

平成23年度 入学試験（9月）問題

人間健康科学研究科

フロンティアヘルスサイエンス学域

筆記試験

試験時間 10:00～11:30 90分間

注意事項

1. 試験開始の合図があるまで、この問題冊子を開いてはいけない。
2. この問題冊子は4ページである（表紙、余白を除く）。
3. 試験中に、問題冊子の印刷不鮮明、ページの落丁・乱丁及び解答用紙の汚れ等に気付いた場合は、手を挙げて監督員に知らせること。
4. 解答用紙の所定の記入欄には、監督員の指示に従って、それぞれ正しく記入すること。
5. 解答は、解答用紙の解答欄に記入すること。
6. 筆記試験に際しては、英和辞典1冊の持ち込み参照を認める。（専門用語辞典及び電子辞典の持ち込みは不可とする。）
7. 問題冊子の余白等は適宜使用してよいが、どのページも切り離してはいけない。
8. 試験終了まで退室してはいけない。
9. 解答用紙は必ず提出すること。問題冊子は持ち帰ること。

首都大学東京 大学院 人間健康科学研究科 博士後期課程

次ページ以降に問題が記載されています。

下記の問題を解答しなさい。

問題 I . [脳機能解析科学分野] …………… 2 頁～4 頁

[脳機能解析科学分野]

問題 I . 次の英文を読み、問に答えなさい。

Baby's Little Smiles: Building a Relationship with Mom

How smiles—and pouts—are helping researchers probe the essence of the complex mother-infant bond.

It's probably not surprising that mothers excel at recognizing and interpreting the moods and emotions of their infants. Although infants can't speak, mothers seem to know what their babies are thinking: they smile when their baby smiles and they frown when their baby is upset. Research suggests that the mother's ability to understand the needs of her infant is very important for establishing a secure mother-infant relationship. However, the neural mechanisms that underlie these behaviors are poorly understood. Such knowledge is crucial for understanding normal as well as abusive and neglectful mothering.

Maternal Rewards

In recent years, several studies have been carried out using (1) fMRI to better understand how a mother's brain responds to her own child's cues. The most recent study, led by neuroscientist Lane Strathearn and colleagues at Baylor College of Medicine, investigated what happens inside the brain of a mother when she looks at the facial expressions of her own infant. In the study, 28 first-time mothers were shown pictures of their seven-month old child that they had never seen before. (The pictures were taken when the mother was not present.) The pictures spanned a wide range of human emotion and included images of the child making happy, sad or neutral faces. These pictures were then matched with images of an unknown infant. The central finding was that seeing the happy face of the mother's own infant activated all of the key areas in the brain associated with reward processing. These regions include the (2) VTA, (3) SN and the striatum. This finding suggests that for mothers the sight of their smiling baby is a potent reward and represents a uniquely pleasurable experience. Furthermore, this neural response was graded, so that happy faces led to more activation than neutral faces. Sad faces generated the least activation. In other words, the response of mothers in their reward areas seemed to directly mirror the emotions the infant displayed.

The argument put forth by Strathearn and colleagues is that maternal behavior is fundamentally rooted in these reward areas. Positive sensory cues from infants, such as a

smiling facial expression, stimulate (4) release and thus promote responsive maternal care. However, many questions remain. In their paper, Strathearn et al. do not discuss the significance of the (5) OFC, although its activity was clearly influenced in the experiment by seeing one's own infant's compared with an unknown infant. The importance of the (5) OFC shouldn't be too surprising, as this brain area is believed to receive ascending (4) projections from reward areas and is critical in representing the "value" of a reward. Other studies have also demonstrated that the (5) OFC is correlated with the positive feelings of the mother, suggesting that it plays a key role in modulating maternal behavior.

Is the Smile Enough?

This study also raises a more fundamental question: is the infant smile the most important element for motivating maternal behavior? It goes without saying that the smiling face of one's own baby is highly rewarding and encourages maternal care. On the other hand, babies aren't always smiling and mothers must also learn to respond to infants in distress. In fact, a human mother's response to an infant in distress is a good indicator of how responsive she is to other infant cues. Studies also show that abusive and neglectful mothers show less empathy and more aversive feelings towards a crying infant when compared with nurturing mothers, suggesting that how a mother reacts to a baby when it's upset and not smiling is a crucial test of maternal behavior.

(6) According to our own recent work, the OFC and striatum were more activated in the brain of a mother when she looked at her own infant compared with other infants regardless of the infant's situation or mood. These brain areas also showed a greater activation when mothers were viewing their infant when he or she was crying (the distressed condition) as opposed to when he or she was happy (the play situation). This discovery makes sense, as a distressed baby might require more effort and thought as the mother must quickly identify the source of the distress and respond appropriately. Another reason to highlight the importance of the OFC in guiding maternal behavior is that, in our experiment, the activity of this brain area showed a positive correlation not only with pleasurable feelings but also the anxious feelings experienced by the mother. Of course, these anxious feelings are important for maternal care, as anxiety and worry can be powerful motivators. Taken together, these findings suggest that maternal behavior is guided by elaborate and complex neural mechanisms. Although reward processing is clearly an important part of this mental process—it seems to mediate maternal love and feelings of joy—other mechanisms are required in order to explain the full range of the mother-infant relationship.

In conclusion, a smiling face of a mother's own infant is certainly rewarding and it motivates maternal care, but this is not the only motivator. We hope that in the future other aspects of maternal behavior—such as the maternal desire to protect her infant, which is a biologically essential mechanism for preservation of the species—will get investigated and explored.

(From Kikuchi & Noriuchi: Scientific American, Mind Matters. September 23, 2008)

- 問 1. 下線部(1)は、ある脳機能計測法の略である。本来の英語と日本語を書きなさい。また、これについて簡単に日本語で説明しなさい。
- 問 2. 下線部(2)は、ある脳部位の略である。本来の英語と日本語を書きなさい。
- 問 3. 下線部(3)は、ある脳部位の略である。本来の英語と日本語を書きなさい。
- 問 4. (4) は、ある神経伝達物質である。これを英語と日本語で書きなさい。
- 問 5. 下線部(5)は、ある脳部位の略である。本来の英語と日本語を書きなさい。
- 問 6. 下線部(6)を日本語に訳しなさい。
- 問 7. 本文で、筆者の主張したい点を簡単にまとめなさい。