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CHAPTER 4

MOOD CONGRUENT MEMORY BIAS OF INDIVIDUALS WITH DEPRESSED MOOD AND ANXIETY

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INTRODUCTION

Mood congruent memory (MCM) is the tendency for individuals to encode and retrieve affectively-valenced information which is congruent with their prevailing mood state more easily than other information (Dalgleish & Watts, 1990; Ellis & Ashbrook, 1989). For example, a depressed or sad individual tends to remember negative or unpleasant memories better than positive or happy memories.

Four main theories have offered explanations for the effect of depression and anxiety on memory, viz., network activation theory, schema theory, resource allocation theory and multilevel processing theory. According to Bower's (1981) network activation theory, mood at encoding biases the way in which unique pathways are set up in memory, and mood at recall determines the emotion nodes used to locate specific memory pathways. According to schema theory (Beck, 1976; Beck & Emery, 1979, 1985; Greenberg & Beck, 1989) selective attention to, and interpretation of, the external environment and specific memories are determined by those schemata which are activated at the time of perception or remembering. Particular mood states are associated with the activation of specific schemata. Depression is associated with schemata

concerning negative aspects of the self, the world and the future and so depressed individuals selectively remember such information. Anxiety is associated with schemata concerned with danger and threat and anxious individuals selectively attend to and remember threat oriented stimuli. According to resource allocation theory, disruptive mood states, such as depression or anxiety reduce the amount of capacity available for processing information and so depressed or anxious individuals perform more poorly on memory tasks (Ellis & Ashbrook, 1987; Solso, 1995). Finally, Williams et al. (1997) argue that while anxiety is associated with an attentional bias, reflecting changes in processing at the passive, automatic priming level, depression is associated with an explicit memory bias involving problems at the effortful elaboration level. According to this multilevel theory, anxiety should mainly affect performance on implicit memory tasks, while depression would have its main effect on explicit memory tasks. Williams et al's theory is the only formulation which predicts differential effects for anxiety and depression on different types of memory task.

Seven well controlled studies which examined the effects of mood on memory have been published in English language journals in the past 15 years. Three studies focused on the effects of depression (Ruiz-Caballero & Gonzales, 1994; Watkins et al, 1992, 1996), three on anxiety (MacLeod, Mathews & Tata, 1986; Matthews et al, 1989; Mogg, Mathews & Weinman, 1987), and only one focused on both depression and anxiety (Greenberg and Beck, 1989). Only three of the seven focused on both implicit and explicit memory (Matthews et al, 1989; Ruiz-Caballaero & Gonzales, 1994; Watkins et al, 1992). In both studies on depression where explicit memory tests were given, an MCM bias occurred on the explicit memory task for depressed participants (Ruiz-Caballaero & Gonzales, 1994; Watkins et al, 1992). In 2 of the 3 studies on depression where implicit memory was assessed, for depressed participants a priming effect was observed and an MCM bias occurred with depressed individuals remembering more negative words (Ruiz-Caballaero & Gonzales, 1994; Watkins et al, 1996;). In both of the studies on anxiety in which explicit memory task were used, no

MCM bias occurred and so anxious participants did not recall more threatening stimuli (Matthews et al, 1989; Mogg et al, 1987). In the single study of anxious individuals, in which implicit memory was assessed, for anxious individuals, a priming effect occurred and an MCM bias was observed with anxious individuals remembering more threatening stimuli (Matthews et al, 1989). In the only study in which attention deployment was assessed, for anxious individuals an attentional bias for threatening stimuli occurred (MacLeod et al, 1986). In the only study comparing depressed and anxious individuals, Greenberg and Beck (1989) found an MCM bias for the depressed participants on an explicit memory task but not for the anxious individuals. In summary, these results suggest that an MCM bias may occur in anxiety for threatening stimuli on implicit memory tasks but not explicit memory tasks. They also suggest that an MCM bias may occur in depression for negative stimuli on explicit memory tasks, and in some instances on implicit memory tasks. These empirical results are more supportive of the predictions of Williams et al's (1988) multilevel information processing theory than of the other theoretical positions outlined above (Beck, 1976; Beck & Emery, 1979; 1985; Bower, 1981; Ellis & Ashbrook, 1987; Greenberg & Beck, 1989; Solso, 1995). However, the results are not entirely consistent with Williams et al's (1997) predictions insofar as depressed individuals showed an MCM bias on implicit memory tasks.

To date no studies have been reported in the literature on MCM bias in individuals with significant levels of both anxiety and depression. Williams et al's (1997) theory predicts an MCM bias for negative words on explicit memory tasks and an MCM bias for threatening words on implicit memory tasks since elaboration is the main process affected by depressed mood, and automatic preconscious registration of threat is the principal process affected by anxiety. The present experiment was designed to test these two hypotheses. A third hypothesis was that individuals without clinically significant levels of depression or anxiety would show an MCM bias for positive words on both implicit and explicit memory tests. A final hypothesis was that there would be no difference

between a normal control group and the group with elevated levels of depression and anxiety for the amount of neutral words produced in implicit and explicit memory tests.

METHOD

Participants

Fifteen individuals who displayed clinically significant levels of depression and anxiety, and 20 individuals without significant mood problems participated in this study. The characteristics of both groups are given in Table 4.1. The two groups were screened from a population of 150 undergraduate psychology students at University College Dublin. Cases whose Beck Depression Inventory (BDI; Beck et al, 1988) scores were 14 or more and whose Burns Anxiety Inventory (BAI; Burns, 1990) scores were 19 or higher were allocated to the experimental group. Control group participants had BDI scores of 8 or less and BAI scores of 18 or less.

Table 4.1. Demographic and clinical characteristics

		Group	
		Depressed & Anxious	**Control**
	N	15	20
Gender	**Male**	4	8
	Female	11	12
Age	**M**	20.67	22.21
	SD	2.47	5.60
BDI	**M**	18.67	3.00
	SD	4.42	2.38
BAI	**M**	33.20	8.90
	SD	12.67	4.59

Instruments

The Beck Depression Inventory (BDI; Beck, Steer & Garbin, 1988). This 21 item questionnaire assesses the cognitive, affective, behavioural and somatic aspects of depression and yields a single depression score. A four stem forced choice response format is used for each item, with item scores varying from 0 to 3 and the sum of scores from all responses gives the overall depression score. Overall BDI scores vary from 0-63. Scores greater than 14 reflect moderate level of depression and this cut-off score of 14 was used to screen participants for the present study.

The Burns Anxiety Inventory (BAI; Burns, 1990). This 33 item questionnaire assesses cognitive, affective and somatic symptoms of anxiety. Each item is evaluated using a four stem forced choice response format, with item scores varying from 0-3, and a single anxiety score is calculated by summing all scores. Overall BAI scores vary from 0 to 99, with scores between 16 and 30 indicating a

moderate level of anxiety. In this study a cut-off score of 19 was used to screen for cases with clinically significant levels of anxiety.

Table 4.2. Master word list

	Negative	Physically Threatening	Socially Threatening	Positive	Neutral
1	Bleak	Assaulted	Accused	Admired	Broad
2	Deterred	Crippled	Blamed	Capable	Cellular
3	Empty	Fatal	Degraded	Confident	Delicate
4	Forlorn	Fractured	Disgraced	Efficient	Descriptive
5	Frustrated	Harm	Embarrassed	Elegant	Evident
6	Gloomy	Hostile	Humiliated	Fulfilled	Filled
7	Hopeless	Incurable	Ignored	Healthy	General
8	Inadequate	Injured	Insulted	Outstanding	Historic
9	Disconnected	Lethal	Judged	Pleasant	Interior
10	Joyless	Mutilated	Mocked	Secure	Layered
11	Miserable	Paralysed	Mortified	Supported	Linguistic
12	Terrible	Strangled	Offended	Talented	Measurable
13	Unhappy	Suffocate	Ridiculed	Valuable	Organic
14	Unfortunate	Tortured	Sneered	Worthy	Recorded

Word list. This list of 70 stimulus words, which is given in Table 4.2, included 14 words in each of the following five affectively valenced categories: negative or depressive, physically threatening, socially threatening, positive and neutral. Words for the list were selected from a larger pool of words on the basis of classification decisions made by 15 independent raters. The larger pool of words included stimuli used in previous research and word lists generated specifically for this study (Mathews et al., 1989; Watkins et al., 1996). Only those words for which 85% of raters agreed into which category they fell were retained for the final list of 70 words. The master list of 70 stimulus words was divided into two lists of 35 words, with each list containing 7 words from each of the 5 different affective categories. These two lists were matched closely on word length and frequency. With respect to word length, words in list 1 had an average of 7.3 (SD=1.5) letters and those in list 2 had an average of 7.8 (SD=1.5) letters. With respect to word frequency, an analysis of the frequency distribution of the stimulus words indicated no significant difference between the two lists, with frequencies for both lists of words ranging from 9 to 24 occurrences per half million words (Kucera & Francis, 1967).

Word stem list. Each of the 70 stimulus words in the master word list had a unique three-letter stem. The stems of all 70 words were printed in a list on a response form, in a fixed pseudorandom order, with the constraint that there should be no more than 2 stems from any word content condition occurring in sequence.

Procedure

Half of the participants were presented with List 1 during the initial encoding stage of the experimental procedure and the other half was presented with List 2. Each of these lists contained 35 words, with 7 in each of the 5 categories mentioned above. All participants were given the following instruction "Your task is to study the words in the following list". After five minutes, learning was interrupted and the lists were collected. Following the encoding task, participants performed an unrelated distracter task. They were presented with a white sheet of paper and instructed as follows "Draw three objects or items that come to mind!". After four minutes, drawing was interrupted and the sheets of paper were collected. Following this, the participants received the word-stem completion task which is an implicit memory test. The word stem list contained stems for all 70 words from the master list. The participants were instructed as follows: "Complete the word-stem with the first word that comes to mind that begins with those three letters. Note: Do not use proper nouns or foreign words". The solution to 35 of the word-stems had been previously presented or primed through studying either List 1 or List 2, whereas the solution to the other 35 word-stems had not been previously presented and so were unprimed. After all the participants had completed this task, the lists were collected. Next, the participants engaged in the free recall task which is an explicit memory test. In this test, the participants were presented with a blank A4 sheet of paper and were instructed as follows: "Write down all the words that you can remember from the

list you were presented with in the learning task". No time limit was set for this test.

RESULTS

To check that the wordstem completion task was a valid measures of implicit memory, for all 35 participants mean numbers of correctly completed word stems from the primed and unprimed lists in each of the five word categories were compared using a series of five dependent t-tests. From Table 4.3 it may be seen that participants produced significantly more primed target words than unprimed target words across all five affective word categories. A significant priming effect occurred and so the wordstem completion task was interpreted as a valid measure of implicit memory.

Table 4.3. Mean number of word stems completed for primed and unprimed words

Category		Primed Words	Unprimed Words	t
Negative	**M**	2.43	0.86	5.57***
	SD	1.38	0.88	
Physically threatening	**M**	2.23	0.83	4.52***
	SD	1.42	0.89	
Socially threatening	**M**	3.06	1.66	4.60***
	SD	1.45	1.03	
Positive	**M**	2.47	0.88	5.60***
	SD	1.52	1.02	
Neutral	**M**	2.60	0.94	5.61***
	SD	1.31	0.94	

Note: N=35. ***p<.001

A series of five 2X2 Mixed Model ANOVAs was conducted to examine the impact of mood (Depressed and anxious Vs Control) and memory processes tested (Implicit Vs Explicit) on the number of correctly recalled words for each of the five word categories (negative, physically threatening, socially threatening, positive and neutral). From Table 4.4 it may be seen that the memory processes tested had a significant effect on the number of words recalled in all five affective

word categories. In all five instances, tests of implicit memory processes led to more words being correctly remembered compared with tests of explicit memory.

Table 4.4. The effects of mood and memory processes tested on recall

Affective word category	Memory Process Tested		Group		ANOVA Effects		
			Depressed & Anxious (N=15)	Control (N=20)	Memory Process	Mood	Mood X Memory
Negative	**Implicit**	**M**	3.00	2.00	8.19**	8.70**	0.00
		SD	1.25	1.38			
	Explicit	**M**	2.33	1.35			
		SD	1.18	0.99			
Physically threatening	**Implicit**	**M**	3.00	1.65	10.50*	4.50*	6.21**
		SD	0.85	1.49			
	Explicit	**M**	1.48	1.45			
		SD	1.25	1.15			
Socially threatening	**Implicit**	**M**	3.53	2.70	58.02**	8.04**	0.00
		SD	1.30	1.49			
	Explicit	**M**	1.53	0.70			
		SD	0.92	0.73			
Positive	**Implicit**	**M**	2.00	3.30	10.71**	12.60**	0.43
		SD	1.25	1.49			
	Explicit	**M**	1.27	2.20			
		SD	0.88	1.15			
Neutral	**Implicit**	**M**	2.27	2.85	22.83*	0.10	6.40**
		SD	1.16	1.39			
	Explicit	**M**	1.67	0.90			
		SD	1.05	0.91			

*P<.05, **p<.01

From Table 4.4 it may also be seen that mood had a significant effect on the number of words remembered in both implicit and explicit memory tests for three of the five affective word categories. The depressed and anxious group remembered more negative and socially threatening words and fewer positive words than the control group in both implicit and explicit memory tests.

Significant Mood X Memory processes interactions occurred in the analyses of data involving the physically threatening and neutral word lists. From Figure 4.1a it may be seen that the anxious and depressed group remembered more physically threatening words in the implicit memory condition compared with the control group, while no such difference occurred for the explicit memory

condition. From Figure 4.1b it may be seen that for the anxious and depressed group, there was a negligible difference between their performance on tests of implicit and explicit memory for neutrally valanced words. In contrast, for the control group the difference was highly significant with far more words being remembered in the implicit compared with the explicit memory condition.

Figure 4.1. Memory for physically threatening and neutral words

Figure 4.1a. Physically threatening words

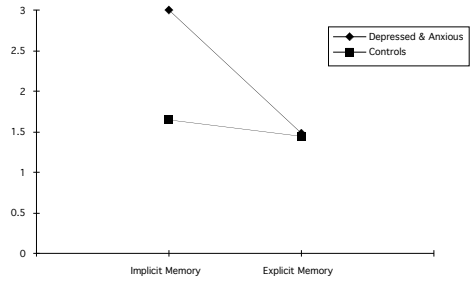
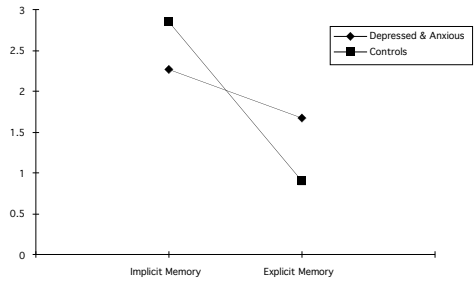


Figure 4.1b. Neutral words



DISCUSSION

Support was gained for all four hypotheses tested in this experiment. The depressed and anxious group showed an MCM bias for negative words on the explicit memory test and an MCM bias for physically threatening words on the implicit memory test, while the control group showed an MCM bias for positive words on both implicit and explicit memory tests. In addition there was no overall difference between the two groups' performance on implicit and explicit memory tests for neutral words.

However, there were also unexpected findings which are not entirely consistent with Williams et al's (1988) multilevel theory of mood and memory.

First, the MCM bias for negative words was not exclusive to tests of explicit memory but also occurred on tests of implicit memory. This finding is consistent with Ruiz Caballero & Gonzales' (1994) results but not those of Watkins et al (1992). Second, the MCM bias for socially threatening words was not exclusive to tests of implicit memory but also occurred on tests of explicit memory. This finding differs from those of Mathews et al (1989) and Mogg et al (1987). Third, the difference between performance on implicit and explicit memory tests for neutral words was far larger in the control group than in the depressed and anxious group. The first two of these findings suggest that the impact of mood on cognitive process including attention and memory is probably more complex than suggested by WIlliams et al (1988). For certain classes of stimuli and certain mood states both automatic and strategic cognitive processes may be implicated. Teasing out these effects is an important goal for future research in this field. The third unexpected finding may reflect more efficient functioning of implicit and explicit memory processes in controls compared with depressed and anxious individuals. That is, controls may automatically register and remember neutral words with considerable ease, but then not devote psychological resources to explicitly learning and remembering these because of their irrelevance. In contrast, depressed and anxious individuals may be less efficient at automatically registering neutral stimuli, but when such stimuli are registered they may be less economical with their psychological resources and squander these on unnecessary elaboration of irrelevant neutral stimuli.

Despite Coyne's (1994) strong arguments to the contrary, in our opinion considerable caution is required in generalising the findings from this analogue study to clinical populations. The present study requires replication with clinical cases co-morbid for anxiety and depressive disorders to evaluate the degree to which the effects observed in this study occur in individuals with clinical syndromes.

SUMMARY

Fifteen individuals with clinically significant levels of both depressed mood and anxiety were compared with 20 demographically similar controls on implicit and explicit memory tests for recall of negative, physically threatening, socially threatening, positive and neutral word stimuli. Compared with the control group, the depressed and anxious group remembered more negative and socially threatening words and fewer positive words in both the implicit and explicit memory conditions. They also recalled more physically threatening words in the implicit memory test. These findings lend partial support to Williams et al.'s (1997) integrative multilevel theory of mood and memory.

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