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INTERNATIONAL JOURNAL OF PSYCHOTHERAPY PRACTICE AND RESEARCH
ISSN NO: 2576-612X

Research **DOI: 10.14302/issn.2574-612X.ijpr-18-2460**

Cognitive Mechanism of Emotional Validity Influencing Conflict Control

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Abstract

Conflict control is the ability to choose relevant information and ignore disturbing information in task processing. Previous studies have found that emotions have a certain influence on conflict control, and the research results of positive emotions and negative emotions affect conflict control are inconsistent. This study attempted to explore the effects of different emotional valorization on conflict control, using images of happy, fearful and sad emotional faces to investigate the effects of different emotional valorization and different emotional types on conflict control. The experiment selected 40 participants and used the variable-face Stroop paradigm. The study found that no matter what emotional task, there is a significant conflict effect. The effects of different valency on conflict control are different. All three emotions have a significant effect on conflict control, and positive emotions play a role in promoting conflict control.

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Key words: Conflict Control；face-word Stroop task；Emotional implicit processing；Emotional conflict.

Received: Nov 03, 2018 **Accepted:** Jan 03, 2019 **Published:** Mar 07, 2019

Editor: Yuzheng Wang, Institute of Psychology, Chinese Academy of Sciences, China.

Introduction

Conflict control refers to the ability to select, save, and task-related information while neglecting non-task-related distracting information during task processing. This ability is a core component of human regulation of various advanced cognitive processes [1]. Non-mission related distracting information generally includes two types, namely emotional and non-emotional stimulation [2]. For the study of conflict control, the most common use is the word-face Stroop paradigm [3]. That is to say, by presenting different emotional emotion words on the faces, the subjects can make judgments under the state of cognitive conflict between the emotions of the emotional words and the emotions of the faces, so as to study the control of the conflict. The results show that emotions can make individuals capture more attention, and then put more attention resources into emotional information [4]. From the perspective of information processing stage, the advantage of emotional processing may exist in the early stage of information processing, while in the late processing stage, the processing of emotional stimulation is regulated by cognitive factors such as attention load and processing resources. At this point, the emotional processing and cognitive processing process affect the completion of the target task in an interactive way [5]. Based on this, more and more researchers are beginning to pay attention to the influence of emotional valence on the cognitive control process in the late stage of information processing.

Previous research [6] although reveals that emotions affect conflict control, the impact of emotions on conflict control is multifaceted, some studies have shown that emotional information promotes conflict processing [7], some studies show that emotional information hinders conflict processing [8]. Different emotional valences (positive and negative) have different effects on the control of conflicts. Negative emotional stimuli can weaken the process of conflict control and have a negative impact on planning ability [9]; Positive emotions improve the efficiency and seriousness of task resolution, which promotes the processing of the system and increases its flexibility and creativity [10]. There are also studies showing that both positive and negative emotions can promote the resolution of conflict control [11] [12]. In addition, the influence of other emotional dimensions on conflict control is also different. The previous studies manipulated the approach of positive emotions to examine the effects of conflict processing, and found that low-near-positive positive emotions interfered, but high. Positive emotion of approaching promotes conflict processing [13]. The emotional motivation dimension model believes that, similar to positive emotions, negative emotions with low motivation intensity (sad) expand the cognitive range, while negative emotions with high motivation intensity (fear) narrow the cognitive perception [14].

Cognitive psychology believes that the processing of information occurs at different levels of processing, corresponding to different stages of task processing. For example, stimulation coding, target detection, reaction selection, and reaction execution conflicts may occur at any point in time from the stimulation input to the reaction. Many studies have examined two types of conflict control in detail, one is the level of conflict at the stimulus level, and the other is the conflict of response levels. At present, most of the experiments focus on the conflict of reaction levels, first to induce emotional state, and the actual behavioral response is faced with another non-emotional stimulus, which causes separation of time and separation of task objectives.

A comprehensive review of the above literature, first of all, in the influence of emotions on conflict control, most of them explore the influence of positive or negative emotions alone, but the overall impact of emotions is rarely mentioned. Fear and sorrow, as negative emotions of different arousal, have differences in the specific influence of conflict control. We will examine the difference between positive and negative emotions of the same group of subjects in the same experimental design. Differences between high arousal emotions (fear) and negative low arousal emotions (sad),through the comparison between positive and neutral emotions, the negative and neutral emotions are compared to analyze the internal cognitive mechanism of conflict control. Secondly, on the experimental materials, using the variant of the word-face Stroop task, the emotions and stimulating materials are

integrated to form a conflicting effect at the level of stimulation, so as to react to the same goal at the same time, so that the emotions An implicit process in which subjects respond to specific materials, facilitating the exploration of their current emotional experience and further researching their underlying cognitive processes.

This experiment aims to examine the effects of different valence emotions on conflict control. It is expected that in the word-face judgment task, significant interactions between positive and negative emotions can be observed, and specific three emotions and neutral emotions can be observed. There is also an interaction between them. That is, emotions have an impact on conflict control, and the emotional effects of different valences are different.

Method

Participants

There were 40 undergraduates in Nanjing Normal University, including 15 male students and 25 female students. The average age is 20±2 years old. All subjects were right-handed, with normal vision or corrected vision, no physical disability, no history of mental illness. All participants signed an informed consent form and received a certain amount of compensation after completing the experiment. The selection of experimental subjects and the conduct of experiments were reviewed and approved by the Ethics Committee of Nanjing Normal University.

Materials

This experiment used a total of 60 face pictures, including 10 faces for happiness, fear and sad. The ratio of male to female is 1:1. The picture came from the Chinese Facial Affective Picture System (CFAPS), Write "male" or "female" in red letters on each emotional face. Where the facial gender is consistent with the meaning of the word it indicates, it is a congruent condition (Write "male" on the male's face or "female" on the female's face),Facial gender and gender are not inconsistent conditions, is a incongruent conditions (Write "female" on a male face or "male" on a female face).

Procedure

In this experiment, the experimental procedure was written using E-prime software. The stimulus presentation and related reaction time was automatically recorded by the computer, and all the stimuli were presented in the center of the screen. In the experiment, the subject was sitting in a quiet, semi-dark laboratory with eyes about 60 cm from the screen. Press "F" with your left index finger and press the "J" button with your right index finger.

The task of the subject is to judge the "face gender" of the presented face while ignoring the meaning of the words written on the face. If the face image of the presented face is male, press the "F" key with the index finger of the left hand; if the facial image presented is a female facial expression, press the "J" key with your right index finger. This experiment has 720 trials, divided into 6 blocks, each block has 120 trials, each of which contains the same number of conditions, that is, the congruent - the congruent (cc), the congruent - the incongruent (ci), the incongruent - the congruent (ic), the incongruent - the incongruent (ii), has the equal number of trails in each block. There are 24 trial exercises before the formal experiment, so that the participants can clearly understand the experimental tasks and become familiar with the buttons. At the beginning of the formal experiment, the happy emotional block was first presented. After the task was completed, the rest was rested for five minutes and the next fear component was completed. After the completion, the rest was rested for five minutes for the sad emotion block. The specific experimental process is as follows: (Figure 1).

Analysis

Behavioral Performance were statistically analyzed using SPSS 22.0 software, and emotional valence (pleasure, fear, sad) X conflict (congruent, incongruent) X emotion type (emotion, neutral) for the correct rate and response time data, respectively. Repeated measures analysis of variance of factors; then two-factor analysis of emotional valence (pleasure, fear, sad) X conflict (congruent, incongruent); and finally, two groups of sentiment analysis of emotion type (emotional, neutral) X conflict (congruent, incongruent) were performed. The results of three emotions of happiness, fear and sad were measured. The LSD (least significant difference) method is used to compare the simple effects. All reaction time was excluded from the

reaction errors and extreme values beyond three standard deviations.

Results

Modulation of Emotions on Conflict Control

To explore the modulation of emotions on conflict control, we used three-way analysis of variance (emotional valence vs. conflict vs. emotion type) to examine how emotions affect conflict control. The results show:

In terms of correct rate, the main effects of emotion valence (pleasure, fear, sad) are significant, $F(2,38)=7.94$, $p<0.01$; conflict (congruent, incongruent) main effect is significant, $F(1,39)=89.13$, $p<0.01$; the main effect of emotion type (emotional, neutral) was not significant, $F(1,39)=1.16$, $p=0.29$. The third-order interaction was significant, $F(1,38)=4.66$, $p<0.05$. This shows that emotions have a regulatory effect on conflict control.

In terms of reaction time, the main effect of emotion was not significant, $F(2,38)=0.15$, $p=0.86$; the main effect of conflict was significant, $F(1,39)=259.77$, $p<0.01$; the main effect of category was not significant, $F(1,39)=0.63$, $p=0.43$; the third-order interaction is not significant, $F(2,38)=0.06$, $p=0.95$. (Table 1, Table 2), (Figure 1, Figure 3).

Positive and Negative Emotions Affect the Interaction of Conflict Control

To further explore the interaction between positive and negative emotions affecting conflict control, we use two-way analysis of variance (emotion vs. conflict) to examine how positive and negative emotions affect conflict control.

In the correct rate, the main effects of emotion valence (pleasure, fear, sad) are significant, $F(2,38)=9.99$, $p<0.01$, and conflict (congruent, incongruent) are also significant, $F(1,39)= 65.42$, $p<0.01$, the interaction effect between the two is also significant, $F(2,38)=5.16$, $p=0.01$. Further simple effects tests were performed, and the differences between happy inconsistency and sad were found to be significant ($P < 0.001$), indicating that positive and negative emotions have significant differences in the modulation of conflict control.

In the reaction time, the main effect of emotion is not significant, $F(2,38)=0.63$, $p=0.54$, the conflict is significant, $F(1,39)=209.25$, $p<0.01$, and the interaction between the two The effect is not significant, $F(2,38)=0.89$, $p=0.42$. (Figure 4).

The Influence of Different Types of Emotions on Conflict Control

In order to specifically explore the specificity of different types of emotions on conflict control, we did three sets of analysis of variance (happy vs. neutral, fear vs. neutral, sad vs. neutral) to examine how the three emotions affect conflict control.

In the pleasant and neutral group, the study found that in the correct rate, the main effect of emotion is significant, $F(1,39)=6.82$, $p=0.01$; the conflict is also significant, $F(1,39)=70.46$, $p < 0.01$; the interaction between the two is also significant, $F(1, 39) = 10.15$, $p < 0.05$. Further simple effect test, the difference between happy inconsistency and neutral inconsistency was significant , $P<0.001$, which indicated that happy emotions had a modulation effect on the conflict control process, and it can be seen that pleasant emotions significantly promoted the conflict control process; The main effect of emotion is significant, $F(1,39)=19.81$, $p<0.01$, the conflict is also significant, $F(1,39)=190.37$, $p<0.01$, but the interaction between the two is not Significantly, $p=0.61$. (Figure 5).

In the fear and neutral group, the study found that from the correct rate, the main effect of emotion is not significant, $F(1,39)=0.04$, $p=0.41$; the main effect of the conflict is significant, $F(1, 39) = 62.84$, $p < 0.01$; the interaction between the two is not significant, $F(1, 39) = 0.45$, $p = 0.51$; from the reaction time, the main effect of the emotion is not significant, $F(1,39)=0.71$, $p=0.41$, the conflict is significant, $F(1,39)=169.37$, $p<0.01$, and the interaction between the two is not significant, $p=0.25$.

In the sad and neutral group, the study found that the main effect of emotion is not significant in the correct rate, $F(1,39)=0.01$, $p=0.93$; the main effect of the conflict is significant, $F(1,39) = 41.92$, $p < 0.01$; the interaction between the two is not significant, $F(1, 39) = 2.54$, $p = 0.12$; from the reaction time, the main effect of the emotion is not significant,

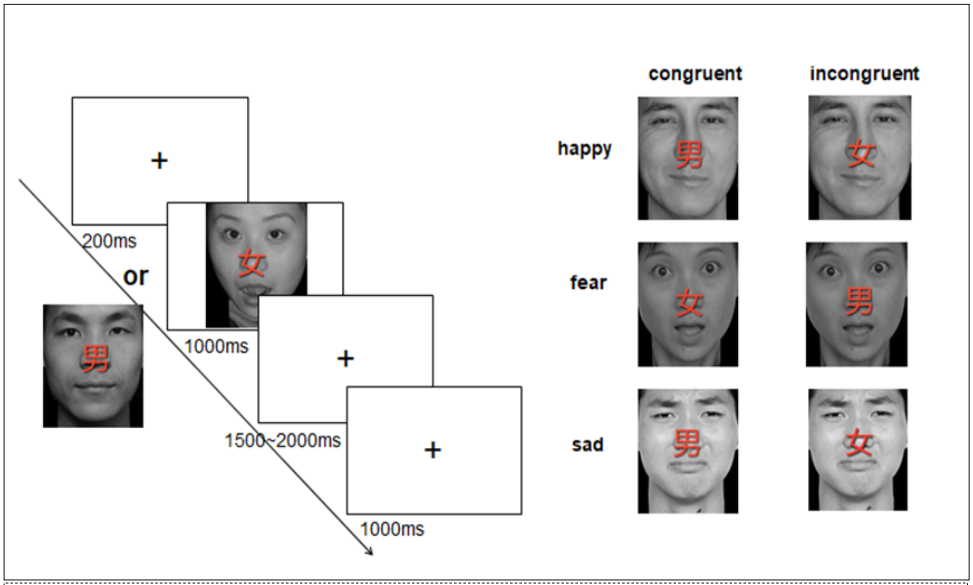

Figure 1. Experimental Flowchart

Table 1. Descriptive statistics of correct rate

	Group	Mean	SD
congruent	Happy	0.99	0.02
	Neutral	0.99	0.02
	Fear	0.98	0.03
	Neutral	0.98	0.03
	Sad	0.97	0.04
	Neutral	0.97	0.07
incongruent	Happy	0.96	0.04
	Neutral	0.94	0.04
	Fear	0.93	0.06
	Neutral	0.93	0.06
	Sad	0.92	0.07
	Neutral	0.92	0.07

Table 2. Descriptive statistics of the reaction time

	Group	Mean	SD
congruent	Happy	590.91	71.2
	Neutral	647.42	70.13
	Fear	598.44	68.26
	Neutral	652.32	66.73
	Sad	602.28	64.62
	Neutral	648.75	70.89
incongruent	Happy	602.31	68.68
	Neutral	662.42	75.65
	Fear	593.33	64.94
	Neutral	652.46	65.51
	Sad	594.71	59.85
	Neutral	643.93	67.37

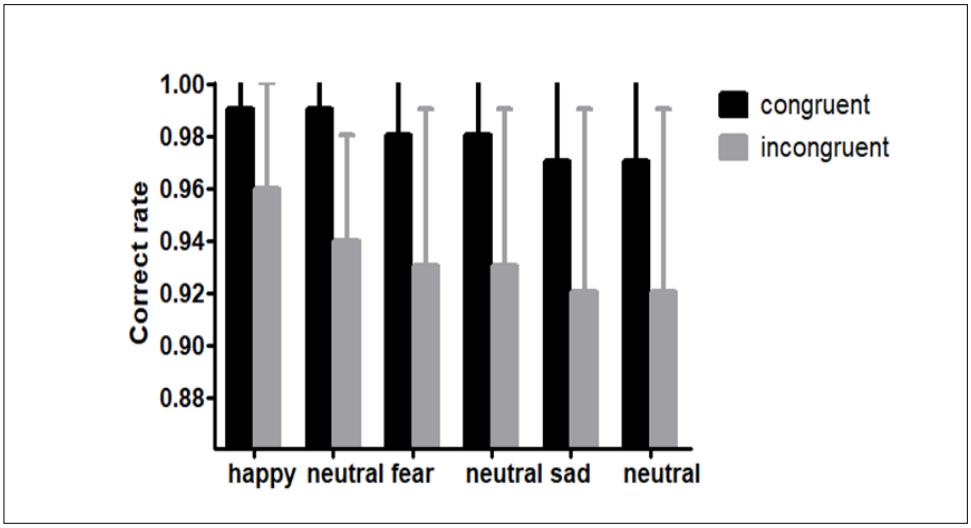

Figure 2. Correct rate of three emotions and neutral emotion

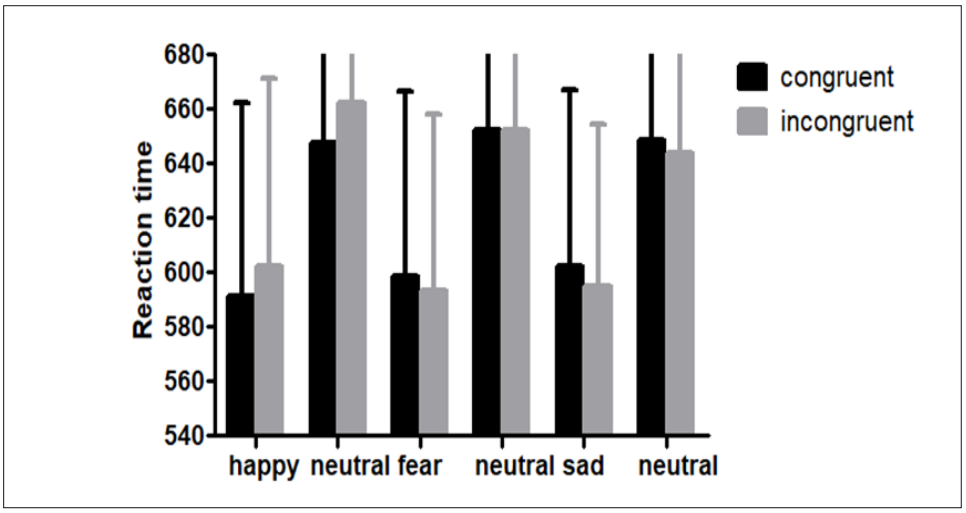

Figure 3. Reaction time in three emotional states

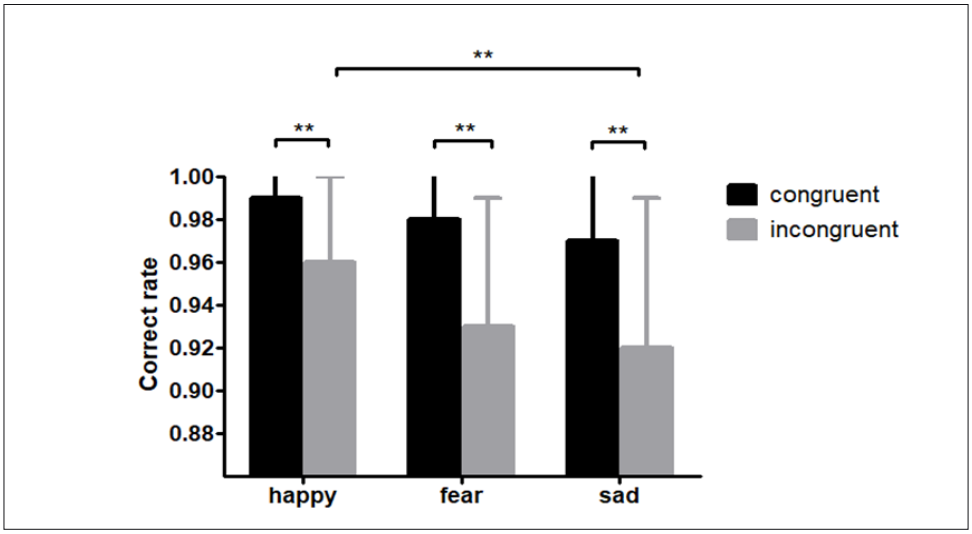

Figure 4. Correct rate in three emotional states

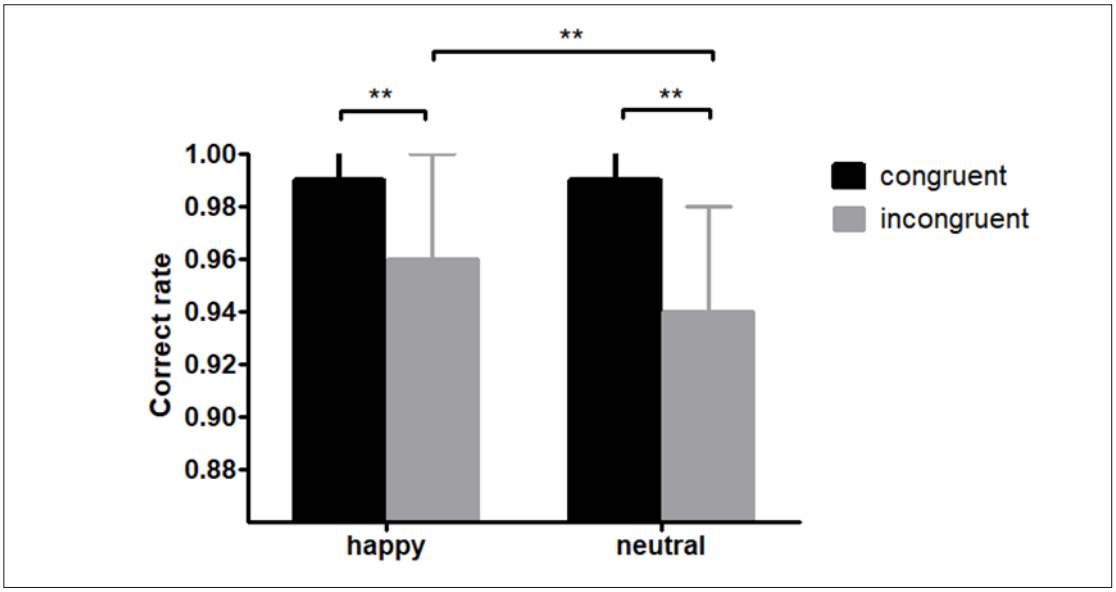

Figure 5. Correct rate of happy and neutral emotions

F (1, 39) = 3.61, p = 0.06, the conflict is significant, F (1, 39) = 137.45, p < 0.01, and the interaction between the two is not significant, p = 0.73.

Discussion

The study of the relationship between conflict control and emotion has always been a hot topic in related fields. Although there are a large number of studies on the differences between specific emotions and conflict control, few people have completely investigated the differences between positive and negative emotions on conflict control. Through the variant word-face Stroop paradigm, this paper incorporates emotion as a process of implicit conflict into the process of cognitive conflict, and combines three different implicit emotion faces to explore the influence of emotion on conflict control.

First of all, in terms of the impact of overall emotions on conflict control, the correct rate results reflect that emotions always have a significant impact on conflict control, which is manifested in the third-order interaction of emotions, conflicts and categories, and also in the three emotions. Inconsistent interaction effects are significant. Then continue to explore the specific effects of positive emotion and negative emotion in conflict control, and still show significant interaction effects in the correct rate, which further testifies that positive emotion and negative emotions have a modulation effect on conflict control. Finally, the differences between the three emotions and the neutral emotions were compared. The correct rate results showed that positive emotions promoted the conflict control process, while negative emotions had not shown obvious effects.

However, the significant difference in the correct rate is not reflected in the reaction time, which may be because the effect amount on the reaction time is small, although there is a trend, but there is no significant data. Because there are two main paradigms in the current research paradigm for conflict control, namely the emotional interference paradigm and the mosaic paradigm. The key difference between these two paradigms is whether emotional stimuli are task-related [15]. In the interference task, the emotional information is task-independent. The main task of the subject is to complete the pure cognitive conflict task. In the mosaic task, the subject must react to the target and process the emotional information to complete the task. As a result, most of the inlay tasks have found a boosting effect, while more interfering tasks have found a blocking effect. This paper adopts the variation of the mosaic task, which is to study the immediate influence of emotional information on the conflict control process. It may be due to the choice of the paradigm that the result mainly shows the positive emotion promotion

effect, while the negative emotion effect is not obvious.

At the same time, the reason for the insignificant results may be due to the differences in the individual subjects. Some studies found that 50 healthy individuals were divided into two groups according to the trait anxiety scores, respectively, and the color-word Stroop task was performed. Only the high-trait anxiety individuals were found. It shows an emotional disturbance effect, that is, aversive stimulation hinders conflict processing [16]. This indicates that the selection of the subject population may also affect the experimental results of the conflict control process.

In previous studies, the researchers compared the interference effects of the completed negative-face and face-to-face Stroop tasks on the negative emotion face, and the results showed that negative emotions increased the interference effect [17], which shows that negative emotions have a restraining effect on conflict control. This paper verifies the existence of the trend to some extent. According to the positive emotion expansion-construction theory, positive emotions can expand the individual's cognition and scope of action, broaden the individual's instantaneous perception, thinking and activity sequence [18]. Many other studies have found that positive emotions can expand the scope of attention. , memory range and cognitive classification [19]; at the same time in the experiment of using the incentive to manipulate rewards, positive emotions also show the promotion of conflict control [20]. The promotion of pleasant emotions in conflict control in this experiment coincides with the theory, and promotes the conflict control process through the promotion of attention and the concentration of cognitive resources.

According to the conflict adaptation effect theory [21], people experience similar conflicts after experiencing a conflict, and can use previous experience to better resolve current conflicts. In the classic Stroop experiment, if there is a conflict in the previous trial, the participants will improve their cognitive control level to better complete the current task, which is reflected in the reduction and shortening of the response. Some scholars have found that pleasure affects conflict adaptation effects significantly, while arousal does not affect conflict adaptation effects: conflicting adaptation effects of high arousal conditions (fear and pleasant emotions) and low arousal conditions (sad and neutral emotions) do not exist Significant differences [22]. At the same time, according to the perspective of emotional and cognitive interaction, emotion and cognition interact [23, 24], that is, the sentiment expressed first will have an impact on the subsequent conflict control process. . In this experiment, because the experimental design was taken in the test, the happy emotions were stimulated as the first order, while the fear and sad were presented later, but the reaction time showed a tendency to grow more than the happy mood, indicating that the conflict The control process is influenced by emotions, that is, positive emotions promote conflict control process, negative emotions hinder conflict control, and fear and sad do not show significant differences, which also confirms the research of predecessors to some extent.

Conclusion

In summary, emotions do have a modulation effect on conflict control, and positive negative emotions have different differences in emotions. Positive pleasures can promote conflict control processes, which will provide future insights into the impact of emotions on conflict control. The data support of behavioral science can also better promote the progress of related research. However, the specific effects of negative emotions such as fear and sorrow on conflict control are still unclear. I hope that in future research, there will be more powerful proofs to clarify the relationship between negative emotions and conflict control.

Acknowledgements

This research was supported by the National Natural Science Foundation of China (31800915), and the Natural Science Foundation of the Higher Education Institutions of Jiangsu Province, China (18KJD190002).

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