Delusions, cognitive biases and emotional priming

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Abstract

Evidence has been accumulated to suggest that cognitive biases in reasoning and information processing would play an important role in the mechanism of delusions (Bentall, 1994; Garety & Hemsley, 1994). Bentall and his colleagues further argue that abnormal cognitive biases would reflect a defensive function in people with delusions; deluded individuals would have much in common with depressives and their defensive function may serve to protect themselves against underlying low self-esteem. Therefore, it was assumed that when the defensive function can be bypassed, deluded individuals would be seen similar to depressives. The aim of the present research was to investigate the proposed defensive mechanism in deluded individuals and to assess a new potential methodology for the investigation of the defensive mechanism. It was suggested that the emotional priming paradigm would be a promising approach, and this was used in addition to a questionnaire-based approach.

The results of the present research partly supported the hypothesis of the defensive mechanism in deluded patients. On an implicit questionnaire which is supposed to bypass the defensive function, the deluded subjects showed more internal attributions for negative events than did the normal subjects (Experiment 1). In the emotional priming task, the deluded subjects were slower to reject negative adjectives than the normal subjects (Experiment 2). However, the other results appeared to be unclear in their support for the hypothesis, thus further research should be required. The emotional priming paradigm was then carefully examined in a student population (Experiment 3). The results of this study indicated that the emotional priming paradigm was indeed a potential methodology, but also suggested that further refinements for clinical use are needed.

Declaration

This research was carried out by the author between April 1995 and December 1996 at University of Durham. I declare that the work contained in this thesis is my own work and that no part has been previously submitted in candidature for any other degree.

Statement of Copyright

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A Brief Outline of the Thesis

Although a considerable number of cognitive and social models for normal beliefs have been proposed, it is surprising that until recently little research on abnormal beliefs have been carried out by experimental psychopathologists (Winters & Neale, 1983). Bentall (1994) suggested two possible reasons for the failure to develop models of abnormal beliefs with the findings gained from normal psychology: first, simply because of a general failure of communication between psychologists and psychopathologists; second, because of psychopathologists' long-held preference for investigating broadly defined syndromes rather than studying particular psychopathological phenomena. In recent years, however, a number of researchers have advocated the study of particular symptoms of madness, such as "delusion" rather than the study of hypothetical syndromes, such as "schizophrenia", either because there has remained doubts about the scientific validity of the traditional diagnoses for psychosis (Bentall, 1993; Bentall, Jackson & Pilgrim, 1988), or because the symptoms per se are interesting research topic (Persons, 1986).

Recently, the attempt to explain the nature and mechanism of abnormal beliefs such as delusions has been one of the most interesting challenges to social and cognitive psychologists. Actually, psychological literature on explanations of abnormal beliefs can be divided into two broad approaches. First, some investigators following Maher's suggestion (1974) have proposed that delusions are the product of a rational attempt to interpret abnormal experiences, and that the perceptions of deluded patients are anomalous but their reasoning processes are almost always normal. On the other hand, the second type of explanations has focused on "cognitive biases" in reasoning and information processing, which are thought to play an important role in the aetiology and the maintenance of abnormal beliefs (e.g., Bentall, 1994; Brennan & Hemsley, 1984; Hemsley & Garety, 1986; Huq, Garety & Hemsley, 1988). Although there have been reports that some delusions are related to abnormal perceptions (Maher & Ross, 1984), it is clear that delusions often develop without either abnormal experiences or perceptual anomaly (Chapman & Chapman, 1988).

Despite the comparatively small amount of empirical research on this area, findings have been accumulated to suggest that people with delusions exhibit certain cognitive biases in reasoning and information processing and these cognitive biases would play an important role in the nature and the holding of delusional beliefs (Bentall, 1994; Garety & Hemsley, 1994). In particular, Benatall and his colleagues have focused on the social reasoning processes in patients with delusions, because many delusions expressed by patients in clinics tend to concern themes that reflect the patients' position in the social environment. Using the Attributional Style Questionnaire (ASQ: Peterson, Semmel, von Baeyer, Abramson, Metalsky, & Seligman, 1982), the work of Bentall and his colleges (e.g., Kaney & Bentall, 1989; Bentall, Kaney & Dewey, 1991) showed that patients with delusions have attributional biases in which they attribute negative outcomes to stable and global causes as do depressed patients, but unlike depressed patients, they make attributions for negative outcomes external to themselves. This pattern of external attributions for negative events is seen in healthy individuals who attribute negative outcomes to external causes and positive outcomes to themselves. This is regarded as "self-serving bias" to maintain self-esteem (more details of "self-serving bias" is given in Chapter 1). Kaney & Bentall (1992) found that the deluded patients also had a self-serving bias on the estimates of their control on computer games: the deluded patients reported more control in the win conditions than in the lose conditions, which was also found in normal subjects although in a moderate way.

The findings of these cognitive biases can be interpreted to suggest that people suffering from delusions would have a general cognitive style which is associated with delusions. Bentall and his colleagues have suggested that patients with delusions would have low self-esteem like depressives, however, unlike depressed patients, deluded individuals need to protect themselves from chronic feelings of low self-esteem. Therefore, cognitive biases exhibited by deluded patients would be the product of their general cognitive style activated by the need to defend themselves against negative feelings about the self. This cognitive mechanism in patients with delusions can be regarded as "defensive function", in order to defend deluded individuals against underlying low self-esteem (e.g., Bentall, 1994; Lyon, Kaney & Bentall, 1994). This suggestion parallels the hypothesis that

paranoia could be a defence against low self-esteem, therefore, might be regarded as a form of camouflaged depression (Zigler & Glick, 1988).

Lyon, et al. (1994) directly investigated the defensive mechanism in people with delusions by using two different types of questionnaires, ASQ and PIT (The pragmatic Inference Test: Winters & Neale, 1985). The ASQ directly asks subjects to give major causes of the hypothetical negative/positive situations involving subjects, and then to judge the causes in terms of internality, stability and globality. Thus, the ASQ requires subjects to make explicit judgements of causes of hypothetical situations involving themselves, which would activate defensive function in deluded patients. Conversely, the PIT asks such judgements implicitly, because it is presented as a memory test. Therefore, on the PIT, the defensive mechanism could be bypassed. Lyon, et al. (1994) found that the deluded patients showed a dramatic transition in style from a self-defensive bias on the ASQ to a self-blaming bias on the PIT, and concluded that these biases indicate the defensive attributional style in the deluded patients (more details of this study is presented in Chapter 1).

This thesis reports an examination of the defensive function in people with delusions following the arguments of Bentall and his colleagues. The defensive function will be investigated by two different approaches. Firstly, adapting the procedure used by Lyon, et al. (1994), the ASQ and the PIT were chosen to use and the comparisons of the responses between these questionnaires will be examined. Secondly, a new experimental task will be carried out. This is "the emotional priming paradigm" which potentially would reflect both explicit and implicit judgmental processes on a self-evaluating task (extending the emotional priming paradigm to this area of research will be discussed in Chapter 1). As mentioned above, little experimental research has been carried out in this area of research, therefore, an attempt to apply the emotional priming paradigm should be valuable.

In this section, a brief outline of the arguments in this thesis have been presented, Chapter 1 presents these arguments more fully along with a selective review of recent research on cognitive biases in deluded patients. In addition, the emotional priming paradigm to use for this research will be considered in Chapter 1. Then, in the following chapters, the questionnaire-based study and the experimental study for investigating the defensive function will be presented.

Chapter 1 Cognitive Biases in People with Delusions and The Emotional Priming Paradigm

1.1 Overview

In recent years, research on abnormal beliefs has received increasing attention from psychologists, and researchers have advocated the investigation of cognitive processes involved in abnormal beliefs such as delusions (e.g., Hemsley & Garety, 1986; Kaney & Bentall, 1989; Bentall, et al., 1991; Garety, Hemsley, & Wessely, 1991). Evidence has accumulated to suggest that the nature and the mechanism of delusions may be explained by cognitive biases (e.g., Bentall, 1994; Garety & Hemsley, 1994; Dudley, 1996).

This chapter will present a selective review, following the arguments that cognitive biases in reasoning and information processing play an important role in the formation and maintenance of delusions. In particular it will focus on the arguments of Bentall and his colleagues. There is a relative lack of empirical studies in this area of research and it would benefit from new potential experimental approaches. In this chapter, "the emotional priming paradigm" will be considered as one such possible methodology.

1.2 Cognitive biases in people with delusions

1.2.1 Social reasoning biases

Bentall (1994) cautioned against dismissing delusions as completely meaningless. When studying cognitive abnormalities in patients suffering from delusions, their abnormal beliefs encountered in psychiatric clinics should be focused on. In fact, delusions tend to concern certain themes, particularly those related to the patients' positions in e social interactions (Kaney & Bentall, 1989; Bentall, 1994; Bentall, Kinderman, & Kaney, 1994, etc.). For this reason, Bentall and his colleagues have chosen Social Attributional Theory which provides a framework for understanding the explanations that individuals give for their own behaviour and the behaviour of other people. Depression has also been studied

from the viewpoint of attributional theory (e.g., Abramson, Seligman & Teasdale, 1978; Peterson & Seligman, 1984), and it has been suggested that depressed patients given the Attributional Style Questionnaire (ASQ: Peterson, et al., 1982) have a specific attributional style, making internal, global and stable attributions for negative social events involving themselves.

The first attempt to apply Social Attribution Theory to delusions was the study of Kaney & Bentall (1989). Based on the findings in depression, Kaney & Bentall (1989) predicted that patients suffering from delusions would also have a particular attributional style. This would be characterised by stable and global attributions for negative events like depressives, but unlike depressives these patients would have external rather internal attributions for negative events. The Attributional Style Questionnaire (ASQ: Peterson, et al., 1982) was given to the patients with persecutory delusions, depressives as psychiatric controls and normal subjects. The ASQ requires subject to think of possible causes for positive and negative events, and then to self-rate these causes on bipolar scales of internality, stability and globality. As predicted, the deluded subjects showed a particular attributional style similar to depressives, making stable and global attributions for negative events. However, in contrast to the depressives, they made abnormally external attributions for negative events. This finding was substantially replicated by Candido & Romney (1990).

Attributional analysis on delusions has been expanded in several ways. For example, Kinderman, Kaney, Morley and Bentall (1992) did further attributional analyses on the data of Kaney & Bentall (1989), together with new data from a further series of patients. Kinderman et al. (1992) asked five independent judges to blindly rate the subjects' actual causal explanations in terms of internality. These judges' ratings of internality were compared with the self-ratings by the subjects. It was found that the judges' ratings of internality on the subjects' actual explanations were relatively even-handed for both positive and negative events for all three groups of subjects (deluded, depressed and normal). However, the self-ratings by the deluded subjects showed that they gave more internal self-ratings of their attributions for positive events than for negative events, as did the normal subjects to a lesser degree. The depressed subjects' self-ratings were again

even-handed like the judges' ones. Kinderman et al. (1992) suggested that "...the deluded subjects had a particular tendency to bias their ratings of their own explanations of negative events towards the external and away from the internal (p.379)".

Bentall et al. (1991) investigated the deluded subjects' explanations for the behaviour of others in social interactions. Bentall et al. (1991) found that the deluded subjects, compared with the depressed and normal subjects, had a significant bias towards attributing negatively-valued actions to the actor rather than circumstances and the victim. This result seems to parallel the earlier findings of Kaney & Bentall (1989) that the deluded subjects were found to be unwilling to make attributions to themselves for negative social events in which they were the victims. In the study of Bentall et al. (1991), even when it is not the case that the deluded patients were victims, they were also unwilling to blame other victims. These findings suggest that the social reasoning of deluded patients could have a protective function (Bentall, et al., 1991).

1.2.2 Self-serving bias

Considering the previous findings obtained from attributional analyses, abnormal beliefs of deluded patients can be accounted for by assuming that they have an extreme form of "self-serving bias" (Kaney & Bentall, 1992; Kinderman, et al., 1992; Lyon, et al., 1994; Bentall, 1994). "Self-serving bias" has been termed by social psychologists, the tendency, widely observed in normal individuals, to attribute positive outcomes to self and negative outcomes to external circumstances to maintain self-esteem (Hewstone, 1989).

Kaney & Bentall (1992) directly tested this hypothesis by adapting the previous procedure of Alloy & Abramson (1979). The subjects were asked to estimate to what degree they believed they had control over winning or losing points on two computer games. Unknown to the subjects, the games were pre-programmed to yield "win" or "lose" outcomes. As predicted, the deluded subjects exhibited strong self-serving bias on their estimates of control, that is, they reported much more control when gaining points than when losing points. This bias was also found in the normal subjects but in a moderate way.

It was absent in the depressives who were more realistic and claimed little control in both win and lose conditions as had been found by Alloy & Abramson (1979).

Bentall et al. (1994) derived a self-concept model from Higgins (1987) in order to understand the self-serving bias. Bentall et al. (1994) proposed that people with delusions may have discrepancies between their perceptions of aspects of themselves. Depression was thought to reflect the discrepancy between actual-self and ideal-self (Scotte & O'Hara, 1993, cited in Bentall, et al., 1994). In addition, anxiety was found to be associated with actual-self/ought-self discrepancies (Scotte & O'Hara, 1993, cited in Bentall, et al., 1994). Bentall et al. (1994) suggested that persecutory delusions may result from an attempt to reduce the actual-self/ideal-self discrepancies at the expense of perceiving others as having a negative view of themselves. It was further proposed that the self-serving bias would reflect and maintain such cognitive abnormalities. On this view, Bentall et al. (1994) predicted that self-serving or self-protective bias would be absent when the self discrepancies are not directly activated.

1.2.3 Other cognitive biases

These findings mentioned above may imply the possibility that people suffering from delusions have a fragile self-concept and cognitive abnormalities in information processing (Kinderman, 1994). Bentall & Kaney (1989) used the emotional Stroop test in order to address this argument more directly. A form of emotional Stroop test was given to the deluded, depressed and normal subjects, which required the subjects to name the ink colours of paranoid words, depressive words, neutral words and meaningless strings of Os. Bentall & Kaney (1989) found that the deluded subjects took significantly longer to colour-name the paranoid words than the controls, showing that they were unable to avoid attending to the meaning of those words. In another study using the emotional Stroop paradigm (Kinderman, 1994), the deluded subjects demonstrated slowed colour-naming for both the positive and negative adjectives, although to a greater extent for the negative words. The deluded subjects rated negative trait adjectives as less self-descriptive when they were required to judge those adjectives as self-descriptive or not. It was concluded

that deluded patients have an attentional bias towards information related to the self-concept and incompatibility between interference and word ratings could reflect a self-defensive process in deluded patients.

Another type of research on information processing biases is investigation of recall bias. Kaney, Wolfenden, Dewey & Bentall (1992) required the deluded, depressed and normal subjects to recall stories which were either threat-related or non threat-related. It was found that the deluded subjects preferentially recalled threat-related material. This finding parallels the results of Bentall & Kaney (1989) where the deluded subjects showed ane attentional bias towards threat-related words. In a more recent study, Bentall, Kaney & Bowen-Jones (1995) employed a mixed list of words (threat-related, depressed-related and emotionally neutral words) which were given to the patients suffering from persecutory delusions, depressed controls, and normal subjects. The subjects were required to recall the words on the list immediately afterwards. It was found that the deluded subjects recalled fewer words overall than the normal subjects, and that there was a recall bias towards both threat-related and depressed related words in the deluded subjects but only towards depressed-related words in the depressed subjects. It was also found that the deluded subjects showed a significant tendency to repeat threat-related words compared to either depressed-related or neutral words.

These findings may suggest that deluded individuals have selective information processing biases towards threatening information in their attention and memory (Bentall, 1994), and that these biases could reflect a defensive process in deluded patients (Kinderman, 1994).

1.2.4 Defensive function

These cognitive biases in reasoning and information processing in people with delusions can be interpreted as deluded individuals having, in an exaggerated form compared with normal individuals, cognitive biases particularly in response to threat. Furthermore, these cognitive abnormalities serve to defend themselves when negative stimuli threaten their self-esteem (Bentall, 1994). This can be regarded as being consistent

with the suggestion of Zigler & Glick (1988) that delusion can be regarded as a form of camouflaged depression.

Lyon et al. (1994) directly investigated this defensive function in patients with delusions. Lyon et al. (1994) predicted that if there is a defensive bias in deluded subjects, they would show a self-serving bias only when they are required to make explicit attributions in negative situations. When defensive processes are not triggered, this bias should be absent and they would attribute negative outcomes to internal causes like depressives. In this study, an anglicised version of the Pragmatic Inference Test (PIT; Winters & Neale, 1985) and a parallel version of the ASQ (Peterson et al., 1982) were given to the deluded, depressed and normal subjects. A parallel version of the ASQ (ASQ pf) was especially developed for this study by the researchers based on the expanded ASQ (Peterson & Villanova, 1988) because of similarity of the PIT and the original ASQ. The PIT is an opaque test in which subjects are not aware of making attributions because the PIT is presented as a memory test. Attributions are tapped indirectly when subjects are required to make (attributional) inferences in their response to some test items. On the other hand, the ASQ pf directly requires subjects to consider the causes of hypothetical positive and negative events and then to judge their explanations. On the ASQ pf, the results were broadly consistent with the previous findings of Kaney & Bentall (1989) and Candido & Romney (1990), showing that the deluded patients made external attribution for the negative events. However, on the PIT, the deluded subjects made internal attributions for negative events and external attributions for positive events like the depressed subjects. These findings suggest that deluded individuals exhibit defensive attributional processes which serve to protect them against harboured feeling of low self-esteem.

Further interpretation of these findings proposed that these defensive processes would be triggered only when subjects are required to make an explicit judgement of blame (Kinderman et al, 1992). It has been suggested that implicit judgement and explicit judgement are sustained by different cognitive systems (Reber, 1989 ; Berry & Broadbent, 1988, all cited in Lyon, et al., 1994), and that self-related information presumably activated by attributional task is presented at both implicit and explicit levels (Power & Brewin, 1991). On this view, implicit information is sustained by *automatic* cognitive process which

is fast, unconscious, uncontrollable and non-attention-demanding, whereas, explicit information is sustained by *controlled* process which is slow, conscious, controllable and attention-demanding. Thus, Lyon et al (1994) interpreted their findings as showing that "the requirement to make explicit attributional judgements would trigger defensive responses, whereas the requirement to make implicit attributional judgements would produce responses consistent with underlying negative self-schema (p.643)".

It would be desirable to test the defensive function in deluded patients using complementary experimental procedures to those outlined above. As mentioned earlier, the studies using the emotional Stroop task already examined automatic level of processes in deluded patients, and these findings would be regarded as evidence of negative self-schemata in patients with delusions. However, the emotional Stroop task cannot display both automatic and controlled processes which are especially important for considering the defensive mechanism. In order to investigate the defensive mechanism, changes in responses from an automatic level of process to a controlled level of process should be focused on. Therefore, further approaches to defensive functions in people with delusions should employ experimental methodologies which are able to reflect both automatic and controlled processes, in particular the transition in response between automatic and controlled processing. In the next section, the emotional priming paradigm will be presented as a methodology which might satisfy this research requirement.

1.3 The emotional priming paradigm and cognitive processes

1.3.1 The emotional priming paradigm

As we have seen, to examine cognitive biases, especially the defensive function in deluded patients, requires an assessment of both automatic and controlled cognitive processes. The emotional priming paradigm appears to be an appropriate methodology for investigating these cognitive processes in people with delusions. The emotional priming paradigm was inspired by the work of Neely (1977) and developed by Power & Brewin

(1990) for the research on the issue of whether affect and self-esteem regulation processes depend on the conscious (controlled) or nonconscious (automatic) information processing systems. Neely (1977) varied the stimulus onset asynchrony (SOA) between the prime and the target letter string in lexical decision tasks and found that the primes can have different effects on the processing of the target stimuli, depending on the length of this SOA. Neely (1977) showed that, in a lexical decision task, very short SOAs produced automatic facilitatory effects which appeared to reflect the permanent associations represented in the subjects' memory. On the contrary, at long SOAs, conscious expectations induced by the experimenter produced separate facilitatory and inhibitory effects. That is, the pattern of responses at the shorter SOA reflect the operation of automatic processes, while the response pattern for the longer SOA is the result of both automatic and controlled processing.

1.3.2 The studies from Power & Brewin's viewpoints

In a preliminary paper, Power & Brewin (1990) developed Neely's (1977) priming paradigm in order to investigate the processing of emotion-related material. Power & Brewin (1990) used a sentence as a prime and an adjective as a target, and asked the subjects to evaluate the target adjectives as self-descriptive or not. Power & Brewin (1990) predicted that the normal subjects would show no automatic facilitatory effects since they are assumed to have no specific negative or positive permanent associations in their memory which seem to produce the automatic effects. In contrast, the subjects would show self-esteem regulation operating primarily at controlled processing level, at long SOA. Power & Brewin (1990) are implying that priming only occurs with personal episodes. While this is starting to be claimed in the mood and memory literature (e.g., Bower, 1992; Eich, 1994), for a long time this was not a focus of the network models (cf., Bower, 1981).

In the study, the primes were presented as a sentence describing positive or negative life events followed by positive or negative self-descriptive adjectives as the targets at either 250 ms or 2000 ms SOA. Two different types of prime were used to test the hypothesis. The first type of prime included interpersonal and achievement events which

were considered to prompt self-esteem regulation, and the second type consisted of survival-threatening events which were not considered to prompt self-esteem regulation. Immediately after a positive or negative prime sentence, a target adjective was presented. The subjects were required to read a prime sentence quietly to themselves, and then to indicate whether or not a target adjective applied to them. The main results of the study showed that in normal subjects, following a negative esteem-related prime, the subjects took significantly longer to endorse the negative adjectives and also endorsed fewer negative adjectives at long SOA than at short SOA. These effects were absent when the primes were positives. Power & Brewin (1990) concluded that these results presented "the moment-to-moment regulation of self-esteem: In the face of a potential challenge to self-esteem, normal individuals may protect their self-concept by inhibition of the processing of negative self-related information stored in memory (p.47)". In addition they found that, contrary to their prediction, following survival-threatening primes the negative adjectives were rejected faster at long SOA than at short SOA, and that fewer subjects endorsed the negative adjectives at long SOA than at short SOA.

Power, Brewin, Stuessy & Mahony (1991) assumed that the inhibitory effect found in the study of Power & Brewin (1990) would reflect a more general affect-regulation effect rather than simply a self-esteem regulation effect. In order to test their prediction, they chose single basic emotion terms as primes which reflect a wider range of emotions (happiness, sadness, anger, and fear). The results replicated Power & Brewin's (1990) study ; at long SOA, negative primes led to slower reaction times to endorse the negative adjectives and to fewer endorsement of the negative adjectives. As Power et al. (1991) predicted, however, this effect was obtained for all of the negative emotion primes. Thus Power et al. (1991) concluded that "in face of a negative emotion-related stimulus..., normal individuals set in motion an affect-repair process....this affect-repair is a general one that occurs in response to any negative emotion rather than being specific to one particular negative basic emotion (p.29)".

These previous studies focused on affect and self-esteem regulation in normal individuals at long SOA rather than paying attention to differences between automatic processes and controlled processes. This thesis, however, puts more weight on the latter

matter in order to examine the defensive mechanism that might be observed by looking at this difference. Therefore, it seems reasonable to summarise the claims of the previous studies (Power & Brewin, 1990; Power, et al., 1991) that are relevant to this issue:

1) normal individuals show no automatic facilitatory effects on self-evaluating tasks.

2) however, affect and self-esteem regulation in normal individuals would be operating at both levels of automatic and controlled processing which reflects at long SOA.

In addition, Dalgleish, Cameron, Power and Bond (1995) summarise the findings of the previous studies (Power & Brewin, 1990, Power, et al., 1991):

1) slower to endorse negative adjectives following negative event primes at long SOA than at a short SOA.

2) endorse fewer negative adjectives following negative primes at a long SOA than at a short SOA.

3) in contrast, these effects are absent if the negative adjectives are preceded by positive primes rather than negative primes.

It should be noted that neutral prime conditions were not used in the previous studies (Power & Brewin, 1990, Power, 1991). The inclusion of neutral prime conditions is vital for interpretation of results, especially for examination of facilitation and inhibition. A subsequent study (Dalgleish, et al., 1995) covers this point, and it may be worth mentioning that the emotional priming task in this thesis had already been designed to have neutral prime conditions before reading the study of Dalgleish et al. (1995).

1.3.3 The emotional priming paradigm in clinical subjects

The previous studies provided evidence that some form of controlled processing serves to regulate affect and self-esteem in normal individuals, however, they do not address the problem as to whether or not the affect and self-esteem regulation found in

normal individuals operates in psychiatric patients, and if it differs in psychiatric patients, what sort of processes exist and how they work. The first attempt using the emotional priming paradigm to investigate cognitive processes in a clinical group was the study of Dalgleish et al. (1995), in which they looked at patients with generalised anxiety disorder.

It has been suggested that anxious patients seem to have cognitive biases towards threat-related material at the automatic processing level, such as perception and attention (e.g., MacLeod, Mathews, & Tata, 1986; Mathews & MacLeod, 1985; Richard & French, 1990, all cited in Dalgleish, et al., 1995), however, such cognitive biases at controlled processing level has remained debatable. Therefore, Dalgleish et al. (1995) aimed to examine cognitive biases at the level of controlled processing by the emotional priming paradigm. In this study, the procedures of Power & Brewin (1990) and Power et al. (1991) were modified to include several refinements: The target adjectives were matched for length and frequency, the prime sentences were matched for length, and, importantly, a neutral-prime condition (a row of Xs) was added to which the results with negative and positive primes could be compared.

The results showed that the clinically anxious were faster to endorse the negative adjectives following the negative primes at long SOA than at short SOA relative to the neutral-prime conditions. However, they were slower to endorse the positive adjectives following the negative primes at long SOA than at short SOA. No facilitation effects for the positive adjectives following the negative primes were found. In addition, no facilitation effects for both the negative and positive adjectives following the positive primes were found. To summarise these findings, affect and self-esteem regulation in the clinically anxious group was:

a) faster endorsement of negative adjectives following negative primes at long SOA than at short SOA.

b) this effect is absent if the primes or the adjectives are positive.

A legend shows type of prime

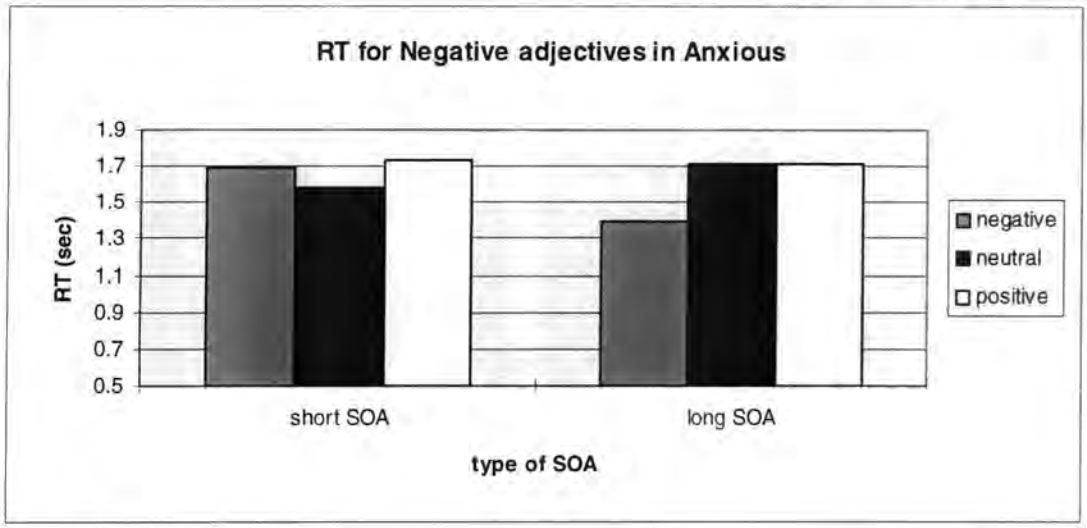

Fig. 1.1
Anxious subjects' mean reaction times for "yes" responses to negative adjectives in Dalgleish et al. (1995).

Dalgleish et al. (1995) concluded that affect and self-esteem regulation in anxious subjects would be operating at the level of both automatic and controlled processing, but in a different manner to normal subjects. In anxious subjects, negative primes facilitated the reaction times for the endorsement of negative adjectives at long SOA more than short SOA, which was interpreted as an information processing bias in favour of negative stimuli at controlled level of processing. Dalgleish et al. (1995) suggested that "it is possible that these data reflect the absence of protective self-regulation processes in clinically anxious individuals and that this is a contributing factor to their anxious condition (p.87)."

The results of this study for the normal subjects supported the earlier studies (Power & Brewin, 1990; Power, 1991); following the negative primes, the negative adjectives were endorsed more slowly at long SOA than at short SOA. More importantly, however, the results of Dalgleish et al. (1995) did not replicate the previous research in several ways:

a) in the normal subjects, slower endorsements of the negative adjectives at long SOA than short SOA occurred following all types of prime.

A legend shows type of prime

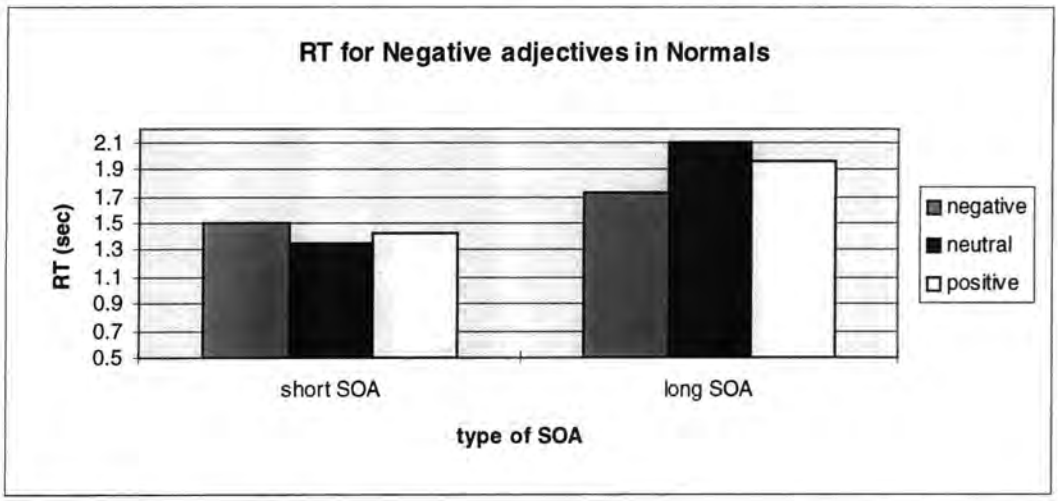

Fig. 1.2
Normal subjects' mean reaction times for "yes" responses to negative adjectives in Dalgleish et al. (1995).

b) slower endorsement of both negative and positive adjectives at long SOA compared to at short SOA following all types of primes.

A legend shows type of prime

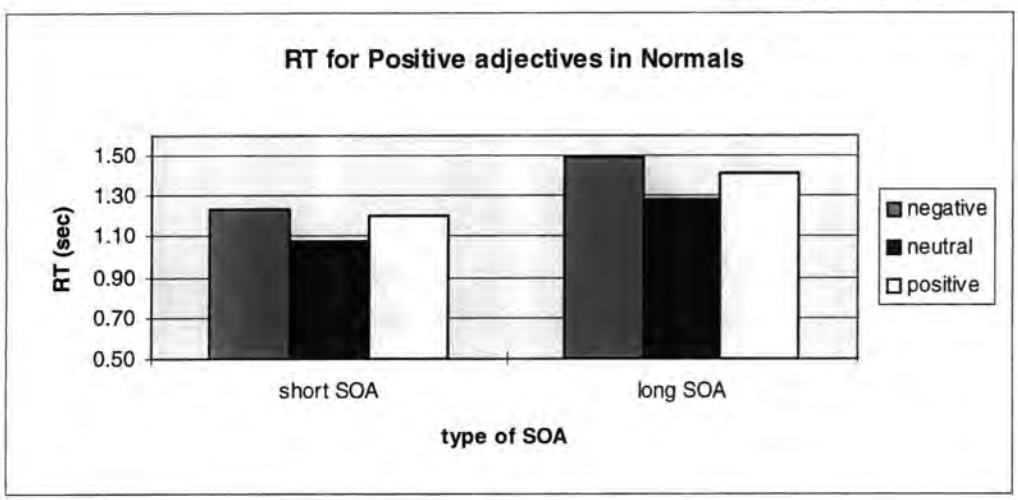

Fig. 1.3
Normal subjects' mean reaction times for "yes" responses to positive adjectives in Dalgleish et al. (1995).

c) no differences in endorsement of the negative adjectives following the negative primes between at long SOA and at short SOA.

A legend shows type of prime

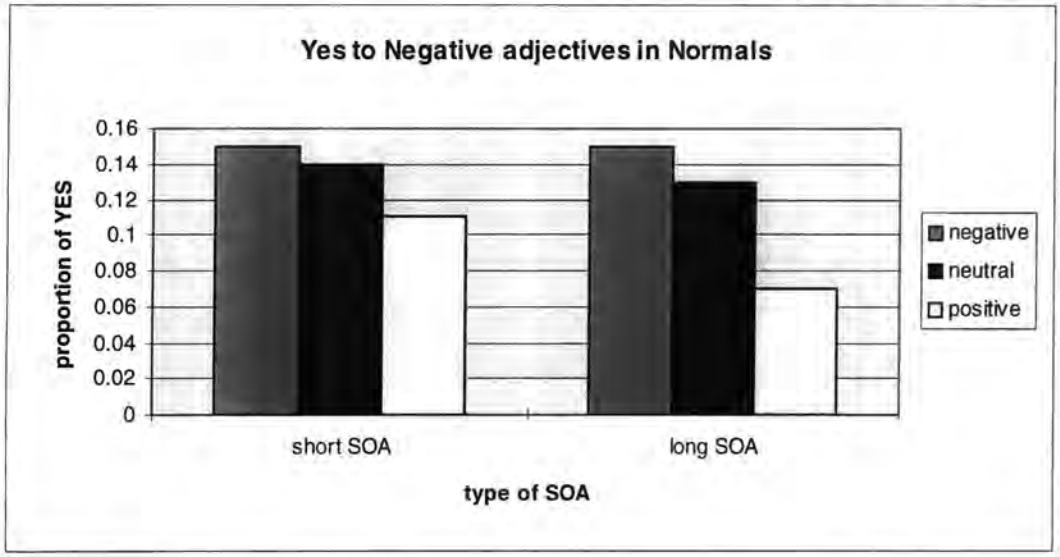

Fig. 1.4
Normal subjects' endorsement rate for negative adjectives in Dalgleish et al. (1995).

Dalgleish et al. (1995) concluded that "the existence of a general effect of SOA on the speed to endorse all adjectives in normal subjects which is independent of the prime stimulus (p.85)" and there might be "a more greatly organised and elaborated positive self-schema in these individuals (p.85)".

1.4 Summary and conclusions

In this chapter, cognitive biases in people with delusions have been considered. In particular there had been a focus on the arguments of Bentall and his colleagues. Bentall (1994) summarised a series of studies as follows:

a) deluded patients have an abnormal attributional style, generally attributing negative outcomes to causes external to themselves.

b) attributional biases are also shown in their judgements about the explanations of the behaviours of other people.

c) persecuted patients show an exaggerated "self-serving bias" on contingency judgement tasks.

d) these biases reflect selective information processing for threatening information as shown on attention and memory tasks.

These findings indicate that patients with delusions have much in common with depressed patients, however unlike depressives, they have defensive function to protect themselves against underlying low self-esteem. Their abnormal beliefs may serve to prevent feeling of low self-esteem from entering consciousness. Further experimental research is required to test the hypothesis of the defensive mechanism in deluded patients.

The emotional priming paradigm may be regarded as an appropriate approach to this research. The emotional priming paradigm reflects both automatic and controlled cognitive processes.

This thesis directly addresses this issue of the defensive mechanism in people with delusions, in following chapters, cognitive processes in patients with delusions will be examined by using both an explicit questionnaire (ASQ) and an implicit questionnaire (PIT), as well as the emotional priming paradigm.

Chapter 2 Experiment 1: Attributional Bias Tests

2.1 Introduction

As mentioned earlier, Bentall and his colleagues found that people with persecutory delusions have reasoning and information processing biases to stimuli related to their theme of their delusional beliefs, and hypothesised that these cognitive biases may reflect their defensive mechanism to protect themselves against underlying negative self-schemata. If this defensive mechanism can be bypassed, responses of deluded patients to negative stimuli should resemble those of depressed people.

In this chapter, the defensive function in people with delusions will be directly examined using a similar procedure to Lyon et al. (1994). The Pragmatic Inference Task (PIT: Winters & Neale, 1985) was chosen to use as an implicit questionnaire which is supposed not to activate the defensive mechanism in deluded patients. The Attributional Style Questionnaire (ASQ: Peterson et al., 1982) was chosen as an explicit measure which is expected to trigger the defensive mechanism. Therefore, following the previous studies' arguments, it is hypothesised that the deluded patients would show a different attributional style from the depressed patients on the ASQ (explicit questionnaire), and would be more similar to the normal subjects. In contrast, on the PIT (implicit questionnaire), the deluded patients would show that they have more in common with the depressed patients in their attributional style. If these different responses between the ASQ and the PIT are found in the deluded patients, it can be concluded that these differences reflect the defensive function in people with delusions.

2.2 Method

Subjects: There were three groups of subjects participated in this experiment. The National Adult Reading Test (NART: Nelson, 1991) was used as a measure of intellectual compatibility across the groups. The subjects were approximately matched for age, sex and intelligence across the groups. Table 2.1 shows the subject characteristics and there were no significant differences across the groups in age and NART estimated IQ scores.

The subjects in the experimental group were 11 patients with delusion currently receiving treatment either and in-patient (6 subjects) or out-patient (5 subjects) basis at the time of this study. The criteria for inclusion are:

1) present delusional symptoms expressed by the patient. 7 patients met the DSM-3R criteria (American Psychiatric Association, 1987) for paranoid schizophrenia, 2 met the criteria for schizoaffective disorder, 1 met the criteria for delusional disorder and 1 for bipolar disorder with psychotic features (Appendix 3 shows which subject had which diagnosis; the data of the subject diagnosed as bipolar disorder were within a standard deviation, and bipolar disorder with psychotic features was included in the deluded subject group in Dudley, 1996).

2) no evidence of any organic impairment, and no current alcohol or drug abuse.

3) have not received a course of ECT for at least the last month.

4) aged 18-65.

The psychiatric comparison group consisted of 11 patients receiving either in-patient (6 patients) or out-patient (5 patients) receiving treatment for depression at the time of study. The criteria for inclusion were:

1) diagnosed as major depression with no psychotic features. 2 showed anxious states (Appendix 3 shows which subject had which diagnosis) at the time of this study.

2) no evidence of any organic impairment, and no current alcohol or drug abuse.

3) have not received a course of ECT for at least the last month.

4) aged 18-65.

The normal control group consisted of 11 normal subjects recruited from the non academic staff of University of Durham by informal contacts. The criteria were:

1) no history of psychiatric disturbance requiring treatment.

2) aged 18-65.

Table 2.1
The subjects characteristics

standard deviations are in brackets

Group	N	In-patients	Out-patients	Sex M	Sex F	Age	NART estimated IQ
Deluded	11	6	5	5	6	43.00 (11.18)	105.57 (8.85)
Depressed	11	6	5	5	6	39.09 (11.15)	109.50 (6.23)
Normal	11			5	6	46.45 (10.32)	111.64 (11.10)
significance						N.S.	N.S.

Test Materials: There were two measures administered for all groups: an Anglicised version of the PIT (Winters & Neale, 1985) and the original ASQ (Peterson et al., 1982). In the previous study (Lyon, et al., 1994), a parallel form of ASQ (ASQ pf) was devised for use in their study because the PIT has similarity to the original ASQ. However, it was decided to use the original ASQ because of the validity limitations of ASQ pf in terms of stability and globality scores. Only modest correlations were found between the original ASQ and the ASQ pf in stability and globality, and globality for negative events failed to reach significance. In addition, the procedure was changed to reduce the influence caused by the similarity between the ASQ and the PIT. The experiments were split into two sessions, the PIT was given to the subjects in the first session and after at least 3 days (up to two weeks) the ASQ was administered in the second session (see Procedure).

The Attributional Style Questionnaire (ASQ)

The Attributional Style Questionnaire (Peterson et al., 1982) was used to assess subjects' overt attributional style. The ASQ consisted of six positive (e.g., You become rich) and six negative hypothetical events (e.g., You meet a friend who acts hostilely towards you) involving subjects. The subjects were required to think of "one major cause" of each event, and then to self-rate each cause along 7-point scales of internality vs. externality, stability vs. instability, and globality vs. specificity. Ratings for each event were summed for each type of event and for each type of sub-scale separately. 6 to 42 is the range of scores for each sub-scale and higher score shows a greater degree of internality, stability and globality. The complete set of ASQ items are shown in Appendix 1.

The Pragmatic Inference Task (PIT)

The Pragmatic Inference Task (Winters & Neale, 1985) was presented as a memory test in order to avoid controlled responses. The test consisted of 12 short hypothetical vignettes, six of them described positive life events and the other six described negative events, which were randomly ordered. All stories were self-referent and the main element of each story was derived from the ASQ (Peterson et al., 1982). After each vignette, four questions were presented as alternative-choice items. One of the questions implied internal-external locus of causality. For example, the subjects were implicitly asked a reason for being unable to find work by choosing either "poor job record (internal cause)" or "poor job market (external cause)". This kind of questions were the target or attributional inference questions. Two of the questions required memory of the stated facts (e.g., "How long do you go for without finding work?") and the other question required the subjects to guess an answer but non-attributional inference (e.g., "What kind of job interests you?"). The types of question were also randomly ordered. In this study, the PIT was anglicised to be more comprehensible for the British subjects. Only target questions were scored to give response frequencies in four categories: internal and external attributions for negative events; internal and external events for positive events. Ratings were summed across the four categories. 0 to 6 is a range of scores for each category and higher scores show

greater degree of internality and externality. Internality and externality scores in the PIT are mutually exclusive. Complete PIT items are shown in Appendix 2.

Procedure: All tests including the emotional priming task (see Experiment 3 in Chapter 4) were administered in a quiet private room. Testing was split into two sessions. In the first session, the emotional priming task was carried out and then the PIT was presented as a memory test. The subjects listened to the PIT vignettes, and the author read aloud corresponding questions and noted the subjects' verbal answers. Following at least 3 days (up to two weeks), the second session took place. In the second session, the ASQ was given to the subjects as a self-administered questionnaire. The subjects were then asked to read aloud the words from the NART. Prior to the experiments all subjects were given a brief explanation of the experiments and asked to fill in a consent form. It took 30 minutes for the first session and 25 minutes for the second session, all in all it took about an hour to complete all experiments.

2.3 Results

Analyses of ASQ: The mean ASQ sub-scale scores are shown in Table 2.2. 3 x 2, Group (deluded vs. depressed vs. Normal) x Event (negative vs. positive) two-way ANOVAs were carried out separately on internality, stability and globality scores. All analyses were performed on SPSS for Windows.

Table 2.2
The attributional style questionnaire sub-scale scores and self-serving bias scores

	Negative event		Positive event		
group	mean	SD	mean	SD	
Internality					*self-serving*
Deluded	28.0	5.8	29.9	7.5	1.91
Depressed	29.7	5.4	30.3	5.5	0.55
Normal	25.2	7.8	29.6	6.6	4.45
Stability					
Deluded	24.5	5.0	29.8	6.5	
Depressed	29.0	4.3	31.5	4.6	
Normal	27.7	5.4	31.9	4.5	
Globality					
Deluded	27.2	4.4	29.7	5.8	
Depressed	30.9	6.9	30.0	5.3	
Normal	21.1	5.1	27.4	4.5	

On the Internality scores, a significant main effect of Event was observed [$F(1, 30) = 4.52$, $p < .05$], however, no other main effects and interactions were significant. That is, all subjects including the depressed subjects made more internal attributions for the positive events than for the negative events.

On the Stability scores, a significant main effect of Event was again observed [$F(1, 30) = 38.18$, $p < .001$], however, no other effect and interaction reached significance. That

means, the depressed subjects as well as the deluded and normal subjects made more stable attributions for the positive events than for the negative events.

On the Globality scores, main effects of Group and Event were significant [$F(2, 30) = 4.61$, $p < .05$; $F(1, 30) = 7.14$, $p < .05$, respectively]. The depressed subjects tended to make more global attributions than did the deluded and normal subjects, and in the case of the positive events all subjects tended to make more global attributions than to the negative events. However, these effects were qualified by an interaction of Group x Event [$F(2, 30) = 4.42$, $p < .05$], thus, simple main effects were analysed for each event and then for each group separately. This Group x Event interaction can been seen in Fig. 2.1.

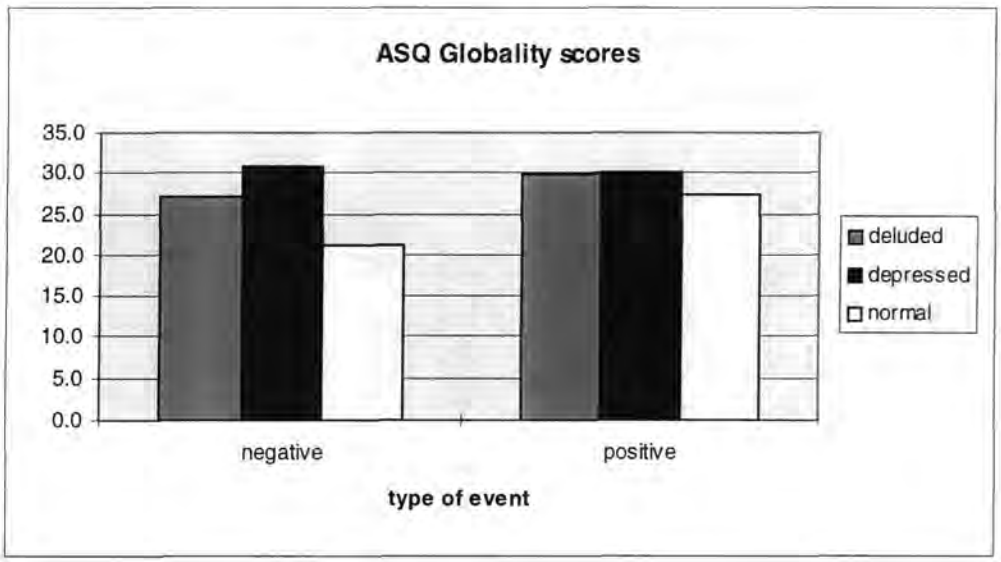

Fig. 2.1
ASQ globality scores across Group and Event

Tests of simple main effects confirmed that for the negative events, the globality scores of the depressed subjects were higher than those of the normal subjects ($p < .005$, by Scheffe tests), whereas no significant differences were found either between the deluded and the depressed or between the deluded and the normal. The depressed subjects made more global attributions for the negative events than both the deluded and the normal subjects. No group differences were observed for the positive events.

Tests of simple main effects also revealed that the normal subjects made more global attributions for the positive events than for the negative events [$F(1, 10) = 28.82$, p

< .001], however both the deluded and depressed subjects made relatively even-handed judgements about the causes of positive and negative events (p = .227, p = .637, respectively).

These findings indicates that on the both internality and stability scores there were no group differences. That is, both the depressed and deluded subjects did not show stable attributions for the negative events relative to the normal subjects. This was a surprising finding. Furthermore, the deluded subjects did not show more internal attributions for the positive events compared to the depressed and the normal subjects. Instead, all subjects showed similar score pattern on both the internality and stability scores. These findings were non-replication of the results of the previous studies (Kaney & Bentall, 1989; Candido & Romney, 1990) where both depressed and deluded subjects, in comparison with the normal subjects, made more stable and more global attributions for the negative events. In addition, the deluded subjects in the previous studies made more external attributions for the negative events, which were opposite response pattern to those of the depressed subjects. The group difference was only found on the globality scores, which indicated that the depressed subjects made more global attributions for the negative events than both the deluded and the normal subjects.

Following the procedure previously used by Kaney & Bentall (1989) and Lyon et al. (1994), "self-serving bias" scores were calculated by subtracting internality scores for the negative events from those for the positive events (these data are shown in Table 2.2). A one-way ANOVA was carried out on this data and no group differences were found (p = .3403), which again did not replicate the results of the previous studies (Kaney & Bentall, 1989; Candido & Romney, 1990; Lyon, et al ,1994) where the deluded subjects showed greater self-serving bias than both the depressed and normal subjects.

Analyses of PIT: The mean PIT internality and externality scores were mutually exclusive, so only internality scores are shown in Table 2.3..

Table 2.3
PIT internality scores and self-serving bias scores

	Negative event		Positive event		
group	mean	SD	mean	SD	self-serving
Deluded	3.27	1.01	3.73	0.90	0.45
Depressed	3.09	0.83	2.27	1.19	-0.82
Normal	2.27	1.10	2.36	0.92	0.09

A 3 x 2, Group (deluded vs. depressed vs. Normal) x Event (negative vs. positive) two-way ANOVA was carried out on this data. It was found that a main effect of Group was significant [$F(2, 30) = 6.44$, $p < .01$] and the interaction of Group x Event was nearly significant [$F(2, 30) = 3.13$, $p = .058$]. In order to interpret the main effect of Group, the mean scores across events were calculated for each group and a one-way ANOVA was carried out on this data. This showed that regardless of the event conditions, the deluded subjects made more internal ratings (3.50) than both the depressed (2.68) and normal subjects (2.32) ($p < .005$). However, the interaction of Group x Event reached nearly significance so as can been seen in Fig. 2.2, thus, further analyses were performed to understand where this nearly significant interaction came from.

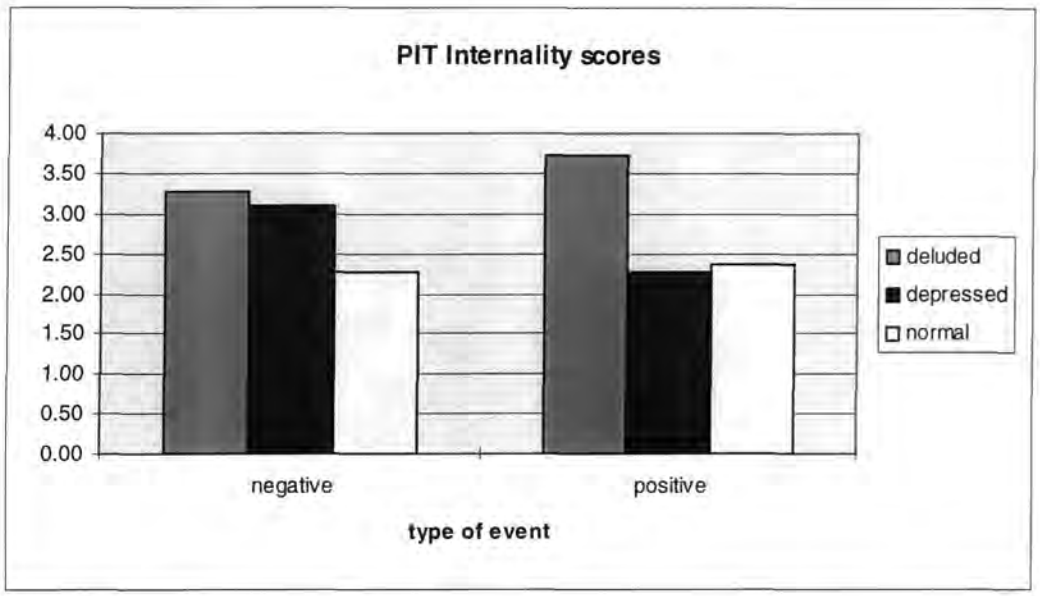

Fig. 2.2
PIT Internality scores across Group and Event

In each group, a simple effect of Event was examined. In both the deluded and normal subjects this was not significant, however, the depressed subjects showed slightly higher internality scores for the negative events than for the positive events [$F(1, 10) = 4.71$, $p = .055$].

A simple effect of Group for each event was then examined. For the negative events, Scheffe tests showed nearly significant differences across groups ($p = .055$). Scheffe test is relatively conservative and the result showed nearly-significance, thus, Duncan tests were performed on the same data. The only significant difference was found between the deluded subjects and the normal subjects. As can be seen Fig. 2.2, the deluded patients showed higher internality scores for the negative events than the normal subjects.

For the positive events, Scheffe tests showed that the deluded subjects made greater internal ratings than both the depressed and normal subjects ($p < .005$).

Lyon, et al. (1994) found that the deluded subjects showed similar score pattern on the PIT, however, in this study, the deluded subjects were more similar to the normal subjects.

Further analyses were performed to investigate more precisely any differences in the pattern of scores for each group between events by looking at the self-serving bias scores. According to the previous studies (Lyon, et al , 1994) the self-serving bias scores were calculated by subtracting the scores for negative events from those for positive events. A one-way ANOVA on this data revealed a nearly significant difference between groups ($p = .058$). Scheffe tests showed nearly significant difference between groups, again, less conservative tests (Duncan test) were carried out on the same data. This showed that the deluded subjects (0.45) showed slightly greater self-serving bias than the depressed subjects (-0.82). This finding again did not replicate the previous study (Lyon, et al., 1994) where the deluded subjects did not show self-serving bias on the PIT.

2.4 Discussion

The results appear to be surprising, in particular, the results of the depressed subjects were odd. Because of the surprising data, the results of this experiment did not support the hypothesis that the deluded subjects would exhibit the defensive function; that is, the deluded subjects would resemble the normal subjects rather than the depressed subjects on the ASQ (explicit questionnaire) scores, whereas on the PIT (implicit questionnaire) the deluded subjects would show similar response pattern to the depressed subjects.

For the ASQ, no group differences were found on the internality and the stability scores. All subjects made more internal and more stable attributions for the positive events than for the negative events. According to one of the main arguments on depression (e.g., Abramson, Seligman & Teasdale, 1978), depressives should show "depressive attributional style", internal, stable and global attributions particularly for negative events, however, the depressed subjects in this experiment did not show this abnormal attributional style. Only on the global scores, the depressed subjects made more global attributions for the negative events than for the positive events.

Not only for the depressed subjects but also for the deluded subjects, the hypotheses were not supported by the results. The deluded subjects did not show an

extreme self-serving bias on the ASQ, namely, the deluded patients did not show abnormally external attributions for the negative events and internal attributions for the positive events. One possibility is that the ASQ might not be sensitive enough to highlight specific attributional styles, or at least not for testing these hypotheses.

For the PIT, the deluded subjects were expected to show similarity to the depressed subjects, however self-serving bias scores for the deluded subjects in this study showed a score pattern closer to the normal subjects than to the depressed subjects. The analysis of self-serving bias scores indicated that the deluded subjects showed extreme self-serving bias which should have been seen on the ASQ and not on the PIT. These findings might again reflect the sensitivity of the PIT; the PIT might not be sensitive enough to penetrate the defensive mechanism in patients with delusions. However, it is worth stating that the PIT was indeed more sensitive than the ASQ with respect to the internality score for the negative events. Although the deluded subjects scored higher than did the normal and the depressed subjects for the positive events, for the negative events the deluded subjects' scores did not differ from those of the depressed subjects and were higher than those of the normal subjects.

2.5 Conclusion

The results from this study did not replicate the previous studies. If the hypothesis of a defensive mechanism in people with delusions is not dismissed by these results, one possibility to explain why the results did not support the hypothesis is that the ASQ and the PIT may not be sensitive enough to reflect their defensive mechanism. Therefore, using ASQ and PIT would not be an appropriate methodology for investigating the defensive mechanism in deluded patients. If this is the case, it seems reasonable to apply potentially more appropriate methodology to testing the hypothesis. As stated earlier, the emotional priming paradigm appears to be suitable. In next chapter, the emotional priming paradigm will be applied to examine the defensive mechanism in patients with delusions.

Chapter 3 Experiment 2: The Emotional Priming Task in Deluded Subjects

3.1 Introduction

As mentioned in Chapter 1, explicit and implicit judgement of self-related information are assumed to be underpinned by different cognitive processes: when self-related information is presented at an implicit level it is sustained by automatic cognitive process, whereas explicit information is sustained by controlled cognitive process (Power & Brewin, 1991). In Experiment 1 in Chapter 2, information involving the subjects was presented at both implicit (PIT) and explicit (ASQ) level, and their responses were examined to see whether or not the deluded subjects showed a defensive bias only when required to make explicit attributional judgements. The hypothesis was that the deluded subjects would show an extreme self-serving bias on the ASQ, however, on the PIT this self-serving bias would disappear and they would resemble the depressed subjects. The results from Experiment 1 did not show such a clear difference between these two types of questionnaire, however there remains a possibility that PIT and ASQ may not be sensitive enough to reflect implicit and explicit judgement on self-related information.

In this chapter, using the emotional priming paradigm developed by Power & Brewin (1990), both automatic (implicit) and controlled (explicit) cognitive processes in patients with delusions will be investigated. As mentioned in Chapter 1, the emotional priming paradigm appears to be another appropriate methodology to investigate both automatic and controlled processes.

The rationale is that at short SOA in the emotional priming task, the deluded subjects will give results similar to the depressed subjects. This is because the prime will automatically activate the negative adjective, bypassing the usual defensive function of the deluded subjects. At long SOA, however, there is time for self-esteem regulation to occur to the responses evoked by the prime, so in this case the deluded subjects should give responses more similar to those of the normal subjects. Thus, the deluded subjects should show even greater self-esteem regulation than the normal subjects at long SOA by evaluating themselves more positively and less negatively in the face of negative stimuli (in

the negative prime condition). However, at short SOA the deluded subjects should show evidence that they would have negative self-schemata, as do the depressed subjects, by evaluating themselves more negatively and less positively. The responses at short SOA can be regarded as an analogue of PIT and the responses at long SOA as an analogue of ASQ.

In this chapter, using the emotional priming paradigm developed by Power & Brewin (1990), both automatic (implicit) and controlled (explicit) cognitive processes in patients with delusions will be investigated. To begin with the experiment, the procedures of the previous studies (Power & Brewin, 1990; Power, et al., 1991; Dalgleish et al., 1995) have been carefully refined for this study. This will be presented in Method section.

3.2 Method

It was decided to make some changes to four aspects of the stimulus presentation procedure used by Power and Brewin (1990). Firstly, they did not include a neutral prime condition, which is crucial as a baseline to indicate whether or not negative and positive primes produce facilitation or inhibition.

Secondly, their priming stimuli stayed on for the full duration of the SOA period for both their short and long SOAs. Thus, the stimulus duration was varied in addition to SOA. Since the priming stimuli in this paradigm consist of several words, it was thought prudent to hold the prime duration constant and only vary SOA to make sure that any differences do not occur because of reading time available for the prime.

Thirdly, they overwrote their primes with a 20 ms pattern mask (consisting of a row of Xs). While this might be the method of choice in studies of 'subliminal' priming, the rationale for it in their procedure was not given by Power and Brewin (1990). Since masking adds an additional level of complexity and no clear reason was given for its inclusion, it was decided to omit this step. The procedure used here was thus more in line with studies that have looked at the effect of short and long SOAs on affective priming (Hermans, De Houwer & Eelen, 1994) and attitude priming using good-bad judgements (Fazio, Sambonmatsu, Powell & Kardes, 1986).

The fourth issue concerned the duration chosen for the short SOA. It was decided to use the upper limit of SOA compatible with facilitation in priming. This was because the prime in this paradigm consists of a series of words rather than a single word and could therefore take longer to encode. In particular, the patient groups might need maximum time because of their reading level and/or medication. Thus 500 msec was chosen. Although it has been suggested that this time might be 'marginal' (Wells & Matthews, 1994), it has certainly shown facilitation in studies looking at effects of varied SOA to threat-related primes (e.g., Richards & French, 1992) and has also shown good facilitation in demonstrations of semantic priming in undergraduate lab classes in University of Durham (D. Kleinman, unpublished data).

Finally, considering the performance of the psychiatric subjects, the number of trials were reduced to 96 trials so that the clinical subjects could maintain concentration on the tasks.

Subject: All subjects were same as those who participated in Experiment 1 in Chapter 2; 11 patients with delusions, 11 depressive patients and 11 normal subjects. The criteria and the characteristics of the subjects are shown in the Method in Chapter 2.

Materials: The priming stimuli consisted of sentences describing certain life events which were modified from the previous studies of the emotional priming paradigm (Power & Brewin, 1990 ; Dalgleish et al., 1995). The primes were either positive (e.g., "A date goes well") or negative (e.g., "You lose your job"), matched for length as far as possible. There were 8 positive and 8 negative primes, plus a set of 8 neutral primes consisting of 2 x 2 THEs (a complete list of the primes is shown in Appendix 7). All primes were 4 words long and presented over two lines, with two words per line. This was to make sure that the prime was seen in central vision.

The target stimuli consisted of positive and negative trait adjectives. Frequency and length of words were carefully considered. According to the previous study (Power & Brewin, 1990; Power, 1991; Dalgleish et al., 1995), the emotional priming effect occurs only when the target stimuli are negative, and not to positive stimuli. Thus, in order to

select negative stimuli, more careful consideration was required. It was assumed that different adjectives in addition to their good-bad valence have different 'intensity' values, so that impact of the meaning of the word (word intensity) would vary. Thus certain words have strong meanings so that individuals would rarely regard these words as self-descriptive, while other words would allow them to be endorsed as self-descriptive more easily. To balance the intensity of negative stimuli, 87 negative adjectives were drawn mainly from the previous studies (Power & Brewin, 1990; Dalgleish et al., 1995) and augmented from the other studies (John, 1988; Anderson, 1968; Zuckerman & Lubin, 1965; a complete set of negative word intensity list is shown in Appendix 6). Then, lists of these negative words were distributed to 16 undergraduate students taking Psychology at University of Durham. The students were required to rate how strong the feeling was that each word conveyed to them on a scale from one to three (1 = mild, 2 = average, 3 = intense). 48 negative adjectives were selected with reference to the results of this word intensity list. 48 positive adjectives were selected carefully from the previous studies (Power & Brewin, 1990; Dalgleish et al., 1995) and Anderson (1968). The positive and negative adjectives were matched for length and frequency as much as possible. All in all a set of 48 negative and 48 positive adjectives were selected as the target situmuli (a complete list of target words is shown in Appendix 8). All target adjectives were presented in the centre of the screen in lowercase letters 5 mm high.

Apparatus: The emotional priming study was run on a BBC model B Microcomputer. Text was displayed in 40 column mode on Monochrome 12 inch monitor. In this experiment, the sequence of fields consisted of a *prime* display and a *target* display; a prime was presented for 300 ms. Primes were presented in upper case letters 5 mm high. After a duration of 200 or 1700 ms (i.e. 500 ms or 2000 ms SOA), a target adjective was presented. Target stimuli were presented in lower case letters, 5 mm high. In order to maintain timing accuracy, displays were always initiated by the vertical screen synch pulse. The target adjective remained on the screen until the subject responded "yes" or "no" on one of two hand-held buttons to indicate whether or not it was self-descriptive. The programme automatically recorded reaction times in milliseconds and key choices.

Design: A mixed factorial design was used. For each of the three groups, there were two durations of SOA (either 500 or 2000 ms), three valences of prime (positive, negative or neutral), and two types of target adjective (positive or negative) to give a total of 12 (2 x 3 x 2) conditions.

The experiment was presented in 8 blocks of 12 trials. Each block of 12 contained one trial of each combination of 2 durations of SOA (short or long), 2 adjectives (negative or positive) and 3 primes (negative, positive or neutral). Over the 8 blocks it was arranged that each of the 8 negative primes occurred once with each of the four combinations of SOA (short or long) and adjective (negative or positive), giving 32 trials in all over the whole set of 96 trials. A similar arrangement was made for positive primes. The remaining 32 trials had the neutral prime (2 x 2 THEs). The same prime never occurred more than once in a block.

The program randomised the order of presentation of the 8 blocks and randomised the order of presentation within a block. The adjectives were also balanced as far as possible within a block for word frequency, length and impact. Because this constrained the adjectives to a particular condition, it meant that there were pre-set combinations of SOA, primes and adjectives. In order to counterbalance this, two different sets of SOA-prime-adjective pairings were used (see Appendix 9), based on endorsement rates of the adjectives when given to student subjects as a pencil and paper test.

Procedure: The experiment was carried out in a quiet private room. As described in Experiment 1 in Chapter 2, the emotional priming task was carried out in addition to administering the PIT in the first session of the experiment (see Procedure of Experiment 1 in Chapter 2). The emotional priming task was introduced by instructions displayed on a computer. The subjects were asked to make decisions about themselves as quickly as possible and told that before the adjectives were presented on the screen, either a short sentence or four words (2 x 2 THEs) would be flashed. Then the subjects were informed that their task was to decide whether or not various adjectives were self-descriptive. Finally, the subjects were asked to respond as fast as possible to each trial by pressing either the "yes" or "no" button. The instructions emphasised that the subjects were

expected to respond as quickly as possible and that this experiment focused on their reaction times.

The subjects were first presented with 16 practice trials in order to ensure that they understood the procedure. During the practice trials, the subjects were given feedback of their reactions, which showed on the screen that their reply was either "It applies to me" or "It does not apply to me". The practice trials were self-paced, the subjects needing to press both buttons after each practice trial to continue. After the practice trials, the instructions reconfirmed the subjects' task and informed them that the experimental trials would appear automatically without pressing both keys to continue, and that they could have a rest after each block of trials. Then, the first block was presented. All in all it took about 13 minutes to complete.

3.3 Results

Overview: The analyses of the results will be presented in two main stages. First, the analyses of proportions of "yes" responses to the target adjectives across SOA and prime type will be presented. Second, the analyses of the mean reaction times for combined "yes" and "no" responses will be presented, and then the mean reaction times for "yes" responses to the positive adjectives and for "no" responses to the negative adjectives will be examined separately. These separate analyses for each type of responses were used in order to examine self-esteem regulation more clearly. Both endorsement of positive adjectives and rejection of negative adjectives are regarded as having a self-esteem enhancing function, thus it seems sensible to focus on these data. However, it should be noted that the analysis of "no" RTs to the negative adjectives could not be performed for the depressed subjects since they tended to accept negative adjectives as self-referent, so there were too many empty cells in this condition.

Analyses of endorsement levels: The table below shows the mean proportions of "yes" responses for each of the three groups across both SOAs, three types of prime and both types of adjectives. The analyses were carried out on SPSS for Windows.

Table 3.1
The mean proportions of "yes" responses

standard deviations are in brackets

		500ms			2000ms		
group	prime	Negative	Positive	Neutral	Negative	Positive	Neutral
Deluded	Negative	0.38	0.42	0.41	0.45	0.42	0.41
n = 11	adjective	(0.18)	(0.25)	(0.28)	(0.24)	(0.29)	(0.27)
	Positive	0.69	0.76	0.65	0.58	0.68	0.81
	adjective	(0.19)	(0.25)	(0.26)	(0.22)	(0.15)	(0.19)
Depressed	Negative	0.72	0.72	0.69	0.73	0.61	0.65
n = 11	adjective	(0.26)	(0.25)	(0.28)	(0.29)	(0.35)	(0.29)
	Positive	0.60	0.64	0.52	0.56	0.58	0.63
	adjective	(0.31)	(0.31)	(0.31)	(0.32)	(0.32)	(0.32)
Normal	Negative	0.27	0.25	0.33	0.33	0.26	0.33
n = 11	adjective	(0.26)	(0.25)	(0.20)	(0.25)	(0.23)	(0.22)
	Positive	0.72	0.78	0.74	0.70	0.80	0.90
	adjective	(0.21)	(0.13)	(0.24)	(0.23)	(0.16)	(0.09)

An overall 2 (SOA: 500msec vs. 2000msec) x 3 (Prime: negative vs. positive vs. Neutral) x 2 (Adjective: negative vs. positive) x 3 (Group: deluded vs. depressed vs. normal) analysis of variance for all variables were performed on these data in order to investigate any difference across the groups.

An overall 2 x 3 x 2 x 3, SOA x Prime x Adjective x Group ANOVA showed a significant main effect of Adjective [$F(1, 30) = 13.29$, $p < .01$], interactions of Group x Adjective [$F(2, 30) = 7.83$, $p < .005$] and SOA x Prime [$F(2, 60) = 3.83$, $p < .05$], and a three-way interaction of SOA x Prime x Adjective [$F(2, 60) = 7.35$, $p < .005$].

The main effect of Adjective indicated that more positive adjectives (0.52) tended to be endorsed than the negative adjectives (0.47), however, this main effect was qualified by the interaction of Group x Adjective. Simple main effects were analysed to understand this interaction. The endorsement rates for each adjective were collapsed across Prime and SOA and compared across the groups for each adjective separately. As can be seen in Fig. 3.1, the depressed subjects showed higher endorsement levels for the negative adjectives and less endorsement of the positive adjectives compared to the deluded and the normal subjects. Tests of simple main effect of Group confirmed that the depressed subjects endorsed the negative adjectives more than both the deluded and the normal subjects (Scheffe test, $p < .001$). For the positive adjectives, no group differences were found ($p = .0889$). In addition, tests of simple main effect of Adjective indicated that both deluded and control subjects endorsed more positive adjectives than the negative adjectives [$F(1, 10) = 7.74$, $p < .05$; $F(1, 10) = 11.17$, $p < .005$, respectively], however significant effect of Adjective was not found in the depressed subjects. The depressed subjects endorsed both types of adjectives almost equally.

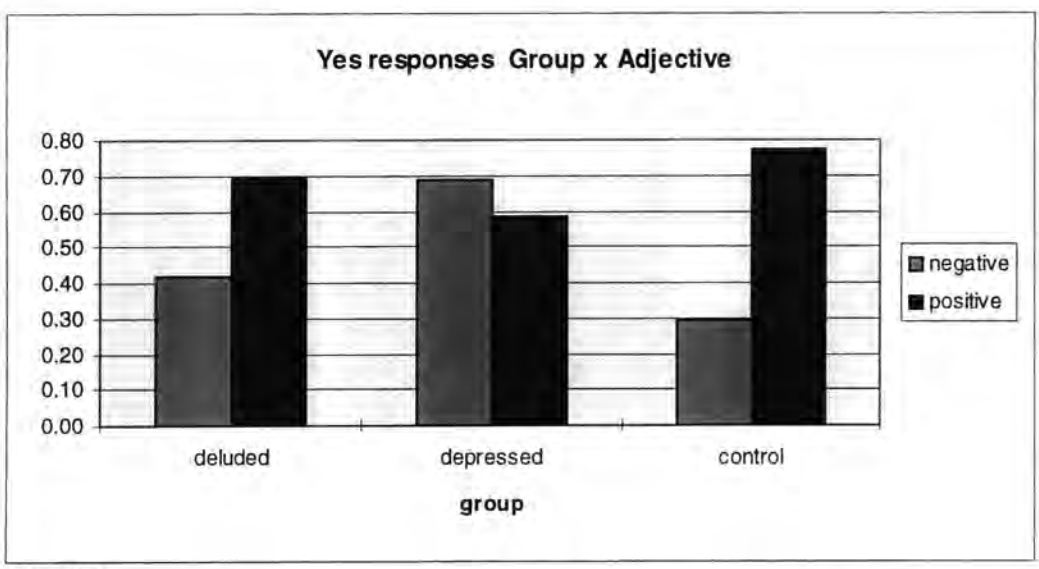

Fig. 3.1
The mean proportions of "yes" responses across Group and Adjective

In order to understand the interaction of SOA x Prime, the proportions of "yes" responses were collapsed across the groups and the adjectives (Fig. 3.2). As can be

assumed from Fig. 3.2, it seems that the positive primes facilitated the endorsement rate of the target adjectives at 500 ms SOA and both the negative and the positive primes inhibited the endorsement rate at 2000 ms SOA.

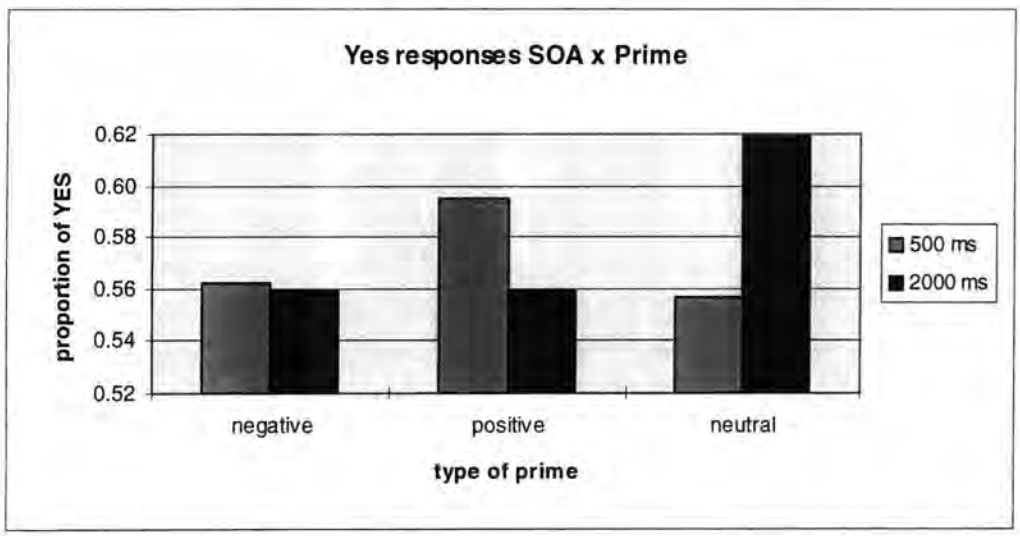

Fig. 3.2
The mean proportions of "yes" responses across SOA and Prime, collapsed across Group and Adjective

However, this interaction was qualified by the three-way interaction of SOA x Prime x Adjective, thus, the mean proportions of "yes" responses were collapsed across the groups and then sub-ANOVAs were performed for each type of adjective separately (these data are shown in Table 3.2).

Table 3.2
The mean proportions of "yes" responses across SOA, Prime and Adjective, collapsed across Group

	500ms		2000ms	
prime	Negative adjective	Positive adjective	Negative adjective	Positive adjective
Negative	0.45	0.67	0.50	0.61
Positive	0.46	0.73	0.43	0.69
Neutral	0.48	0.64	0.46	0.78

For the negative adjectives, nothing reached significance. In the case of the positive adjectives, a SOA x Prime interaction was found [$F(2, 64) = 10.22$, $p < .001$] (shown in Fig. 3.3). Therefore, the interaction of SOA x Prime was further analysed but only for the positive adjectives.

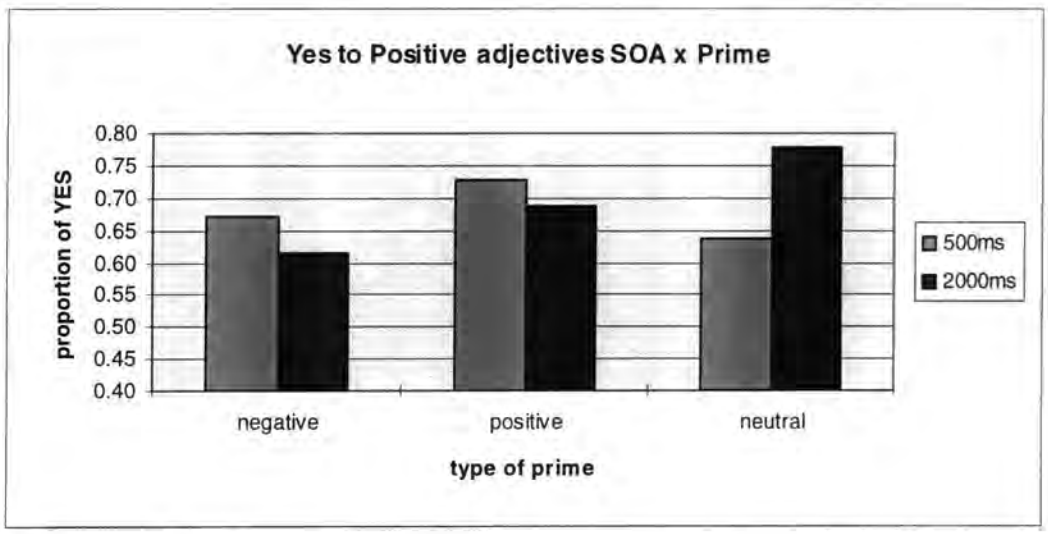

Fig. 3.3
The mean proportions of "yes" responses for positive adjectives across SOA and type of prime

In order to interpret this interaction, a simple main effect of Prime was analysed for each SOA by looking at the contrast terms which compared the three possible permutations of pairs of prime. At 500 ms SOA, the subjects endorsed more positive adjectives following the positive primes than following the neutral primes [$F(1, 32) = 5.45$, $p < .05$]. At 2000 ms SOA, less positive adjectives were endorsed following either the negative or positive primes than following the neutral primes [$F(1, 32) = 13.85$, $p < .005$; $F(1, 32) = 6.67$, $p < .05$, respectively].

A simple effect of SOA was then analysed. Following either the negative or the positive primes, the endorsement rates of the positive adjectives did not differ between SOAs, however, following the neutral primes more positive adjectives were endorsed at 500 ms SOA than at 2000 ms SOA [$F(1, 32) = 13.51$, $p < .005$].

Analyses of the mean reaction times (RT): The table below shows the mean reaction times for combined "yes" and "no" responses across both SOAs, the three types of prime, both types of adjective and for each of three groups.

Table 3.3
The mean reaction times for combined "yes" and "no" responses

standard deviations are on brackets

		500ms			2000ms		
group	prime	Negative	Positive	Neutral	Negative	Positive	Neutral
Deluded	Negative	2100.6	2021.9	1740.3	2068.1	2239.8	1980.0
n = 11	adjective	(654.6)	(739.4)	(587.0)	(659.6)	(1022.5)	(666.8)
	Positive	1889.6	1833.8	1785.9	1921.0	1872.0	1577.4
	adjective	(576.6)	(591.8)	(608.6)	(687.3)	(633.2)	(444.8)
Depressed	Negative	1675.8	1781.5	1571.3	1495.1	1789.5	1570.8
n = 11	adjective	(452.8)	(498.6)	(569.4)	(412.3)	(590.4)	(565.4)
	Positive	1639.1	1484.2	1546.2	1682.1	1661.3	1543.8
	adjective	(484.3)	(398.2)	(412.3)	(505.5)	(538.1)	(447.2)
Normal	Negative	1610.1	1652.7	1576.7	1570.8	1604.8	1483.5
n = 11	adjective	(449.4)	(656.9)	(539.3)	(445.7)	(485.0)	(396.1)
	Positive	1543.5	1493.5	1510.4	1556.2	1500.7	1258.5
	adjective	(576.8)	(537.6)	(441.6)	(504.6)	(434.9)	(382.2)

An overall 2 (SOA: 500 ms vs. 2000 ms) x 3 (Prime: negative vs. positive vs. neutral) x 2 (Adjective: negative vs. positive) x 3 (Group: deluded vs. depressed vs. normal) analysis of variance for all variables were performed on these mean reaction times for combined "yes" and "no" responses.

The overall ANOVA for the mean reaction times showed significant main effects of Prime [$F(2, 60) = 7.88$, $p < .01$] and Adjective [$F(1, 30) = 6.66$, $p < .05$], interactions of Prime x Adjective [$F(2, 60) = 4.05$, $p < .05$] and Group x SOA x Adjective [$F(2, 30) = 4.09$, $p < .05$].

To understand the main effect of Prime, the reaction times data were first collapsed across Group, SOA and Adjective, and then the three possible permutations of pairs of prime type were compared. These showed that in general, the subjects were slower following either the negative primes (1729.3 ms) or the positive primes (1744.6 ms) than following the neutral primes (1594.6 ms). The main effect of Adjective indicated that the subjects took longer to respond to the negative adjectives (1751.9 ms) than to the positive adjectives (1627.2 ms). However, these main effects were qualified by the interaction of Prime x Adjective, thus further analyses were performed to understand this interaction.

The reaction times data were collapsed across Group and SOA and simple main effects were examined. These data are shown in Table 3.4 and Fig. 3.4.

Table 3.4
The mean reaction times across Prime and Adjective, collapsed across Group and SOA

	Negative prime	Positive prime	Neutral prime	*mean*
Negative adjective	1753.4	1848.4	1653.8	*1751.9*
Positive adjective	1705.2	1640.9	1535.5	*1627.2*
mean	*1729.3*	*1744.6*	*1594.6*	

A simple main effect of Adjective showed that in the positive prime conditions, the subjects took longer to respond to the negative adjectives than the positive adjectives [$F(1, 32) = 16.39$, $p < .001$], however, such effects were not found following either the negative primes or the control primes [$F(1, 32) = .47$, $p = .500$; $F(1,32) = .06$, $p = .807$, respectively].

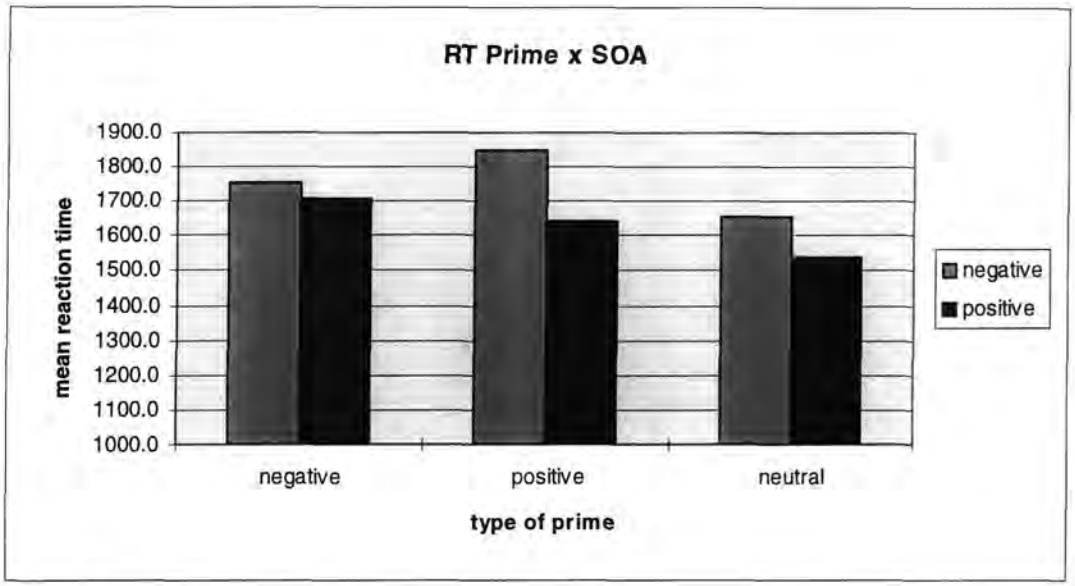

Fig. 3.5
The mean reaction times across Prime and Adjective, collapsed across Group and SOA

Tests of a simple main effect of Prime by the comparison across the three possible permutations of pairs of prime type indicated that in the case of the negative adjectives, the subjects were slower to respond following the positive primes than following the neutral primes [$F(1, 32) = 10.32$, $p < .005$]. The subjects were also slightly slower with the negative primes than with the neutral primes [$F(1, 32) = 4.30$, $p = .046$], and with positive primes than with the negative primes [$F(1, 32) = 4.15$, $p = .050$]. In the case of the positive adjectives, the subjects were slower following the negative primes than following either the positive and neutral primes [$F(1, 32) = 8.24$, $p < .01$; $F(1, 32) = 4.76$, $p < .05$, respectively]. That is, for both types of adjectives, the subjects were always slower in the negative and positive prime conditions than in the neutral prime conditions.

In order to interpret the three-way interaction of Group x SOA x Adjective, the reaction times data were collapsed across Prime (shown in Table 3.5 and Fig. 3.6) and analysed for each SOA and then for each adjective type separately.

Table 3.5
The mean reaction times across SOA x Adjective x Group, collapsed across Prime

	500ms		2000ms	
group	Negative adj.	Positive adj.	Negative adj.	Positive adj.
Deluded	1954.3	1836.5	2096.0	1790.1
Depressed	1676.2	1556.5	1618.5	1626.1
Normal	1613.2	1515.8	1553.0	1438.5

At 500ms SOA, a Group x Adjective sub-ANOVA was carried out. Only the main effect of Adjective reached significance [$F(1, 30) = 4.72$, $p < .05$]. As can be seen in Table 3.4 and Fig. 3.3, the subjects showed slower response to the negative adjectives than to the positive adjectives at 500ms SOA.

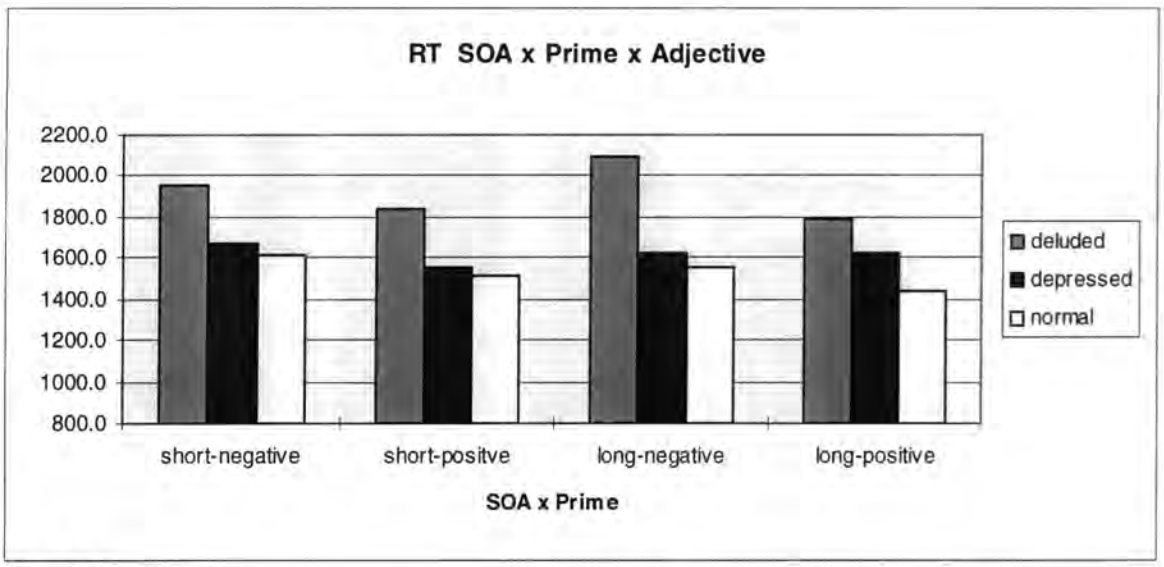

Fig. 3.6
Three-way interaction of SOA x Adjective x Group in the mean reaction times

At 2000ms SOA, a similar analysis was performed. There was found to be a main effect of Adjective [$F(1, 30) = 6.23$, $p < .05$] and a nearly-significant interaction of Group x Adjective [$F(2, 30) = 2.74$, $p = .081$]. These can be interpreted as the subjects tending to be slower to respond to the negative adjectives than the positive adjectives, but it was not the

case for the depressed subjects as can be seen in Table 3.5, which would be a causal factor of the Group x Adjective interaction.

The Group x SOA interaction was then analysed for each adjective separately. In the case of the negative adjectives, nothing reached significance. In the case of the positive adjectives, again, no significant effects were found.

In order to analyse the three-way interaction of SOA x Adjective x Group further, the mean reaction times for combined "yes" and "no" responses were analysed for each group separately.

Table 3.6
The deluded subjects' mean reaction times across Prime, collapsed across SOA and Adjective

	Negative prime	Positive prime	Control prime
Deluded	1994.8	1991.9	1770.9

In the deluded group, a 2 x 3 x 2, SOA x Prime x Adjective ANOVA revealed that there was a significant main effect of Prime [$F(2, 20) = 7.14$, $p < .01$]. To analyse this effect further, first the mean reactions times were collapsed across SOA and Adjective (the data are shown in Table 3.6), then these data were analysed by looking at the contrast terms which compared the three possible permutations of pairs of prime type. These contrasts showed that following either the negative or the positive primes the deluded subjects were slower to respond to the target adjectives than following the neutral primes [$F(1, 10) = 7.94$, $p < .05$; $F(1, 10) = 10.72$, $p < .01$, respectively], however, there was no significant difference between following negative primes and following positive primes [$F(1, 10) = .00$, $p = .958$]. In addition, a nearly-significant main effect of Adjective [$F(1, 10) = 4.25$, $p = 0.66$] was found. The deluded subjects tended to be slower to respond to the negative adjectives (2025.2 ms) than the positive adjectives (1813.3 ms).

In the depressed group, a 2 x 3 x 2, SOA x Prime x Adjective, ANOVA showed that there was an interaction of Prime x Adjective [$F(2, 30) = 5.96$, $p < .05$]. To interpret

this interaction, the mean reaction times were collapsed across SOA, and simple effects were analysed on these data (the data are shown in Table 3.7 and Fig. 3.7).

Table 3.7
The depressed subjects' mean reaction times across Prime and Adjective, collapsed across SOA

	Negative prime	Positive prime	Control prime
Negative adjective	1585.5	1785.5	1571.0
Positive adjective	1660.6	1572.7	1540.5

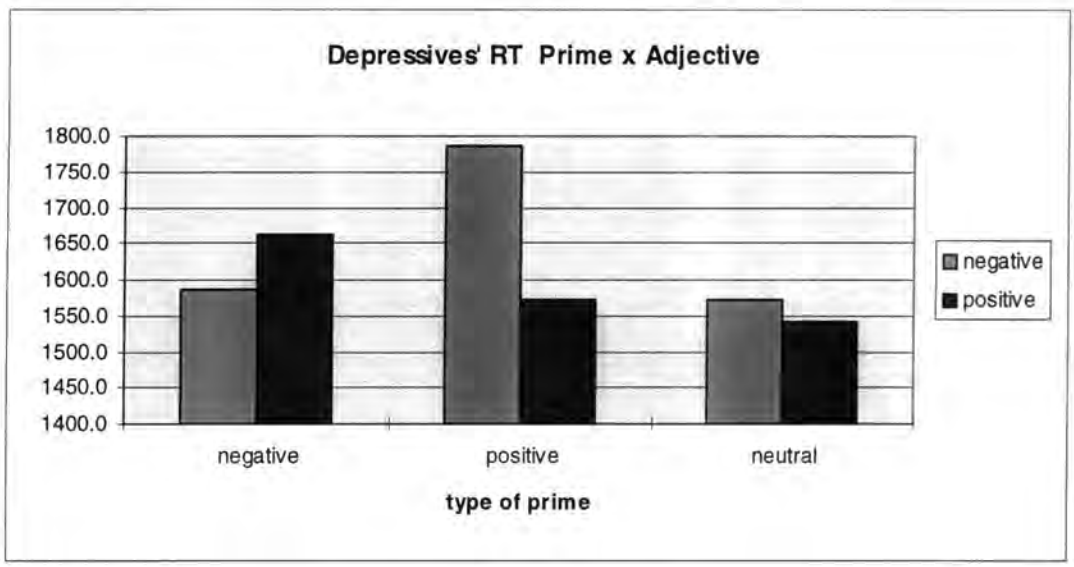

Fig. 3.7
The depressed subjects' mean reaction times across Prime and Adjective, summed across SOA

A simple main effect of Prime for the negative adjectives nearly reached significance [$F(2, 20) = 2.82$, $p = .083$], but not for the positive adjectives [$F(2, 20) = 1.10$, $p = .351$]. The simple main effect of Prime for the negative adjectives was further analysed by the comparison across the three possible permutations of pairs of prime type. This indicated that the depressed subjects were slower to respond to the negative adjectives following the positive primes than following the negative primes ($p < .05$), however, such difference between the positive and the neutral primes was not confirmed ($p = 0.127$). It may be

acceptable to perform these analyses given the *nearly* significant simple effect of Prime for the negative adjectives ($p = .083$), but given that there was no hint of significance for the simple effect of Prime on positive adjectives ($p = .351$), this was analysed no further.

A simple main effect of Adjective was then interpreted. In the positive prime conditions, the depressed subjects took longer to respond to the negative adjectives than to the positive adjectives [$F(1, 10) = 7.73$, $p < .05$]. However, it was found that the mean reaction times did not differ between the two types of adjectives in either the negative or the neutral prime conditions. That is, the depressed subjects were slower to respond to the negative adjectives than to the positive adjectives following the positive primes, but not when following either the negative or the neutral primes.

In the normal group, a 2 x 3 x 2, SOA x Prime x Adjective, ANOVA showed that no main effects nor interactions reached significance.

Analyses of RTs for "yes" and "no" responses separately: As mentioned in Overview of the analyses, to analyse the mean reaction times for "yes" responses to the positive adjectives and for "no" responses to the negative adjectives appears to be another way to investigate self-esteem regulation. Endorsement of the positive adjectives and rejection of the negative adjectives are both regarded as self-esteem enhancing, therefore, not only the endorsement levels, but also the reaction times for positive endorsement and for negative rejection would reflect how the subjects regulate their self-esteem. For instance, if the deluded subjects take longer to endorse the positive adjectives than the normal subjects even when their endorsement rates are not different, it would be concluded that the deluded subjects might have negative self-schemata, therefore, they need more time to say "yes" to the positive adjectives, or at least it can be assumed that more controlled processes are required in the deluded subjects.

In the analyses of the RTs for "yes" responses to the positive adjectives, one depressed subject was excluded because of empty cells for these analyses. For the same reason, in the analyses of the RTs for "no" responses to the negative adjectives, one deluded subject was excluded for the analyses. It should be noted again that the depressed subjects tended to accept the negative adjectives as self-descriptive, thus the analysis of

RTs for rejection of the negative adjectives could not be performed for the depressed subjects.

The mean reaction times for "yes" responses to the positive adjectives across both SOAs and the three types of prime are shown in Table 3.8, and for "no" responses to the negative adjectives are shown in Table 3.9.

Table 3.8
The mean reaction times for "yes" responses to the positive adjectives across SOA, Prime and Group

	500 ms			2000 ms		
	Negative	Positive	Neutral	Negative	Positive	Neutral
Deluded (n = 11)	1734.6	1883.7	1597.7	2021.5	1662.5	1470.5
Depressed (n = 10)	1510.1	1547.2	1497.7	1513.6	1503.7	1217.5
Normal (n = 11)	1284.0	1224.6	1227.1	1233.0	1273.8	1103.5

An overall 2 (SOA: 500 ms vs. 2000 ms) x 3 (Prime: negative vs. positive vs. neutral) x 3 (Group: deluded vs. depressed vs. normal) analysis of variance for all variables were performed on these mean reaction times for "yes" responses. This showed that there was a main effect of Prime [$F(2, 58) = 7.22$, $p < .005$], however, the other effects and interactions failed to reach significance. To interpret the main effect of Prime, the mean reaction times for endorsement of the positive adjectives were collapsed across SOA and Group, and then analysed by looking at the contrast terms which compared the three possible permutations of pairs of prime type. These contrasts revealed that the subjects were slower to endorse the positive adjectives following either the negative (1650.6 ms) or the positive primes (1510.7 ms) than following the neutral prime (1379.9 ms) ($p < .005$; $p < .05$, respectively).

Since any effects involving Group factor appeared to be non-significant, SOA x Prime ANOVAs were carried out for each group separately in order to investigate further the mean reaction times for "yes" responses to the positive adjectives within each group.

In the deluded subjects, a main effect of Prime was significant [$F(2, 20) = 7.38$, $p < .005$]. The RTs for endorsement of the positive adjectives were collapsed across SOA and then analysed by looking at the contrast terms which compared the three possible permutations of pairs of prime type. These contrasts showed that the deluded subjects took longer to endorse the positive adjectives following either the negative (1878.1 ms) or the positive primes (1773.1 ms) than following the neutral primes (1543.1 ms) ($p < .05$; $p < .05$, respectively). No other effects and interactions reached significance.

In both the depressed and the normal subjects, SOA x Prime ANOVAs showed that no effects and interactions appeared to be significant.

Table 3.9
The mean reaction times for "no" responses to the negative adjectives between Deluded and Normal subjects across SOA and Prime

	500 ms			2000 ms		
	Negative	Positive	Control	Negative	Positive	Control
Deluded (n = 11)	2631.3	2431.0	1854.4	2219.5	2280.5	2195.7
Normal (n = 11)	1675.4	1914.5	1548.2	1449.2	1605.2	1474.4

Table 3.9 shows the mean reaction times for rejection of the negative adjectives between the deluded and the normal subjects across SOA and Prime.

An overall 2 (SOA: 500 ms vs. 2000 ms) x 3 (Prime: negative vs. positive vs. neutral) x 2 (Group: deluded vs. normal) analysis of variance for all variables were performed on these mean reaction times for rejection of the negative adjectives. This revealed that there was a nearly significant main effect of Group [$F(1, 19) = 4.17$, $p = .055$]. That is, the deluded subjects tended to be slower to reject the negative adjectives than the normal subjects regardless of both SOA and Prime.

SOA x Prime ANOVAs were then carried out for the deluded and the normal subjects separately. However, no main effects or interactions reached significance in either group.

3.4 Discussion

The present study sought to refine the emotional priming paradigm and apply it to patients with delusions to see whether the deluded subjects would indicate a negative response style similar to that of depressed subjects at short SOA. Further it was argued that this negative response style would be hidden, and by contrast transformed into an extreme form of positive response style at long SOA.

The results of this study did not support this hypothesis. However, the results showed some hints that the deluded subjects might have negative self-schemata and a defensive mechanism to prevent themselves from experiencing negative feelings.

Although the deluded subjects endorsed relatively more positive adjectives than negative adjectives like the normal subjects, in absolute terms they seemed to endorse slightly fewer positive adjectives and slightly more negative adjectives than the normal subjects. Considering the mean reaction times, the deluded subjects took significantly longer to respond to the negative adjectives than to the positive adjectives, which was not found in the normal subjects. In addition, the deluded subjects were slower to reject the negative adjectives than the normal subjects. These findings could be interpreted to indicate that making judgements on negative stimuli requires more controlled processing than making judgements on positive stimuli in the deluded subjects in order to prevent their low self-esteem from being excited. This interpretation raises the question of whether the negative primes would make the deluded patients defensive. Indeed, the deluded patients generally became slower in the negative prime conditions than in the neutral prime conditions, but they were also slower following the positive primes than the neutral primes. It might be concluded that the deluded subjects would be sensitive to any meaningful stimuli, however when they are required to make judgements on negative valued matters, this judgmental processing would take the first priority since they need to protect themselves against feelings of low self-esteem. Their defensive function would be activated only by requirement to make explicit judgement on negative valued matters about the self. This argument is consistent with the previous findings (Kinderman, et al., 1991 ; Lyon et al., 1994).

The depressed subjects showed interesting results. They endorsed the negative and the positive adjectives even-handedly, although they endorsed more negative adjectives than did the deluded and the normal subjects. Not surprisingly, the depressed subjects endorsed fewer positive adjectives than the control subjects. These findings partly replicated the previous study (Power, Cameron & Dalgleish, 1996) where the subjects in the depressed group endorsed more adjectives in total than did the subjects in the control group. In the present study, though, no effects of either Prime or SOA on endorsement rates were found, whereas Power et al. (1996) found that the endorsement rates were influenced by the primes in the depressed subjects. However Prime effects were found in the reaction times to negative adjectives and in the reaction times for endorsement of positive adjectives. As shown in fig 3.7, the depressed subjects were slower to respond to the negative adjectives following the positive primes than following the neutral primes. They were also slower to respond to the negative adjectives than the positive adjectives in the positive prime conditions. In addition, they took longer to endorse the positive adjectives following either the negative or the positive primes than following the neutral primes. This could be interpreted as the depressed patients being generally sensitive to stimuli; in particular, the incongruent valence pairs of a prime and target would slow down the depressed subjects.

The results from this study for the control subjects also failed to replicate the findings of the previous studies. They only showed the significant effect of Adjective on the endorsement rates; endorsing more positive adjectives than the negative adjectives. In the reaction times for both combined and separated "yes" and "no" responses, no effects were found. This raises the possibility that this emotional priming paradigm might not clearly reflect differences between automatic and controlled processes. Further research is required to re-examine the emotional priming paradigm in a larger number of normal subjects.

3.5 Conclusion

The principal results of this study did not replicate the findings of the previous studies (Power & Brewin, 1990 ; Power, et al., 1991 ; Dalgleish at al., 1995) in normal

subjects. Rather, there remains a doubt as to whether the emotional priming paradigm would reflect both automatic and controlled processes, and whether it would be a appropriate methodology for this kind of research. Therefore, more research is required to investigate further the emotional priming paradigm in a larger number of normal subjects. In the next chapter, the emotional priming paradigm will be examined more carefully in a number of student subjects.

Chapter 4 Experiment 3: The Emotional Priming Task in Student Subjects

4.1 Introduction

Power & Brewin (1990) developed the emotional priming paradigm based on the work of Neely (1977) to investigate the effects of priming on a self-evaluation task. It was predicted that the presentation of salient information should automatically prime the related information stored in long term memory. For example, if positive primes facilitate the endorsement of positive trait adjectives as self-descriptive, this is regarded as a positive automatic facilitatory effect which would be evidence of positive self-representations in memory. Similarly, if negative primes facilitate endorsed negative targets, it would be regarded as a negative automatic facilitatory effect reflecting negative self-schemata. Adapting the findings of Neely's study in a lexical decision task, it was hypothesised that short SOA would reflect automatic effects, however, at long SOA conscious strategies would take place. Therefore, the emotional priming paradigm is thought to involve both automatic and controlled processing. According to the predictions of Power & Brewin (1990), if this is the case, people with negative self-schemata such as depression could show negative automatic facilitatory effects at short SOA, however, healthy individuals might not show such automatic facilitatory effects unless they have actually had the experiences in question. In the previous studies (Power & Brewin, 1990 ; Power, et al., 1991), it was also predicted that normal individuals would indicate the greatest self-esteem regulation at long SOA when primed by negative stimuli in order to present themselves in the best possible light. As summarised in Chapter 1, the summary of the findings from the previous studies is:

1) Normal individuals show no automatic facilitatory effects on self-evaluating tasks.
2) However, self-esteem regulation in normal individuals would be operating at the level of both automatic and of controlled processing which is reflected at long SOA by:
    a) being slower to endorse negative adjectives following negative primes at long SOA than at a short SOA,

b) endorsing fewer negative adjectives following negative primes at long SOA than at short SOA

c) in contrast, these effects are absent if the negative adjectives are preceded by positive primes rather than negative primes.

In this chapter, it will be examined whether the emotional priming task used in Experiment 2 in Chapter 3 would be able to assess both automatic and controlled processes on the self-evaluation task in healthy student subjects. In particular, as mentioned above, student subjects should show greater self-esteem regulation at long SOA than at short SOA in the negative prime conditions, and no prime effects would be expected at short SOA since automatic facilitatory effects might not be found in normal individuals.

4.2 Method

Subject: A sample of 52 students taking psychology at University of Durham and Open University. There were 17 male and 35 female with a mean age of 24.56 years (SD = 10.86) in the sample.

Materials: The priming and target stimuli used in Experiment 3 were the same as those in Experiment 2 in Chapter 3 (see Material in Experiment 2), 8 positive, 8 negative primes and 8 neutral primes as priming stimuli, and a set of 48 positive and 48 negative adjectives as target (complete lists of primes and target are shown in Appendix 7 and 8).

Apparatus: This was the same as Experiment 2, the emotional priming task was run on a BBC model B Microcomputer. The sequence of fields consisted of a *prime* display of 300 ms followed by a duration of either 300 or 1700 ms (i.e., 500 or 2000 ms SOA), and *target* display. A target adjective was presented and remained on screen until the subject pressed either "yes" or "no" key to indicate whether or not it applied to themselves. The programme automatically recorded reaction times and key choices.

Design: A within-subjects design was used; two durations of SOA (either 500 or 2000 ms), three valences of primes (positive, negative or neutral), and two types of target adjective (positive or negative). Thus, there were 12 conditions and each set of positive and negative adjectives was carefully divided into each of 6 groups (total 12 groups, 8 adjectives in a group) and allocated to each condition. There were 2 combinations of the adjective groups and the conditions to be counterbalanced (complete lists of the adjective groups and the allocation into the conditions in Appendix 9). Each of the 16 primes and 8 no-prime controls was presented four times and paired with each of the two types of adjective at both SOAs to give a total of 96 trials. The SOA durations were presented in blocks (8 blocks) and the order of presentation of the blocks and the conditions (12 conditions in a block) in each block was randomised.

Procedure: The experiment was carried out in a quiet experimental laboratory. The procedure of this experiment was same as Experiment 3 except that the students subjects only participated in the emotional priming tasks not in the questionnaire based experiment. The emotional priming task was introduced by instructions displayed on a computer. The subjects were then presented with 16 practice trials and given feedback of their reactions on the screen showing that their reply was either "It applies to me" or "It does not apply to me". The practice trials were self-paced; the subjects pressed both keys to indicate readiness for the next trial. After the practice trials, the instructions were again presented and also indicated that the experimental trials would appear automatically rather than being self-paced. Then the first block was presented. There were eight blocks (12 trials in a block) and after each block the subjects could have a rest until they pressed both buttons to indicate that they were ready to continue. It took about 13 minutes to complete.

4.3 Results

Overview: The analyses of the results will be presented in two main stages. First, the analyses of proportions of "yes" responses to the target adjectives across SOA and prime type. Second, the analyses of the mean reaction times for combined "yes" and "no"

responses will be presented, and then the mean reaction times for "yes" responses to positive adjectives and for "no" responses to negative adjectives will be separately considered to investigate self-esteem regulation more precisely. As mentioned in Experiment 2, since endorsement of the positive adjectives and rejection of the negative adjectives can be both regarded as self-esteem enhancement, the separate analyses of the mean reaction times for each type of response seems reasonable.

Analyses of endorsement levels: Table 4.1 shows the mean of proportions of "yes" responses across both SOAs, three types of prime and both types of adjective. The analyses were carried out on SPSS for Windows.

Table 4.1
The mean proportion of "yes" responses (n=52)

standard deviations are in brackets

	500 ms			2000 ms		
prime	Negative	Positive	Neutral	Negative	Positive	Neutral
Negative	0.30	0.29	0.28	0.36	0.23	0.25
adjective	(0.20)	(0.25)	(0.24)	(0.28)	(0.24)	(0.21)
Positive	0.69	0.82	0.69	0.69	0.73	0.83
adjective	(0.24)	(0.20)	(0.23)	(0.25)	(0.22)	(0.23)

These mean proportion of yes responses were analysed in a 2 (SOA: 500 ms vs. 2000 ms) x 3 (Prime: negative vs. positive vs. neutral) x 2 (Adjective: negative vs. positive) analysis of variance with repeated measures for all variables. There was a main effect of Adjective [$F(1, 51) = 136.12$, $p < .001$]. There were also a two-way interaction of Prime x Adjective [$F(2, 102) = 7.98$, $p < .005$] and another two-way interaction of SOA x Prime [$F(2, 102) = 14.26$, $p < .001$].

It can be seen from Table 4.1 that the subjects endorsed more positive adjectives than negative adjectives at all levels; this would be expected in normal students. In addition, it is suggested by Table 4.2, that the endorsement rates were affected by the negative primes compared to the other types of prime. It seems that the subjects endorsed more

negative adjectives and less positive adjectives following the negative primes than following the positive or the neutral primes.

Table 4.2
The mean proportions of "yes" responses across Prime and Adjective, collapsed across SOA

	Negative prime	Positive prime	Neutral prime
Negative adjective	0.33	0.26	0.26
Positive adjective	0.69	0.78	0.76

It can be also inferred from Table 4.3 that the positive primes facilitated the endorsements of the target adjectives at 500 ms SOA, whereas at 2000 ms SOA, the positive primes showed the opposite effect; they inhibited the endorsement of the target adjectives.

Table 4.3
The mean proportions of "yes" responses across SOA and Prime, collapsed across Adjective

	Negative prime	Positive prime	Control prime
500 ms SOA	0.50	0.56	0.48
2000 ms SOA	0.52	0.48	0.54

However, the interactions of Prime x Adjective and SOA x Prime were qualified by a higher-order interaction of SOA x Prime x Adjective [$F(2, 102) = 9.95$, $p < .001$], further analyses were required to understand this three-way interaction. Since more positive adjectives were endorsed than the negative adjectives at all levels, the simple two-way interaction of SOA x Prime for each type of adjective valence was separately analysed (see Fig. 4.1 and Fig. 4.2).

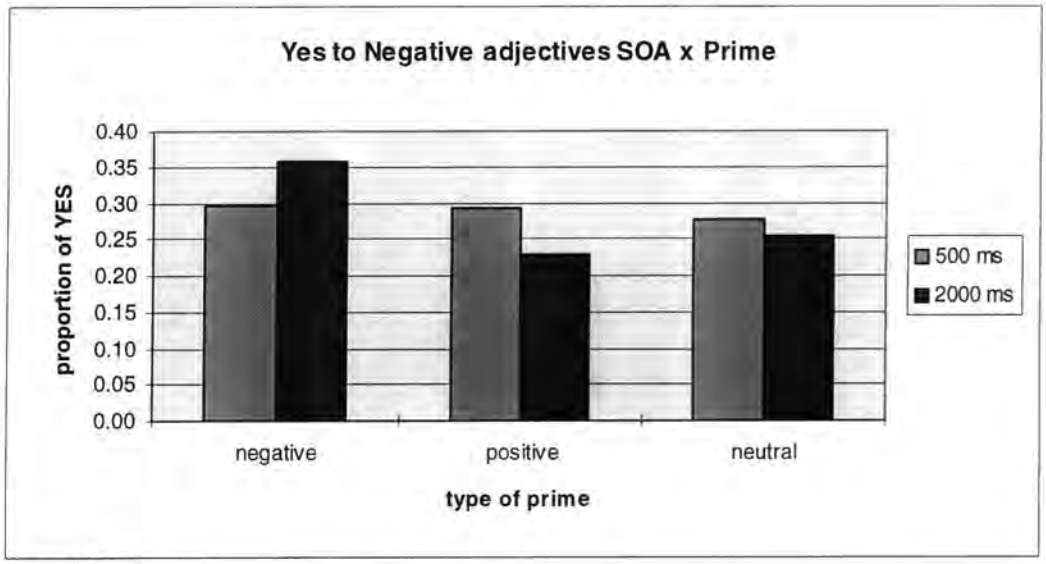

Fig. 4.1
The mean proportions of "yes" responses to the negative adjectives across SOA and Prime

In the case of negative adjectives, the interaction of SOA x Prime reached significance [$F(2, 102) = 5.32$, $p < .01$]. In order to understand this interaction, simple main effects were performed for each SOA and then for each prime separately.

At 500 ms SOA, the main effect of Prime was not significant [$F(2, 102) = .20$, $p = .820$]. That is, there was no difference across the three types of prime in endorsing the negative adjectives at short SOA. However, at 2000 ms SOA, a significant simple main effect of Prime was found [$F(2, 102) = 6.79$, $p < .005$]. This was analysed by looking at the contrast terms which compared the three possible permutations of pairs of prime type. These contrasts showed that at 2000 ms SOA, the subjects rejected significantly less negative adjectives following the negative primes (0.36) than following both the positive (0.23) and the neutral primes (0.25) [$F(1, 51) = 10.23$, $p < .005$; $F(1, 51) = 7.92$, $p < .01$, respectively], however, the positive prime conditions did not differ from the neutral prime conditions [$F(1, 51) = .53$, $p = .471$].

In looking at the simple main effect of SOA, more negative adjectives were endorsed at 2000 ms SOA than at 500 ms SOA in the negative prime conditions [$F(1, 51) = 7.32$, $p < .01$]. To the contrary, in the positive prime conditions, more negative adjectives

were endorsed at 500 ms SOA than at 2000 ms SOA [$F(1, 51) = 5.28$, $p < .05$]. However, the effect of SOA disappeared in the neutral prime conditions [$F(1, 51) = .60$, $p = .441$].

The interaction of SOA x Prime for the positive adjectives was then analysed. This also reached significance [$F(2, 102) = 20.40$, $p < .001$], thus simple main effects were analysed out for each SOA and for each prime separately.

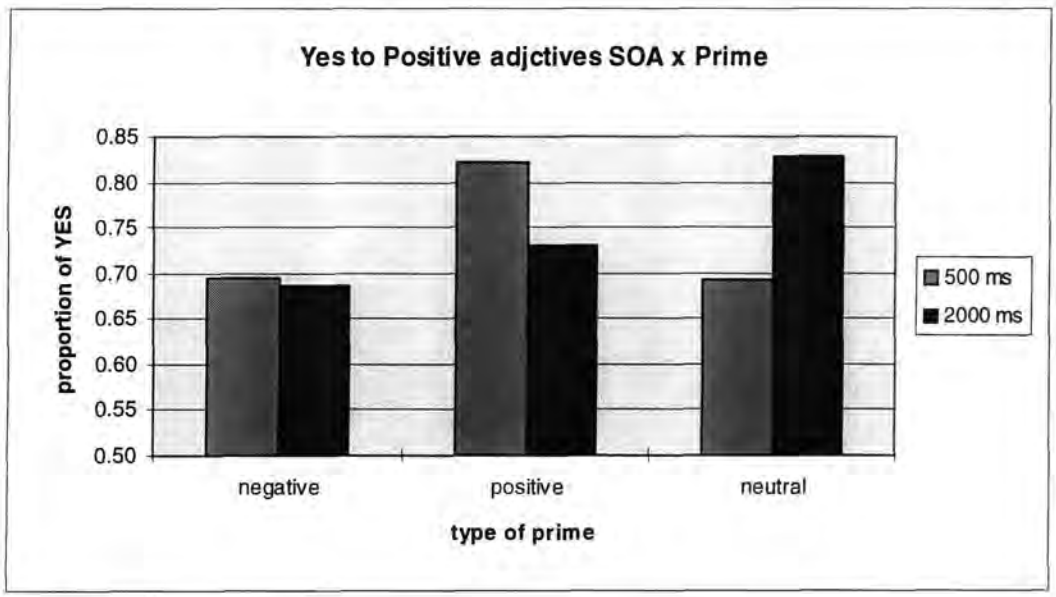

Fig. 4.2
The mean proportions of "yes" responses to the positive adjectives across SOA and Prime

At both 500 ms SOA and 2000 ms SOA, there was a significant simple main effect of Prime [$F(2, 102) = 15.69$, $p < .001$; $F(2, 102) = 11.20$, $p < .001$, respectively]. This was further analysed by looking at the contrast terms which compared the three possible permutations of pairs of prime type. At 500 ms SOA, the subjects endorsed significantly more positive adjectives following the positive primes than following both the negative and the neutral prime [$F(1, 51) = 18.39$, $p < .001$; $F(1, 51) = 29.56$, $p < .001$, respectively], however, the other contrast term (negative prime vs. neutral prime) was not significant [$F(1, 51) = .02$, ps = .899]. At 2000 ms SOA, more positive adjectives were endorsed following the neutral primes than both the negative and the positive primes [$F(1, 51) =$

25.53, $p < .001$; $F(1, 51) = 10.62$, $p < .005$, respectively], however the other contrast terms (negative prime vs. positive prime) was not significant [$F(1, 51) = 1.82$, $p = .184$].

The simple main effects of SOA were then examined. Following the negative primes, there was no significant effect of SOA [$F(1, 51) = .10$, n.s.], however, following the neutral primes, more positive adjectives were endorsed at 2000 ms SOA than at 500 ms SOA [$F(1, 51) = 27.65$, $p < .001$]. In addition, contrary to the neutral prime conditions, more positive adjectives were endorsed at 500 ms SOA than at 2000 ms SOA following the positive primes [$F(1, 51) = 7.27$, $p < .01$].

In summary, at short SOA the positive primes increased the endorsement rates of the positive adjectives, showing a positive automatic facilitatory effect in normal subjects. However, for the negative adjectives, no Prime effects were found at short SOA. At long SOA, both the positive and the negative primes reduced the endorsement of the positive adjectives compared to the neutral primes. For the negative adjectives, the subjects accepted more negative adjectives following the negative primes than following either the positive or the neutral primes, which is an opposite finding to the previous studies (Power & Brewin, 1990; Power et al., 1991) where the normal subjects endorsed fewer negative adjectives following negative event primes at long SOA.

Analyses of the mean reaction times (RT): The table below shows the mean reaction times for combined "yes" and "no" responses across both SOAs, three types of prime and both types of adjective.

Table 4.4
The mean reaction times for combined "yes" and "no" responses (n=52)
standard deviations are on brackets

	500msec			2000msec		
prime	Negative	Positive	Control	Negative	Positive	Control
Negative	1308.4	1294.6	1239.1	1330.7	1274.0	1198.5
adjective	(469.3)	(497.4)	(482.7)	(617.9)	(515.5)	(426.0)
Positive	1259.0	1096.8	1131.8	1301.7	1179.6	1066.0
adjective	(492.5)	(376.3)	(410.9)	(593.7)	(445.8)	(365.5)

These mean reaction times for combined "yes" and "no" responses were analysed in a 2 (SOA: 500 ms vs. 2000 ms) x 3 (Prime: negative vs. positive vs. neutral) x 2 (Adjective: negative vs. positive) analysis of variance with repeated measures for all variables. This overall ANOVA showed a significant main effect of Prime [$F(2, 102) = 12.89$, $p < .001$] and another significant main effect of Adjective [$F(1, 51) = 19.60$, $p < .001$]. There were no effects of Prime.

As can be seen in Table 4.4, it took longer to respond to the negative adjectives than to the positive adjectives. In addition, it seems that the subjects were slower in the negative prime conditions than in the positive and the neutral prime conditions. However, these main effects were qualified by a two-way interaction of Prime x Adjective [$F(2, 102) = 3.45$, $p < .036$], so the mean reaction times were collapsed across SOA and then the Prime x Adjective sub-ANOVA was carried out on these data (the data are shown in Table 4.5 and Fig. 4.3) .

Table 4.5
The mean reaction times across Prime and Adjective, collapsed across SOA

adjective	Negative prime	Positive prime	Control prime	*mean*
Negative	1319.5	1284.3	1152.6	*1252.1*
Positive	1280.4	1138.2	1098.9	*1172.5*
mean	*1300.0*	*1211.2*	*1125.7*	

A simple main effect of Adjective indicated that the subjects took longer to respond to the negative adjectives than to the positive adjectives in all types of prime condition [negative prime: $F(1, 51) = 19.79$, $p < .001$; positive prime: $F(1, 51) = 30.39$, $p < .001$; neutral prime: $F(1, 51) = 10.14$, $p < .01$].

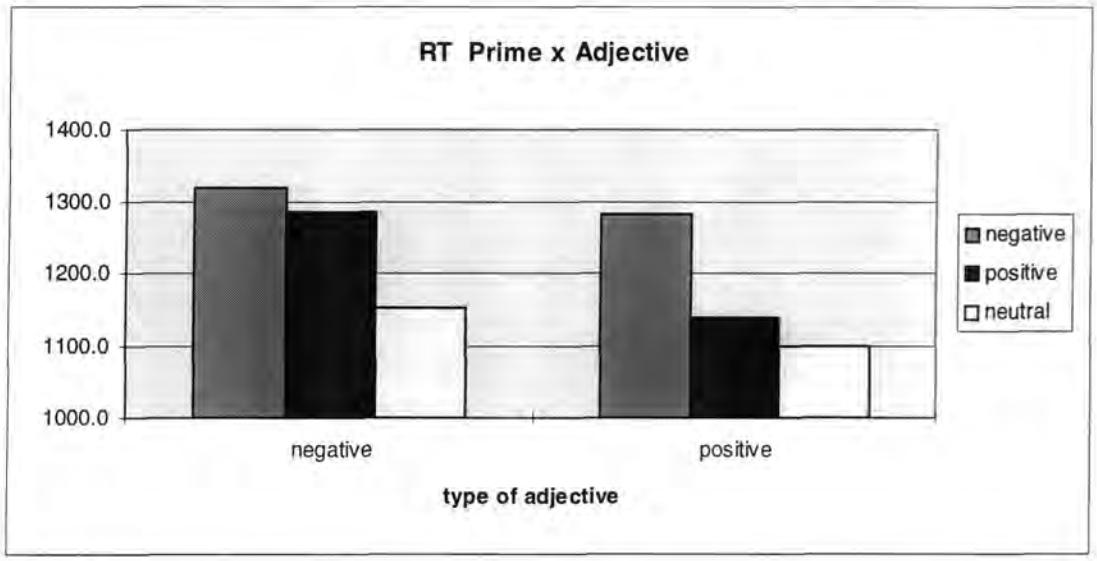

Fig. 4.3
The mean reaction times across Prime and Adjective, collapsed across SOA

To examine the simple main effect of Prime, the three possible permutations of pairs of prime type were analysed. It was found that in the case of the negative adjectives, the negative primes significantly increased the reaction times compared with the neutral primes [$F(1, 51) = 6.94$, $p < .05$], however the other contrast terms failed to reach significance. In the case of positive adjectives, a similar analysis showed that the negative primes again increased the reaction times compared with both positive and neutral primes [$F(1, 51) = 4.51$, $p < .05$; $F(1, 51) = 11.02$, $p < .005$, respectively]. That is, although the subjects took longer to respond to the negative adjectives than to the positive adjectives in all types of prime conditions, the negative primes increased the reaction times for both negative and positive adjectives.

Analyses of RTs for "yes" and "no" responses separately: To examine self-esteem regulation more carefully, the mean reaction times for "yes" responses to the positive adjectives and for "no" responses to the negative adjectives will be analysed separately. Since endorsement of the positive adjectives and rejection of the negative adjectives can be both regarded as self-esteem enhancement, these data would show how the subjects regulate their self-esteem in another way.

The reason why these particular responses were chosen for analysis is that the subjects endorsed few negative adjectives and rejected few positive adjectives (because they were healthy students). This makes the analyses of "yes" RTs to the negative adjectives and "no" RTs to the positive adjectives extremely difficult. If attempts were to be made to analyse such data, then the likelihood arises that there would be many empty cells in these conditions: thus the average of "yes" RTs to the negative adjectives and of "no" RTs to the positive adjectives might not produce reliable estimates. In the previous studies (Power & Brewin, 1990 ; Power, et al., 1991 ; Dalgleish, et al., 1995 ; Power, et al., 1996), the reaction times for "yes" responses to negative as well as positive adjectives were analysed. Because such analyses could possibly include many empty cells, it may be that the results are unrepresentative of the whole sample,

There were however, in the present sample some subjects who endorsed the positive adjective relatively less and rejected the negative adjectives relatively less. Therefore, the more suitable 40 subjects from the 52 subjects were chosen for these analyses. First, the analyses of the mean reaction times for "yes" responses to the positive adjectives will be presented, and then for "no" responses to the negative adjectives will be presented.

The mean reaction times for "yes" responses to positive adjectives across both SOAs and the three types of prime are shown in Table 4.6.

Table 4.6
The mean reaction times for "yes" responses to positive adjectives (n=40)

	Negative prime	Positive prime	Neutral prime
500 ms	1176.6	1055.2	1006.7
2000 ms	1260.5	1068.0	1033.8

These mean reaction times for "yes" to positive adjectives were analysed in a 2 (SOA: 500 ms vs. 2000 ms) x 3 (Prime: negative vs. positive vs. neutral) analysis of variance with repeated measures for all variables. The only significant result was a main

effect of Prime [$F(2, 78) = 10.71$, $p < .001$]. Comparing the three possible permutations of pairs of prime type, it was found that the subjects were slower to endorse the positive adjectives following the negative primes than following either the positive or the neutral primes [$F(1, 39) = 11.40$, $p < .005$; $F(1, 39) = 12.99$, $p < .001$, respectively], however there was no significant difference in the reaction times between the positive and the neutral prime conditions [$F(1, 39) = 1.80$, $p = .187$].

The mean reaction times for "no" responses to the negative adjectives across both SOAs and the three types of prime are shown in Table 4.7.

Table 4.7
The mean reaction times for "no" responses to negative adjectives (n=40)

	Negative prime	Positive prime	Neutral prime
500 ms	1271.8	1267.1	1273.4
2000 ms	1211.8	1170.9	1184.4

These mean reaction times for "no" to negative adjectives were analysed in a 2 (SOA: 500 ms vs. 2000 ms) x 3 (Prime: negative vs. positive vs. neutral) analysis of variance with repeated measures for all variables. There was a main effect of SOA [$F(1, 39) = 6.67$, $p < .05$], that is, the subjects were slower to reject the negative adjectives at 500 ms SOA than at 2000 ms SOA. The other effects failed to reach significance.

4.4 Discussion

The present study examined whether the refined emotional priming task could provide a suitable approach to assess both automatic and controlled processes in normal student subjects.

The subjects, not surprisingly, endorsed more positive adjectives than negative adjectives, but interestingly, the endorsement rates for each type of adjective was differently affected by the type of Prime and SOA. For the negative adjectives, no

automatic effects were found as it was predicted, however, for the positive adjectives, the positive primes increased the endorsement rates at short SOA. This is a positive automatic facilitatory effect which could reflect positive self-schemata. Conversely, at long SOA both the positive and the negative primes reduced the endorsement of the positive adjectives. In the case of the negative adjectives, however, the negative primes increased endorsement of the negative adjectives at long SOA, which was a non-replication of the findings from the previous studies where the normal subjects showed lower endorsement of the negative adjectives following the negative primes at long SOA. From these findings it could be concluded that normal individuals have positive self-schemata that produce positive automatic facilitatory effects and are not be damaged by accepting negative stimuli as self-descriptive in hypothetical situations; indeed, they could become more critical about the self when negatively primed at long SOA.

The analyses of the mean reaction times provided some support for the analyses of the endorsement rates and further implications. The subjects were slower to respond to both types of adjectives in the negative prime conditions than in the control prime conditions. In addition, the positive primes inhibited the reaction times for the positive adjectives. In any type of prime conditions, the subjects were slower to respond to the negative adjectives than to the positive adjectives. These findings suggest that the negative primes would affect the judgmental processes as can be assumed from the analyses of the endorsement rates, and also the judgmental processes for negative stimuli would be different from those for positive stimuli. To judge negative stimuli might require more controlled or complex processing which are regarded as "slow" processes. It might be the case that negative stimuli which are presented for judgement would have more impact than positive stimuli and prior information. In normal individuals, judgmental processes for negative stimuli would primarily depend on controlled processes, but in judgmental processes for positive stimuli, the controlled processes would not be dominant as much as in the processing of negative stimuli. Indeed, the mean reaction times for "yes" responses to the positive adjectives were inhibited by the negative primes, however, the mean RTs for "no" to the negative adjectives were not affected by any prime effects. Interestingly, the subjects took longer to reject the negative adjectives at short SOA than at long SOA,

which might be interpreted as suggesting that judgmental processes for these negative stimuli is different from simply processing information such as happens for the primes: when the negative target stimuli come up, individuals need to switch from processing the prior information (the primes) in order to process the new input. At short SOA, there is not enough time to turn off the processes for the primes, but at long SOA the processes for the primes are fading, thus it would quicker to switch another processes.

4.5 Conclusions

The present study examined the refined emotional priming paradigm. The findings indicate that this emotional priming task can assess both automatic and controlled processes. However, the previous studies (Power & Brewin, 1990 ; Power, et al., 1991) were not replicated by this study and also other implications have arisen. Therefore, new theoretical explanations for the emotional priming paradigm should be considered in addition to the possibility of extention for clinical use.

Chapter 5 Summary and Conclusions

5.1 Overview of thesis

The purpose of this thesis was to examine cognitive biases in people with delusions, especially to investigate the defensive function in deluded patients following the arguments of Bentall and his colleagues. To test the hypothesis that people with delusions would have defensive mechanisms, two different approaches were used and a new experimental methodology for this area of research was carefully considered. The results from each experiment will be summarised in turn in the next section.

5.2 Summary of each chapter

In Chapter 1, the selective review on cognitive biases in people with delusions was considered. It appeared to be reasonable to state that people suffering from delusions have abnormal cognitive biases in reasoning and information processing and these would be one of the most important key factors in understanding the nature and the mechanism of delusions. The findings are summarised that; deluded individuals have an attributional bias towards attributing negative outcomes to causes external to themselves; they exhibit an abnormal self-serving bias; these biases may reflect information processing biases for threatening materials. It has been argued that all the above cognitive biases would indicate a defensive function in deluded individuals, which would serve to protect themselves against feelings of low self-esteem. In order to investigate the defensive mechanism in deluded patients, some experimental tasks have been developed and it was suggested that the emotional priming paradigm which could potentially assess both automatic and controlled processes would provide a new approach for this area of research.

In Chapter 2, the defensive attributional style was examined by comparing an explicit questionnaire (ASQ) and an implicit questionnaire (PIT). The results from this

experiment failed to replicate the previous study (Lyon, et al., 1994). For the ASQ, the results of the deluded subjects were unexpected. They did not show stable and global attributions for the negative events like depressives, and external attributions for the negative events like normals as claimed in the previous studies (Kaney & Bentall, 1989; Candido & Romney, 1990; Lyon, et al., 1994). Indeed, the deluded subjects were not different from the subjects in the depressed and the control groups. Problematically, on the ASQ, the depressed subjects did not make more internal and stable attributions for the negative events than did the normal subjects. Only on the globality scale, the depressed subjects showed more global attributions for the negative events compared with the control subjects. This is different from what would be normally expected for depressives.

On the PIT, again the results did not replicate the previous study (Lyon, et al., 1994). The deluded subjects showed higher self-serving bias scores than the depressed subjects and did not differ from the normal subjects. However, the deluded subjects showed similar responses to the depressed subjects for negative events; both the deluded and the depressed subjects scored more internal for the negative events than the control subjects. The PIT was expected to bypass the defensive function in deluded subjects, but these results suggest that the PIT still activates their defensive function in some ways.

In Chapter 3, the defensive function in the deluded subjects was then investigated by the emotional priming paradigm. This emotional priming task was regarded as a promising experimental approach for this area of research. It was expected that at automatic processing level (at short SOA), the deluded subjects' responses would resemble those of the depressed subjects, whereas at controlled processing level (at long SOA) they would show similar responses to the normal subjects. However, the results from the present experiment were not positive. Although Group x SOA effects were found in the endorsement rates and the mean reaction times, differentiation between automatic and controlled processes could not be seen clearly across the groups. However, some results indicated that the deluded subjects have low self-esteem and the defensive mechanism to prevent themselves from entering negative feelings: the deluded subjects were slower to respond to the negative adjectives than to the positive adjectives; the deluded subjects were slower to reject the negative adjectives than the normal subjects. These could be

interpreted as suggesting that the deluded subjects need a greater degree of controlled processing with negative materials to protect themselves against feelings of low self-esteem.

Since the emotional priming paradigm unexpectedly failed to clearly assess both automatic and controlled processes in clinical groups in Experiment 2 (Chapter 3), it was then checked whether the emotional priming paradigm would still be a promising approach to assess both processes in a student population in Experiment 3 (Chapter 4). The results suggest that the emotional priming task can reflect both automatic and controlled processes but in a different manner from the suggestions made by the previous studies (Power & Brewin, 1990; Power, et al., 1991; Dalgleish, et al., 1995). At short SOAs, the subjects endorsed more positive adjectives following the positive primes than following the neutral primes. This is a positive automatic facilitatory effect which was not found in the previous studies (Power & Brewin, 1990; Power, et al., 1991; Dalgleish, et al., 1995; Power, et al., 1996). However, on the mean reaction times for both combined and separated "yes" and "no" responses, the results seemed to be more complicated and could not be interpreted by automatic and controlled processes. These findings are consistent with the suggestion by Power et al. (1996), "...endorsement rates may provide a clearer measure of the effects of interest and may be less prone to the wider range of methodological and strategic effects that influence reaction time data in such tasks (p.9)."

In next section, the two approaches used in this research will be more fully considered separately.

5.3 Discussions on the two different approaches used in this research

5.3.1 Questionnaire-based study (ASQ vs. PIT)

As shown earlier, the results from using the ASQ and the PIT did not replicate the study of Lyon et al. (1994). One possible interpretation could be consistent with the suggestion by made Power (1991, cited in Power, et al., 1996). He suggested that self-report cognitive measures might be less sensitive to current symptom levels than

experimental tasks. Nonetheless, self-report measures are still useful for clinical use because they are easy to administer as a part of therapy or assessment and no special equipment is required as in experimental tasks. Therefore, the attempt to assess both implicit (automatic) and explicit (controlled) response processes by self-report measures seems desirable. It seems especially difficult to develop self-report measures which can bypass explicit response processes, thus further research on the PIT is required.

5.3.2 Experimental study (the emotional priming paradigm)

From a different theoretical perspective, some studies employing the priming paradigm to investigate the processing of affect and emotion have been reported. In order to understand and interpret the results from the present research, it appears to be sensible to look at other priming paradigms related to the emotional priming paradigm. For example, Fazio et al. (1986) addressed the issue of whether affect could be activated automatically on the mere observation of an affect loaded stimulus. They used a priming procedure, in which the affective association between prime words and target words was manipulated. The prime words presented either positive (e.g., music), negative (e.g., death) or a string of three identical letters (e.g.., BBB) followed by a target word. The subjects were asked to evaluate whether the target word was "good" or "bad". It was found that response latencies to the target words were facilitated if both prime and target had the same valence (positive-positive or negative-negative: congruent pairs), but were inhibited if prime and target had the opposite valence (positive-negative or negative-positive: incongruent pairs) compared with the control trials (neutral-positive or neutral-negative: control pairs). These activation effects occurred only at 300 ms SOA, but disappeared at 1000 ms SOA, suggesting that the observed effects of affective congruence should be attributed to automatic processes. Fazio et al. (1986) concluded that "affect can be activated automatically from memory in the same way that has been demonstrated previously for semantic knowledge (p.236)".

Further research by Hermans et al. (1994) modified the procedure of the study of Fazio et al. (1986) and examined the affective priming effects found in Fazio et al.'s study

focusing on what conditions would be required to produce automatic affective activation. In Experiment 1 of Hermans et al.'s study, they chose colour pictures as both primes and targets instead of words. Hermans et al. (1994) tried to test "whether the affective priming effect is only confined to the affective processing of words, or whether it can be generalised towards other types of stimulus material (p.518)". The results showed that the study of Fazio et al. (1986) can be replicated even when complex visual stimuli were used. Facilitation was expected for the affectively congruent pairs and inhibition for the incongruent pairs in the comparison with the control pairs. Both facilitation and inhibition occurred only for 300 ms SOA condition. In Experiment 2, in order to investigate further whether or not the affective priming effect was dependent on an intentional, conscious evaluative process, they eliminated the explicit instructions to evaluate the target adjectives. The subjects were simply asked to read aloud the targets as quickly as possible. The subjects did not have to make judgements on the targets. It was found that "pronunciation latencies were longer for affectively incongruent trials, and were shorter for affectively congruent prime-target pairs (p.526)". Hermans et al. (1994) concluded that the automatic affective activation effect is independent of an evaluative processing goal (Experiment 2), or the verbal character of the stimuli (Experiment 1). They argued that these findings provide information about necessary conditions to produce the automatic activation of affective information in memory.

Hermans et al.'s study lies in the line of *conditional approach to automaticity* which was driven from the argument against the current consensus definition of automaticity (e.g., Bargh, 1992, 1989). In the 'traditional agreement' on cognitive processing, automatic processing is usually regarded as being fast, involuntary, unintentional, unconscious, effortless and outside awareness. However, Bargh (1992, 1989) argued that the current consensus definition of automaticity continues to be a unitary concept that entails all the above characteristics in an all-or-none fashion. That is, under this dual-mode model of cognition, a cognitive process would be either automatic or controlled. Instead of this unitary concept of automaticity, the decomposition of automaticity has been suggested by several studies (e.g. Hermans, et al, 1994; Bargh, 1992, 1989; Logan & Cowan, 1984). It is argued that the defining features do not all occur in an

all-or-none fashion, but rather seem to be likely to co-occur as combinations of different features (e.g. Hermans, et al, 1994; Bargh, 1992, 1989; Logan & Cowan, 1984). For example, a process might be intentional but effortless. This approach makes the researchers investigate the preconditions that are needed to have the automatic process occur, as we have seen the study of Hermans et al. (1994). Then the varieties of automaticity can be classified with respect to their necessary preconditions (Bargh, 1992, 1989). As a consequence, cognitive processing does not seem so simple as unitary concept of automaticity, rather, it may be required to classify the varieties of automaticity according to the preconditions.

As we have seen, according to Bargh's arguments (1992, 1989), the characteristic of automatic processing is conditional; in order to produce automatic processing, the necessary preconditions should be considered. In the present research, the emotional priming paradigm was chosen to assess automatic and controlled processes in people with delusions. However, a possibility arises that the preconditions required to produce automatic processing in deluded patients might be different from those in normal individuals. Recalling the hypothesis on cognitive biases in people with delusions; deluded patients would show negative self-concept when they are unaware of being assessed about the self, whereas deluded patients would show self-defensive function when directly asked to evaluate about the self. The emotional priming paradigm actually requires overt evaluations about the self at both short and long SOAs. While a prime might bias at short SOAs, it would follow that the requirement to make an overt self evaluative decision might make it difficult to bypass the defensive function of deluded patients could not be bypassed. For people with delusions, being independent of evaluation about the self would be an important precondition for automatic processing to occur. This precondition may not apply to normal individuals, since positive automatic facilitatory effects on self-evaluating tasks were found in the normal subjects in Chapter 4. From the results of this research it can be suggested that simple pronunciation of target adjectives, as in Hermans et al.'s Experiment 2, seems to be a more appropriate procedure for investigating automatic processing in deluded patients.

If the preconditions for automatic processes are considered, the emotional priming paradigm might become properly sensitive and employ appropriate methodology. Furthermore, the emotional priming paradigm could be extended to other psychiatric patients where it would be useful to understand both their automatic and controlled cognitive processing. For example, some studies were carried out to understand both automatic and controlled processing in anxious patients (Dalgleish, et al., 1995) and in remitted manic patients (Winters & Neale, 1985).

5.4 Conclusions

Cognitive biases, particularly the defensive mechanism in people with delusions was investigated in two different methodologies in this thesis. The results partly supported the hypothesis of the defensive function in patients suffering from delusions; on the PIT the deluded patients showed higher internal scores for negative events than the normal subjects, in the emotional priming task they were slower to respond to the negative adjectives than to the positive adjectives, and also slower to reject the negative adjectives than the normal subjects. The results suggested that the emotional priming paradigm would be a potential approach to focus on assessing both automatic and controlled processes in psychiatric groups. However, further research should be required to refine the emotional priming paradigm with respect to the preconditions required for automatic processing in deluded patients.

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Appendix 1: The Attributional Style Questionnaire.

A.S.Q.

NAME:

DATE:

DIRECTIONS

Please read each situation and vividly imagine it happening to you.
Decide what you believe would be the major cause of the situation if it happened to you.
Write this cause in the blank provided.
Answer three questions about the cause. Circle only one number per question.
Go to the next question.

YOU MEET A FRIEND WHO COMPLIMENTS YOU ON YOUR APPEARANCE.

Write down the one major cause.....

1. *Is the cause of your friend's compliment due to something about you or something about other people or circumstances?*

Totally due to other people or circumstances	1	2	3	4	5	6	7	Totally due to me

2. *In the future when you are with your friend, will this cause again be present?*

Will never again be present	1	2	3	4	5	6	7	Will always be present

3. *Is the cause something that just affects interacting with your friends or does it also influence other areas of your life?*

Influences just this particular situation	1	2	3	4	5	6	7	Influences all situations in my life

YOU HAVE BEEN LOOKING FOR A JOB UNSUCCESSFULLY FOR SOME TIME.

Write down the one major cause.....

4. *Is the cause of your unsuccessful job search due to something about you or something about other people or circumstances?*

Totally due to other people or circumstances	1	2	3	4	5	6	7	Totally due to me

5. *In the future when looking for a job, will this cause again be present?*

Will never again be present	1	2	3	4	5	6	7	Will always be present

6. *Is the cause something that just influences looking for a job or does it also influence other areas of your life?*

Influences just this particular situation	1	2	3	4	5	6	7	Influences all situations in my life

YOU BECOME VERY RICH.

Write down the one major cause.....

7. *Is the cause of your becoming rich due to something about you or something about other people or circumstances?*

Totally due to other people or circumstances	1	2	3	4	5	6	7	Totally due to me

8. *In your financial future, will this cause again be present?*

Will never again be present	1	2	3	4	5	6	7	Will always be present

9. *Is the cause something that just affects obtaining money or does it also influence other areas of your life?*

Influences just this particular situation	1	2	3	4	5	6	7	Influences all situations in my life

A FRIEND COMES TO YOU WITH A PROBLEM AND YOU DON'T TRY TO HELP THEM.

Write down the one major cause.....

10. *Is the cause of not helping your friend due to something about you or something about other people or circumstances?*

Totally due to other people or circumstances	1	2	3	4	5	6	7	Totally due to me

11. *In the future when a friend comes to you with a problem, will this cause again be present?*

Will never again be present	1	2	3	4	5	6	7	Will always be present

12. *Is the cause something that just affects what happens when a friend comes to you with a problem or does it also influence other areas of your life?*

Influences just this particular situation	1	2	3	4	5	6	7	Influences all situations in my life

YOU GIVE AN IMPORTANT TALK IN FRONT OF A GROUP AND THE AUDIENCE REACTS NEGATIVELY.

Write down the one major cause.....

13. Is the cause of the audience reacting negatively due to something about you or something about other people or circumstances?

Totally due to other people or circumstances	1	2	3	4	5	6	7	Totally due to me

14. In the future when giving talks, will this cause again be present?

Will never again be present	1	2	3	4	5	6	7	Will always be present

15. Is the cause something that just influences giving talks or does it also influence other areas of your life?

Influences just this particular situation	1	2	3	4	5	6	7	Influences all situations in my life

YOU DO A PROJECT WHICH HIGHLY PRAISED.

Write down the one major cause.....

16. Is the cause of being praised due to something about you or something about other people or circumstances?

Totally due to other people or circumstances	1	2	3	4	5	6	7	Totally due to me

17. In the future when doing a project, will this cause again be present?

Will never again be present	1	2	3	4	5	6	7	Will always be present

18. Is the cause something that just affects doing projects or does it also influence other areas of your life?

Influences just this particular situation	1	2	3	4	5	6	7	Influences all situations in my life

YOU MEET A FRIEND WHO ACTS HOSTILELY TOWARDS YOU.

Write down the one major cause.....

19. Is the cause of your friend acting hostile due to something about you or something about other people or circumstances?

Totally due to other people or circumstances	1	2	3	4	5	6	7	Totally due to me

20. In the future when interacting with your friends, will this cause again be present?

Will never again be present	1	2	3	4	5	6	7	Will always be present

21. Is the cause something that just influences interacting with your friends or does it also influence other areas of your life?

Influences just this particular situation	1	2	3	4	5	6	7	Influences all situations in my life

YOU CAN'T GET ALL THE WORK DONE THAT OTHERS EXPECT OF YOU.

Write down the one major cause.....

22. Is the cause of your not getting the work done due to something about you or something about other people or circumstances?

Totally due to other people or circumstances	1	2	3	4	5	6	7	Totally due to me

23. In the future when doing the work that others expect, will this cause again be present?

Will never again be present	1	2	3	4	5	6	7	Will always be present

24. Is the cause something that just affects doing work that others expect of you or does it also influence other areas of your life?

Influences just this particular situation	1	2	3	4	5	6	7	Influences all situations in my life

YOUR SPOUSE (BOYFRIEND/GIRLFRIEND) HAS BEEN TREATING YOU MORE LOVINGLY.

Write down the one major cause.....

25. *Is the cause of your spouse (boyfriend/girlfriend) treating you more lovingly due to something about you or something about other people or circumstances?*

Totally due to other people or circumstances 1 2 3 4 5 6 7 Totally due to me

2. *In future interaction with your spouse (boyfriend/girlfriend), will this cause again be present?*

Will never again be present 1 2 3 4 5 6 7 Will always be present

3. *Is the cause something that just affects how your spouse (boyfriend/girlfriend) treats you or does it also influence other areas of your life?*

Influences just this particular situation 1 2 3 4 5 6 7 Influences all situations in my life

YOU APPLY FOR A POSITION THAT YOU WANT VERY BADLY (e.g., IMPORTANT JOB, GRADUATE SCHOOL ADMISSION.) etc., AND YOU GET IT.

Write down the one major cause.....

4. *Is the cause of your getting the position due to something about you or something about other people or circumstances?*

Totally due to other people or circumstances 1 2 3 4 5 6 7 Totally due to me

5. *In the future when applying for a position, will this cause again be present?*

Will never again be present 1 2 3 4 5 6 7 Will always be present

6. *Is the cause something that just influences applying for a position or does it also influence other areas of your life?*

Influences just this particular situation 1 2 3 4 5 6 7 Influences all situations in my life

YOU GO OUT WITH SOMEONE AND IT GOES BADLY.

Write down the one major cause.....

1. *Is the cause of the outing going badly due to something about you or something about other people or circumstances?*

Totally due to other people or circumstances	1	2	3	4	5	6	7	Totally due to me

2. *In future outings, will this cause again be present?*

Will never again be present	1	2	3	4	5	6	7	Will always be present

3. *Is the cause something that just influences outings or does it also influence other areas of your life?*

Influences just this particular situation	1	2	3	4	5	6	7	Influences all situations in my life

YOU GET A PAY RISE.

Write down the one major cause.....

4. *Is the cause of your getting a raise due to something about you or something about other people or circumstances?*

Totally due to other people or circumstances	1	2	3	4	5	6	7	Totally due to me

5. *In the future on your job, will this cause again be present?*

Will never again be present	1	2	3	4	5	6	7	Will always be present

6. *Is the cause something that just affects getting a raise or does it also influence other areas of your life?*

Influences just this particular situation	1	2	3	4	5	6	7	Influences all situations in my life

Appendix 2: Anglicised version of the Pragmatic Inference Test. 12 vignette and the questions for each vignette.

A. You decide to open your own dry cleaning shop in a small but growing town near the border. Your shop will be the only one of its kind for miles around. In the first year of business, the town's population doubles and your business prospers. Your advertising campaign is a big success and reactions from your customers indicate that the cleaning is of good quality. Your gross sales exceed expectations. You wonder whether it would be to your advantage to open a chain of shops, so you go to a bank and apply for a loan. As you hoped, the bank approves the loan.

B. You have been looking unsuccessfully for a job as a factory worker. The unemployment rate has risen lately, and jobs are especially tight in your field. Sales have been hurt because of foreign competition. You decide to talk to a friend about the situation. He reminds you that you have had difficulties with management in the past because of being late and a poor performance record. Your search for a job is frustrating and you go for six months without finding a job.

C. You pride your self on your appearance. You recently spent some money on new cloths and a new hair style. The next day you receive a number of compliments at work, especially from one colleague. However, this person angers you later on in the day, by asking you a lift home. This is a great inconvenience because this person lives quite distance from your destination.

D. A neighbour mentions to you that their teenager had a drinking problem. You wonder if the neighbour is going to ask you for advice. This neighbour is an independent and headstrong person who rarely seeks advice from others. You are uncomfortable because you do not have any children of your own and you are not very good at counselling people. The neighbour leaves without asking for your advice.

E. You and a colleague decide to go our one night for a bite to eat. You wonder whether you will have a good time since your colleague is a moody person. The night stars out badly when you forget to call a taxi for both of you and you also fail to make dinner reservations. You and the colleague wait for an hour at the restaurant and there is still no table. You both decide to go elsewhere for a meal. The food and service are unsatisfying at the other place, especially for the colleague. On the trip home the colleague asks you a lot of questions how you were able to receive a recent promotion from the boss, and mentions that no one else in the office has received a promotion in over two years. The questioning indicates a hostile tone.

F. You have a date with somebody new. You go to a film and your date has a poor opinion of it. And for most of the evening, your date does not say much. You also do not initiate much conversation, and when you do talk you have a difficult time keeping up your end of the conversation. When the evening is over, your date expresses disappointment about how the evening went.

G. A lonely, elderly person sits next to you on a park bench while you are reading a book and begins to talk to you. You are not surprised by this, since strangers are often friendly towards you. After some small talk, you find out this person is down on their luck and needs help. You and the person talk for some time, and it seems to you that this person continues to enjoy your company.

H. The company you work for is always busy around holiday time. It is the day before Christmas holiday and everyone in the office is exhausted. At short notice you decide to throw an office party. You prepare an interesting mix of gin and fruit punch, which draws a number of compliments from others. Everyone seems to enjoy themselves. You make friends with a couple of new colleagues and everyone laughs at your jokes.

I. You give an important talk on a controversial topic to a group of town residents. You present a point of view that in the short term in unpopular but will likely benefit the town in the long run. The audience reacts negatively, especially to your suggestion that the town ought to purchase more lorries. The next speaker presents a point of view that is opposite to your own. As you listen to the speech, you notice that this person is a very fluent and persuasive speaker. It becomes quite obvious to you that the second speaker receives a positive reaction from the audience.

J. Recently, you have not done all the work that your boss expects of you. The boss begins to complain about your performance. The job is sometimes difficult because it is quite technical and the hours are a burden. Also, you recently discover through the office grapevine that the boss' nephew is very interested in your position.

K. You take a college course in English Literature because you like to write. One of your assignments is to write a paper on one famous English author. You choose John Fowles, a decision which is met with praise by the teacher who is a great fan of Fowles. The teacher tells you that Fowles is perhaps the most influential writer. You work hard on the paper and think it is well written. You are pleased when the paper is returned. The teacher comments that your interpretation of Fowles' work is consistent with her own, and you receive an excellent mark.

L. You recently receive a salary increase at work. While you are a bit surprised by this since you had no prior notice about such a raise, you do feel you have been a reliable worker. Indeed, others have received wage increases in the past when you did not. The day after receive this news, a memo is sent to all workers indicating in the last few months a number of employees have voluntarily left the company. The company's owner offers to be sensitive to suggestions to improving job satisfaction.

The questions for vignette A;

A 1. What kind of shop do you open?
   A. Hardware.
   B. Dry cleaning.

A 2. In what part of the country is the town located?
   A. Birmingham.
   B. Carlisle.

A 3. Where is the loan obtained?
   A. A finance company.
   B. Bank.

A 4. What is the reason for the success of your business?
   A. You are a clever businessman.
   B. You had no competition.

The questions for vignette B;

B 1. Why do you discuss your situation with a friend?
   A. Need advice.
   B. Your friend is recruiting staff.

B 2. How long do you go for without finding work?
   A. Six weeks.
   B. Six months.

B 3. Why do you have trouble finding work?
   A. Poor job record.
   B. Poor job market.

B 4. What kind of job interests you?
   A. A big company.
   B. A small company.

The questions for vignette C;

C 1. Why do you receive a compliment from your colleague?
   A. Your appearance is genuinely perceived as worthy of a compliment.
   B. This person needs a favour from you.

C 2. Why do you spend money on your appearance?
A. Self pride.
B. You enjoy compliments.

C 3. Who gives you the most compliments at work?
A. Same sexed people.
B. Opposite sexed people.

C 4. On what do you spend your money?
A. Shoes.
B. Hair style.

The questions for vignette D;

D 1. Who comes to you for advice?
A. Colleague.
B. Neighbour.

D 2. What is the nature of the problem?
A. Stealing.
B. Drinking.

D 3. What gender is the person with the problem?
A. Male.
B. Female.

D 4. Why doesn't the neighbour ask you for advice?
A. This person is the type not to ask for advice.
B. You are inexperienced in this area.

The questions for vignette E;

E 1. Where do you and the colleague go?
A. To a film.
B. To a restaurant.

E 2. At what time of day does the activity take place?
A. Afternoon.
B. Evening.

E 3. Why does the colleague act hostilely towards you?
   A. The person is jealous of you.
   B. The person is angry that you forgot to call a taxi and make dinner reservations.

E 4. Who initiates the activity?
   A. You.
   B. The colleague.

The questions for vignette F;

F 1. With whom do you have a date?
   A. A close friend.
   B. A new acquaintance.

F 2. Where do you go on the date?
   A. To a film.
   B. For dinner.

F 3. Why does the date go badly?
   A. Your date was a boring person.
   B. You were not interesting enough for the person.

F 4. Where did you go after the date?
   A. For a drive.
   B. Nowhere.

The questions for vignette G;

G 1. Who starts the conversation with you?
   A. A tourist.
   B. A stranger.

G 2. Why does this person talk with you for so long.
   A. You are friendly.
   B. This person wants your help.

G 3. What are you doing when you are approached by this individual?
   A. Reading a newspaper.
   B. Reading a book.

G 4. Why is this person down on their luck?
A. Illness.
B. Deserted by family.

The questions for vignette H;

H 1. Why is the party a success?
A. Your colleagues are in the mood to unwind.
B. You know how to throw a good party.

H 2. What is popular at the party?
A. The drink.
B. The food.

H 3. At what time of year is the party?
A. Christmas.
B. Summer.

H 4. Is the party well attended?
A. Yes.
B. No.

The questions for vignette I;

I 1. Where do you give the speech?
A. A political convention.
B. A town hall meeting.

I 2. Why does the audience react negatively to your speech?
A. You were an ineffective speaker.
B. The second speaker took the less controversial viewpoint.

I 3. How do you learn about the audience's reaction to the second speaker?
A. Someone tells you.
B. You witness it.

I 4. What is being discussed at the meeting?
A. Road repair.
B. Rubbish removal.

The questions for vignette J;

J 1. With whom do you talk about your problems at work?
   A. No one.
   B. Your spouse.

J 2. What kind of skill does this job require?
   A. Manual.
   B. Technical.

J 3. Why does your boss complain about your work performance?
   A. You have poor technical skills.
   B. The boss wants you to leave to make room for a relative.

J 4. What shift do you work?
   A. Day.
   B. Night.

The questions for vignette K;

K 1. What kind of course do you take?
   A. English Literature.
   B. Writing course.

K 2. Why do you take the course?
   A. Compulsory.
   B. Pleasure.

K 3. Why does the teacher like your paper?
   A. You are a good writer.
   B. Your viewpoints are similar to the teachers.

K 4. Why do you choose to write about Fowles?
   A. He is your favourite author.
   B. The teacher tells you to.

The questions for vignette L;

L 1. What type of income raise do you receive?
   A. Bonus payment.
   B. Wage increase

L 2. How do you hear about the raise?
   A. A memo.
   B. Told personally.

L 3. Why do you get the raise?
   A. Company wants to prevent further resignations.
   B. You deserve the raise because of good performance.

L 4. Who else gets a raise?
   A. No one.
   B. Everyone.

Appendix 3: Description of subjects in Experiment 1 and 2.

	Diagnosis	in/out-patient	sex	age	NART
S1	schizoaffective disorder	in	F	61	97
S2	schizophrenic	in	M	31	100
S3	schizophrenic	in	M	29	107
S4	delusional disorder	in	M	42	114
S5	schizophrenic	out	F	51	119
S6	schizophrenic	out	F	43	102
S7	bipolar disorder with psychotic features	out	F	37	98
S8	schizophrenic	in	M	51	105
S9	schizoaffective disorder	in	F	28	96
S10	schizophrenic	out	M	57	116
S11	schizophrenic	out	F	43	107
D1	major depression	in	M	54	109
D2	depression + anxiety	out	F	30	115
D3	major depression	out	F	27	112
D4	major depression	in	M	38	103
D5	major depression	in	M	61	100
D6	depression + anxiety	out	F	49	116
D7	major depression	in	F	34	116
D8	major depression	in	M	29	112
D9	major depression	out	F	42	112
D10	major depression	out	M	32	109
D11	major depression	in	F	34	100
N1	normal subject		F	46	99
N2	normal subject		M	42	111
N3	normal subject		M	48	120
N4	normal subject		F	28	115
N5	normal subject		M	54	110
N6	normal subject		F	48	91
N7	normal subject		F	57	98
N8	normal subject		M	30	120
N9	normal subject		F	61	125
N10	normal subject		M	53	121
N11	normal subject		F	44	118

Appendix 4: Each subject's scores on the Attributional Style Questionnaire.

maximum score for each sub-scale: 42
minimum score for each sub-scale: 6

		positive event			negative event		
		internality	stability	globality	internality	stability	globality
Deluded	S1	31	40	33	25	34	32
	S2	21	21	33	24	21	30
	S3	35	35	26	30	27	20
	S4	15	34	29	13	26	21
	S5	40	32	35	31	25	22
	S6	34	30	38	27	21	34
	S7	24	30	36	30	24	30
	S8	39	28	24	28	21	25
	S9	33	30	17	36	28	30
	S10	33	33	27	30	28	27
	S11	24	15	29	34	14	28
Depressed	D1	39	37	40	27	38	42
	D2	27	30	23	28	27	21
	D3	31	31	28	24	27	37
	D4	33	33	29	26	30	36
	D5	37	39	36	37	27	24
	D6	33	26	30	36	31	37
	D7	30	31	33	30	25	29
	D8	18	23	24	21	23	21
	D9	27	33	25	36	28	31
	D10	26	27	26	26	27	26
	D11	32	36	36	36	36	36
Normal	N1	30	29	18	19	19	12
	N2	29	32	28	18	27	18
	N3	25	34	28	19	28	24
	N4	33	30	31	35	24	20
	N5	38	34	29	38	30	20
	N6	36	34	26	22	29	19
	N7	12	42	24	12	42	24
	N8	27	30	24	28	25	20
	N9	33	25	26	31	25	16
	N10	30	26	31	32	28	31
	N11	33	35	36	23	28	28

Appendix 5: Each subject's scores on the Pragmatic Inference Test.

maximum score for each sub-scale: 6
minimum score for each sub-scale: 0
self-serving bias score: subtracting score for negative event from score for positive event

		Internality		
		positive event	negative event	self-serving bias
Deluded	S1	4	4	0
	S2	4	2	2
	S3	3	3	0
	S4	3	2	1
	S5	4	4	0
	S6	3	3	0
	S7	6	4	2
	S8	4	5	-1
	S9	3	2	1
	S10	3	4	-1
	S11	4	3	1
Depressed	D1	5	4	1
	D2	3	3	0
	D3	2	1	1
	D4	2	3	-1
	D5	1	4	-3
	D6	2	3	-1
	D7	2	3	-1
	D8	3	4	-1
	D9	3	3	0
	D10	1	3	-2
	D11	1	3	-2
Normal	N1	4	4	0
	N2	3	2	1
	N3	1	2	-1
	N4	3	1	2
	N5	2	1	1
	N6	2	1	1
	N7	1	4	-3
	N8	3	3	0
	N9	2	2	0
	N10	2	3	-1
	N11	3	2	1

Appendix 6: The Word Intensity List.

Word Intensity

On the following page there is a list of adjectives. Please rate how strong the feeling is that each word conveys to you on a scale from one to three. So if you think that the adjective is fairly mild, put a 1 in the brackets just to the left of the word. If you think that the adjective conveys a medium amount of feeling, put a 2 in the brackets. If you think that the adjective is very strong in feeling, please out a 3 beside it. Try to give your immediate reaction to each adjective rather than thinking hard about the decision.

(rating: 1= mild, 2= average, 3= intense)

( )----uptight
( )----fearful
( )----restless
( )----upset
( )----tense
( )----scared
( )----uneasy
( )----nervous
( )----desperate
( )----frightened
( )----anxious
( )----troubled
( )----worried
( )----confused
( )----afraid
( )----shy
( )----jittery
( )----panicky
( )----jumpy
( )----insecure
( )----shaky
( )----disorganised
( )----terrified
( )----unloved
( )----apathetic
( )----unlucky
( )----downcast
( )----gloomy
( )----forlorn

( )----tormented
( )----worthless
( )----inhibited
( )----unwanted
( )----unpopular
( )----pessimistic
( )----inferior
( )----resigned
( )----depressed
( )----miserable
( )----bored
( )----hopeless
( )----ashamed
( )----useless
( )----ugly
( )----unfortunate
( )----lonely
( )----abandoned
( )----unhappy
( )----guilty
( )----tragic
( )----rejected
( )----sad
( )----isolated
( )----hurt
( )----lost
( )----unsociable
( )----enraged
( )----discontented

( )----vexed
( )----resentful
( )----irritable
( )----disgusted
( )----outraged
( )----stormy
( )----furious
( )----cruel
( )----hostile
( )----violent
( )----angry
( )----cross
( )----critical
( )----mean
( )----impolite
( )----devious
( )----heartless
( )----insincere
( )----dishonest
( )----indecisive
( )----unkind
( )----thoughtless
( )----unreliable
( )----selfish
( )----lazy
( )----irresponsible
( )----impatient
( )----cold
( )----deceitful

Appendix 7: Priming stimuli in the Emotional Priming Paradigm

Negative Primes	Positive Primes
1. Your family rejects you.	1. A date goes well.
2. Your work is criticised.	2. Your work is praised.
3. Others control your life.	3. You make new friends
4. Your life if failure.	4. You pass an important test.
5. A close friend dies.	5. Your family encourages you.
6. You lose your job.	6. You get a good job.
7. A loved one leaves you.	7. A close friend moves nearly.
8. You fail an interview.	8. You attain a lifelong goal.

Appendix 8: Target adjectives in the Emotional Priming Paradigm.

Negative adjectives

block	N-1	N-2	N-3
1	Angry	Greedy	Nervous
2	Uneasy	Anxious	Isolated
3	Ashamed	Unloved	Stubborn
4	Worried	Cautious	Miserable
5	Unwanted	Troubled	Frightened
6	Restless	Depressed	Jumpy
7	Heartless	Indecisive	Gloomy
8	Inadequate	Empty	Awkward

block	N-4	N-5	N-6
1	Confused	Restless	Unreliable
2	Helpless	Suspicious	Upset
3	Impatient	Timid	Unkind
4	Unsociable	Lonely	Unhappy
5	Tense	Unlucky	Fearful
6	Guilty	Selfish	Critical
7	Useless	Insecure	Rejected
8	Hostile	Negative	Worthless

Positive adjectives

block	P-1	P-2	P-3
1	Alert	Loving	Patient
2	Gentle	Gifted	Fearless
3	Strong	Helpful	Talented
4	Capable	Cheerful	Confident
5	Carefree	Sensible	Optimistic
6	Reliable	Competent	Loyal
7	Assertive	Dependable	Modest
8	Attractive	Happy	Bright

block	P-4	P-5	P-6
1	Friendly	Tolerant	Respected
2	Creative	Important	Successful
3	Fulfilled	Productive	Witty
4	Perceptive	Smart	Honest
5	Lucky	Tender	Mature
6	Polite	Lively	Sincere
7	Clever	Relaxed	Generous
8	Popular	Sociable	Truthful

Appendix 9: The combinations of each type of target adjective and the conditions in the Emotional Priming Task.

Appendix 9-1
The combinations of Negative adjectives and the conditions

SOA	500 ms			2000 ms		
prime	Negative	Positive	Neutral	Negative	Positive	Neutral
combination 1	N-1	N-2	N-3	N-4	N-5	N-6
combination 2	N-6	N-4	N-5	N-3	N-1	N-2

Appendix 9-2
The combinations of Positive adjectives and the conditions

SOA	500 ms			2000 ms		
prime	Negative	Positive	Neutral	Negative	Positive	Neutral
combination 1	P-1	P-2	P-3	P-4	P-5	P-6
combination 2	P-6	P-4	P-5	P-3	P-1	P-2

Appendix 10: Each subject's endorsement rate for each type of target adjective in Experiment 2.

Appendix 10-1
The endorsement rates of Negative adjectives in Experiment 2.

		500 ms			2000 ms		
		negative	positive	neutral	negative	positive	neutral
Deluded	S1	0.50	0.25	0.38	0.25	0.25	0.00
	S2	0.25	0.38	0.13	0.38	0.25	0.25
	S3	0.50	0.38	0.63	0.75	0.38	0.38
	S4	0.25	0.38	0.25	0.13	0.13	0.25
	S5	0.38	0.25	0.63	0.50	0.75	0.50
	S6	0.25	0.25	0.00	0.13	0.25	0.25
	S7	0.13	0.63	0.25	0.63	0.13	0.50
	S8	0.75	1.00	1.00	0.88	0.88	0.88
	S9	0.25	0.38	0.25	0.50	0.25	0.13
	S10	0.38	0.63	0.50	0.50	0.88	0.63
	S11	0.50	0.13	0.50	0.38	0.50	0.75
Depressed	D1	0.25	0.63	0.25	0.25	0.00	0.25
	D2	0.63	0.25	0.38	0.63	0.25	0.13
	D3	0.25	0.38	0.38	0.13	0.13	0.25
	D4	0.88	0.75	1.00	0.75	0.63	0.75
	D5	1.00	0.63	1.00	0.88	1.00	0.75
	D6	1.00	1.00	1.00	1.00	0.88	0.88
	D7	0.75	0.75	0.75	0.88	0.75	0.88
	D8	0.75	0.63	0.63	0.88	0.50	0.88
	D9	0.88	1.00	0.63	0.75	0.88	0.75
	D10	0.88	1.00	1.00	0.88	0.88	0.88
	D11	0.63	0.88	0.63	1.00	0.88	0.75
Normal	N1	0.25	0.50	0.38	0.38	0.25	0.50
	N2	0.63	0.13	0.25	0.63	0.00	0.13
	N3	0.13	0.38	0.38	0.50	0.38	0.38
	N4	0.63	0.88	0.63	0.38	0.75	0.50
	N5	0.13	0.13	0.13	0.00	0.13	0.25
	N6	0.13	0.13	0.25	0.25	0.25	0.13
	N7	0.13	0.13	0.25	0.13	0.00	0.00
	N8	0.13	0.13	0.25	0.13	0.25	0.25
	N9	0.75	0.25	0.50	0.75	0.38	0.75
	N10	0.00	0.00	0.00	0.00	0.00	0.25
	N11	0.13	0.13	0.63	0.50	0.50	0.50

Appendix 10-2

The endorsement rates of Positive adjectives in Experiment 2.

		500 ms			2000 ms		
		negative	positive	neutral	negative	positive	neutral
Deluded	S1	0.75	0.88	0.75	0.38	0.75	0.75
	S2	0.38	1.00	0.63	0.63	0.63	1.00
	S3	0.63	1.00	0.75	0.13	0.75	1.00
	S4	1.00	0.75	0.50	0.63	0.75	1.00
	S5	0.63	0.88	0.38	0.75	0.88	0.50
	S6	0.75	0.88	1.00	0.88	0.75	0.88
	S7	0.50	0.38	0.63	0.50	0.63	0.88
	S8	0.88	0.63	0.88	0.75	0.63	0.63
	S9	0.75	1.00	1.00	0.75	0.88	0.88
	S10	0.50	0.25	0.25	0.38	0.38	0.50
	S11	0.88	0.75	0.38	0.63	0.50	0.88
Depressed	D1	1.00	0.88	0.88	0.88	0.75	0.88
	D2	0.13	0.63	0.63	0.38	0.38	0.88
	D3	0.88	1.00	0.75	1.00	1.00	1.00
	D4	0.50	0.63	0.25	0.25	0.50	0.63
	D5	0.50	0.88	0.50	0.50	0.88	0.50
	D6	1.00	1.00	1.00	1.00	1.00	1.00
	D7	0.63	0.63	0.25	0.38	0.50	0.25
	D8	0.50	0.50	0.63	0.38	0.38	0.50
	D9	0.88	0.63	0.63	0.75	0.75	0.75
	D10	0.13	0.00	0.00	0.00	0.00	0.00
	D11	0.50	0.25	0.25	0.63	0.25	0.50
Normal	N1	0.75	0.75	0.25	0.75	0.63	0.88
	N2	0.25	0.88	1.00	0.25	1.00	1.00
	N3	0.75	0.75	0.88	0.63	0.88	0.75
	N4	0.63	0.75	0.38	0.50	0.63	0.88
	N5	0.63	1.00	0.88	1.00	1.00	0.88
	N6	0.75	0.88	0.75	1.00	1.00	1.00
	N7	0.88	0.88	1.00	0.88	0.75	1.00
	N8	0.63	0.75	0.88	0.63	0.75	0.75
	N9	0.63	0.75	0.75	0.50	0.63	0.88
	N10	1.00	0.75	0.63	0.75	0.63	0.88
	N11	1.00	0.50	0.75	0.88	0.88	1.00

Appendix 11: Each subject's mean reaction times for each type of target adjective in Experiment 2.

Appendix 11-1
The mean reaction times for Negative adjectives in Experiment 2.

		500 ms			2000 ms		
		negative	positive	neutral	negative	positive	neutral
Deluded	S1	2480	1877	1572	2082	2181	2260
	S2	1228	1123	932	1272	1271	1083
	S3	1854	1986	1315	1873	1249	1511
	S4	2077	1707	1543	1677	1470	1672
	S5	2464	3055	2593	2697	3169	2815
	S6	1654	1530	1419	1688	2047	1950
	S7	1329	1369	1419	1442	1371	1389
	S8	1514	1470	1623	1595	1571	1185
	S9	3236	2455	1903	3341	4426	2894
	S10	2331	2131	1834	2152	2751	2218
	S11	2940	3538	2990	2930	3132	2803
Depressed	D1	2490	2792	3016	2369	2962	2931
	D2	2055	1908	1989	1928	2061	1697
	D3	1262	1845	1416	1295	1381	1392
	D4	1644	2491	1170	1501	1963	1101
	D5	1429	1587	1173	1786	2187	1693
	D6	1368	1316	1946	1084	910	1424
	D7	1835	1998	1595	1535	2093	1391
	D8	1012	1165	1182	898	1109	1027
	D9	1339	1590	1063	1154	1358	949
	D10	2251	1398	1401	1429	2116	2141
	D11	1749	1506	1333	1467	1544	1533
Normal	N1	1557	1399	959	1514	1561	1314
	N2	1986	1676	1671	1850	1480	1479
	N3	1720	1558	1741	1658	2702	1711
	N4	1292	1112	1498	1194	1340	1658
	N5	1331	1402	1206	1362	1352	1171
	N6	1436	1196	2162	1774	1543	1454
	N7	1308	1485	1222	1314	1197	1069
	N8	2340	2078	2347	1997	2039	1754
	N9	1425	2578	1407	1358	1478	1433
	N10	954	722	773	801	937	908
	N11	2362	2974	2358	2457	2024	2367

Appendix 11-2

The mean reaction times for Positive adjectives in Experiment 2.

		500 ms			2000 ms		
		negative	positive	neutral	negative	positive	neutral
Deluded	S1	2134	1945	1888	1924	2788	1817
	S2	1175	1112	984	862	844	907
	S3	1963	1098	1107	1229	1496	1043
	S4	1290	1540	2345	1736	1749	1371
	S5	2947	2097	2710	2648	2433	1709
	S6	1757	1878	1829	1264	1888	1347
	S7	1356	1426	1202	1542	1317	1340
	S8	1456	1764	1364	1788	1509	1598
	S9	1916	2004	1414	2891	1590	1644
	S10	2030	2052	2342	2482	2064	2246
	S11	2762	3256	2460	2765	2914	2329
Depressed	D1	1942	1715	2376	2422	2795	1952
	D2	2062	1610	1620	2241	1724	1543
	D3	1146	1005	1046	1012	936	962
	D4	1728	1917	1620	1640	1691	1197
	D5	2205	1805	1849	2262	2168	2331
	D6	1003	1039	1354	1040	1125	1677
	D7	1617	2180	1981	1491	1698	1732
	D8	969	1049	1032	1220	1053	904
	D9	1232	1443	1153	1418	1510	1213
	D10	2312	1138	1548	2101	2021	1954
	D11	1814	1425	1429	1656	1553	1418
Normal	N1	1813	1065	1642	1485	1320	968
	N2	1766	1620	1403	1681	1523	1359
	N3	1887	1417	1570	1515	2030	1682
	N4	935	1148	1175	1095	1082	1113
	N5	1312	1035	860	1078	1131	1297
	N6	1441	1778	1577	1478	1402	1456
	N7	926	912	1010	1196	917	810
	N8	2859	2499	2222	2734	2041	1835
	N9	1133	1374	1789	1350	1939	807
	N10	1031	1184	1191	1284	1101	818
	N11	1875	2396	2175	2222	2022	1699

Appendix 12: Each subject's endorsement rates for each type of adjective in Experiment 3.

Appendix 12-1
The endorsement rates for Negative adjectives in Experiment 3.

	500 ms			2000 ms		
	negative	positive	neutral	negative	positive	neutral
1	0.38	0.38	0.38	0.50	0.50	0.13
2	0.13	0.25	0.00	0.13	0.00	0.13
3	0.00	0.25	0.00	0.00	0.00	0.00
4	0.13	0.25	0.25	0.38	0.13	0.13
5	0.38	0.13	0.38	0.25	0.13	0.25
6	0.50	0.38	0.75	0.63	0.88	0.38
7	0.25	0.25	0.13	0.25	0.13	0.13
8	0.25	0.00	0.25	0.13	0.00	0.13
9	0.50	0.88	0.88	0.50	0.88	0.75
10	0.38	0.63	0.25	0.38	0.50	0.25
11	0.38	0.50	0.38	0.50	0.25	0.25
12	0.13	0.38	0.13	0.00	0.00	0.00
13	0.38	0.75	0.50	0.63	0.50	0.63
14	0.50	0.13	0.00	0.75	0.25	0.38
15	0.38	0.13	0.50	0.38	0.13	0.13
16	0.63	0.50	0.88	0.88	0.75	0.63
17	0.00	0.13	0.25	0.13	0.25	0.38
18	0.50	0.25	0.00	0.50	0.13	0.00
19	0.63	0.38	0.00	0.75	0.00	0.00
20	0.13	0.50	0.38	0.00	0.50	0.13
21	0.38	0.13	0.50	0.25	0.13	0.50
22	0.25	0.63	0.38	0.38	0.75	0.00
23	0.75	0.88	0.75	0.50	0.50	0.13
24	0.00	0.25	0.00	0.00	0.00	0.25
25	0.38	0.75	0.75	0.75	0.38	0.25
26	0.25	0.13	0.25	0.25	0.00	0.25
27	0.63	0.25	0.38	0.63	0.25	0.50
28	0.25	0.13	0.13	0.25	0.13	0.63
29	0.13	0.13	0.50	0.38	0.13	0.25
30	0.25	0.13	0.13	0.13	0.13	0.13
31	0.38	0.50	0.25	0.38	0.38	0.38
32	0.13	0.00	0.25	0.38	0.00	0.25
33	0.00	0.00	0.13	0.13	0.50	0.00
34	0.38	0.38	0.13	0.63	0.00	0.38
35	0.25	0.00	0.13	0.25	0.00	0.13
36	0.25	0.50	0.25	0.25	0.25	0.50
37	0.13	0.00	0.13	0.00	0.00	0.25
38	0.13	0.63	0.13	0.25	0.13	0.25
39	0.25	0.13	0.00	0.25	0.13	0.25
40	0.00	0.13	0.00	0.13	0.00	0.00
41	0.50	0.38	0.63	0.88	0.50	0.50
42	0.13	0.00	0.13	0.00	0.00	0.25
43	0.63	0.00	0.13	0.75	0.00	0.00
44	0.00	0.00	0.00	0.00	0.00	0.00
45	0.13	0.25	0.25	0.13	0.25	0.50
46	0.13	0.38	0.50	0.25	0.13	0.13
47	0.38	0.63	0.13	0.63	0.25	0.13
48	0.25	0.13	0.00	0.00	0.25	0.13
49	0.25	0.13	0.25	0.00	0.25	0.13
50	0.38	0.75	0.63	0.88	0.50	0.88
51	0.75	0.00	0.25	1.00	0.00	0.38
52	0.25	0.00	0.13	0.38	0.13	0.13

Appendix 12-2

The endorsement rates for Positive adjectives in Experiment 3.

	500 ms			2000 ms		
	negative	positive	neutral	negative	positive	neutral
1	0.88	0.88	0.63	0.63	0.88	0.88
2	0.38	0.50	0.38	0.13	0.38	0.25
3	0.63	1.00	0.75	0.88	1.00	1.00
4	1.00	1.00	1.00	1.00	1.00	1.00
5	0.63	1.00	0.63	1.00	0.75	0.88
6	0.88	0.88	0.50	0.50	0.38	0.88
7	0.50	0.63	0.63	0.75	0.25	0.50
8	0.88	1.00	0.75	1.00	0.75	1.00
9	0.63	0.88	0.75	0.50	0.75	0.75
10	0.75	1.00	0.75	0.88	0.63	0.88
11	0.75	1.00	0.88	1.00	0.88	0.88
12	1.00	1.00	0.88	1.00	1.00	1.00
13	0.38	0.88	0.63	0.75	0.25	0.75
14	0.63	0.88	0.75	0.50	1.00	1.00
15	0.88	1.00	0.88	0.63	1.00	1.00
16	0.38	0.25	0.38	0.50	0.13	0.63
17	1.00	1.00	0.75	1.00	1.00	1.00
18	0.25	0.63	0.00	0.13	0.75	0.00
19	0.50	0.88	0.75	0.38	0.63	1.00
20	0.75	0.88	0.75	0.75	0.63	0.63
21	0.63	0.88	0.75	0.75	0.88	1.00
22	0.88	0.88	0.63	1.00	0.63	1.00
23	0.88	0.88	0.75	0.63	0.88	0.88
24	0.13	0.00	0.13	0.88	1.00	1.00
25	0.50	0.88	0.63	0.38	0.75	0.63
26	0.38	0.88	0.63	0.13	0.38	0.63
27	0.38	0.63	0.63	0.50	0.75	0.88
28	0.88	1.00	0.75	0.75	0.50	0.88
29	1.00	0.75	0.50	0.75	0.75	0.88
30	0.75	0.63	0.38	0.63	0.63	0.63
31	1.00	0.75	1.00	1.00	0.88	1.00
32	0.88	1.00	1.00	0.88	0.88	0.88
33	1.00	0.75	1.00	0.75	0.75	0.88
34	0.63	1.00	0.75	0.38	0.75	1.00
35	1.00	1.00	1.00	0.88	0.75	1.00
36	0.63	0.75	0.75	0.88	0.63	0.75
37	0.88	0.88	0.88	0.88	0.88	1.00
38	0.88	0.75	0.88	0.75	0.88	0.88
39	0.63	0.50	0.50	0.75	0.75	0.88
40	0.88	1.00	1.00	0.88	0.88	1.00
41	0.75	1.00	1.00	0.75	1.00	0.88
42	0.88	0.75	0.63	0.88	0.75	0.88
43	0.13	0.75	0.13	0.25	0.38	0.00
44	0.88	1.00	1.00	0.88	1.00	1.00
45	0.50	0.75	0.63	0.63	0.88	0.88
46	0.75	0.75	0.50	0.50	0.50	0.88
47	0.38	0.63	0.50	0.38	0.38	0.75
48	0.88	1.00	0.88	0.88	0.88	1.00
49	1.00	0.75	0.75	0.38	0.75	0.75
50	0.38	0.63	0.50	0.63	0.63	0.63
51	0.75	0.88	0.75	0.63	0.88	0.88
52	0.50	1.00	0.88	0.63	0.88	1.00

Appendix 13: Each subject's mean reaction times for each type of adjective in Experiment 3.

Appendix 13-1

The mean reaction times for Negative adjectives in Experiment 3.

	500 ms			2000 ms		
	negative	positive	neutral	negative	positive	neutral
1	958	1278	863	1211	928	772
2	1044	852	641	821	723	356
3	1101	1069	885	940	1134	900
4	1155	1375	1166	1186	1345	1716
5	2107	1577	1731	1970	1536	2278
6	1269	2720	2226	4038	1719	2011
7	1685	1336	1643	1672	1805	1543
8	938	1104	1022	1044	1061	982
9	958	950	979	983	1141	912
10	949	875	840	941	781	850
11	1007	1074	725	956	826	966
12	2109	1319	2060	2868	2432	1691
13	967	1269	886	1097	1027	755
14	622	719	685	743	794	720
15	1563	1581	1385	1558	1138	1587
16	1913	2317	2047	1779	2247	2074
17	1452	1208	1260	1373	1351	1390
18	1056	893	1013	864	855	851
19	1860	1173	1187	2592	2830	1288
20	2455	1695	1320	1810	2106	1168
21	1330	1226	1156	1841	1520	1266
22	1333	1433	1280	1326	1505	1201
23	1218	1052	920	867	1240	1330
24	1372	1037	1301	1563	1279	1243
25	968	1042	1017	1030	1023	1051
26	1479	1163	1048	1001	952	1023
27	917	934	770	666	756	841
28	866	879	1125	900	975	967
29	1094	1313	1171	1133	1520	1004
30	737	949	853	760	760	772
31	697	721	677	710	731	777
32	737	687	664	754	753	693
33	1315	1032	1134	1194	1359	1284
34	849	1272	866	1121	873	905
35	1258	907	959	1233	726	841
36	1492	1503	1568	1400	1283	1415
37	1754	1223	1448	901	943	1397
38	1409	1583	1457	1408	1458	1365
39	2203	2460	2292	1858	1544	2078
40	699	732	711	755	702	786
41	2291	3118	2259	2091	2651	1891
42	1118	1422	1529	1177	1186	1600
43	1745	1210	954	1688	1435	813
44	888	1112	1068	963	1033	1063
45	2119	1779	2825	2178	2286	2053
46	1785	1594	1550	1493	1343	1348
47	706	1034	808	776	800	782
48	833	791	819	852	889	986
49	1131	1415	1314	1302	1126	1106
50	1765	2041	1551	1064	1626	1287
51	1541	1277	1600	1574	1185	1271
52	1220	994	1178	1171	1006	1071

Appendix 13-2

The mean reaction times for Positive adjectives in Experiment 3.

		500 ms			2000 ms	
	negative	positive	neutral	negative	positive	neutral
1	1177	851	815	928	694	828
2	927	773	589	821	851	645
3	1182	1049	1251	1016	1235	1097
4	1599	1081	996	1319	1456	2001
5	1690	1011	1559	1823	1216	996
6	1233	1509	1062	3850	1550	972
7	1291	1395	1673	1491	1420	1201
8	998	743	1020	1179	1070	1221
9	869	705	990	1099	845	964
10	960	961	828	957	892	815
11	978	1002	936	854	790	1183
12	1916	2012	1599	2845	2373	2105
13	1676	1139	1088	1380	824	1140
14	593	498	601	600	501	575
15	1379	1093	1073	948	1162	1564
16	1990	1443	2005	1805	2652	1714
17	1205	1339	1190	1590	1258	1146
18	1121	811	1049	749	915	815
19	2141	1737	1519	2340	1539	1064
20	1535	1082	2079	1312	1464	1132
21	1389	1103	1338	1298	1354	1556
22	1128	969	1310	1138	1300	1038
23	1078	1047	1176	837	1113	883
24	1220	748	871	973	786	850
25	1032	956	983	1032	865	1094
26	888	714	836	843	651	1179
27	827	761	690	746	671	805
28	777	853	858	899	784	747
29	1229	1030	1347	1546	1328	1050
30	804	887	877	749	779	723
31	603	617	645	630	600	679
32	631	649	701	668	647	498
33	933	1269	1103	1288	1539	1058
34	854	883	812	1061	1056	801
35	1079	1152	967	1265	1141	723
36	1646	1410	1113	1172	1204	1214
37	1138	1352	1329	1720	1052	848
38	1435	1216	1190	1156	1329	1162
39	2565	2351	2415	1925	1647	1403
40	622	614	565	711	762	675
41	3028	2038	2134	2281	1934	2237
42	1213	1424	1347	1520	1224	1150
43	1534	1283	806	1547	1839	1026
44	936	811	911	920	934	949
45	1837	1391	1641	1767	1563	1340
46	1440	1279	1494	1754	1564	1237
47	597	752	869	778	987	719
48	970	897	716	927	756	814
49	1045	1139	1001	1434	1568	952
50	1962	1430	1010	1758	1837	1241
51	1384	933	1127	1257	970	826
52	1184	842	751	1184	847	776