Effect of Task Relevance on Emotional Conflict in the Faces - Word Stroop Paradigm

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Abstract

This study focused on effect of task relevance on emotional conflict in the Faces - word Stroop paradigm, and the effect of the time on the Stroop effect was also discussed. This study contained two experiments. In Experiment 1, we investigated the mechanisms of influences of task relevance on emotional conflict by using the Faces - word Stroop paradigm. Independent variable 1 was the task type ("face task" and "word task"). The independent variable 2 was the consistency of the meaning of the facial emotion and the emotion word. The independent variable 3 was task relevance (relevant, unrelated). Results showed that in the reaction time, the main effects of task correlation, task type and consistency were significant. The interaction of the task type and the correlation, the consistency and the correlation was significant. In Experiment 2, the experimental paradigm and experiment design were the same as experiment 1. The independent variable 1 was the time (150ms or 1500ms), the independent variable 2 was the meaning of the face and the emotional words (consistent, inconsistent), the independent variable 3 was task relevance (relevant, unrelated). Results showed that in terms of the reaction time, the main effect of consistency, task correlation, presentation time was extremely significant. The interaction of presentation time and the correlation, presentation time and the consistency, the consistency and the correlation was significant.

Key words: A Faces - word Stroop; Stroop; task relevance; Emotional conflict.

1 Introduction

The Stroop effect was found in the color naming experiments by the psychologist Stroop, and the phenomenon of mutual interference of the color information and semantic information of the same stimulus. That was to say, when subjects judging the font color, in the consistent conditions (the font color and meaning said the same color, such as the "red") reaction was significantly faster in the incongruent condition (font color and the meaning of said different colors, such as red "green"), semantic information and color information interfered with each other. in a more general sense, the Stroop effect was a mutual interference phenomenon of the same stimulations of the two different latitudes or characteristics[1]. The experimental paradigm of the psychologist Stroop was called the Stroop paradigm, which was later introduced into the emotional research. Emotional Stroop effect mainly refered to the effect of the emotional information to the non emotional information in the stimulus, this paradigm was also changed from the classic Stroop paradigm [2].

The face - word Stroop paradigm was derived from the Stroop paradigm and was widely used in the study of Stroop effects of emotional conflict situations. The face - word Stroop paradigm was that the emotional word was increased in the central part of the face, emotional information of face and words form consistent, inconsistent and unrelated conditions. The task was to judge the value of the face by ignoring the emotional words, or judge the value of the emotional words by ignoring the value of the emotional face[3-5]. In everyday life, each person received a lot of emotional information every day, these emotional information could be positive or negative. When two or more than two different valence emotional information appeared at the same time, it constituted the emotional conflict situation. In recent years, researchers have applied the face - word Stroop paradigm to emotional conflict situations. For example, the Haas [6] used the Stroop paradigm of face — word to study. He wrote emotional words "sad" on the happy face, and wrote emotional words " happy " words written on the sad face, so that it constituted the two conditions with consistent and inconsistent.

And they wrote neutral words (such as tables and chairs, clothes, etc.) in the calm face as the control conditions. These three types of stimuli were randomly presented, and subjects were asked to judge the valence of the emotional words. It was found that the reaction time under inconsistent conditions was longer than those in the consistent conditions, and the reaction time was the shortest in the control conditions. Etkin[7] et al.'s study also used this paradigm. The difference was that they only choose two most typical emotional material of happy and fear, written the red "happy" or "fear" in the middle of happy or fear faces, 4 types of stimuli were randomly appeared. Subjects were asked to judge the valence of the emotional faces, and finally get the same results. In addition, the study also found that when the front stimulus was also conflict, the response was more quickly, and this phenomenon was known as a sequence of emotional conflict. Similarly, Zhou and Xu[8] also found that the current two stimuli were both consistent or inconsistent stimulation, the reaction time was shorter than that of other condition. This was because the previous stimulus and the current stimulus were consistent or inconsistent; the reduction of competition between the two reduced the interference of the current task.

This effect was defined as a "conflict adaptation effect" There was two views on the mechanism of Stroop effect. One view was that the selection mechanism of the Stroop effect was based on the goal (object-based). For example, through the control of material presentation mode, target stimulations would be divided into two different colors of the same small rectangle by Wuhr[9], etc. the results showed that the target color words caused a large Stroop effect, the larger Stroop effect, and color words in the non target and background had no difference. The choice of the relevant information, and the suppression of irrelevant information, was possible to be an important factor to adjust or change the Stroop effect. Another view was that the selection mechanism of the Stroop effect was based on the response (response-based). If Magen[10] thought that the nature of the stimulus was similar to the nature of the reaction, and was a part of the reaction, it was automatically selected for those who were similar to those of the reaction. The Stroop effect was caused by the reaction mechanism of the independent meaning filtering failure. To sum up, the selection mechanism of Stroop effect was based on the reaction, or the mechanism of visual selection, and the relationship between the times of the study and so on. In this study, based on previous studies[11] we used the face - word Stroop paradigm, and increased the correlation of the independent variables, to continue to explore the face - the emotional conflict in the Stroop paradigm.

Method

Participants A group of 30 individuals (15 female, 15 male) between 19 and 25 years old (mean age = 21 years) participated in return for payment. The participants were recruited from the University of Nantong, were right-handed with normal or corrected-to-normal vision, no color feebleness, no color blindness, and no physical or mental illness, not to previously participate in similar experiments. Stimuli Emotional face pictures selected from the Chinese Facial Expression Picture System, the selected emotional face pictures included 20 fear face pictures and 20 happy faces, Male and female faces were accounted for half. Used the computer's own image processing software to add the emotional word "happy" and "fear" to the image of the face. Emotional faces and emotional words in the emotional valence were consistent or inconsistent, and gave each picture to add on the border, the border color was red, blue, yellow, green, blue, five kinds of color appeared with the equal opportunity, the emotional words with these five colors, made the emotional word color and border color be consistent or inconsistent. The size of the picture was 5cm × 7cm, the size of the emotional word was about 1.5cm × 1.5cm.

Procedure we investigated the mechanisms of influences of task relevance on emotional conflict by using the Faces - word Stroop paradigm and 2 (consistency: consistency, inconsistency) × 2 (task relevance: relevant, unrelated) × 2 (task: face task, word task) within-group design. Using E-Prime2.0 to program, the experiment was composed of practice and formal experiment. Subjects were familiar with the test procedure and requirement in practice. Practice and formal experiments had the appropriate guidance. The formal experiment was divided into four blocks, the task was to judge pictures be "happy" or "active" based on the previous guidance of the judgment (face or word) ". In the first block, the beginning of the experiment would appear "+", and then presented the picture, subjects were asked to try to ignore the words to judge whether the face was positive or negative or ignore the face to determine whether the words was positive or negative. Second block was required to judge whether colors of face and words were consistency or inconsistency. The instruction was the same as in the previous two block. Judge for the positive by the "Q" key, the judge was negative by "P". Judge for the consistency, by the "Q" key, the judge was inconsistency by "P".

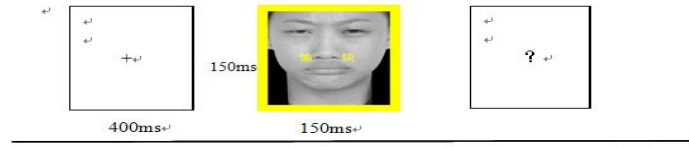Fig. 1 was schematic diagram of the task trails.

Figure1. Schematic diagram of the task trails in experiment 1.

3 Results

3.1 Means and standard deviations) of reaction time under various experimental treatments

The computer automatically recorded the keys and response time, correct rate, data consolidation. The invalid response data were excluded from 3 standard deviation. The error response was only involved in the correct rate statistics, the data did not enter the follow-up statistical analysis. The average number and the standard deviation of the reaction time were shown in table 1.

Table 1: Means and standard deviations) of reaction time

		reaction time（ms）	
consistency	relevance	face task	word task
consistent	relevant	492.72±120.09	438.31±127.58
	unrelated	637.10±245.81	761.69±225.89
inconsistent	relevant	525.144±154.44	476.01±146.77
	unrelated	735.11±262.89	868.34±277.66

3. 2 Analysis of variance of reaction time under different conditions

Analysis of variance of the reaction time under different conditions was shown in table 2.

Table 2: Analysis of variance of reaction time

		reaction time（ms）	
	df	F	Sig.
task	1	11.55	.002**
relevance	1	100.51	.000***
consistency	1	46.28	.000***
task relevance	1	30.50	.000***
task consistency	1	0.21	.65
relevance consistency	1	21.78	.000***
task relevance consistency	1	0.01	.92

Note: the figures in the table were the values of F in the results of analysis of variance,
*** means significant at 0.001 level, **indicates significant at 0.01 level.

The reaction time was made 2 (consistency: consistency, inconsistency) $\times$ 2 (task relevance: relevant, unrelated)$\times$ 2 (task: face task, word task) repeated measures analysis of variance, and the results showed that The main effect of consistency was significant $F(1,29)=46.28$, $p<0.001$, the reaction time under the inconsistency conditions was longer than those under the consistency conditions; The main effect of task relevance was significant $F（1,29）=100.51$，$P<0.001$;The reaction time under the task relevant conditions was shorter than those under the task unrelated conditions; The main effect of task type was significant $F（1,29）=11.55$，$P<0.01$. The response time of the face task was shorter than the word task. The interaction between task type and task relevance was significant $F(1,29）=30.50$，$P<0.001$; The interaction between task type and consistency was significant $F(1,29)=21.78,P<0.001$; The interaction of the three factors was not significant.

3.3 Discussion

The results of Experiment 1 showed that the main effects of task type, task correlation and consistency were significant. The reaction time under the condition of consistency was significantly shorter than that of the reaction time, that was to say, the Stroop effect was found.

Different from previous experimental results, this experiment had not been observed the Stroop asymmetric effect, the interaction of task type and consistency was not significant, no matter which task the Stroop effect generated. The interaction of consistency and correlation were significant, and the effect of Stroop was related to task relevance. The reaction time of the task unrelated was longer than the reaction time under the condition of the task relevant, and the reaction time was longer than the reaction time under different conditions. The Stroop effect was also present. Task dependence had an effect on Stroop, but it was not the main factor of affecting the Stroop effect. As a result, the Stroop effect existed in the unrelated task, and the stimulus properties were not similar to the response properties, and the conflict between emotional faces and emotional words was not related to the color naming. The effect of Stroop was not based on the response mechanism, which supported the hypothesis of Stroop effect that it was an important factor to adjust or change the Stroop effect that people selected the relevant information, otherwise suppressed the irrelevant information.

Method

Participants A group of 30 individuals (15 female, 15 male) between 19 and 25 years old (mean age = 21 years) participated in return for payment. The participants were recruited from the University of Nantong, were right-handed with normal or corrected-to-normal vision, no color feebleness, no color blindness, and no physical or mental illness, not to previously participate in similar experiments. Stimuli Emotional face pictures selected from the Chinese Facial Expression Picture System, the selected emotional face pictures included 20 fear face pictures and 20 happy faces, Male and female faces were accounted for half. Used the computer's own image processing software to add the emotional word "happy" and "fear" to the image of the face. Emotional faces and emotional words in the emotional valence were consistent or inconsistent, and gave each picture to add on the border, the border color was red, blue, yellow, green, blue, five kinds of color appeared with the equal opportunity, the emotional words with these five colors, make the emotional word color and border color be consistent or inconsistent. The size of the picture was 5cm × 7cm, the size of the emotional word was about 1.5cm × 1.5cm.

Procedure We investigated the mechanisms of influences of task relevance on emotional conflict by using the Faces - word Stroop paradigm and 2 (consistency: consistency, inconsistency) × 2 (task relevance: relevant, unrelated) × 2 (presentation time: 150ms，1500ms) within-group design. In the first two block pictures appeared after 1500ms again "?", In the back two block pictures appeared after 150ms again "?", The instruction was the same as in the previous two block. Schematic diagram of the task trails was showed as Fig. 2.
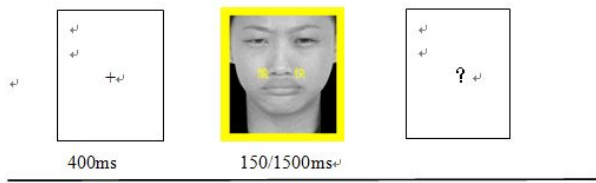

Figure2. Schematic diagram of the task trails in experiment 2.

5 Results

5.1 Means and standard deviations) of reaction time under various experimental treatments

The computer automatically recorded the keys and response time, correct rate, data consolidation. The invalid response data were excluded from 3 standard deviation. The error response was only involved in the correct rate statistics, the data did not enter the follow-up statistical analysis. The means and the standard deviation of reaction time were shown in Table 3.

Table 3: Means and standard deviations) of reaction time

		reaction time（ms）	
consistency	relevance	150ms	1500ms
consistent	relevant	492.72 ± 120.09	461.50 ± 244.61
	unrelated	637.10 ± 245.81	433.05 ± 216.95
inconsistent	relevant	525.14 ± 154.44	433.81 ± 216.37
	unrelated	735.11 ± 262.89	487.11 ± 309.80

5. 2 Analysis of variance of reaction time under different conditions

Analysis of variance of the reaction time under different conditions were shown in table 4.

Table 4: Analysis of variance of reaction time

		reaction time（ms）	
	df	F	Sig.
Presentation time	1	23.16	.000***
relevance	1	18.23	.000***
consistency	1	11.80	.002**
Presentation time relevance	1	19.59	.000***
Presentation time consistency	1	9.48	.005**
relevance consistency	1	16.08	.000***
Presentation time relevance consistency	1	0.02	.90

Note: the figures in the table were the values of F in the results of analysis of variance,
*** mean significant at 0.001 level, **indicates significant at 0.01 level.

The reaction time was made 2 (presentation time: 150ms，1500ms) × 2 (task relevance: relevant, unrelated)× 2 (consistency: consistency, inconsistency) repeated measures analysis of variance, and the results showed that the main effect of presentation time was significant F（1,29）=23.16，p<0.01, the reaction time of 150ms was longer than that of 1500ms; The main effect of consistency was significant F（1,29）=11.80，p<0.01, the main effect of task relevance was significant F（1,29）=18.23，P<0.001; The interaction between consistency and task relevance was significant F(1,29）=16.08，P<0.001; The interaction between consistency and presentation time was significant F(1,29)=9.48,P<0.01; The interaction between task relevance and presentation time was significant F(1,29)=19.59,P<0.001; The interaction of the three factors was not significant.

5. 3 Discussion

The experimental results showed that the main effect of consistency was significant, which showed that the emotional conflict between faces and words affected the reaction and the Stroop effect. The interaction between presentation time and consistency was significant. When the presentation time was 1500ms, the reaction time under the consistent conditions was not significantly shorter than the reaction time under inconsistent conditions. When tasks were relevant, the reaction time under the consistent conditions was longer than the reaction time under inconsistent conditions. The Stroop effect was not caused by the emotional conflict of the subjects. When the presentation time was 150ms, the reaction time under the consistent conditions was significantly shorter than the reaction time under inconsistent conditions. The Stroop effect appeared. Thus the presentation time was an important factor in the emergence of the Stroop effect. The interaction of correlation and consistency was significant, when the presentation time was 150ms, the task correlation could affect the Stroop effect, but it was not an important factor to affect the Stroop effect. When the presentation time was 1500ms, under the condition of the task related, the reaction time under the consistent conditions was longer than the reaction time under inconsistent conditions, which showed that there was the Stroop effect. Under the condition that the task was not related, the reaction time under the consistent conditions was significantly shorter than that of the inconsistent conditions, that was to say, the Stroop effect was produced.

6 Conclusions

This study focused on effect of task relevance on emotional conflict in the Faces - word Stroop paradigm, and the effect of the time on the Stroop effect was also discussed. Results of experiment1 showed that in the reaction time, the main effects of task correlation, task type and consistency were significant. The interaction of the task type and the correlation, the consistency and the correlation was significant. Results of experiment 2 showed that in terms of the reaction time, the main effect of consistency, task correlation, and presentation time was extremely significant. The interaction of presentation time and the correlation, presentation time and the consistency, the consistency and the correlation was significant.

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Reference

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