Neural Mechanism of Subjective Malignancy’s Influence on the Decision-making of Simulated Sentencing

Li Yang

ABSTRACT
In order to facilitate the implementation of criminal judicial decision-making, this article studies the neural mechanism of the subjective malignancy’s influence on the simulated sentencing decision-making. Subjects are randomly recruited and divided into Groups A and B. The results are obtained through the subjects’ responses. Most of the subjects report that the criminal intent of the offender is one of the main bases for the conviction and sentencing, and they feel a conflict when they punish the offender with low malignant intent. The neural basis of sentencing decision-making includes mental brain network, dorsolateral prefrontal cortex, intraparietal sulcus and other brain regions.

Key Words: Judicial Decision, Criminal Intent, Sentencing

Introduction
Third-party penalty refers to that the individuals who are not directly affected, evaluate and punish those who violate social norms which are universally agreed upon. In the judicial field, the decision-making of criminal justice is a kind of cloud-side penalty (Lin et al., 2003). Criminal justice decision-making is mainly divided into conviction judgments and sentencing decisions. Criminal intent is very important to criminal justice decisions, and the conviction and sentencing process must consider the offender’s intents, including the degree of subjective malignancy of intents (Bechara et al., 2005; Bechara et al., 2005). However, although the law circles at home and abroad believes that the subjective malignancy of intent will affect the verdict, the mechanism of the subjective malignancy’s influence on judicial decision-making is rarely examined (Panksepp, 1999).

This study is divided into two parts: behavior pre-experiment and magnetic resonance imaging experiment (Edmund, 2000). Based on the results of behavior pre-experiment, the experimental materials are classified into two types: one with high subjective malignant intents and the other with low subjective malignant intents. Except for the difference in the degree of subjective malignancy, the offender, the victim, the degree of injury and the number of words in the case are the same. Magnetic resonance imaging experiment adopts event-related design with subjective malignant intent as independent variable and penalty degree as dependent variable (Dehaene, 2001). During the magnetic resonance scan, the subjects are required to read the case materials with intents of different degrees of subjective malignancy, and then to make penalty decisions for the criminals in the cases, in an effort to investigate the influence of subjective malignant intent on the decision-making of simulated
sentencing, and to explore the neural mechanism of brain. After completing the magnetic resonance scan, the subjects need to fill in the related questionnaire and scale (Stanley, 2007). The behavior experiment results show that there are significant differences in the penalty intensity, the decision difficulty, moral acceptability, and the sentiments towards the offenders in cases with different subjective malignant intents. When the crime has a low subjective malignant intent, the penalty is lighter, the decision-making is more difficult, the moral acceptability of the crime is higher, the sympathy produced is stronger, and the anger and the disgust produced towards the crime are weaker (Bilgrami, 2010). This shows that subjective malignancy of intent has influence on sentencing decision-making, and the lower the degree of malignancy, the lower the penalty will be. The results of magnetic resonance imaging experiment are as follows: (1) In the complete trial analysis, the dorsolateral prefrontal cortex, the ventral lateral prefrontal cortex, the apex junction region, the caudate nucleus and the supplementary motor region are significantly activated under the conditions with high subjective malignant intent and low malignant intent, compared to the baseline; (2) In the analysis of penalty decision-making stage, the activation levels of brain regions such as the dorsolateral prefrontal cortex, the ventral lateral prefrontal cortex, the apex junction region, the intraparietal sulcus, insula, anterior and posterior cingulate cortex, caudate nucleus, and supplementary motor region are significantly higher than that under the conditions with low subjective malignant intent and low malignant intent, compared to the baseline; (3) The differences in brain regions under different conditions are analyzed. It is found that the activation level of the left dorsolateral prefrontal cortex, the right insula and the left posterior cingulate gyrus is higher than that under the conditions with high malignant intent in the complete trial analysis. In the penalty decision-making stage analysis, the activation levels of the right dorsolateral prefrontal cortex, the left dorsolateral prefrontal cortex, the left apex junction, and the left caudate nucleus is also higher than that under the conditions with high malignant intent.

The results are shown as follows: (1) High subjective malignant intent can lead decision makers to make more severe penalties; (2) In the sentencing decision-making process, the psychological state and damage of the criminal act of the offender are estimated and evaluated through the mental brain network including the dorsolateral prefrontal cortex and apex junction region, then the information about the intent and injury is integrated by the dorsolateral prefrontal cortex and the intraparietal sulcus, and finally the penalty is given by right dorsolateral prefrontal cortex; (3) During the decision-making process, the brain regions with rational analysis and emotional processing are significantly activated, indicating that sentencing decision-making is a process of rational analysis and empirical intuition.

Methods

Subjects

A total of 20 non-law major undergraduates and postgraduates aged between 18 to 25 years old are recruited, including 10 male and 10 female, with an average of 21 years old, who are randomly assigned to two groups (A/B), each with 5 males and 5 females. All the subjects have normal visual acuity or normal corrected visual acuity, and are right-handed, without any mental illness or neurological disease. Each obtains cash compensation of 15 yuan upon completion of assessment materials.

Experimental materials

In order to control the level of intent, all cases involve intentional crimes, rather than negligent crimes. According to the degree of subjective malignancy of intent, 100 cases are divided into two categories: those with low subjective malignant intent and those with high subjective malignant intent, each with 50 cases. Each case with low subjective malignant intent corresponded to one with high subjective malignant intent, resulting in 50 pairs of cases. In the 50 pairs of cases, each pair of cases are the same in the offender, the victim, the criminal means, the degree of injury and the number of words in the case. The average number of words in all cases is 135 words, with a maximum of 149 words and a minimum of 109 words. Some of the cases are listed in Appendix I. After the preparation of the materials, 20 subjects are recruited for evaluation. In order to avoid the subjects guessing the experimental purpose, 50 pairs of case materials are also randomly assigned to Groups A and B, corresponding to Groups A and B of subjects, respectively. The specific material grouping method is as follows. First, all case materials are numbered from 1 to 50. The NO.1 case with high malignant intent is marked as “1 high”, and its corresponding case
with low malignant intent is marked as “1 low”. Other cases are marked accordingly. If Case “1 high” was assigned to Group A, Case “1 low” will be assigned to Group B. All the cases are randomly grouped accordingly.

**Results and discussions**

**Material evaluation results**

All participants could understand all case materials and questions. The selection of formal experimental materials is mainly based on the difference in the degree of subjective malignancy of intent of each pair of cases. Therefore, an independent sample test is performed on the degree of subjective malignancy of intent using software SPSS20.0. The results show that among 50 pairs of cases, 40 pairs of cases have significant difference in degree of subjective malignancy of intent, while the other 10 pairs of cases have no significant difference in degree of subjective malignancy of intent. The test results are shown in Appendix II. The 40 pairs of case materials with significant differences are submitted to a law student who has passed the national judicial examination and a law graduate student for conviction and judgment in order to ensure that each corresponding pair of cases get the same conviction. From these cases, those that the two assessors both give the same convictions were screened out. If the conviction given by the two assessors on a pair of cases does not match, the pair of cases will be removed or amended, so would be the cases that will arouse the assessors’ strong sentiments. Finally, after modification and screening, 36 pairs (72 cases) are obtained as materials for the magnetic resonance imaging experiment. In addition, the assessment results show that most of the subjects reported that the criminal intent of the perpetrator is one of the main bases for their conviction and sentencing (Table 1), and that they feel inner conflict when punishing the perpetrator with low malignant intent (Table 2).

**Functional magnetic resonance imaging (fMRI) experiment**

The experimental materials are 36 pairs (72) of crime case essays, which are selected after pre-experiment and modification. The average number of words is 130 words (with a maximum of 132 words and a minimum of 129 words). All cases are grouped (A/B) using the method used to assess the materials, so there are 36 cases in each group, 18 cases with high subjective malignancy corresponding to 18 cases with low subjective malignancy. Group A subjects are given Group A materials, and Group B subjects were given Group B materials. In each case, that text is made into picture using Textimage software: The font adopts Song style and is bold, with a size of 28, a line space of 10, and a right margin of 6. The characters are black against white background. Figures 1 and show the images of crime case essays.
Experimental procedure
The formal MRI scan is divided into three stages, the first of which is the resting magnetic resonance scan, wherein subjects are required to lie flat on a magnetic resonance scanner, keeping their heads still and eyes closed, but not to fall asleep. The following is the structural scan, wherein subjects are also required to lie flat on a magnetic resonance scanner, keeping their heads still, but not to fall asleep. Finally, it is the task of sentencing decision-making, wherein the subjects first read the essay on the crime case, and then give appropriate penalty to the offender (“A”) in the essay according to their own legal knowledge and internal moral standards. Penalty intensity uses a 10-point scale of 0-9, with 0 representing “no penalty” and 9 representing “extremely severe penalty”. The higher the number, the greater the penalty strength will be. Sentencing decision-making tasks are divided into three runs, each with 12 trials. As shown in Figure 3 below, each trial starts with a gazing point for 2 seconds and then a crime case essay is presented. Next the subjects can read the essay and respond by pressing the button. Then questions for sentencing decision-making and the 10-point scale used to select the penalty intensity are presented. Subjects could select between 0 and 9 by pressing the button to control the position of the red box. After the subjects select the number, there is no need for them to press the key for confirmation, the screen will automatically jump to the next image, and the number in the red square will represent the penalty intensity given by the subjects. The total time for reading the essay and giving penalty decision is 30 seconds. Regardless of whether the participant makes a penalty decision, it will jump to the next screen after 30 seconds, that’s, random blank screen. However, the subjects have practiced in advance and thus are familiar with the sentencing decision-making task, so all the participants can read the short essay and give corresponding penalty within 30 seconds. After the scan, the subjects need to fill out the case questionnaire and other related scales.

Behavioural results
The results of paired sample tests show that under different subjective malignant intent conditions, there are significant differences in the penalty intensity, the difficulty of penalty decision-making, the moral acceptability of A’s behavior and the three sentiments towards A’s behavior. When the criminal malignant intent is low, the penalty for A is lighter, the decision-making is more difficult, the moral acceptability for a certain behavior is higher, and the sympathy for A is stronger, but the anger and disgust is weaker, as shown in Figure 4.

Results
Based on the previous research, this study explores the neural mechanism of criminal sentencing decision-making, and draws the following conclusions. The neural basis of sentencing decision-making includes mental brain network, dorsolateral prefrontal cortex, intraparietal sulcus and other brain regions. In the sentencing decision-making process, the psychological state and damage of the criminal act of the offender are first estimated and evaluated through the mental brain network, then the information about the intent and injury is integrated by the dorsolateral prefrontal cortex and the intraparietal sulcus, and finally the penalty is given by right dorsolateral prefrontal cortex.

References

