

## Positive Affect and Creative Problem Solving

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### Abstract

Two studies run simultaneously investigated the influence of positive affect on creative problem solving as indicated by Duncker's (1945) candle task. Results show that positive affect, as induced by exposure to a funny movie, facilitated a subject's ability to solve the problem in comparison with those in control groups who either saw a control film or who did not view a film at all. In addition, in accord with previous findings (Adams, 1952; Higgins & Chaires, 1980), subjects in another comparison group who were exposed to a facilitative display of the items were also more likely than a control group to solve the candle task. Results are discussed in terms of the influence of a positive affective state on accessibility of material and on cognitive organization.

Recently, researchers have shown a growing interest in the influence of affective states on cognitive processes. Earlier work had indicated an influence of affective states on social behavior such as helping and interpersonal attraction (e.g., Adelman, 1972; Gouaux, 1971; Isen, 1970; Isen & Levin, 1972; Veitch & Griffitt, 1976); and more recent work had suggested examining this relationship in terms of the influence of affect on the cognitive processes involved in the decision to engage in such social behavior (Levin & Isen, 1975; Isen, Shalke, Clark, & Karp, 1978). Most recently, attention has begun to focus on the influence of affect on cognitive processing more generally.

This work indicates a number of influences on cognition. For example, a state-dependent-learning effect of affective state has been observed under some circumstances (intense affect induction and maximal discriminability of the lists of words learned in the different states), as had been found earlier for other states such as drug and alcoholic intoxication (Bower, 1981; Bower, Montiero & Gilligan, 1978; Henry, Weingartner, & Murphy, 1973; Weingartner & Faillace, 1971; Weingartner, Miller, & Murphy, 1977). Work on the influence of affect on memory has also shown us that even a mild affective state of the kind likely to be experienced in everyday life (and of the kind previously shown to influence social behavior as described above) can influence cognitive processing. In addition, this influence may be even more general than that of a state-dependent learning effect. For example, a positive affective state has been shown to be capable of serving as a retrieval cue for positive material in memory, influencing such measures as the subset of words likely to be recalled from a memorized list and the reaction time for recall of affect-compatible words (Isen, Shalke, Clark, & Karp, 1978; Teasdale & Fogarty, 1979; Teasdale & Russell, 1981).

These latter findings suggest that affect influences not only memory but also cognitive organization and cognitive consequences of this organization. One study, for example, investigated the influence of affective state on judgment and evaluation. These results indicated that when people had been given a small free gift, they were more likely to judge their consumer goods more favorably; and the authors of that paper attributed these improved opinions to the affect-cued accessibility of positive material described above (Isen, et al., 1978). Positive feelings were hypothesized (and

shown) to cue positive material in memory, and the presence of this material was hypothesized to influence the decision-making process with regard to affect-compatible judgments and behavior, which were shown to be affected by a positive feeling state. (This process was called a "cognitive loop," since the resulting positive judgments and behavior would then be expected to sustain the feeling state and the process.)

There is growing evidence, then, that positive affect can influence cognitive organization through what is brought to mind, and that the altered cognitive organization can then influence other ongoing cognitive processes. In the present paper, we test the hypothesis that one effect of this change in cognitive organization is to facilitate creative problem solving of the type that requires seeing things in new ways.

The task that we use is the "candle task" employed by Karl Duncker in his demonstrations (in 1945) of creative problem solving (actually, his demonstration of "functional fixedness"). In this task, the subject is presented with the common objects of a box of tacks, a candle, and a book of matches, and s/he is asked to attach the candle to the wall (a cork board) in such a way that it will burn without dripping wax on the table or floor beneath. The problem can be solved if the box is seen as an object separate from the tacks and its own properties recognized and utilized. The box can be emptied, tacked to the wall, and used as a platform for the candle, which can then be lit and will not drip wax on the table or floor.

Adams (1952) showed that displaying the items involved in the task separately—that is, with the tacks on the table and the box empty—highlighted their independence of one another and facilitated successful solution of the problem. Recently, Higgins and Chaires (1980) found that having subjects repeat the names of common pairs of objects, but in relatively unaccustomed linguistic structures that tended to differentiate the pair members instead of in the accustomed undifferentiating structure ("tray and tomatoes" instead of "tray of tomatoes") facilitated performance on the candle task. They interpreted their results as due to the way in which the stimulus display is encoded and the increased accessibility of different constructs that could be used to characterize its elements. Thinking about the actual independence of usually-paired or united items might allow them to be utilized more completely.

We suggest that positive affect should also facilitate performance on such tasks through this same mechanism, accessibility of cognitive material. But we propose that in the case of affect, accessibility facilitates creative problem solving, not through the particular content of that which comes to mind, but through the overall amount and variety of material cued, and concomitant changes in cognitive organization and processing strategies that accompany increased accessibility of this large volume of material (Isen, 1981). We have already noted that positive affect has been found to cue positive material in memory. In addition, there is evidence that positive material tends to be more extensive and more interrelated than other material (Bousfield, 1944, 1950; Boucher & Osgood, 1969; Matlin & Stang, 1979; White, 1936; White & Powell, 1936; see also Clark & Isen, 1980). Together with the knowledge that a positive state cues positive material, this would imply that a person who is feeling good will have access to a greater amount and variety of material or ideas. This should result in the person having more ideas about how to solve a problem requiring creative inventiveness, if she is asked to solve such a problem.

In addition, if all of this is happening, a person who is feeling good will have a more abundant amount of material, and it is therefore reasonable to suggest that he will organize it differently from the way he would when not so abundant with ideas. There is some evidence, for example, that decision-making style is altered by positive affect, in the direction of more efficient, or at least speedier, processing (Isen, 1981). This altered approach might well involve changes in organization of material which result in the person's seeing relationships not ordinarily seen. For both of these reasons, then, a broader array of ideas and an altered organizational structure for processing them that allows the person to relate otherwise-unrelated items, we predict that positive affect should lead to improved creative problem solving.

#### Method

**Subjects.** Subjects were 65 male and female students enrolled in classes in introductory psychology.

**Procedure.** Subjects were admitted to the laboratory in groups of four. They were seated and given a few minutes of introduction to the study. Then, in Study I subjects were shown a ten-minute segment of a film, either a comedy film in Condition 1 (the positive-affect condition) or a neutral film in Condition 2.

Subjects in Study II, which was run simultaneously with Study I and which thus can also be conceptualized as two additional conditions of Study I, saw no films. Instead, in this study, differing conditions were created by differences in the way in which the items presented to the subject as part of the candle task were displayed. In Condition 3, the control display was presented: a box filled with tacks, a candle, and a book of matches. In Condition 4, the same items were presented, but the tacks were displayed in a pile next to the empty box.

Following the initial phases of the study, subjects were asked to fill out a word-rating scale, in which they rated the pleasantness of unfamiliar words, as a manipulation check. Previous studies have used such indirect assessments of affect (for example, ratings of ambiguous slides), demonstrating their association with behavioral indices of positive affect such as willingness to help another person (Isen & Shalke, 1977; Forest, Clark, Mills, & Isen, 1979).

Next, subjects were seated at individual tables in the four corners of the room. The materials for the candle task were on the table, in the appropriate display, but under a cover until the task was explained by the experimenter. After reading subjects the instructions, the experimenter removed the cover from the items and gave subjects 10 minutes in which to solve the problem.

#### Results

Results of the manipulation check indicate that unfamiliar words were rated more positively by subjects in the positive affect condition than the control condition ( $t = 2.0$ ;  $p < .05$ ).

**Table 1.** Percent and number of Correct Solutions to the Candle Task in Each of 4 Conditions.

Comedy Film	Neutral Film	No Film Control	Facilitative Display
9/12 75%	3/15 20%	2/15 = 13%	19/23 = 83%

Table 1 presents the data showing the number and percent of subjects obtaining the solution in each condition.  $\chi^2$  tests indicate that both the facilitative display condition and the positive affect condition produced significantly more solutions than did the control conditions, which did not differ from each other ( $\chi^2 = 15.20$ ,  $p < .01$ ;  $\chi^2 = 6.09$ ,  $p < .01$ , respectively).

#### Discussion

Our results indicate that procedures designed to induce positive feelings can facilitate creative problem solving of the kind assessed by Duncker's (1945) candle task. Duncker spoke of people's inability to solve this task as reflecting "functional fixedness." Another way to view this task, or perhaps an elaboration of Duncker's idea, is that it involves the ability to see all aspects of the objects presented or to see among them potential relationships other than the existing ones. Our interpretation of the fact that positive affect can facilitate this process is that it does so through the increased accessibility that it affords to the large volume of material that is positive material. This results, we believe, in a greater number of ideas coming to mind when feeling good and, as a result also, an altered method of organizing and processing them that allows the person to see potential relationships not ordinarily seen.

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