



Title	Neural basis of fear conditioning induced by video-clip : a PET study
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論 文 内 容 の 要 旨

[目的]

In patients with post-traumatic stress disorder (PTSD), re-experiencing the trauma is often induced by external cues in the environment. The cues, which were emotionally neutral for the patients before the traumatic event, become fearful ones after the event. This phenomenon is considered to be associated with fear conditioning. We set up the paradigm so that the emotionality changes in the patients with PTSD would be reproduced, and we compared the regional cerebral blood flow (rCBF) measured with positron emission tomography (PET) during exposure to the same stimuli between before and after acquisition of fear conditioning.

[方法]

In the emotional task, the *Conditioning* and the *Control* conditions were set up. In both conditions, three phases ; namely *First photo phase*, *Video phase*, and *Second photo phase*, were set up. We asked ten healthy male subjects to watch some emotionally neutral photos (*First photo phase*), then to watch video-clip of which the content was fearful (*Conditioning* condition) or neutral (*Control* condition) and contained images of the same kind of the object presented in the photos (*Video phase*), and afterwards to watch the photos again (*Second photo phase*). The PET images were scanned in the *First photo phase* and *Second photo phase*, but not in the *Video phase*. Five of the ten subjects felt the object in the photos more fearful after watching the video-clips than before (group A), and considered to have already acquired fear conditioning. The subjects who did not meet these criteria were considered as having not acquired fear conditioning (group B).

The PET data were first analyzed by two separate subtractions as follows : [*Second photo phase-First photo phase* in the *Conditioning* condition] and [*Second photo phase-First photo phase* in the *Control* condition]. The double subtraction procedure was conducted for the inter-group analysis to compare the magnitude of the phase effect (*First photo phase* versus *Second photo phase*) in the *Conditioning* condition across the groups (group A versus group B). Also, the double subtraction procedure was conducted for the inter-group analysis to compare

the magnitude of the phase effect (*First photo phase* versus *Second photo phase*) in the *Conditioning* condition across the groups (group A versus group B).

[成績]

In group A, the right superior frontal gyrus (Brodmann area (BA) 8), the right amygdala, and the left superior temporal gyrus (BA 38) were activated in the *Second photo phase* as compared with the *First photo phase* in the *Conditioning* condition. In the *Control* condition, the left medial frontal gyrus (BA 11), the right orbital gyrus (BA 11), the left superior temporal gyrus (BA 38), and the cerebellum were activated in the *Second photo phase* as compared with the *First photo phase*. The double subtraction for the intra-group analysis was as follows [*Second photo phase-First photo phase* in the *Conditioning* condition]-[*Second photo phase-First photo phase* in the *Control* condition], and revealed activations in the right amygdala, the left posterior cingulate gyrus (BA 29), and the parieto-occipital sulcus (BA 19). In group B, no activated brain regions in the *Second photo phase* as compared with the *First photo phase* were observed in both of the *Conditioning* condition and *Control* condition. Furthermore, the inter-group analysis, that is, [*Second photo phase-First photo phase* in the *Conditioning* condition in group A]-[*Second photo phase-First photo phase* in the *Conditioning* condition in group B] revealed activations in the right amygdala and the left posterior cingulate gyrus.

[総括]

We discuss the results of the double subtraction for the intra-group analysis in the five subjects who seemed to have acquired fear conditioning, in whom the effect of phase (*First photo phase* versus *Second photo phase*) was more intensive in the *Conditioning* condition than in the *Control* condition. The results of this double subtraction showed activations in the right amygdala, the parieto-occipital sulcus (BA 19), and the left posterior cingulate gyrus (BA 29). In addition, the inter-group analysis demonstrated that the right amygdala and the left posterior cingulate gyrus (BA 29) was activated more intensively in group A than in group B. These regions seem to have critical roles in fear conditioning.

論文審査の結果の要旨

本申請者は、本研究で、健常者において、日常生活体験により近い動画刺激を用いて、情動条件付けが可能かどうか、可能であるのなら情動条件付けに関連する神経学的基盤はどこかを PET を用いて検討した。その結果、条件付けがなされたとなされなかった被検者に二分されること、両群の脳活動変化の様態が異なること、情動条件付けがなされた被検者群では右扁桃体と左後部帯状回の過活動が関連していることを明らかにした。

本研究は、情動条件付けの神経学的基盤を明らかにしたものであるが、日常生活に近い動画刺激を用いた点が斬新であり、また、健常者において情動条件付けがなされる者となされない者がいることを明らかにしたことは、健常者における情動刺激に対する脆弱性の差を示唆するものであり、何れもストレス性精神障害の臨床研究への応用という観点から意義が大きい。したがって、学位授与に十分値するものと考えられる。