in hundreds of different biological activities throughout the body. Prolactin influences the body's homeostasis, reproduction and immune

system. The role of prolactin in mammalian fathering behaviours has been under discussion and recent studies of human fathers give new input to this debate. Prolactin has shown a significant positive correlation with fathers' coordinated exploratory play, which is his ability to coordinate between the child's readiness to explore a toy and his facilitation of exploration. Oxytocin did not show any correlation to this behaviour whereas prolactin did not associate with the father's affected synchrony.

Another interesting finding came from a study that analysed hormone levels before exposure to infant stimuli (holding a doll wrapped in a used baby blanket, listening to baby cries and watch a short video about lactation) and 30 minutes afterwards. Men who reported feelings of anxiety when introduced to baby cries had higher levels of prolactin than men who did not report these feelings. This indicates that prolactin has a positive correlation to specific paternal behaviours.

Testosterone – more than testis determination?

Testosterone is widely known to be the primary steroid hormone responsible for the development and maintenance of secondary male characteristics. Testosterone has been connected with physical aggression and competitive behaviours for a long period of time. It seems to decrease feelings of fear and increase stress resistance and thus has importance in the seeking of social status. But how is this typical male hormone correlated with parenting behaviours? A lower concentration of testosterone seems to give benefits in fathering behaviour. Men who reported feelings of anxiety and need to comfort when they heard a crying baby had lower levels of testosterone than men who did not report these feelings. Additionally men who showed more willingness to hold a baby on their shoulder for a longer period of time had lower levels of testosterone. These findings suggest that men's lower testosterone level is related to a higher degree of paternal behaviour. A potential reason could be that lower testosterone levels in men decrease their tendencies to engage in competitive

What is behaviour?

Behaviour is both coordination of movements and lack of motion. A complex cooperation between three different parts of the nervous system; the sensory system (input), the central nervous system and the motor system (output) results in a specific behaviour. These systems are regulated by hormones. Parenting behaviours are all behaviours that a parent shows in relation to its offspring in order to increase the survival of the young.

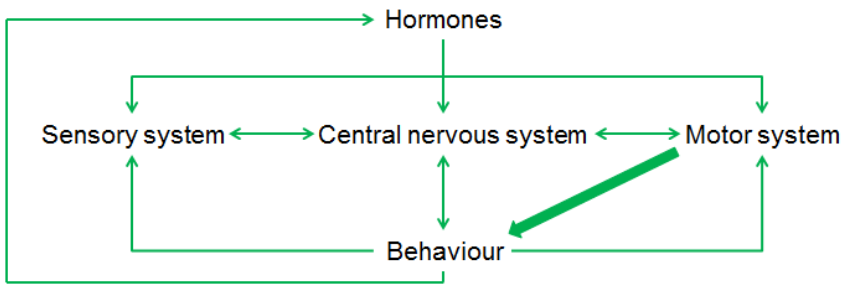

Figure 2. Schematic model of how hormones influence behaviours.

behaviours and other behaviours that would not favour the infant.

Cortisol – mothers watch out!

Stress, anxiety and depression are all symptoms related to increased levels of cortisol. Cortisol has a central role in organizing the body's response to physiological and psychological stressors. Women's cortisol levels increase during the first six months of parenting whereas men's is unaffected. This may be explained by that women are exposed to greater physiological demands following childbirth such as breastfeeding and sleep deprivation. Stress and anxiety are not favourable emotions during infant care. Not surprisingly cortisol has shown to have a negative correlation with maternal behaviours. It decreases mother-infant attachment, mother's checking-behaviour and her ability of triadic synchrony. Cortisol does not seem to have any correlation with any aspect of paternal behaviours. The relationship between cortisol and behaviours are complex and there is still a long way to go before researchers have functional proof of the involvement of cortisol as well as the other hormones in parenting behaviours.

Complex relationship between hormones and behaviours

So far the researchers have found results suggesting that hormones have both similar and different impact on parenting behaviours in men and women. A hormone like oxytocin does not have to affect the amount of time each parent engage in a specific behaviour but it is related to stimulatory behaviour in men and affectionate behaviour in women. Prolactin regulates lactation as a physiological aspect of mothering whereas it seems to be associated with social aspects of fathering, related to men's coordinated exploratory play. Testosterone and cortisol are steroid hormones that have negative impact on parenting behaviours. They support aggression and stress responses respectively and thus lower levels of these hormones favour paternal and maternal behaviour.

Today the studies cannot proof that a specific behaviour is due to a certain hormone concentration. The complexity of the human body and the ethical problems of research on humans complicate the studies of hormones and behaviours. The causality between hormones and behaviours is far from straight forward. Hormones can influence behaviours indirectly by regulating cellular functions and gene expression to increase the likelihood for a specific behaviour. On the other hand behaviours have the capacity to affect hormone concentrations. The studies of the correlations between hormones and human parenting behaviours have only started. Many more studies need to be done before the hormonal reason behind men and women's parenting behaviours can be proved.

Do you want to read more?

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