Journal of Affective Disorders 151 (2013) 763–768

Contents lists available at ScienceDirect

Journal of Affective Disorders

journal homepage: www.elsevier.com/locate/jad

Preliminary communication

# Hyperthymic temperament and brightness preference in healthy subjects: Further evidence for involvement of left inferior orbitofrontal cortex in hyperthymic temperament

Mayu Harada [a], Takeshi Terao [a,*], Koji Hatano [a], Kentaro Kohno [a], Yasuo Araki [a], Yoshinori Mizokami [a], Kensuke Kodama [a], Nobuhiko Hoaki [a], Miyano Arasaki [a], Tsuyoshi Shimomura [b], Minoru Fujiki [b], Takanori Kochiyama [c]

[a] *Department of Neuropsychiatry, Oita University Faculty of Medicine, Oita 879-5593, Japan*
[b] *Department of Neurosurgery, Oita University Faculty of Medicine, Oita, Japan*
[c] *ATR Promotions, Brain Activity Imaging Center, Kyoto, Japan*

ARTICLE INFO

*Article history:*
Received 1 June 2013
Accepted 14 June 2013
Available online 5 July 2013

*Keywords:*
Hyperthymic temperament
Brightness preference
fMRI
Left inferior orbitofrontal cortex

ABSTRACT

*Background:* Hyperthymic temperament has been generally accepted as one of premorbid temperament of bipolar disorders. Although several studies indicate that subjects with hyperthymic temperament receive more illuminance, our recent study suggests that the threshold of brightness and darkness judgment is not different between more and less hyperthymic subjects, and that hyperthymic temperament may be associated with left inferior orbitofrontal cortex, which has been reported to be associated with bipolar disorder. Therefore, at the next stage, it can be hypothesized that hyperthymic subjects may prefer brightness (i.e., heliotropism) and thereby seek illuminance, and that percent signal changes of left inferior orbitofrontal cortex during the preference task may be associated with hyperthymic temperament scores.
*Methods:* We compared brightness preference and un-preference between more and less hyperthymic subjects, and investigated percent signal changes of left inferior orbitofrontal cortex during brightness preference judgment, brightness un-preference judgment, and control task by using functional Magnetic Resonance Imaging (fMRI).
*Results:* There were significant differences in brightness preference judgment and un-preference judgment, showing that more hyperthymic subjects preferred brighter illuminace levels and un-preferred darker illuminance levels than less hyperthymic subjects. Moreover, fMRI signal changes of left inferior orbitofrontal cortex was significantly and negatively associated with hyperthymic temperament scores.
*Limitations:* It is unknown why left but not right inferior orbitofrontal cortex was associated with hyperthymic temperament scores.
*Conclusions:* The present findings suggest that more hyperthymic subjects may prefer brightness and un-prefer darkness than less hyperthymic subjects (i.e., heliotropism), and reconfirm that hyperthymic temperament may be associated with left inferior orbitofrontal cortex, which have been reported to be associated with bipolar disorders.

© 2013 Elsevier B.V. All rights reserved.

## 1. Introduction

With regard to the association between hyperthymic temperament and light, Hoaki et al. (2011) and Araki et al. (2012) showed that illuminance of daytime was significantly and positively associated with hyperthymic temperament scores. This positive association between hyperthymic temperament and illuminance may suggest several possibilities. One possibility is that high illuminance may maintain and enhance hyperthymic temperament such as light therapy for depression. To examine this possibility, Kohno et al. (2012) reported that healthy residents at higher latitude (43°, Sapporo city in Japan) with lower illuminance had lower hyperthymic temperament scores than another healthy residents at lower latitude (33°, Oita city in Japan) with more illuminance, supporting the possibility.

Another possibility is that hyperthymic temperament may involve heliotropism and thereby seek brightness as a sunflower. Before examining heliotropism, we hypothesized that brightness and darkness judgment are different between healthy subjects with more and less hyperthymic temperament (i.e., more hyperthymic subjects feel darker than less hyperthymic subjects at the same illuminance and thereby seek brightness) and investigated this hypothesis (Harada et al., in press). Consequently, there was no significant difference in the threshold of brightness or darkness judgment between more and less

* Corresponding author. Tel.: +81 97 586 5823; fax: +81 97 549 3583.
*E-mail address:* terao@oita-u.ac.jp (T. Terao).

0165-0327/$ - see front matter © 2013 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.jad.2013.06.017

hyperthymic subjects. Nonetheless, there was a significant difference in activations of left inferior orbitofrontal cortex during control task between more and less hyperthymic subjects, indicating that hyperthymic temperament may be associated with left inferior orbitofrontal cortex, which has been reported to be associated with bipolar disorder (Bermpohl et al., 2010; Hulvershorn et al., 2012; Nusslock et al., 2012). At the next stage, in the present study, it can be hypothesized that hyperthymic subjects may prefer brightness (i.e., heliotropism) and thereby seek illuminance, and that percent signal changes of left inferior orbitofrontal cortex during the preference task may be associated with hyperthymic temperament scores.

## 2. Methods

### 2.1. Subjects

Thirty-four (16 women and 18 men, 26.1 ± 4.7 of a mean age with range 21–41 years) healthy subjects participated in this experiment. The duration between this experiment and the previous one (Harada et al., in press) was at least 3 months and there were overlapping 10 subjects. All subjects were right-handed and had normal or corrected to normal vision. None of the subjects had any current or lifetime history of psychiatric disorders, which were determined by mini-international neuropsychiatric interview. They gave written informed consent to participate in this study according to procedures approved by the ethical committee at Oita University Faculty of Medicine.

### 2.2. Hyperthymic temperament identification

The Temperament Scale of Memphis, Pisa, Paris and San Diego-Autoquestionnaire (TEMPS-A) has been developed by Akiskal et al. (2005). This scale has 110 questions to measure five temperaments (depressive, hyperthymic, cyclothymic, irritable and anxious) and has been verified in 32 language versions and widely used in a number of epidemiological and clinical studies with psychiatric patients and healthy subjects. Also in Japan, the scale has been validated and widely used to identify affective temperaments (Akiyama et al., 2005; Matsumoto et al., 2005), where it was decided that the cut-off point is 6 points (i.e., subjects with equal to or more than six points are considered to have more hyperthymic temperament whereas subjects with less than six points have less hyperthymic temperament). The present subjects were divided into subjects with more hyperthymic temperament (more hyperthymic subjects) and subjects with less hyperthymic temperament (less hyperthymic subjects) using this cut-off point.

### 2.3. Functional magnetic resonance imaging (fMRI) stimuli

Similar to the previous study (Harada et al., in press), all blocks consisted of a sequence of 11 blank screens (with 11 levels of indirect illuminance in the absence of any figure) screens adjusted by tristimulus value (Red, Green, and Blue: 0∼250), each blank screen gradating from white to black by 25 tristimulus value (Fig. 1). The gradated blank screens were randomly assigned in each block. From the white to black screen, the illuminance at the location of the subject's head was measured as 700, 589, 481, 396, 324, 263, 220, 185, 164, 152, and 146 lx (Fig. 1).

### 2.4. Experiment

The same three different experimental conditions/blocks as the previous one (Harada et al., in press) were presented to the subjects in randomly allocated pattern of two balanced-order patterns which consisted of nine blocks of “A” pattern or reverse “B” pattern. In a different way from the previous study (Harada et al., in press), at this experiment, subjects were instructed as follows; “Please judge if the screen is preferable or not preferable by pressing the corresponding button” in preference judgment, and; “Please judge if the screen is un-preferable or not un-preferable by pressing the corresponding button” in un-preference judgment, and; “Please press the button when the screen changes without making a judgment of preference or un-preference” in control task.

### 2.5. Analysis of performance data

As performance data, the rate of preference judgment at 11 illuminance levels were compared between more and less hyperthymic subjects while the rate of un-preference judgment at 11 illuminance levels were also compared between more and less hyperthymic subjects. For statistical analysis, Fisher's exact probability test was used for the rates of each preference or un-preference judgment at 11 illuminance levels between more and less hyperthymic subjects without multiple comparison correction.

### 2.6. fMRI image acquisition

fMRI images were collected using Siemens magnetom verio 3 T MRI system. A time course series of 174 volumes was acquired with a T2-weighted single shot gradient echo planar imaging (EPI) sequence. Each volume consisted of 36 slices, with a slice thickness of 3 mm and a gap of 0.75 mm, and covered the almost the whole brain. Images were acquired in the axial plane (TR = 3000 ms; TE = 30 ms; FOV = 210 mm; voxel size = $3 \times 3 \times 3$ mm$^3$). The total acquisition time was 8 min 50 s, including periods for signal equilibration. T1-weighted structural images were acquired with 3-D magnetization prepared rapid gradient echo (MPRAGE) in the sagittal plane (TR = 2040 ms; TE = 2.53 ms; TI = 900 ms; the flip angle was 9°; FOV = 192 mm; voxel size = $1 \times 1 \times 1$ mm$^3$).

### 2.7. fMRI image analysis

All fMRI analysis was performed in SPM8 (Statistical Parametric Mapping software, University College of London, London, UK; available at: http://www.fil.ion.ucl.ac.uk/spm/). Preprocessing (movement correction, normalization 6 to the MNI EPI template, smoothing with an isotropic 8 mm FWHM kernel, and resampling to 2 mm cubic voxels) were performed firstly. Each individual data set was carefully screened for data quality via inspection for image artifacts and excessive head motion (> 3 mm head motion or 2° head rotation).

### 2.8. Region of interest (ROI) analyses of BOLD signal change

We conducted region of interest (ROI) analyses using marsbar toolbox (marsbar.sourceforge.net). Before that, conventional individual analyses were performed on SPM8 to estimate the task-related activation for later use in ROI analyses. We defined three conditions: preference judgment, un-preference judgment and control task. Each condition was modeled with a boxcar function and convoluted with a canonical hemodynamic response function. Low frequency drifts were removed using a temporal high-pass filter with a cutoff of 128 s. Serial autocorrelation was also corrected using AR (1) model.

Following the hypothesis that percent signal changes of left inferior orbitofrontal cortex during the preference task may be associated with hyperthymic temperament scores, ROI was set at left inferior orbitofrontal cortex using automated anatomical labeling (Fig. 2), and percent signal change (relative to the low-level baseline activity observed during viewing of the fixation cross during the individual task) in the ROI was measured by marsbar toolbox. Moreover, the association between percent signal changes of the ROI and hyperthymic scores were

Download English Version:

https://daneshyari.com/en/article/6233997

Download Persian Version:

https://daneshyari.com/article/6233997

Daneshyari.com