

MOOD STATE AND RECALL BIASES: THE ROLE OF AFFECT

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Mood state and recall biases: the role of affect. In this experiment, mood states were induced by exposure to two film clips, one happy and another sad, without any specific verbal instruction from experimenters. Subsequently, tests of immediate memory were performed. Subjects had to remember lists of positive, negative or neutral words. Results show that watching films produces a reliable and strong bias on remembering but a lesser effect on expression of mood. Moreover, verbal affect expression and biased remembering were unrelated. These results are more favourable to a cognitive priming hypothesis than to an affective state-dependent one.

El presente trabajo consiste en un experimento en el que se inducen estados de ánimo mediante la exposición a unas películas (una alegre y otra triste) sin instrucciones concretas por parte de los experimentadores y se realizaron pruebas de memoria inmediata de listas que contenían palabras neutras, con connotaciones alegres y con connotaciones tristes. Los resultados indican que mientras el efecto de la exposición a las películas sobre el recuerdo de palabras fue claro y consistente, los cambios subjetivos del estado de ánimo fueron débiles, sin que ambos efectos mostraran ningún tipo de correlación. Estos resultados son más favorables a la hipótesis que destaca el papel de la preparación cognitiva que a la basada en el estado afectivo.

As early as 1968, Velten proposed a method for inducing mood states in controlled laboratory situations, opening up a new chapter in basic research on human emotions. The procedure used by Velten consisted in drawing up three lists of 60 sentences in the first person (i.e., self-referential). Each list had a different emotional content: depressive, euphoric or neutral. There were three groups of subjects, so that each group read only one of the three lists of sentences. Subsequently, all subjects were administered various psychological tests, and it was found that this simple procedure induced a mood state capable of producing marked differences in writing speed, decision-making speed, word association and subjective expression of affect. The importance of these results is due to the fact that, until now, basic research on emotions has focused on its antecedents, especially cognitive determinants, on the analysis of subjective experience and on physiological concomitants; but not so much on the way emotional states alter psychological functioning.

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Currently, it is accepted that a particular mood state includes not only an affective component, that is, a subjective experience, but also a cognitive context and a general state of the organism (Mayer, Salovey, Gomberg-Kaufman and Blainey, 1991). However, as regards the relationships between these different components, a variety of approaches can be found. There are those who argue that it is thinking that produces both affective states, that is, the experience of emotion, and behaviours associated with the emotions and all other effects derived from them (Lazarus, 1982). Others, like Zajonc (1980), defend the primacy of affect over cognition. Finally, there are intermediate propositions, such as those of Teasdale and Fogarty (1979), who suggest a reciprocal relationship between cognition and affect, since, while some cognitions might produce changes in mood states, these states may, in turn, affect or alter certain cognitive processes, such as memory.

Bower (1981, 1987, 1992) made a considerable contribution to research on the relationship between emotion and cognition, demonstrating the influence of mood states on memory and other cognitive processes, developing new experimental procedures, producing an important body of empirical data and formulating an influential theory on the relationship between emotions and cognition.

In one of his early works, Bower (1981) induced a state of happiness or sadness by means of hypnotic suggestion. While in this state subjects had to read a story involving two characters, one a cheerful person for whom things always turned out well, and the other a sad character for whom things always went wrong. The following day, in a neutral mood state, subjects were asked what they remembered of the story. The results suggest that those induced with a sad mood state remembered the sad character, and vice-versa. This work, together with others, demonstrated that information is selected according to its degree of congruence with subject's mood state at the time he/she is processing it.

Similar results have been found by other research groups using somewhat different procedures. Using Velten's method, evidence has been accumulated in support of the notion that when a particular mood state is induced and subjects are asked to recall autobiographical episodes, the content of these apparently free recalled memories is consistent with the mood state induced (see Rholes, Riskind and Lane, 1987; Matthews and McLeod, 1994). Isen, Shalke, Clark and Karp (1978) found similar results using a different method. These authors presented to their subjects a list of words with different emotional value and asked them to remember as many of them as they could after experiencing a situation of success or failure. The words that coincided with the mood state produced in the subject were more frequently recalled than the incongruent ones. Also, it is well established empirically that natural depressive episodes increase access to memories of sad episodes from the past (Matthews and McLeod, 1994).

To the above we might add the following: mood states related to happiness, sadness or anger affect free association tasks carried out with words of neutral emotional content; such states also bias the interpretation of ambiguous scenes and influence judgements with respect to familiar objects and people about whom heterogeneous impressions have been stored; and finally, they affect the subjective probability of the occurrence of future events (see Matthews and McLeod, 1994). Furthermore, mood states can also alter expectations of self-efficacy (Kavanagh and Bower, 1985). In sum, a great quantity of processes related to cognition that appear to determine emotions may also be biased and influenced, in turn, by emotions themselves.

In order to explain these findings, Bower (1987, 1992) has proposed that the way in which an experience is codified in the memory is determined, at least partly, by the mood state of the subject at the moment of carrying

out this codification. Further, the similarity between the mood states at the time of acquisition and at the moment of recall may also determine accessibility to memory. This would occur through the activation of certain emotional nodules that include the physical experience of each emotion, expressive behaviour, verbal labels and the situations that can produce emotions. These nodules would be connected to propositional networks, so that inducing the emotional state would also activate the whole network. Since pleasant experiences are codified precisely when one is in a good mood, these experiences will be remembered more easily when the subject is once more in a good mood and, conversely, sad or negative memories will be easier to evoke when the subject is in a state of depression.

Bower's approach, as Teasdale and Fogarty point out (1979), has diverse interpretations, and has had implications for the development of subsequent models of the relationship between cognition and emotions. In fact, it is a perspective that is too general and unspecific to provide concrete predictions. The problems with this general theory of cognitive processing dependent on mood state have become numerous, and are clearly exposed by Matthews and McLeod (1994).

At the present time, one of the questions raised concerns which characteristics of mood states are sufficient and necessary to produce bias in the processing of information. In this line, Rholes et al. (1987) proposed an alternative theoretical interpretation of the phenomenon in question, and one with some very interesting practical implications. These authors make a distinction between two alternative explanations of the way in which mood state influences memory. The first interpretation is based on the so-called *mood state dependent mechanism* (Bower, 1981; Teasdale and Fogarty, 1979), to which we have already referred, and which presupposes that all the elements of the emotional nodules are activated together and are necessary for producing bias in the processing of information. The second interpretation supports the view that the impact of mood states is influenced mainly by the cognitions that accompany them, and not so much by the emotional experience. This interpretation is based on studies that demonstrate that the repeated exposition or use of a certain schema, concept or word makes any material associated with it easier to recall. Thus, it is supposed that a situation that provokes an emotion activates both an affect and a related cognition. This cognition may semantically prepare or guide other processes (such as the memory of life experiences) associated with it. In other words, it would be the cognition related with

the mood state and not the affect itself (the emotional experience) that influences selective memory (Higgins, Rholes and Jones, 1977; Higgins and King, 1980). These two mechanisms –recall dependent upon general mood state and memory prepared only cognitively– are, of course, not incompatible.

Rholes *et al* (1987) tested both explanations, comparing the inducement of mood states using both phrases that primed affect –that is, the subjective experience and perception of somatic changes– and those that represented self-evaluations which made no specific reference to sensations or experiences. Examples of the first type of sentence would be: *I'm sad* or *My heart is heavy*, and of the second, *I've failed* or *I've made a fool of myself*. They found that both types of sentence were capable of producing changes in mood state, but that those based on self-evaluations had more influence on selective memory. The authors' conclusion was that affective experience (the subjective experience produced by mood state) is not relevant to the matters we are discussing here.

Within this line of work on induced mood states, the quest for a method that is at once simple, easy to administer, quick, and which would induce a strong and consistent mood state has provided the motivation for some research. The original method proposed by Velten continues to be widely used, though hypnotic induction has also been employed with good results (Bower, 1981; Natalie and Hantas, 1982), as we mentioned earlier. Nevertheless, these methods have not been without their critics. Another method, frequently used in clinical contexts, is that developed by Mosak (see Brewer, Doughtie and Lubin, 1980), in which subjects are asked to recall events from their own lives that have been especially sad or happy. Series of self-referential statements and autobiographical anecdotes have in common cognitive bases as causal factors of mood states. The procedures using one and the other approach, however, differ in that while autobiographical memories are individual and refer to feelings as they occurred in reality, the series of self-referential statements are general, and refer to feelings and thoughts in hypothetical situations.

The direct experience of failure or success has also been used to induce mood states –for example obtaining a result higher or lower than expected in a cognitive laboratory task (Edo, 1994). Another method used has been to have subjects listen to recorded stories that induce depressive states (Goodwin and Williams, 1982).

It would appear that, whatever the method used, it is not too difficult to obtain the results found in the litera-

ture. The majority of procedures presented have demonstrated their effectiveness, be it to different degrees, for inducing a depressed mood state and effects on behaviour congruent with such a state, assessed through activity (speed of writing, reckoning, etc.), through quantitative and prosodic aspects of speech, through ability and through motivation in problem-solving and non-verbal communication tasks –not to mention the effects on memory and recall already referred to.

Our opinion is that the preferred method should be as simple as possible, with the minimum of intervention and instructions from the experimenter, and as different as possible from the subsequent tests or tasks. Some methods require that the experimenter, directly or more subtly, asks the subject to feel sad or happy. This may influence the mood state self-report that the subject makes subsequently, since it introduces what is known as the experimental “demand effect”, that is, a situation in which the subject may emphasise that which he/she thinks may please the experimenter (Hulley and Cummings, 1993).

The method of inducing mood states by means of the showing of films with sad or happy content (or at least with content that is so considered by a majority of viewers) has the advantage that no special instructions are required that induce a subject to feel something in particular: participants in the experiment simply watch the films. Moreover, attention is guaranteed precisely because of the emotional content of the films and, given that it is visual and auditory material, there is less formal similarity with the memory tasks, which are based on read and written material.

Our objective is to examine the role of affect in recall bias resulting from mood state, using a method of non-self-referential induction. Specifically, the method used is the presentation of audiovisual material with sad or happy content. Our aim is to assess both the impact of these films on affect and the bias they can induce with regard to selective recall of emotionally-charged words. If the effect of mood states on selective memory is mediated by affect, we should find a correlation between magnitude of affective state and recall bias; in the opposite case no such correlation should exist.

METHOD

Subjects

The initial sample of subjects was made up of 50 student volunteers who received no type of reward or payment for their participation. One subject was subsequently excluded from the analysis after obtaining extreme sco-

res in the questionnaires assessing symptoms of anxiety and depression. The definitive sample was made up of 49 subjects, with a mean age of 21.5 years (Confidence Interval (CI) 95%: 20.7 to 22.2 years), of whom 40 were women (CI 95%: 68% to 91%).

Material

The material used in each experimental session included:

- *Beck's Depression Inventory, BDI*. We used the Spanish adaptation (Conde and Useros, 1976). This scale consists of a self-assessment inventory of 21 items, each of which includes between 4 and 8 manifestations graduated in increasing order of intensity of depressive symptoms. The items refer to aspects such as mood, pessimism, suicidal desires, social abandonment, indecision and weight loss, among others.
- *State-Trait Anxiety Inventory, STAI-E*. We used only the *state* form of the Spanish adaptation (Spielber, Gorsuch and Lushene, 1982), which contains 20 items that measure on a 4- point Likert scale (where 0 corresponds to 'none' and 4 to 'high') the general level or general state of anxiety.
- *The Multiple Affect Adjective Check List - Revised, MAACL-R* (Zuckerman and Lubin, 1985). We used a translation made by ourselves of the 132 adjectives in the list. There were two versions, one in the masculine form and another in the feminine, and the adjectives were printed on a single sheet, in three alphabetically-ordered columns. From this list the subject had to indicate as many adjectives as he/she wanted that described his/her state at that moment. The scoring system was much simpler than in the original, given that adjectives were classified in just two groups: positive, or pleasant, and negative, or unpleasant, and the number of adjectives from each group marked by each subject was counted. Since the numbers of adjectives in each group were unequal (72 negative and 60 positive), the number of adjectives marked by each subject in each group was divided by the number of adjectives in that group and a corrected score obtained, which was used in all subsequent analyses. As the scores obtained in this way are not standardised for the Spanish population, the data have only been used for comparing the responses of subjects participating in this study, without extrapolating conclusions to the general population.
- *Immediate recall test*: For this test five different lists were used. These lists were formed of 7 words whose content evoked positive emotions, 7 words

whose content evoked negative emotions and 7 neutral words, distributed randomly. The presentation of the lists was made using a slide projector.

- *Videotapes with emotional content*. This material consisted of: a clip from a Spanish TV documentary about "*child slavery in the world*", of some 15 minutes' duration (this film was used to induce a negative –depressive or sad– mood in the subjects) and an excerpt from the Woody Allen film "*Everything you always wanted to know about sex (but were afraid to ask)*", of similar duration to the other clip, and which was used to induce a positive (euphoric or happy) mood state. Selection of these materials was made from a list of possible excerpts with the following characteristics: running time of 10 to 15 minutes, with sad or happy content (this emotional character being the most salient feature of the excerpt, over and above informative or other aspects), and suitable for the type of subject participating in the study. In addition to that of the authors, the opinion was sought of a further colleague from the faculty who was aware of the study's requirements; the two clips were chosen unanimously by this selection group.

Procedure

The study was carried out collectively over five scheduled sessions in a lecture room of the Psychology faculty during teaching hours. Each subject attended a single session according to his or her timetable. It was attempted to make session numbers as equal as possible, with the smallest being 7 and the largest 15.

At the beginning of each session subjects were provided with a booklet containing the questionnaires to be filled out and blank sheets on which to write down the words recalled in the memory tasks. The material was put in order according to the sequence of the tasks, and subjects were requested not to look at any of it until they received instructions from the experimenter.

At the beginning of the session participants were asked to complete the BDI and STAI-E questionnaires. A first memory task was then administered, consisting in the presentation of 5 lists of 21 words each (7 with positive emotional valence, 7 with negative valence and 7 neutral words), projected onto a screen. Viewing time for each list was 30 seconds, after which 45 seconds were allowed for subjects to write in their booklets as many words as they remembered from the list. This procedure was repeated for each of the 5 lists.

Once these preliminary tasks had been administered

subjects were shown one of the selected films. The order of presentation of these excerpts was balanced in the different sessions. In the first, third and fifth sessions the sad sequence was shown first; in the second and fourth sessions it was the happy film that was shown first. There was no indication that order of presentation of the clips affected subjects' responses.

Immediately after seeing the film, subjects were administered the MAACL-R adjective task, indicating which adjectives best described them at that moment. After this adjective task a second memory test was administered. The same words as used at the beginning of the session were projected, but distributed randomly in five new lists (which again contained 7 positive, 7 negative and 7 neutral words).

Subsequently, the other film excerpt was shown, and the same steps followed as with the first excerpt: administration of the MAACL-R and a third memory test, for which 5 further word lists were drawn up, following the procedure as above.

At the end of this experimental session the subjects were thanked for their participation and asked not to discuss its content with their colleagues.

RESULTS

Subjects obtained normal scores on the BDI and STAI-E questionnaires. 84% of them obtained a total score on the BDI of 10 points or less, and none scored a total of more than 8 points on the STAI-E. Only in one case was an extreme score found: 18 points on the BDI, which led to the exclusion of this subject's data from the subsequent analysis.

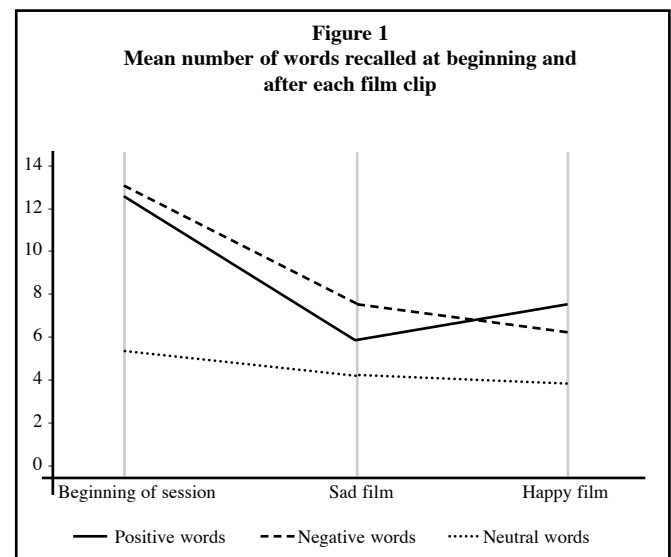
In the first place it was checked whether the showing of the film clips had been effective as a procedure for inducing emotions. In order to do this we compared the positive and negative adjectives from the MAACL-R list that the subjects had marked after watching each excerpt (see Table 1). The statistical analysis was carried out through comparison of means with the Student-Fisher *t* test. The mean of positive adjectives marked (Row 1) was higher after watching the happy clip than after the sad one ($t=5.10$; $P<0.0005$), and the mean of negative adjectives marked (Row 2) was higher after watching the sad film ($t=7.83$; $P<0.0005$). However, it was also observed that subjects marked more positive than negative adjectives both after watching the happy excerpt (column 1: $t=10.34$; $P<0.0005$) and after the sad one (column 2: $t=2.28$; $P=0.027$).

To check the assumption that a positive emotional state in subjects favours general recall, whatever the emotio-

	Happy film	Sad film
Positive adjectives	0,3961 (0,239)	0,2499 (0,214)
Negative adjectives	0,0368 (0,052)	0,1645 (0,125)

nal content of the words, an analysis of variance was carried out with paired data using the total words recalled at the beginning of the session and after watching each of the two clips. Results showed that the mean of the total of recalled words differed between the first stage (beginning of the session), the second and the third (sad and happy films) ($F=235.16$; $P<0.0005$). Comparisons carried out, corrected in accordance with Bonferroni, indicated that the difference in number of words recalled for each excerpt ($d=18.7-18.4=0.3$) was not statistically significant ($t=0.68$; $P=0.501$). However, the total mean number of words recalled before watching either of the film clips was statistically superior to the mean number of words recalled after seeing the happy excerpt ($d=30.2-18.7=11.5$; $t=18.2$; $P<0.0005$; CI 95%: 7.25 to 9.05) and the sad one ($d=30.2-18.4=11.8$; $t=16.28$; $P<0.0005$; CI 95%: 7.35 to 9.42).

Once it had been confirmed that recall of the group of words was not affected by the mood state induced, the next step was to check the hypothesis that recall of words with emotional content is favoured if this content is congruent with that of the film presented immediately before. In order to do this, we carried out a factor analysis of variance with paired data of the results summarised in Table 2 and represented in Figure 1.



	Neutral words	Positive words	Negative words
Beginning of session	5,90	12,12	12,20
Happy film	4,388	7,878	6,429
Sad film	4,469	6,143	7,755

It was observed that after watching the happy film clip the words with positive emotional content were those best remembered ($F=24.84$; $P<0.0001$). Keeping the type of film constant and applying the appropriate corrected comparisons it was confirmed that the mean number of words recalled with positive emotional content was superior to that of recalled words with negative emotional content ($t=2.55$; $P=0.014$) and of recalled neutral words ($t=7.74$; $P<0.0005$), and that the mean number of words recalled with negative emotional content was superior to that of recalled neutral words ($t=4.38$, $P<0.0005$).

After watching the sad clip, the words with negative emotional content were those most recalled ($F=17.34$; $P<0.0001$). The applied comparisons indicated that the mean number of words with negative emotional content recalled was superior to the mean number of words with positive emotional content ($t=2.55$; $P=0.014$) and neutral words ($t=2.89$; $P=0.006$) recalled, and that the mean number of words with positive emotional content recalled was superior to that of neutral words recalled ($t=7.40$; $P<0.0005$).

Analysing the results obtained at the beginning of the session (before watching the film clips) it was found that the words with emotional content were better recalled than the neutral words ($F=17.34$; $P<0.0001$). The comparisons applied indicated that the average number of words with negative emotional content recalled was similar to the mean number of words with positive emotional content recalled ($t=0.12$; $P=0.90$). Similarly, the mean number of words with positive emotional content recalled was superior to that of neutral words recalled ($t=5.66$; $P<0.0005$), and the mean number of words with negative emotional content recalled was also superior to that of neutral words recalled ($t=11.30$; $P<0.00005$).

Keeping the emotional content of the words constant, it was observed that there were no significant differences between the mean numbers of neutral words recalled after each of the two film clips ($t=0.24$; $P=0.813$).

However, the mean number of words with positive emotional recalled was superior after watching the happy film ($t=3.78$; $P<0.0005$), and the mean number of words with negative emotional content recalled was superior after the sad film ($t=2.81$; $P=0.007$). Moreover, it was found that the mean number of words recalled (whatever their content) was always statistically superior at the beginning of the session (before watching the films).

A significant interaction was found between the number of positive and negative words recalled after watching each film clip ($t=3.73$; $P=0.00051$).

The following step consisted in examining the relationship between the number of adjectives marked on the MAACL-R adaptation and the number of positive or negative words recalled in the memory tests. Although both variables are clearly influenced by the content of the film clips, there is no appreciable correlation between them (see Table 3).

Finally, with the aim of checking whether prior mood state influenced the results, we calculated the correlation matrix and the level of bilateral significance of the scores obtained on the BDI and STAI-E with the rest of the dependent variables. The results were not significant except in two cases: the number of positive adjectives chosen after watching the happy film clip presented a negative correlation ($r=0.30$, $P=0.017$) with the score obtained on the BDI, and the number of negative adjectives chosen after watching the happy film presented a positive correlation ($r=0.39$, $P=0.003$) with the score obtained on the STAI-E.

DISCUSSION

The first result worthy of comment is that each film clip induced a different affective state. Such a statement is based on the score obtained for the adapted MAACL-R list of adjectives, from which subjects have to choose words describing their current mood. Although there is

	Happy film		Sad film	
	Positive words	Negative words	Positive words	Negative words
Positive adjectives	0,0733 ($P=0,617$)	-0,2683 ($P=0,062$)	0,0955 ($P=0,514$)	0,0423 ($P=0,773$)
Negative adjectives	0,0949 ($P=0,517$)	0,0683 ($P=0,641$)	0,0950 ($P=0,516$)	0,0714 ($P=0,626$)

no doubt that subjective expression of mood state was different after each clip and congruent with their content, it is also true that the intensity of affect induced by each film, especially the sad one, was no more than moderate, since in either case the number of positive adjectives marked was superior to the number of negative adjectives marked. A possible interpretation of this result would be to postulate that people's neutral or normal state tends more to the positive than the negative, and that the effect of the sad film would have been, rather than inducing a negative state, to reduce the magnitude of this supposedly happy or positive normal state. In any case, it would seem that for the type of subject participating in this study –university students– it is easier to induce happy mood states than sad ones.

Moving on to analyse the effects on recall of words, we see that the results coincide with those generally obtained in the literature in this area (Cohen, Eysenck and Levi, 1986). It seems clear that words with emotional connotations are normally recalled more easily than neutral ones. We have also seen that the first time the memory test is carried out, recall is better than the two subsequent times, possibly due to proactive interference, since the subject is attempting each time to remember the same words but in a different order (Crouse, 1971). Nevertheless, these differences in recall between the first test and the subsequent ones do not affect the differential results according to type of film.

Mood state did not influence in an appreciable way the total quantity of recall, but it did affect the number of emotionally marked words, and this effect was congruent with film content: whilst in the first test there were no differences between positive or negative words recalled, after the happy clip more positive than negative words were recalled, with the opposite effect being observed after the sad clip. Thus, these results confirm the notion that recall bias produced by congruence between subject's mood state and the emotional content of words can be observed even though the mood state induced is weak; put another way, it is not necessary to induce really intense mood states in order to observe this phenomenon.

If we look at the correlations between number of positive and negative adjectives marked by subjects and number of positive words and negative words recalled, we see that they amount to practically nil. This gives greater force to the supposition that they are two independent effects. It would appear that recall bias does not depend on the subject's affective experience at time of recall.

These results, taken overall, support the hypothesis of Rholes *et al* (1987), which assumes that the effect of mood states on recall, and possibly on other cognitive processes, depends not on the intensity of the affective experience, but mainly on the cognitive context activated. The presentation of sad situations appears to facilitate the processing of information associated with sad situations, *without the subject necessarily feeling particularly sad*. Obviously, it must be recognised that our data does not rule out the role of affect in emotionally intense situations; rather, it simply demonstrates the possibility of the effect of emotional situations on cognitive processing irrespective, or relatively independently, of the emotional or affective experience. That this state has been induced by means of a film, and with no specific instructions, seems to us to lend greater force and ecological validity to this result.

The fact that the scores on anxiety and depression influenced the adjectives marked on the MAACL-R and not the words recalled confirms what has been stated above. Also, this result is congruent with the fact, already observed in the literature on the topic and mentioned by Matthews and MacLeod (1994), that variables of state of an emotional nature influence the link between emotion and selective processing of information in an interactive way, contributing to the modulation of the intensity of mood state.

We believe that the data from this study can help to analyse the way people who do not feel strong affect cope with emotional situations. Attempts have been made to explain this type of reaction through various concepts, such as repression (Byrne, 1964), avoidance (Krohne, 1993) or alexitimia (Martínez Sánchez, 1995), which, while differing among themselves, have in common the notion of the absence of the experience and expression of emotions in situations that require them. It is clear, too, that this absence of affect is of decisive importance in the process of coping with situations of stress. In our case it has been demonstrated that normal subjects can think as though they were sad without feeling especially sad. Applying this possibility to people who do not express affect, or do not feel it in manifestly emotional situations, our data opens the door to the idea that blocking out the perception of one's own mood state or its expression does not necessarily imply also blocking out the cognitive effects of 'sad' situations of threat or failure, and contributes to the search for ways of assessing emotional impact independently of the affective experience.

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