Behavioural and Cognitive Psychotherapy, 1998, 26, 323–338
Cambridge University Press. Printed in the United Kingdom

ATTENTIONAL BIAS IN MORBID JEALOUSY

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Abstract. Morbid jealousy is a potentially disruptive condition that has received little attention. A cognitive-behavioural formulation of morbid jealousy proposes that such individuals possess schema in which there is a perceived threat of loss of their sexual partner. An attentional bias in morbid jealousy was investigated by using a dichotic listening task and the modified Stroop test. Twenty subjects who had met criterion for morbid jealousy were compared with 20 control subjects. In the dichotic listening task, word pairs were presented to each ear simultaneously, and subjects shadowed one channel while identifying target words. Ten percent of the words presented to the non-attended channel were target words, of which half were jealousy-related and half were not. Subjects were not told that the target words were only presented in the unattended channel. In the modified Stroop test, subjects had to name the colour of a series of Os, colour words, emotional words, control neutral words and jealousy-related words. As predicted, jealous subjects showed a superior performance in detecting jealousy-related stimuli in the dichotic listening task and an impaired performance in the colour naming of jealousy-related stimuli in the modified Stroop test, compared to the control subjects and the control conditions. The results of this study add support to the formulation that morbid jealousy involves an attentional bias towards jealousy-related information and this may have clinical implications.

Keywords: Morbid jealousy, attentional bias, dichotic listening, modified Stroop.

Introduction

Morbid or pathological jealousy is a disorder in which an individual holds an abnormal belief or conviction that their sexual partner is or will be unfaithful. The condition is classified as pathological because the belief is held on inadequate grounds (Gelder, Gath, & Mayou, 1989, p. 334). It has been described in clinical surveys and classified in a number of ways (Todd & Dewhurst, 1955; Shepherd, 1961; Seeman, 1979; Cobb,

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1979; Mullen & Maack, 1985; de Silva, 1997). Tarrier, Beckett, Harwood and Bishay (1990) outlined a cognitive-behavioural formulation of neurotic morbid jealousy. They described morbid jealousy as a condition in which there is an unfounded suspicion of sexual and emotional rivals and a fear of losing the partner manifested by cognitive, affective and behavioural responses. Intrusive thoughts and suspicions about the partner's fidelity are central to the disorder; these include thoughts and images about the partner's whereabouts and activities and even what their partner would prefer to be doing. Confirmatory behaviour, which are overt behaviours aimed to substantiate the suspicions, are related to these pre-occupations. These may include accusations and interrogations, checking on the partner's whereabouts, examination of letters and clothing, and more extreme measures such as following the partner or hiring a private detective to do so (Shepherd, 1961; Mooney, 1965; Seeman, 1979; Mullen, 1990; Tarrier et al., 1990). Other associated problems include: the avoidance of jealousy provoking situations such as social gatherings; the experience of high levels of personal distress and disruption to the patient's daily functioning; a high risk of domestic violence and persistent feelings of insecurity; depression and low self-esteem (Tarrier et al., 1990; Tarrier, Beckett, Harwood, & Ahmed, 1989).

Following Beck and colleagues' cognitive model of psychopathology (e.g., Beck, Rush, Shaw, & Emery, 1979), Tarrier et al. (1990) hypothesized that morbid jealousy is maintained by the manner in which information is processed. They proposed that morbidly jealous individuals possess schema that involve a perceived threat of "loss of a partner to a rival . . . through the partner's infidelity" (p. 322). A central feature of the condition is the individual's propensity to make errors in the perception and interpretation of information relating to their partner's fidelity. Situations that can be potentially misinterpreted provoke jealousy in persons whose expectations bias them towards construing such events as incriminating evidence of their partner's infidelity.

An aspect of the cognitive model of jealousy is that such individuals selectively attend to threat-relevant information. Isolated pieces of information, such as social situations, words, a photo in a magazine, or even perceived changes in the partner's behaviour, are all potentially salient events that may activate an upsurge of jealous thoughts relating to fears of loss of the relationship through the partner's infidelity. Thus the hypervigilant scanning of the environment for evidence of infidelity may be a manifestation of an attentional bias.

There has been considerable interest in recent years in investigating information processing in various emotional disorders and the use of cognitive-experimental paradigms in such investigations (MacLeod & Mathews, 1991). Attentional allocation tasks have been used to test predictions that there will be preferential processing of schema congruent information. It is theorized that the way an individual distributes a finite pool of attentional resources reflects a schema-driven process that filters schema congruent information (Neisser, 1967, 1976). Hence, attentional allocation tasks involve the competition for attentional resources.

Attentional allocation can be examined by a dichotic listening task, a method initially developed to assess rival models of attention (Reed, 1991). Individuals are presented with a competing verbal message (e.g., word pairs or sentences) and are instructed to repeat (i.e., shadow) the message presented to one ear, while ignoring the message to the other unattended ear (Triesman & Geffen, 1967). The extent that distractor stimuli

presented in the unattended channel attract the individual's attention is thought to indicate the pertinence of these stimuli to the individual's cognitive schema.

The dichotic listening task can be modified to include emotionally relevant distractor stimuli and can be used to demonstrate how limited attentional resources can be diverted to schema-relevant information. It provides evidence for an attentional bias towards emotionally relevant stimuli through an enhanced performance towards these stimuli. Studies investigating anxiety have presented fear-relevant stimuli to the non-attended ear and demonstrated a superior detection of disorder-relevant stimuli in patients suffering from agoraphobia, social phobia and obsessional-compulsive disorder (Burgess et al., 1981; Foa & McNally, 1986).

Another approach that has been commonly used to investigate attentional biases examines the extent to which threat distractor words interfere with performances on timed tasks, such as colour naming. In the classic Stroop test, individuals are asked to name the colour ink in which the word is printed while ignoring the meaning of the word itself. It has consistently been shown that subjects take longer to name colours that are antagonistic to the colour name (e.g., RED written in green ink). Slower colour naming is assumed to reflect an attentional bias towards the meaning of the stimulus word. In the modified Stroop, emotionally relevant distractor stimuli are included and the extent to which threat-distractor stimuli disrupts colour naming reflects the salience of the fear-related stimuli. Hence, stimuli that relate to the fears or concerns of the individual result in longer latencies as the stimulus meaning competes for attentional resources. Significantly, slower colour naming of psychopathology-related words have been reported in patients suffering from spider phobia (Watts, McKenna, Sharrock, & Trezise, 1986), dental anxiety (Muris, Merckelbach, & de Jongh, 1995) generalized anxiety disorder (Mathews & MacLeod, 1985; Mogg, Mathews, & Weinman, 1989), panic attack disorders (Ehlers, Margraf, Davies, & Roth, 1988; McNally, Riemann, & Kim, 1990), social phobia (Hope, Rapee, Heimberg, & Dombeck, 1990), post-traumatic stress disorder (Cassiday, McNally, & Zeitlin, 1992; Foa, Feske, Murdock, Kozak, & McCarthy, 1991; McNally, Kaspi, Riemann, & Zeitlin, 1990; Harvey, Bryant, & Rapee, 1996; Thrasher, Dalgleish, & Yule, 1994), obsessive-compulsive disorder (Lavy, van Oppen, & van den Hout, 1994), eating disorders (Lovell, Williams, & Hill, 1997) and chronic pain (Pincus, Fraser, & Pearce, 1998).

In this study we use both a dichotic listening test and the modified Stroop test to investigate whether morbidly jealous individuals preferentially select jealousy related information. Using these two experimental tasks, predicting opposite effects, we hypothesize that jealousy subjects, when compared to controls, will: (i) detect jealousy-relevant targets in the dichotic listening test with greater speed; and (ii) will exhibit slower colour naming reaction times to the jealousy words. Such results would support the hypothesis that morbidly jealous individuals have a readiness to attend to jealousy related cues.

Method

Subjects

Experimental group. Subjects were recruited through media advertisement in New South Wales, Australia, over a period of three years. As the majority of respondents

contacting the project were female it was decided to include female subjects only so as to increase homogeneity of the sample. Subjects were initially screened by post using the Prestwich Jealousy Questionnaire (PJQ, Beckett, Tarrier, Intili, & Beech, 1992; Intili, 1993). This questionnaire consists of two parts each of 30 items covering: cognitive, affective and behavioural aspects of jealousy, including preoccupation with infidelity; avoidance of perceived risk situations; confirmatory behaviour; and aggression. Forty-nine items are scored on a 5-point scale (0–4) and two items on a 3-point scale (0–2). Nine items provide further information but are not included in the score. Factor analysis suggested the presence of seven factors: suspicion, jealousy expression, behavioural effects of jealousy, violence/guilt, anger, checking and irritability (Beckett et al., 1992). Initial analysis suggested that the following cut-offs were applicable: no jealousy (0–33), mild jealousy (34–50), moderate jealousy (50–99), severe jealousy (100–132) and very severe jealousy (133 and above). A score of 50 was chosen as the cut-off for a clinical problem of jealousy. All subjects who scored above this cut-off were assessed to be morbidly jealous at clinical interview. Examples of PJQ items include: Become suspicious or jealous when your partner goes out alone on a social or work event? Physically threatened your partner because you felt jealous? Followed your partner or turned up unexpectedly to check on them because you were suspicious or jealous? Hired someone or got an acquaintance to follow your partner or report on their behaviour? Do you believe that most people would be unfaithful if they had the chance? How frequently do you have thoughts that your partner is sleeping with someone else even though you know it is not true?

Subjects scoring 50 or above on the PJQ were then interviewed to confirm that jealousy was a clinical problem and that they acknowledged that their jealousy was unfounded. Furthermore, subjects were required to experience all of the following as a consequence of their jealousy: (1) significant interference with daily function; (2) uncontrollable preoccupations, fears or suspicions about their partner's infidelity, experienced at least daily; (3) at least one type of confirmatory behaviour that accompanied the fears, weekly; (4) a minimum duration of 12 months or an occurrence with at least two partners. Finally, subjects were recruited into the study if: (i) they were not suffering from a psychotic illness; (ii) were heterosexual.

From the 90 respondents who were initially screened, 20 subjects were recruited, having met the required criteria. The mean age of the sample was 28.3 ($SD = 7.9$) years and their mean Occupational Rating was 3.8 ($SD = 0.35$). The Daniel's Prestige Scale (Daniel, 1983), which provides an Occupational Rating, was used to determine SES as it is the most commonly used scale for this purpose in Australia. A high score indicated a less prestigous occupation. The mean score on the PJQ was 79 ($SD = 14.2$, range of 53–104).

Subjects were also given the following questionnaires: Brief Anger-Aggression Questionnaire (BAAQ; Maiuro, Vitaliano, & Cohn, 1987), Beck Depression Inventory (BDI, Beck, 1978) and the Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988). The mean results on these inventories were; BAAQ 14 ($SD = 4.4$), BDI 19 ($SD = 10.3$) and BAI 17 ($SD = 6.7$) indicating scores outside the normal range for all three inventories.

Control group. The control group consisted of 20 subjects who were matched for age, gender and social economic status (SES). To ensure the absence of jealousy, subjects

were required to score 20 or less on the PJQ. From the initial sample of 29, nine subjects were discarded because they scored greater than 20 on the PJQ. Their mean age of the control sample was 27.1 (9.3), mean Occupation Rating 3.7 (0.26) and mean PJQ score 12.7 (6.5) with a range of 3–20. The experimental and control groups did not differ on age or occupational rating but significantly differed on the PJQ scores ($p < .0001$).

Experiment 1: Dichotic listening test

Subjects performed a dichotic listening task in which word pairs, spoken by a female voice, were presented simultaneously to each ear at a set volume. They were instructed to shadow one ear and also to decide, as rapidly as possible, whether a target word was presented. The target words were only presented in the non-attended channel but subjects were unaware of this. They were instructed to call out the target word irrespective of the channel in which it had been presented. Thus if they detected a target in the non-attended channel they should call out this word instead of the attended word. A forced choice procedure whereby subjects specified whether or not a target word had been presented was adopted. All subjects were exposed to two conditions: jealousy-relevant and neutral. The jealousy-relevant condition consisted of 100 trials of word pair presentations. Ten of these trials contained jealousy targets which occurred randomly in the unattended channel. The remaining 90 trials served as neutral filler words. The control condition was arranged in an identical manner except that the target words were neutral. Thus the experiment was designed to encourage the subject to maintain a criterion that was free of response bias by having 10% of signal trials only and by using a forced choice method.

Materials

Jealousy-relevant condition. This condition consisted of 100 word pairs (e.g., cattle-island, seafood-paddock, edit-gala) in which five jealousy-relevant words were embedded. All word-pairs were matched for word length and usage frequency (Carol, Davies, & Richman, 1971). The five jealousy words (BETRAYAL, INFIDELITY, JEALOUSY, DISHONEST, DECEIT) were presented twice throughout the set of 100 word-pairs, so that target words appeared in 10% of the trials. They were fully randomized with the constraint that no two target words occurred within five words of one another. Target words were selected on the basis of pilot work indicating that they were relevant threat stimuli for morbidly jealous individuals.

Control condition. This consisted of a further 100 words in which five neutral target words (RAINSTORM, DECORATION, SAUCE, SUNFLOWER, TRIBE) were embedded. In an attempt to control for word categorization as a potential confounding variable (Mogg et al., 1987) subjects were informed that these neutral target words reflected an anthropological theme. Each of these targets was presented twice throughout the set of 100 word-pairs, being randomized and matched as in the jealousy-relevant condition.

https://doi.org/10.1017/S1352465898264046 Published online by Cambridge University Press

Practice condition. The practice condition consisted of 20 word-pairs in which five target words (LOCOMOTIVE, MATCHBOX, SPORT, LOCAL, VOCABULARY) were embedded. These words were randomized and matched as in the above two conditions.

Apparatus

The experiment was run from a Hypercard stack on an Apple Macintosh IIci with a 13 inch monitor. The stimuli were constructed over a three month period. Words were recorded individually onto the Macintosh IIci computer through the MacRecorder and the Hypersound 2.0 application. Many trials were taken to synchronize the word pairs. Arista MHD-2A headphones connected to the Macintosh IIci computer presented the dichotic stimuli to the subject. A card appeared on the central monitor with a *start* button and a *target* and *non-target* box. The reaction time to the mouse click in the *target* or *non-target* box was recorded in milliseconds. Feedback as to whether the response was correct or incorrect was provided.

Procedure

Subjects were initially screened for possible hearing deficits. This involved the detection of a series of tones decreasing in frequency and intensity. The jealousy and control conditions were presented twice to each subject. To counterbalance any recording differences and to avoid potential ear advantage effects, subjects were first instructed to shadow the words presented to the right ear and then the headphones were reversed and the subjects were presented with the same word-pairs but instructed to shadow the left ear. Hence, a total of 200 word-pairs was presented in the jealousy condition with 20 jealousy targets occurring throughout the condition, and likewise with the control condition. Target words always occurred in the unattended channel and were presented at a set volume (number 3 on the speaker control volume of Macintosh IIci) and in one of two orders, counterbalanced as follows: Order 1 = Jealousy, Control, Jealousy, Control; Order 2 = Control, Jealousy. Control, Jealousy.

The dichotic listening task was of 90 minute duration on average and subjects were allowed 10 minute breaks at the end of every 50 trials. Subjects were asked to call out the words they heard as they shadowed the attended channel but to call out a target word irrespective of the channel where it was presented. Following these instructions, a list of practice target words printed on a sheet of A4 paper was then placed in the subject's view and subjects were asked to read the words aloud. To ensure that the subjects were aware that these were the target words, the experimenter also read the words out loud. The subjects were then given the following instructions:

> You determine the presentation of words by pressing the start button (start pad pointed to with the mouse). Each time you call out the word from your right ear, you must decide if you hear a target word. If you think you hear a target word, call out that word and click the target box (target box pointed to with mouse). If you do not think that you hear a target word, click the non-target box (non-target box pointed to with mouse). You must make a decision and click either box,

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otherwise you cannot go on to the next pair of words. A "Correct" or "Incorrect" response will appear in a top centre box after you have made your decision. Make your decision as quickly and accurately as possible.

Subjects were not told in which ear the target word would be presented so as not to facilitate target detection. Twenty practice trials were then given. If subjects were not familiar with using a mouse, which was the case for three of the jealousy subjects, they were given further practice until they became accustomed to it. The experiment then continued with the jealousy target words placed in the subjects' view during the jealousy condition and the neutral targets in their view during the Control condition.

The purpose of the experiment was not revealed to the experimental group until they were de-briefed at the completion of the experiment. To ascertain their degree of jealousy at the time of testing, they completed the PJQ prior to testing. Participants were offered treatment in the University Psychology Clinic after participating in this project. To determine if awareness that the experiment was related to jealousy influenced the detection of jealousy-relevant words, the control group was divided into two conditions. Half the control group (Control A) were told that the experiment was about designing treatments for jealousy and were asked to complete the PJQ prior to testing. The other half (Control B) were informed that the study was investigating attention and were not asked to complete the PJQ until after the completion of the experiments.

Experiment 2: Modified Stroop test

Materials

Following the procedure of Watts et al. (1986), six colour naming tests were used.

(i) *Simple colour naming test*: Each item consisted of a series of five Os. Each of these series was printed in one of five colours (red, orange, green, brown and blue).
(ii) *Stroop colour words*: Each item was one of five coloured colour words (red, orange, green, brown and blue). No word was presented in its own colour.
(iii) *McKenna emotional words*: The items were five words with a strong emotional connotation (CRASH, FAIL, FEAR, DEATH, GRIEF).
(iv) *McKenna control words*: The items were five neutral words matched on the number of letters and frequency of usage to the McKenna emotional words (CLOCK, GATE, NOTE, THUMB, FIELD).
(v) *Jealousy target words*: The items were five words with a strong jealousy connotation (SUSPICIOUS, RIVAL, UNFAITHFUL, CHEATING, FALSE).
(vi) *Jealousy control words*: The items were five neutral words matched for word length and frequency of usage to the jealousy target words (NEEDLEWORK, FLASK, HELICOPTER, METAPHOR, STAIR).

The McKenna emotional words were used to control for the effect of general threat and stress connotation of the words and for the effect of words that are semantically related that may cause an increase in the latency of colour naming. Both the McKenna emotional words and the jealousy words had a set of control words that matched them for word length and frequency of usage.

Each test consisted of 20 presentations of the five items randomly ordered so that no colour appeared twice in succession in the 100 item presentation. In each test, each item was printed in one of five colours (red, orange, green, brown and blue).

Apparatus

The Stroop tests were run on the True Basics application and the stimuli were presented to the subjects via an Apple Macintosh IIci computer with a 13 inch colour monitor. Stimulus words appeared in the centre of the computer screen in upper case letters (Geneva font in 48 point print). They ranged from 2 cm to 5 cm blocks. The space bar was pressed to move on to the next stimuli and the response latencies for each stimuli were recorded.

Procedure

Subjects were first tested for colour blindness by being asked to name a number of coloured rings presented in the five colours used in the experiment. They all identified the colours accurately. Subjects were then given a practice trial consisting of 20 colour words (red, orange, green, brown and blue) printed in their own colour. Subjects were given the further option of more practice trials to familiarize themselves with the equipment but nobody requested this. Subjects were then randomly allocated to two order conditions so that the emotional and jealous stimuli were varied to prevent any order effect. The conditions were as follows: (1) simple colour naming, Stroop, McKenna emotional, McKenna control, jealous control, jealous target; (2) simple colour naming, Stroop, McKenna control, McKenna emotional, jealous target, jealous control.

Subjects then commenced the tests. For the simple colour naming task they were instructed to call out the stimulus colours and to move through the list as quickly as possible. The following standard instructions appeared on the screen:

> Your task will be to call out the colour in which the rings are printed on the screen. When you have called the colour, press the space bar in order to bring up the next set of rings. Using the space bar, move through the list as quickly and as accurately as you can.

For the remaining colour naming tasks they were told to ignore the meaning of the words and to call out the colours in which the words were printed as quickly and as accurately as possible. The following instruction appeared on the screen:

> Your task now will be to call out the colour in which the following words are printed on the screen and then press the space bar.

Errors were not recorded as they were infrequent and usually corrected before the space bar was pressed. During pilot work it was decided to use the motor response of pressing the space bar to record reaction time rather than voice activation. The latter was found to be inaccurate due to over-sensitivity to extraneous noise.

Results

Experiment 1: Dichotic listening task

The main dependent variables, reaction time and d prime (d') were analysed by using an analysis of variance (ANOVA) with repeated measures, with groups (jealousy subjects and control subjects) as the between subjects measure and target word type (jealousy target and neutral target) as the within subject repeated measure.

Reaction time

Reaction times from error trials were excluded from the analyses. Therefore, the mean reaction time was calculated by summing the observations within and across subjects and by the number of observations. In this design, the mean of the five targets in each condition (i.e., of the 5 jealous words and the 5 neutral words) were obtained separately, and then a mean of means completed for each subject and a grand mean was completed across subjects.

The mean reaction time for the jealous group was 2667 (*SD* 424) milliseconds for the jealousy target words and 3253 (*SD* 594) for the control target words. The mean reaction time for the matched control was 3526 (*SD* 557) for the jealousy target words and 3267 (*SD* 537) for the control target words.

Repeated measures analysis of variance of reaction time revealed a significant main effect for groups ($F_{1,38} = 7.63$, $p < .01$). Jealous subjects were quicker to react. There was a significant interaction between subject groups and target words ($F_{1,38} = 35.5$, $p < .001$). Further investigation of this interaction was carried out by analysing the simple main effects (Keppel, 1973). Examining the differences between the subject groups for each condition revealed that the groups differed for the jealousy target words ($F_{1,38} = 28.2$, $p < .001$), but not for the neutral target words ($F_{1,38} = .01$, NS). Further, the effect of target words was significant for the jealousy subject group ($F_{1,38} = 36.44$, $p < .001$) and for the control group ($F_{1,38} = 5.73$, $p < .05$). Figure 1 illustrates that the jealousy group showed faster reaction times to the jealousy words, whereas the control group showed faster reaction times to the control words.

D prime

D prime (d') is a measure of sensitivity and accuracy and is defined as the difference between the means of the signal and noise (SN) and noise (N) alone distributions divided by their standard deviations (McBurnery & Collings, 1977). The d' is obtained by converting the probability of hit and false alarm into z scores. The z associated with the false alarm is subtracted from the z of the hit rate to give the value d'. The d' mean for the jealous group was 5.95 (*SD* .86) for the jealousy targets and 4.54 (*SD* .99) for the neutral targets. The mean d' for the control group was 4.59 (*SD* 1.14) for the jealousy targets and 4.68 (*SD* 1.18) for the neutral targets.

There was a significant main effect for group ($F_{1,38} = 4.37$, $p < .05$) and a significant interaction between subject group and target word ($F_{1,38} = 22.88$, $p < .001$). Reducing this interaction to a simple main effect revealed significant differences between subjects for jealous target words ($F_{1,38} = 18.35$, $p < .0001$) but not for neutral targets ($F_{1,38} = 0.18$,

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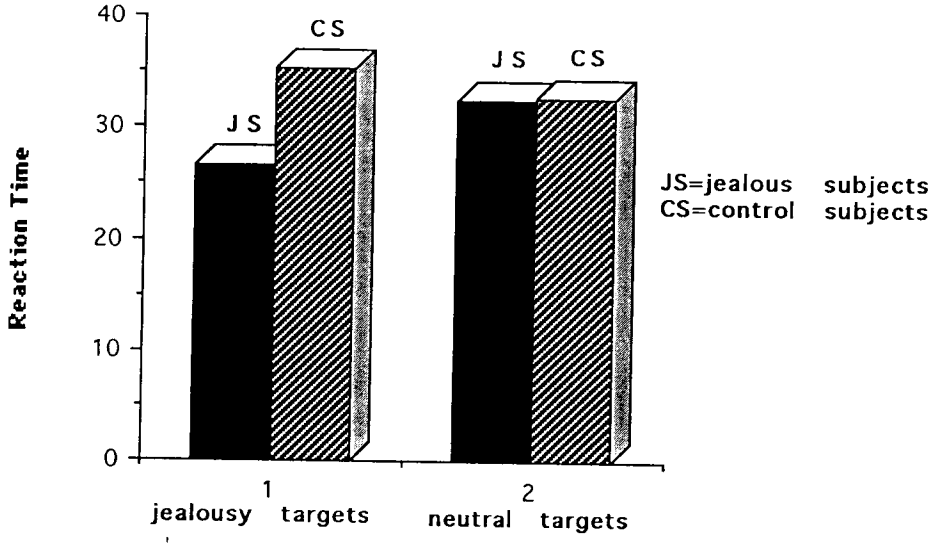

Figure 1. Mean reaction time in dichotic listening test

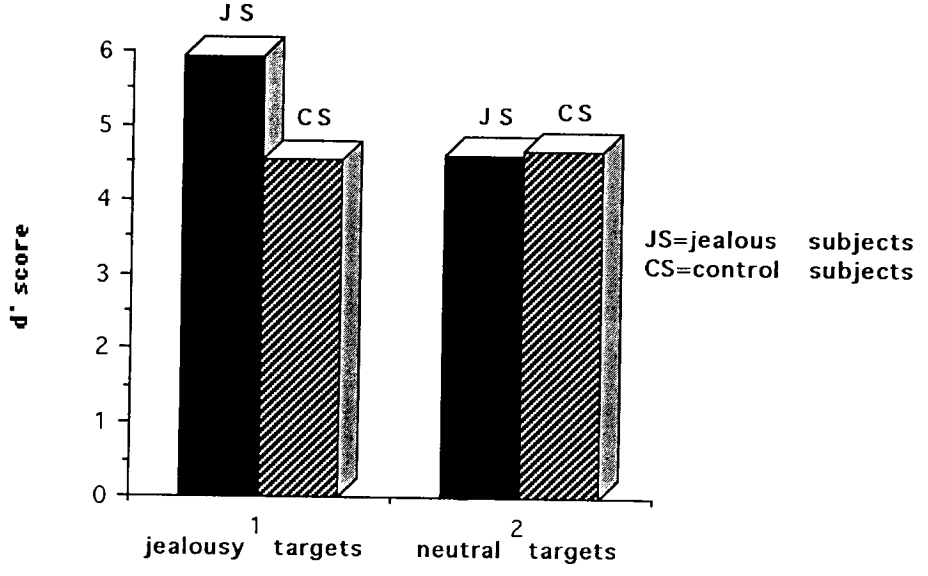

Figure 2. dprime (d') prime mean scores for jealousy and neutral target words

NS). Moreover, the effects of the target words were significant for the jealous subjects ($F_{1,38} = 40.2$, $p < .0001$) but not for the control subjects ($F_{1,38} = 0.18$, NS). Thus the jealousy subjects detected the jealous target words with greatest accuracy, whereas the controls showed no such preference.

Prior knowledge

To test the effect of prior knowledge of the experiment, the Control group was divided into two groups: Control A had prior knowledge of the purpose of the experiment

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Table 1. Mean reaction time in seconds to the six Stroop conditions for jealous and control subject groups

	Jealous subjects	Control subjects
Colour patches	207.66 (12.91)	188.69 (10.24)
Stroop colour naming	252.16 (8.34)	227.71 (11.25)
McKenna emotional words	207.34 (9.46)	196.07 (11.13)
McKenna control words	193.10 (9.23)	185.76 (9.8)
Jealousy target words	218.47 (10.17)	187.91 (10.13)
Jealousy control words	197.92 (9.52)	189.34 (10.68)

whereas Control B did not. An independent *t*-test revealed that there was no significant differences between Control A (mean RT to jealous target words = 3377.8 msecs (*SD* = 502.27)) and B (3600.1 (*SD* = 639.26)) ($t_{18} = 0.87$, NS) indicating that RT was not significantly affected by awareness of the experiment.

Experiment 2: Modified Stroop test

The reaction times for the six conditions of the Stroop test (simple colour naming, Standard Stroop, McKenna Emotional and Control Words, Jealousy Target and Control Words) are presented in Table 1. The reaction times to the jealous and controls targets are presented in Figure 3.

Two-way ANOVA indicated that there was no significant overall difference between the jealous and control subject groups ($F_{1,38} = 2.515$, NS), but there was a significant difference between conditions ($F_{1,38} = 10.641$, $p < .002$) and a significant interaction between groups and conditions ($F_{1,38} = 17.961$, $p < .001$). Scheffe tests indicate that there

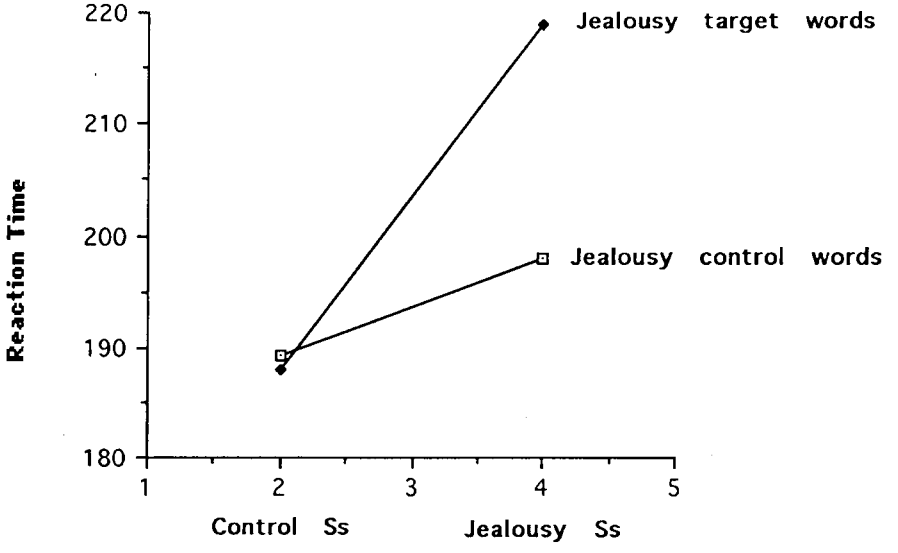

Figure 3. Mean Stroop reaction time to jealousy target and control words

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were significant differences between the jealousy subject and control groups on the standard Stroop test and on the jealousy target words. Reference to Table 1 and Figure 3 indicates that the jealous subjects had significantly slower colour naming reaction times for the standard Stroop and jealousy target words.

Discussion

The results of this study appear to support the hypothesis that jealous individuals selectively attend to threat-relevant stimuli. In the dichotic listening task, jealous subjects had significantly faster reaction times to jealousy target words than to control targets, and faster reaction times than the control subjects. Conversely, the control subjects showed slightly faster reaction times to the control target words compared to the jealousy targets, but this difference was not significant. In the modified Stroop test, jealous subjects were significantly slower at colour naming target words compared to the other word control conditions and compared to matched controls.

The results of these findings are consistent with previous studies investigating attentional biases, for anxiety disorders and suggest that jealous subjects preferentially attend to stimuli related to their concerns. However, other possible explanations of these results need to be considered.

A response bias is a potentially confounding factor in studies of selective attention. Although jealous subjects detected more threat-relevant targets with greater speed and accuracy in the dichotic listening test, it might be argued that they were better at guessing the presence of jealousy targets and therefore had a readiness to respond more quickly to these targets. To minimize such a bias the following precautions were taken. Firstly, the occurrence of targets was limited to 10%, thus encouraging subjects to move the mouse cursor to the non-target box rather than the target box location. Secondly, subjects did not know in which channel target words would be presented and they were required to specify the target word by calling it out rather than just responding in the affirmative. Thirdly, results of the signal detection analysis indicated that the jealous group's sensitivity to the jealous words was genuine since there was a significant d' effect. Moreover, the beta values were markedly greater than one, indicating that subjects were confident with their decision rather than merely guessing.

Another potential confounding factor in the dichotic listening experiment was the word categorization. Subjects have been found to respond more quickly to categorized words than non-categorized words (Mogg, Mathews, & Weinman, 1989). Although subjects were told that the words in neutral targets reflected anthropological themes, the neutral targets were less closely categorized than jealousy because selection of these words was limited by word length and frequency of use. Hence, it was difficult to exclude the possibility that semantic relatedness influenced the detection of jealousy targets in jealous subjects. Interestingly, the control subjects showed a slight, but not significant, preference in the detection of neutral targets. It is difficult to comment on this as this issue was not addressed in the study, but it may suggest that semantic relatedness did not influence performance.

An unexpected finding in the dichotic listening experiment was the high percentage of target words recognized in the unattended passage by all subjects. Although the jealous subjects detected more jealous-related targets than did controls (98% vs. 85%),

over 85% of targets were detected across both groups. Foa and McNally (1986) found that 68% of threat targets vs. 10% neutral targets were detected in the unattended channel. The high percentage of target detection could be a result of more closely related neutral targets in the present study compared to previous studies. Alternatively, the fact that subjects determined their own presentation rate could have made the task, hence target detection, easier.

There is also the question of whether being familiar with the purpose of the study influenced the results. This was addressed by dividing the control group into two separate conditions: control A had prior knowledge, and control B did not. As this manipulation had no effect, it can be concluded that sensitivity to jealousy-related stimuli was not attributable to knowledge that the study concerned jealousy. This is consistent with previous reports that familiarity does not enhance target detection (Foa & McNally, 1986).

General threat words were included in the modified Stroop test to control for an increased sensitivity to generally stress-related stimuli in jealous subjects. Although both groups were slower to colour name the McKenna emotional words than the appropriate control words, there was no evidence that the jealous subjects were significantly slower than controls on these general threat words. This indicated that the results were not due to a general impairment of performance in the jealous subjects caused by the negative connotations of the stimuli. One limitation in controlling for emotionality is the exclusion of positive emotional words, although other studies investigating this issue have indicated that positive emotional words unrelated to concerns do not cause interference (Mogg, Kentish, & Bradley, 1993; Thrasher et al., 1994).

Perhaps the main limitation of the current findings is that the methods used (i.e., dichotic listening and the modified Stroop) in the study might not have been the most direct measure of an attentional bias. Cognitive theories propose that an attentional bias is mediated by automatic pre-attentive processes that do not involve conscious awareness. Although the methods used involved competition of attentional resources of relevant information, presumably presented outside the subjects' focus, the possibility that selective processing was mediated by deliberate and conscious strategies cannot be discounted. Further reaction time constituted the dependent variable for both the dichotic listening and the colour naming tasks. The vocal responses and the time taken to move the cursor mouse to the appropriate location on the screen for the dichotic listening, and the vocal response and the time taken to press the space bar in the Stroop, despite being equal in both groups and therefore controlled, may have introduced a confound and therefore not have been the most sensitive measures of attentional bias. A modified version of the probe detection task (e.g., Mathews, Ridgeway, & Williamson, 1996) may prove a more direct measure of attentional bias in future studies.

Finally, there is the question of the selection of the clinical sample as well as the nature of the group itself. The Prestwich Jealousy Questionnaire (PJQ), which was used for the initial screening, has no detailed psychometric data available. To avoid misclassification of subjects, potentially morbid jealousy sufferers identified by the PJQ were also interviewed by an experienced clinician and had to fulfil stringent criteria for entry into the study. The scores on questionnaires indicated that elevated levels of anxiety, anger and depression verifies the clinical nature of this group but raises the

question of the influence of secondary pathology in response to jealousy cues. Control for these emotional disorders would be desirable in future studies.

In conclusion, the aim of this study was to empirically evaluate one of the predictions generated by a cognitive-behavioural formulation of morbid jealousy; specifically whether morbidly jealous individuals preferentially process jealousy-related information. The results presented here suggest that morbid jealousy may be characterized by an attentional bias to threat-relevant cues and this may have implications for its assessment and treatment. First, it may serve as a useful diagnostic feature or criteria. Second, treatment may beneficially be aimed at reducing the continual selection of jealousy-relevant cues that may contribute to the maintenance of the condition. The extent to which attentional bias is reduced would prove useful in treatment evaluation, and could be an index of future relapse risk (Lavy et al., 1994). Currently, it is unclear whether CBT can alter automatic processing, given that it deals with conscious phenomena. Whether such treatment can reduce, if not eliminate, a preconscious bias for threat is a question that remains for future investigation.

Acknowledgements

Some of the results described in this report were presented by the first author as part of a thesis submitted to the Department of Psychology in partial fulfilment of the requirements of the Master of Psychology degree at the University of Sydney, 1993. This research was, in part, supported by a small project grant from the University of Sydney to the second author. The authors would like to thank: Rosemary Elliott, Gillian Haddock and Adrian Wells for their helpful comments on earlier drafts of this paper and to Cyril Latimer for his invaluable assistance with the equipment.

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