

Subliminal Affective Priming of Internet Emotions Influences Attentional Bias

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Abstract—This research aims at studying the effect of subliminal affective priming of Internet emotions on the attentional bias. The prime stimulus of this experiment are Internet emotions, which take from a social networking software. The experiment adopts a single factor within-subject design. The independent variable is the emotional valence of Internet emotions (positive, neutral, negative). The dot-probe paradigm is used to examine the differences of reaction time to the probe stimulus. The results show that subliminal presence of positive Internet emotions do not affect the attentional bias. Subliminal presence of negative Internet emotions would influence the attentional bias. There is a significant faster reaction time to negative pictures than to neutral pictures after the negative affective priming of Internet emotions. The subliminal presence of the neutral Internet emotions do not affect attentional bias.

Keywords—Internet emotions; Subliminal affective priming; Dot-probe paradigm; Attentional bias

I. INTRODUCTION

A. Internet emoticons

With the development of the Internet nowadays, people are increasingly unable to live a normal life without social software such as mobile QQ and WeChat. In addition to using for communication, Internet emoticons are also deeply loved by people because of their intuitiveness, vividness, and fun. By evaluating the emotional valence of Internet emoticons, two main emotional dimensions of valence and arousal were extracted. It indicates that the Internet emoticons have emotional characteristics and can be used as emotional priming materials during research. Researchers have found that online emoticons have the effect of communicating information that resembles the true expression of daily life. They would influence emotions and attitude judgments. Zhang Xiaowei studied the subliminal affective priming of Internet emoticons. The results showed that Internet emoticons can generate subliminal emotional priming effect.

B. Subliminal affective priming

Emotional priming effect has two meanings. On the one hand, it means that the emotional valence of probe stimulus is consistent with the prime stimulus, and the reaction time of the participants will be shorter and the accuracy rate will be improved under the consistent condition. On the other hand, the emotional characteristics of the prime stimulus will affect the subsequent cognitive processing. Studies have shown that when the presentative time of prime stimulus is extremely brief and below the sensory threshold, the affective priming effect can still be observed. This phenomenon is known as “Subliminal affective priming”.

C. Attentional bias

Attentional bias means that individuals with a high degree of sensitivity to specific stimulus and generate selective attention. This selective attention will make limited attention resource occupied, so that other stimulus information can not be processed.

D. The relationship between affective priming and attention bias

When there are plenty of different kinds of dangers in the environment, individuals will make adaptive responses to specific situations or stimuluses, which is conform to the trend of human evolution. According to N.Kyle Smith, when the individual is dominated by a negative emotion model, compared to the positive stimulus, the negative stimulus will have higher accessibility, so the individual is more likely to show attentional bias to the negative ones. When the positive model is in a dominant position, individuals will allocate more attention resources to positive events.

E. Negative attention bias

For external stimulus that give rise to unpleasant emotions, such as bloody violent images and furious expressions, individuals will give priority in cognitive processing and behavioral responses. This is known as negative emotion bias. The study have showed that groups with anxiety disorder or high anxiety appear attentional bias toward threatening stimuluses. In other words, they response more quickly to negative stimuluses than to neutral stimuluses. However, whether the nonanxious individuals also show attention bias to negative stimuluses, there are still different conclusions in the present research findings.

Based on the previous studies, the study uses Internet emotions as prime stimulus and dot-probe paradigm as experimental paradigm to further study the influence of subliminal affective priming of Internet emotions on attentional bias.

II. METHOD

A. Participants

Participants are undergraduate students in Shanxi Datong University. Before the experiment, participants were asked to write self-rating anxiety scale and through the screening, 58 non-anxiety participants were finally obtained. There are 19 boys and 39 girls.

B. Experimental paradigm

The dot-probe paradigm was adopted in this experimented experimental procedure is at first, a series of paired stimuluses, i.e., emotional stimulus and neutral stimulus appears in the screen. After the presentation is completed, the probe stimulus, i.e., a dot will appear immediately in one of the paired stimuluses positions. Then we can know the attentional bias of participants through the speed of the button response. The paradigm includes two conditions of consistency and inconsistency. When the position of the probe stimulus is the same as emotional stimulus, it is called the consistent condition. When the position of the probe stimulus is the same as the neutral stimulus, it is called the inconsistent condition. In general, the reaction time of the consistent condition is significantly faster than the inconsistent condition.

C. Experimental design

A single factor within-subject design was adopted in this experiment. The independent variable was the emotional valence of prime stimulus (positive, neutral, negative). At each level of the independent variable, there were consistent and inconsistent conditions. After presenting a positive Internet emotional picture, we will compare the reaction time differences of the probe stimulus on the position of positive picture and the position of neutral picture. Similarly, we will compare the reaction time differences of the probe stimulus on the position of negative picture and neutral picture after a negative Internet emotional picture. Finally, we will make a comparison between the probe stimulus on the position of emotional picture and neutral picture after a neutral Internet emotional image.

D. Materials

SAS: The Anxiety Self-Assessment Scale has wide applicability and is mainly used to assess the subjective sensibility of anxious patients. It contains 20 items. Each item has four options. "1", "2", "3", "4" respectively means: completely, somewhat, moderately, and very clearly. Item 5, 9, 13, 17, and 19 scores reversely. After getting a total score and multiply by 1.25 to get a new number, and then remove the decimal point of the number, which is a final score. According to the norm, score of 50 and below are not anxious and are valid experimental data.

Prime stimulus materials: The prime stimulus for the experiment were 90 Internet emotional pictures which were randomly selected from a social software. According to make a 7-rank grade to these pictures by 20 students from the department of Psychology of Datong University, based on two dimensions of valence and arousal, 20 pictures of positive, negative and neutral were respectively selected.

There was a significant difference in the degree of valence between the three groups of Internet emotions ($F=147.58$, $p<0.01$). Further comparison results showed that the positive emotional pictures were significantly more pleasant than the neutral emotional pictures, and the neutral emotional pictures were significantly more pleasant than negative emotional pictures. The p values were both less than 0.01 (see Table 1). There was no significant difference in arousal between the three groups of Internet emotions ($F=0.29$, $p>0.05$).

TABLE I THE VALENCE AND AROUSAL OF DIFFERENT EMOTIONAL PICTURES

Type	Valence ($M\pm SD$)	Arousal ($M\pm SD$)
Positive	5.71 \pm 0.76	4.05 \pm 0.31
Neutral	3.60 \pm 0.39	4.01 \pm 0.20
Negative	2.13 \pm 0.76	3.97 \pm 0.18

Picture Materials: The pictures before probe stimulus choose from the Picture Library of International Emotions (IAPS), including 30 positive, 30 negative and 60 neutral emotional pictures.

E. Procedure

The experimental task is presented by E-prime 2.0. There are 3 blocks in total. There are 20 trails in each block. So there are a total of 60 trails, which are presented randomly. Five trails are practiced before the formal experiment. Participants can rest twice during the experiment, and the duration of rest will be determined by the participants.

In each trail, "+" of 800ms will appear in the center of the screen, then there will be a blank of 500ms, and a 40ms prime stimulus will appear. After the 200ms interval, there will be a pair of pictures appear with form of left and right which last 1100ms. Following the pictures, the probe stimulus "." is presented. The task of the participant is to accurately and quickly make a key reaction after seeing the dot. If the dot appears on the left picture, press the "F" key; if the dot appears on the right picture, press "J" key. The program will enter the next trail automatically and record the reaction time.

III. RESULTS

A. The Difference Tests of reaction time after positive Internet emotions

The results(see Table 2) show that after subliminal presence of positive Internet emotions, the reaction time of the probe stimulus appearing in the neutral picture position (inconsistent) is faster than that in the positive picture position (consistent),but the difference was not significant ($t=1.61$, $p>0.05$).

TABLE II PAIRED SAMPLE T-TEST OF REACTION TIME

Condition	M±SD	t	p
Consistency	470.58±103.22	1.61	0.11
Inconsistency	454.12±85.73		

B. The Difference Tests of reaction time after negative Internet emotions

From the results in Table 3, it indicates that after presence of negative Internet emotions, the reaction time of the probe point appears in the position of the negative picture (consistent) is faster than the position of the neutral picture (inconsistent),and the difference is significant ($t=2.94$, $p<0.05$).

TABLE III PAIRED SAMPLE T-TEST OF REACTION TIME

Condition	M±SD	t	p
Consistency	463.54±86.78	2.94	0.00
Inconsistency	478.38±103.59		

C. The Difference Tests of reaction time after neutral Internet emotions

From the results in Table 4, it can be seen that after presence of neutral Internet emotions, the reaction time of the probe point appears in the position in the neutral picture position is the fastest, and in the positive picture position is the slowest, but the difference is not significant ($F=0.38$, $p>0.05$).

TABLE IV ONE-QAY ANOVA OF REACTION TIME

Type	M±SD	F	p
Positive	482.20±110.76	0.38	0.68
Neutral	472.49±86.64		
Negative	466.30±97.90		

IV. DISCUSSION

A. Analysis about influence of positive Internet emoticons on attentional bias

When the prime stimulus was positive pictures, the response of participants to the probe stimulus in the position of the positive picture is no faster than the neutral picture. There is no attentional bias towards positive stimulus.

Some studies have shown that when individuals is in a pleasant emotional state, they would have attention bias towards positive information. It can be explained with the availability model. When the positive model is dominant, the individual will keep pleasant, which makes the positive information is easier to obtain than other information, thus shows attentional bias towards positive pictures.

Results of this study are inconsistent with above and don't show the emotion consistent effect. There are two main reasons. On the one hand, unlike threatening pictures, positive pictures can't catch the attention of individuals. On the other hand, may be because the task of this experiment is too simple for participants .To be specific, participants only need to press left and right buttons after the probe dot, which makes them have little time to make deep cognitive processing on the positive and neutral stimuluses in front. Therefore, there was no significant difference in reaction time.

B. Analysis about influence of negative Internet emoticons on attentional Bia

The results showed that after subliminal presence of negative Internet emotions, the reaction time of participants to negative pictures significantly faster than neutral pictures. The emotion consistent effect indicates that nonanxious individuals also have negative attentional bias. It consistent with most previous experimental results.

Because the negative stimulus will deliver some information that may threaten the safety of people, the participants will respond more quickly to negative stimuluses than positive and neutral ones. In addition, attention to negative information conform to the requirements of human development, and it also helps individuals make instant feedback to ensure life safety. At the same time, it makes them to better adapt to changing condition, which correspond with the tendency of human evolution.

C. Analysis about influence of neutral Internet emoticons on attentional Bias

Studies have shown that individuals will be alert to the threat information, but in this experiment, the participants did not appear negative attention bias to negative stimulus after Internet emoticons. For this contradiction, it may be related to the design of this experiment. On the one hand, the task of responding to the probe dot is relatively simple, so that the participants don't have adequate process to the negative pictures. On the other hand, the negative pictures with very low emotional valences are not be selected as experimental material to avoid uncomfortable feelings of participants. But this result is also consistent with the trend of human development. In order to keep normal social order, we must consciously ignore

the interference of negative events and concentrate more attention on current task.

V. CONCLUSION

The conclusion of this study is that subliminal presence of positive Internet emotions do not affect the attentional bias. Subliminal presence of negative Internet emotional pictures would influence the attentional bias. There is a significant faster reaction time to negative images than to neutral after the negative affective priming. The presentation of the neutral Internet emotional images under the threshold does not affect attentional bias.

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