Mood Induction and Unintentional Learning in Healthy Subjects

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Article ID: WMC00717

Article Type: Research articles

Submitted on:23-Sep-2010, 02:22:07 PM GMT **Published on:** 23-Sep-2010, 04:37:51 PM GMT

Article URL: http://www.webmedcentral.com/article_view/717

Subject Categories:PSYCHOLOGY

Keywords: Unintentional Learning, Mood Induction, Mood Congruence Bias, Repression Defence Mechanism, Attentional Processes, Consciousness

How to cite the article: Kwok S . Mood Induction and Unintentional Learning in Healthy Subjects . WebmedCentral PSYCHOLOGY 2010;1(9):WMC00717

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Abstract

Whether induced-depressed individuals demonstrate a mood congruence effect in unintentional learning is unknown. We manipulated 51 healthy participants into either a happy (n = 25) or a sad mood (n = 26) state and tested their mood-congruent information processing with unintentional learning of negatively charged pictorial stimuli. Participants in the happy mood induction group recognised significantly more negative items than induced-depressed participants. I conclude that there was no evidence of mood-congruence in unintentional learning in induced-depressives.

Introduction

People have a tendency to encode the world in terms of what occupies their mind [1]. When a stimulus can be perceived in a variety of ways, the information that is cognitively most accessible will capture the stimulus and guide the way in which it is perceived and remembered. The mood congruence theory stipulates that some material, by virtue of its affectively valenced content, is more likely to be stored and/or recalled when one is in a particular mood [2]. Mood congruent facilitation in memory has been reported in recall of word lists [3, 4] and autobiographical memory [5].

The cognitive theory of depression purports that people with depression are particularly vulnerable to mood congruent bias in their information processing [6] and memory [7]. Empirically, this bias often leads depressed subjects to recall more negative than positive materials on explicit, supraliminal memory tasks [7, 8].

In comparison to ample findings on explicit memory tasks such as free recall or recognition in depressives [2], there is relatively little evidence to indicate whether a similar effect is present in unintentional learning processes. In order to address this issue, we manipulated participants into either a happy or sad mood state, and then assessed their unintentional learning performances of a set of negatively charged pictorial material. Their performances in the recognition test were taken to indicate to what extent mood state affects an individual's unintentional learning.

Methods

Participants

The sample consisted of 51 healthy undergraduate students (18 male and 33 female, aged between 18 and 20). People with a history of psychiatric or neurological disorders were excluded. The participants were pseudorandomly assigned to either a positive mood (n = 25) or a negative mood group (n = 26). Each participant was tested individually in a sound-attenuated, well-lit experiment cubicle, and was told as a disguise that the purpose of the experiment was to examine their reaction time to presentation of stimuli to avoid confirmatory bias.

Stimuli

Seventy-five coloured images of various objects were selected from The International Affective Picture System (IAPS) [9]. The selection was based on the valence, dominance and arousal ratings. All were equated for arousal values; the selected images were either positively charged (n = 20, of a mean valence of 7.37) or negatively charged (n = 55, of a mean valence of 1.84). Twenty out of the 55 negative images were superimposed individually with the 20 positively charged or neutral images to generate a set of 20 testing stimuli used in the encoding phase. The remaining 35 negative images were used as foils in the recognition test. All stimuli were presented with SuperLab Pro software on an IBM computer with a high-resolution colour monitor, with a distance of 60 cm from participants.

Procedure

The procedure of an experimental session was as follows: (1) first mood state rating, (2) mood induction procedure, (3) second mood state rating, (4) encoding phase (unintentional learning), (5) recognition test, and (6) third mood state rating.

Mood induction and self-report rating

Self ratings of mood [10] were used to ascertain the participants' mood states at three time points: (1) the beginning of the experiment, (2) immediately after the mood induction procedure, and (3) upon completion of all experimental tests. This design was used to ensure effectiveness and sustainability of the mood induction procedure [10-12]. Each participant rated his/her mood on a 0 to 10 continuum upon six dimensions: unpleasant-pleasant, tense-relaxed, tiresome-energetic [10], anxious-peaceful, sad-happy, and fearful-calm [12]. The mood score of each participant was derived from the average of these six dimensions.

For the happy group, a 5-min clip excerpted from a Cantonese comedy film called “From Beijing with Love” was shown to induce a happy mood [13]. After the viewing, Mozart’s Eine Kleine

Nachtmusik was played until the end of the experiment to help maintain the positive mood state of participants [14]. For the sad group, participants read a passage from a Chinese novel about a well-known earthquake tragedy Tang Shan in China in their own pace. Albinoni’s was played throughout the experiment to build up and maintain the sad mood [14]. The amount of time taken in the mood induction procedure was roughly equivalent in both groups. Adagio in G-minor

Encoding task and recognition test

In the encoding phase, each trial consisted of the presentation of a superimposed stimulus for 700 ms, and then an inter-trial interval of 4000 ms with a fixation cross in the middle of the screen. For each trial, the participant was instructed to ignore the negatively charged object (e.g. a mildly mutilated hand) and verbally report the other object (e.g. a white rabbit) to the experimenter. Each encoding session comprised 20 trials.

The encoding phase was immediately followed by a recognition test, during which the 20 negatively charged target images, which had appeared in superimposition with the positively charged or neutral images in the encoding task, were presented in its unrendered form intermixed with 35 novel foils to the participants. The foils were equated on their valence and arousal ratings with the target images. Each image was presented for a period of 1000 ms and followed with the presentation of a fixation cross for an inter-trial interval of 2000 ms. Participants were required to indicate whether they had seen each of the images earlier in the encoding phase by pressing the corresponding keys on a keyboard before the next trial. There was no repetition of stimuli and no correction procedure; the recognition test session comprised 55 trials. Presentation of stimuli in the encoding and recognition tasks was randomised across participants to eliminate any order and sequence effects. The scores of correct recognition were used to index the participants’ performance in unintentional learning.

Results

Effect of mood on recognition

The results inform us of the role of mood states in unintentional learning of negatively charged stimuli. The mean percentages of correct identification of target images for the happy group and sad group were 52.9% and 41.0% respectively in the recognition test. We conducted an independent samples t-test between groups on the scores of correct identification of target pictures. The analysis showed that participants in the sad group was significantly worse off in identifying the negatively charged images than the happy group [t (49) = 2.29, $p = .027$], suggesting no evidence of a mood congruent effect on unintentional learning in the sad group.

Mood induction

The mean mood scores of participants were not different between groups before the mood induction procedure [$p > .05$]. We then conducted a repeated measures ANOVA with two levels of the between-subjects factor ‘Group’ (Happy, Sad) and two levels of the within-subjects factor ‘Time point’ (immediately post-induction, after the experiment proper) on the self-report mood scores. The analysis showed that the mean mood score of the happy group was significantly higher than the sad group [Group: F (1, 49) = 26.34, $p < .001$] and there was a significant Group*Time point interaction [Group*Time point interaction: F (1, 49) = 20.52, $p < .001$]. This prompted us to examine the differences between groups at these two time points separately: immediately after the mood induction procedure, the happy group was significantly happier than the sad group [t (49) = 7.15, $p < .001$] (mean mood scores for the happy and sad groups were 7.11 and 4.75, respectively); and that the sad group was still marginally more depressed than the happy group at the end of the experiment [t (49) = 2.02, $p = .049$] (the corresponding mean mood scores were 4.89 and 4.14 respectively). These indicate the mood induction was effective and sufficiently long lasting throughout the experiment.

Discussion

In the present study, induced-happy (happy) and induced-depressed (sad) participants were tested on their unintentional learning of an array of negatively charged pictorial stimuli. We did not find a mood congruence effect in the sad group, suggesting that predictions generated from the mood congruence theory do not necessarily generalise to all learning conditions. We also validated a new mood induction procedure consisting of both music and reading or film viewing components.

Despite evidence suggesting negative emotional arousal enhances memory of negatively charged materials [15], here, we are able to rule out an arousal account because the arousal values of the foil and target images were equated. Rather, I propound that the findings can be explained by a repression account. Repression is a theoretical defence mechanism whereby memories of disturbing events are stored in the unconscious and unintentionally inhibited from entering consciousness. The sad group might have employed a defence mechanism to repress the ego-threatening experiences thereby making the materials difficult to remember [16], in turn leading to a weakened identification of the target images. This explanation accords with Clark and Teasdale's [17] suggestion that mood has the effects of influencing the selection of emotional material for entry into consciousness.

While clinically depressed patients are characterised by dysfunctional inhibition toward negative information [18], they are not biased in early attentional processes [19]. I suggest future studies can attempt to test the speculation of whether induced-depressed individuals would orient their attention preconsciously toward negative information [4], and of whether there are any preattentive mood congruent bias at the preconscious level of processing.

The second contribution of this study is the validation of an effective means of mood induction in healthy individuals. Coupling a music induction [14] with either viewing a film clip or reading a passage, this mood induction procedure was shown to be effective and lasting for over 25 minutes in a reasonably large group of individuals. The paradigm is promising for future investigations of mood-related studies.

Conclusion

In summary, the present study showed no mood congruence bias in unintentional learning of negative stimuli in induced-depressed individuals, suggesting that not all predictions inferred from the classic mood congruence theory are readily generalised to all learning conditions. An effective paradigm for mood inductions was also developed and validated for future studies in affect research.

Acknowledgements

I thank Tatia M.C. Lee for her help on this study.

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