Original Communication

Subliminal Emotional Priming and Decision Making in a Simulated Hiring Situation

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Abstract. The present study examines the unconscious influence of emotional information on decision making in a simulated hiring situation. We used a subliminal masked priming paradigm with varying faces as primes, which were presented for a duration of 50 ms and had two levels of emotion: positive emotion (happiness) and negative emotion (anger). These primes were followed by emotionally neutral target faces. Primes were congruent (same faces) or incongruent (different faces). Prime Emotion (positive vs. negative) was crossed with Prime Repetition (repeat vs. unrelated) in a 2 × 2 factorial design. Each participant was tested in all four of the experimental conditions, each of which had 5 different trials. The participants were asked to indicate as rapidly as possible whether they were “favorable” or “unfavorable” toward the selection of the candidate (target face). Two dependent measures were analyzed: number of target faces chosen (i.e., number of “favorable” responses to target faces) and reaction time (RT). Results revealed a strong effect of emotional priming. Participants tended to choose more target faces preceded by positive prime faces than by negative prime faces. Moreover, they reacted faster when presented with target faces preceded by negative primes. Despite its exploratory nature, this study provides further evidence for the role of emotional processing in modulating decision processes and extends the experimental manipulation of subliminal emotion to the case of the masked repetition priming technique.

Keywords: subliminal priming, emotion, decision making

Introduction

Since Murphy and Zajonc’s (1993) seminal study it has been known that affective primes have a very fast effect on our behavior. Many subsequent studies have shown such influences in various ways, including having participants judge the affect of an ambiguous expression of target faces (Li, Zinbarg, Boehm, & Paller, 2008), judge the validity of advertising messages (Channouf, 2000), and inducing emotional priming with word stimuli of varying emotional valence (e.g., Bargh & Pietromonaco, 1982; Fazio, 2001; Gibbons, 2009). In the present study, we further demonstrate that subliminal emotional information can be a useful, indirect source of information for optimizing the decision process.

A perpetually thorny problem in the social and psychological sciences is the fuzziness in defining what emotion actually is. It is generally assumed that emotion is basically a component process (Scherer, 2005). This recent approach provides a direct link between each emotion component and its associated function as follows: the cognitive component is responsible for the evaluation of objects and events; the neurophysiological component determines the system regulation; the motivational component affords preparation for action and execution of actions; the motor expression component defines behavioral intentions and communication; and the subjective feeling component represents the monitoring of the interactions between internal and external states of the organism.

Moreover, three dimensions frequently emerge to explain this concept (see Smith & Lazarus, 1990):

– Emotion as a state: This dimension is very close to Damasio’s (1994) definition of feelings. It entails a significant change in a body’s state (i.e., organism) caused by the real presence of “external agents” responsible for the physiological reactions of the body and also for “internal variations” where the causes can be simply representations and mental states.

– Emotion as a process: This dimension is rooted in the notion of action associated with the “source cause” of the emotional reaction, where the organism builds up strategies by taking into consideration contextual constraints (e.g., Russell, 2003).

– Emotion as a source of knowledge: It is obvious that when we picture or imagine fictional events, we experience deep emotional reactions that allow the body to
acquire expectations about the way these reactions vary when facing unknown events. Ultimately, the body establishes an elaborate knowledge structure about the emotional quality of our behavior (see also Russell, 2003).

Cognitive approaches consider emotion, for the most part, to be an indirect source of knowledge. The use of affect1 as information involves both identification of the affective reactions and the determination of the relevance of these reactions for a given judgment. The affect-as-information model (see Clore, Gasper, & Garvin, 2001; Schwarz & Clore, 1983, 1988, 1996) is a good candidate for providing a framework for a cognitive approach to understanding the unconscious influence of emotion on behavior. Indeed, this model is based upon the assumption that emotional processes occur without conscious awareness. Hence, affective feelings allow us to explicitly learn about our own implicit judgments and decisions.

Three levels of behavioral analysis of emotional information can be discussed when we refer to the cognitive models of emotion:

1) level of cognitive structures, which refers to different forms of organization of emotional information;
2) level of cognitive strategies, which is mostly involved in problem-solving situations (e.g., Forgas, 1991; Schwarz & Clore, 1983, 1988);
3) level of cognitive “propositions,” which refers to semantic contents (e.g., Bower, 1981).

In the absence of conscious awareness, the content of emotional stimuli can influence human decision making (Bargh & Pietromonaco, 1982; Greenwald, Klinger, & Liu, 1989).

One way to test this assumption is to use the masked repetition priming paradigm, which has become a dominant tool in the investigation of early cognitive and emotional processes (Bargh, 1998; Dixon, 1971, 1981; Forster & Davis, 1984; Marcel, 1983). In this paradigm, the prime stimulus is preceded by a pattern mask and followed by a target stimulus that requires a response. Because the prime is presented for a very short duration, participants are typically not aware of the prime stimulus. In order to assess the size of priming effects, a comparison is required of the congruent/related condition (with physical similarity between the prime and the target) with the incongruent/unrelated condition (no relationship between prime and target). The standard result corresponds to an advantage in favor of the related condition with faster reaction times (RTs) and a higher rate of accuracy as compared to the unrelated condition.

Many studies have used this experimental procedure with various manipulations and typically show that participants are faster to recognize a target word when it is primed by a semantically related as opposed to a semantically unrelated word (e.g., Marcel, 1983; Pillon, 1993). A similar result was observed when a subliminal image prime and a target word shared the same semantic category (e.g., Channouf, Canac, & Gosset, 1999). The first demonstration of an implicit affective effect was shown by Clore and Storbeck (2006) who manipulated participants’ mood, inducing positive or negative mood by presenting participants with sad or happy music prior to the categorization, judgment, or lexical decision task. Their results revealed that positive mood significantly facilitated priming effects relative to negative mood. The same pattern of results was observed over the three priming tasks and also for different prime presentations.

Most relevant to our study is subsequent research that manipulated facial expressions by using the priming technique. Channouf (2000) conducted an experiment in which participants evaluated advertising messages by pressing buttons corresponding to “true” or “false” answers. These messages were primed by faces displaying either positive or negative emotion. In the condition in which the presentation of facial expression was subliminal, participants responded with more “true” answers to the advertising target sentences preceded by positive as compared to negative prime faces. These results were observed only with the number of true/false answers as a dependent variable, whereas no significant effect was reported for reaction time (RT). More recently, Winkielman, Berridge, and Wilbarger (2005) found that participants exposed to subliminal pictures of happy faces drank more and were willing to pay more for their beverage than participants exposed to angry faces.

Pittman and Bornstein (1998) conducted a subliminal priming experiment aimed at understanding the effect of gender and social discrimination in a simulated hiring situation. Prior to the experiment, the authors subliminally presented the participants with a series of pictures of candidates who might aspire to the position. Their results showed that, in 70% of the cases, the participants chose the candidates seen beforehand.

Since a very brief presentation of stimuli produced this mere exposure effect (see Zajonc, 1968), one may ask how emotions can be a useful indirect source of information. Because the Pittman and Bornstein (1998) study did not use an emotion manipulation, in the present experiment we combined the standard masked priming procedure with a subliminal manipulation of emotion. We also opted for a two-alternative forced choice task (2-AFC) to capture the decision processes in the RT measure. In addition, the present study aimed to provide further support for the subliminal influence of emotion on decision-making processes. Unlike previous studies, we used the hiring situation as a scenario and a context in order to enhance the relevance of the decision made by the participant and to provide a more

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1 The use of “affect” as a synonym of “emotion” is very common. We consider affect, as did Schwarz and Clore (1983, 1988, 1996), to be an instant expression of emotion.
straightforward evaluation of emotional influence. Finally, by excluding participants from the final analysis who were aware of prime presentation, we obtained a more conservative measure of the behavioral effects due to a subliminal emotional influence at the prime level.

**Method**

**Participants**

A total of 65 students (11 males, mean age = 22, SD = 2.4 years) from the Université de Provence volunteered to take part in the experiment. In the end, only 60 participants were used in the analyses because of their verbal self-reports in a brief postexperimental interview (e.g., Chalmers, 1996; Critchfield, 1993; Geissler, 1990; Merikle, 1992). These 60 participants reported that they were unable to detect or identify any stimulus prior to the target presentation during the entire experiment.

**Stimuli and Design**

In order to obtain the different faces used as stimuli, we asked another group of 35 student volunteers (M = 24 years, SD = 2.3) to express the required facial expressions (positive, neutral, and negative) for the experiment. These students consented to be photographed. A total of 128 pictures of faces were collected, but only 40 were used in the experiment. The pictures selected illustrated the emotional expression most saliently. All faces selected were plain-looking, without any particular clue (e.g., eyeglasses, hat, excessive make-up, etc.) making their perception confusing, difficult, or cued. The facial expressions chosen as prime faces (positive emotion vs. negative emotion) and target faces (neutral) were selected based on Kendall’s method of evaluating the degree of consensus between five raters. For the ratings, all pictures were presented in sequence on a computer screen and each rater used a Likert-type scale from -2: *obviously negative expression* to +2: *obviously positive expression* to decide which level matched the given facial expression best. The results showed highly significant interjudge agreement, W = 0.89, p = .0001.

In the present study, all target faces were neutral, whereas the prime faces were either positive or negative. A trial in which the target neutral face was preceded by the same prime face, whether expressing positive or negative emotion, was considered a related (repeat) trial. The opposite – an unrelated trial – consisted of a neutral target face primed by a different face, regardless of facial emotion.

Two factors were manipulated in this experiment: Prime Emotion (positive vs. negative) and Prime Repetition (repeat vs. unrelated) crossed in a 2 × 2 factorial design. Each participant was tested in all four experimental conditions, each of which contained five different trials. The entire set of 20 trials was presented randomly during the experiment. Two dependent measures were recorded: number of target faces chosen by participants to continue on in the hiring process and reaction time (RT).

**Procedure**

**Situation Scenario**

The situation scenario consisted in showing the participant a document summarizing the main steps in a professional hiring protocol. A report was enclosed in the document stating that the remaining candidates involved in this important selection have a remarkable education and career pathway (see Appendix). It also stated that because of the limited number of positions required for the job, the participant was to choose the candidates most likely (according to the participant) to proceed to the final hiring step. The experimenter walked the participant through each step of the document in order to make sure that he or she understood what the task required before moving on to the experiment.

**The Experiment**

The experiment was run in a sound attenuated and dimly lit room. The participants were seated in front of a computer screen on which stimuli were displayed on a monitor with a resolution of 1024 × 768 pixels and a 60-Hz refresh rate. The experiment was conducted using SuperLab® software. Before the experiment started, participants carefully read the instructions and performed a practice session of 5 trials that did not appear in the main experiment.

Each trial began with a central fixation point lasting for 300 ms. The fixation point was then replaced by a forward mask (premask) consisting of a black and white spotted square, which appeared for 20 ms. The prime face immediately followed the forward mask and lasted for 50 ms, which, in turn, was replaced by a backward mask (postmask) similar to the premask for 20 ms. The target face followed the backward mask and remained on the screen until the participant had made his or her response. The procedure is described in Figure 1.

The participants were asked to indicate as rapidly as possible whether they were “favorable” or “unfavorable” toward the selection of each candidate by pressing a green response button with their right index finger for a “favorable” answer and a red button with their left index finger for an “unfavorable” answer. The response hand was counterbalanced across participants. At the end of the experiment, a verbal response to the question, “Just before the display of faces on the screen, were you able to detect the very brief appearance of other faces?” was recorded for every participant.
Results

Of the 65 participants, 5 were excluded (7.7%) from the main analysis because they had reported being able to perceive “blurry images,” “flashes,” or “brief patterns” prior to the target presentation. Table 1 presents the average RTs and number of chosen target faces for all 60 participants in the four experimental conditions. Overall, for both number of target faces chosen and RTs, repeated measures ANOVAs and paired t-tests techniques showed that the repetition effect was not significant. Regarding the number of target faces chosen, the net repetition priming effect – the difference between Mean unrelated and Mean repeat – gives only 0.06 units (1 unit is the equivalent of an average of one target face chosen per participant) in the presence of positive emotion and only 0.07 units in the presence of negative emotion. For RTs, this difference was not null, but also not significant, with a net repetition priming effect of 56 ms for positive emotion relative to 53 ms for negative emotion. The trends of emotional priming for RTs and number of target faces chosen are in opposite directions; in fact, emotional priming is in favor of negative emotion when measuring RTs (faster RTs) and in favor of positive emotion when measuring the number of target faces chosen (higher rate).

Table 1
Mean reaction times (ms) and number of target faces chosen plus or minus standard errors for all experimental conditions

<table>
<thead>
<tr>
<th></th>
<th>Positive emotion</th>
<th>Negative emotion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Prime repeat</td>
<td>Prime unrelated</td>
</tr>
<tr>
<td>Mean number of target faces chosen</td>
<td>3.13</td>
<td>3.19</td>
</tr>
<tr>
<td>Standard error</td>
<td>± 0.40</td>
<td>± 0.41</td>
</tr>
<tr>
<td>Mean RT</td>
<td>1417.52</td>
<td>1473.73</td>
</tr>
<tr>
<td>Standard error</td>
<td>± 183.0</td>
<td>± 190.26</td>
</tr>
</tbody>
</table>

ANOVA Results

Number of Choices

A repeated measures ANOVA was performed on the number of target faces chosen data with Prime Emotion and Prime Repetition as factors. Results revealed a significant main effect of Prime Emotion, $F(1, 59) = 7.06, p = .01$ (see Figure 2), but no significant main effect of Prime Repetition, $F < 1$, and no significant interaction between these two factors, $F < 1$.

Reaction Times

We also conducted a repeated measures ANOVA on the RT data with Prime Emotion and Prime Repetition as factors. There was a significant main effect of Prime Emotion, $F(1, 59) = 5.10, p = .02$ (see Figure 3), but no significant main effect of Prime Repetition, $F(1, 59) = 2.77, p > 1$, and no significant interaction, $F < 1$.

In summary, the results regarding number of target faces chosen showed significantly more positive primes and RTs were faster for negative primes.
Discussion

The present study investigated the effects of emotional repetition priming on decision making by manipulating the relatedness of the prime and target faces (same face vs. different face) and also the emotional facial expression of primes (positive vs. negative). The results revealed a strong effect of emotional priming. With respect to the number of candidates chosen for final selection, participants tended to choose more target faces preceded by positive primes. This result is consistent with previous studies that have shown a facilitating role of positive emotion on human performance. This facilitation is reflected in favorable feedback that has been observed in various tasks such as evaluation, judgment, decision, etc. (e.g., Channouf, 2000; Channouf et al., 1999; Clore & Storbeck, 2006; Isen & Patrick, 1983; Petty, Schumann, Richman, & Strathman, 1993).

Unlike Channouf’s research (2000), the present study showed a significant effect of priming with RT data. RT responses were significantly faster when participants responded to target faces preceded by primes with negative emotion relative to positive emotion. This result is consistent with the evolutionist interpretation provided by Hansen and Hansen (1994). According to their interpretation, negative emotion has a greater impact than positive emotion on our behavior both as individuals and also as a species. This evolutionist approach highlights the adaptive aspect of a person trying to avoid potential sources of danger, for instance, negative emotional information within the environment. Thus, on the one hand, our participants are faster at avoiding negative emotional information by pressing the response button quickly. On the other hand, they have a preference for positive emotional information and therefore respond less quickly but choose more target faces preceded by positive primes. The speed of such processing is consistent with the idea that negative affect may foster a processing style that is characterized by bottom-up processing, whereas positive affect may foster a top-down processing style that relies more on general knowledge structures (Bless & Schwarz, 1999; Clore, Gasper, & Garvin, 2001).

Our results do not reveal a reliable masked repetition effect for faces, either for the number of target faces chosen or for RT. In other words, whether the target face was preceded by the same candidate’s face or a different one did not change the pattern of the priming effect. In the so-called “sandwich priming” experiment, which is similar to the present experiment, Henson, Mouchlianitis, Matthews, and Kouider (2008) manipulated face familiarity (famous vs. nonfamous) and prime repetition condition (same view vs. different view vs. unprimed). Their results revealed a significant face priming repetition effect with both behavioral and ERP data for familiar faces, but no priming effect in behavioral data for unfamiliar or nonfamous faces. This latter result is consistent with our study as all of our stimuli are unfamiliar faces and the absence of repetition priming in the present study could be explained by the familiarity effect. In the Henson et al. study (2008), the repetition variation between the prime face and the target face preserves the emotional expression even with views from different perspective. Therefore, the absence of repetition effects in this study may be attributable to the absence of emotion repetition regardless of face repetition (i.e., repetition of the same person’s face). These results are consistent with the idea of an emotional congruency effect between prime and target (Hansen & Shantz, 1995) where each is processed as two emotively incongruent behaviors.

It is conceivable that the participant’s affective state could also play an important role in modulating the amount of priming effects observed under such experimental conditions. The effect of this variable has been demonstrated by many authors in a variety of tasks including social judgment and the judgment of facial expressions (e.g., Baron, 1987; Bower, 1981; Forgas, 1991; Forgas & Moylan, 1987). Bower’s network model of emotions (Bower, 1981; Bower & Cohen, 1982) acknowledges the role of mood-dependent processes in modulating decision making. The key idea of this model is that moods can activate memories, concepts, and categories that are congruent with the valence (positive vs. negative) of a given mood. This influence can operate at a very low level (attentional and perceptual level) as well as at the level of memory retrieval and judgment. It is possible that the subliminal facial ex-

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pressions of our prime faces triggered a mood induction that consequently affected the judgment or the decisional processes. Our results support Scherer’s proposal (2005) that emotion has a cognitive component responsible for the evaluation of objects and events.

From an applied perspective, the present findings suggest that it is advisable that recruiters heed emotional information to optimize the likelihood of making an unbiased decision. Such a strategy could be crucial in a real environment of an enterprise with high stakes. Alternatively, job seekers’ advisors have tried to help candidates optimize their chances of being hired by taking into account factors such as their social background, gender, physical appearance, stance, and attire. However, more and more, current research takes into account the influence of emotion and shows that mood, facial expression, and emotional information are of the same importance as all other factors.

Despite its exploratory dimension, this study provided further evidence for the role of emotion in modulating cognitive processes. Moreover, it extends the experimental manipulation of subliminal emotion to the masked repetition priming technique. In light of the results from this simulated hiring experiment, one possible interesting external validation of the study would be an action research project carried out within an organization and conducted with professionals in a real hiring situation.

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References


I. Skandri-Marzouki & Y. Marzouki: Emotion and Decision Making

Appendix

Information About the Hiring Task

In order to help you select the appropriate candidates for the position, we have prepared an overview of standard steps in the hiring process. These steps start with:

1. **Job description:** Where the employer defines the criteria about what the position involves exactly.
2. **Advertising the position:** The job description is posted on the internet and in newspapers.
3. **Screening applicants:** This step is based on a review of all applicants’ resumes, skills, and whether applicants meet the education requirements for the job.
4. **Interviewing:** In this step, the interviewer needs to have a clear idea of correct responses to a list of questions involving the applicant’s skills, education, and experience, ask and anticipate general questions based on the candidate’s responses.
5. **Comparing applicants:** Applicants are rated according to how well they performed during the interview.
6. **Decision:** This step entails two possible outcomes: Job offer or rejection of application.

The remaining candidates involved in this important selection step showed remarkable education and career backgrounds. Because of the limited number of positions required for the job, during this session, you are invited to select the candidates who are most likely to proceed to the final hiring step. Below is a summary of the “average resume” that all remaining candidates share.

- **Job or career expectations:** Reach high-level managerial position.
- **Education:** Minimum is master’s degree in management with high honors.
- **References:** With respect to schools as well as companies, candidates come from leading institutions.
- **Experience:** Despite their young age (24 years average), all candidates have an impressive amount of experience in various organizations and with different responsibilities.
- **Special skills:** These candidates have excellent computer skills and programming expertise, including knowledge of specific software and operating systems. Moreover, their talents include good social skills and the ability to work efficiently in a team.