Colour-naming of dentist-related words: role of coping style, dental anxiety, and trait anxiety

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(Received 8 July 1994)

SUMMARY—The Stroop colour-naming task requires that subjects name the colour that a word is written in while ignoring the word's content. Previous studies have shown that anxious individuals are slower to colour-name fear-related words. Apparently, anxious individuals are characterized by an attentional vigilance for fear-related stimuli, known as attentional bias. The present study investigated whether individual differences in monitoring (vigilant) and blunting (avoidant) coping styles are related to attentional bias. Forty-five normal, healthy subjects had to colour-name dentist-related words. The results showed that dental anxiety, but not trait anxiety, was related to colour-naming performance: high dental anxious subjects were slower in colour-naming dentist-related words than low dental anxious subjects. Monitoring and blunting coping styles were found to be unrelated to colour-naming performance.

INTRODUCTION

Numerous studies have shown that anxious Ss, at a pre-attentive level, direct their attention to threat-related rather than to neutral stimuli (for a review see Eysenck, 1992). One way to demonstrate this so-called attentional bias is the modified Stroop task, in which Ss are presented with words that are printed in different colours. The words have either threatening or non-threatening meanings. The task of the S is to name the colours as quickly as possible while ignoring the meaning of the words. A consistent finding is that anxious patients are slower to colour-name threatening words than to colour-name neutral words (see e.g. Watts, McKenna, Sharrock & Tresize, 1986). This phenomenon is considered to be indicative of an emotional interference effect due to an automatic tendency to attend to threat-related stimuli (e.g. Williams, Watts, MacLeod & Mathews, 1988).

The attentional bias phenomenon has not only been documented in clinical populations but also in non-clinical samples. There is reasonable evidence that individual differences in trait anxiety modulate the extent to which normal subjects attend to threatening stimuli (Eysenck, 1992). For example, Richards and Millwood (1989) compared groups high and low in trait anxiety with respect to colour-naming of threatening, neutral, and positive words. It was found that the group high in trait anxiety responded fastest with the positive words and slowest with the threatening words, whereas the group low in trait anxiety had comparable colour-naming times with all three types of material.

Interestingly, in theories on coping with threatening situations two basic modes of coping have been the focus of attention: vigilance, which reflects an orientation towards the threat, and avoidance, which is an orientation away from it (Krohne, 1993). In the same way, Miller (1980) distinguishes two styles of information seeking: monitoring (equivalent to the vigilant style) is defined as the tendency to seek out threatening information, and blunting (equivalent to the avoidant style) pertains to the tendency to avoid such information. To assess these two styles, Miller devised a self-report scale, the Miller Behavioural Style Scale (MBSS (Miller, 1987)). The scale consists of four hypothetical, threatening scenarios (dentist, hospital, exposure, and aeroplane), each of which is followed by eight coping options. Four options represent monitoring, whereas the other four are blunting options. Ss are asked to indicate to what extent each item is applicable to them. The MBSS has proven to predict threat-seeking behaviour in Ss who were confronted with experimental stressors (i.e. electric shocks and a cognitive task). Furthermore, monitoring and blunting are found to be unrelated to trait anxiety (see e.g. Miller & Mangan, 1983; Miller, 1987; Muris & de Jong, 1993).

It may well be the case that, apart from trait anxiety, monitoring and blunting coping styles play a role in attentional bias (see Muris, Merckelbach & de Jong, 1994). It should be noted that the concepts of monitoring and attentional bias share an important feature: both concepts are characterized by vigilance, i.e. (as mentioned above) on orientation towards threat (see Mathews, 1993). As to the present authors' knowledge, no study has investigated the relationship between monitoring/blunting on the one hand and attentional bias on the other hand. Thus, the primary aim of the present study was to examine this relationship. Forty-five undergraduate students were asked to do a series of Stroop tasks: a standard Stroop task (i.e. colour-naming of colour words), a neutral Stroop task, and a dentist Stroop task. The dentist Stroop task consisted of words related to dental treatment. The experiment focussed on dental treatment for two reasons. Firstly, research indicates that the prevalence of dental fear in the general population is rather high (Milgram, Fiset, Melnick & Weinstein, 1988; Stouthard & Hoogstraten, 1990). Secondly, "going to the dentist" is one of the hypothetical situations that is included in the MBSS. This provides the opportunity to examine not only total monitoring and blunting scores in relation to attentional bias but also situation-specific (i.e. dentist) monitoring and blunting scores. In order to examine the contribution of anxiety in attentional bias, individual differences in trait anxiety and dental anxiety were measured with self-report questionnaires.

Some researchers have proposed that increased levels of state anxiety and subjective tension lead to increased slowing on threat-related words (see e.g. MacLeod, 1990; Mathews, 1993). In order to investigate this issue, the Ss of the present study were exposed to dentist slides and sounds, and asked to do the dentist Stroop task for a second time. It was hypothesized,
that especially dentist-fearful Ss would show heightened levels of tension due to the experimental manipulation, and hence would exhibit a further decrement in colour-naming performance.

Taken together, the current study investigated (1) the relationship between monitoring/blunting and attentional bias, (2) the relationship between dental anxiety and attentional bias, (3) the relationship between trait anxiety and attentional bias, and (4) the relationship between levels of subjective tension and attentional bias.

METHOD

Subjects
Ss were 45 female undergraduate students who volunteered to participate in the study. Their mean age was 21.4 yr (SD = 3.0; range 18–36).

Materials
The Stroop colour-naming tasks were presented on 39 x 39 cm white boards. Each task consisted of 100 words in 10 rows of 10 items. The letters of the words were 0.5 cm high and printed with a high-contrast pen. Five colours were used: red, blue, green, brown, and yellow, and each colour was presented 20 times on each board. The arrangement of colours was random but with two constraints: that each colour appeared twice in each row and that there were no immediate repetitions of any colour. Three Stroop tasks were used.

(1) A standard Stroop task. This task consisted of five colour words (i.e. the colours mentioned above) each printed in one of the colours. Words and colours were randomly paired except that no word was printed in its own colour.

(2) A neutral Stroop task. This task involved 10 neutral words: motor-tire, pointer, month, avenue, blanket, soup, picture, clock, key, and glue.

(3) A dentist Stroop task. This task contained 10 words related to dental treatment: nerve, blood, pain, drilling, hole, filling, extraction, dentist, tooth, and syringe.

In the neutral Stroop task and the dentist Stroop task, each word appeared 10 times, once on each line. Neutral words and dentist words were matched for word length and frequency (in the Dutch language).

Performance time, i.e. the time needed to colour-name the words on a card, was measured with a stop-watch. The experimenter who measured performance time was blind to the Ss questionnaire scores (i.e. STAI, DAS and MBSS).

A Kodak Carousel was used for the presentation of a series of slides. Each slide was projected for 10 sec on a white wall, 2 m in front of the S. There were 15 slides, all representing clearly recognizable pictures about dental instruments (drill, extractor, syringe), dental treatment, blood and decayed teeth. During slide presentation, subjects listened to the sounds of the dentist's drill through a Sony headphone.

Questionnaires
The MBSS measures monitoring and blunting coping styles. As mentioned earlier, Ss are asked to imagine four hypothetical stress-evoking scenes. Each scene is followed by statements about ways of dealing with the situation, four of a monitoring and four of a blunting variety. Ss are asked to indicate on a five-point scale to what extent each item is applicable to them (1 = not at all; 5 = very much). A total monitoring and a total blunting score can be derived by summing the scores on the relevant items (range 16–80). Furthermore, since the present study pertained to dental fear, a dentist-monitoring and a dentist-blunting score was calculated by only summing the scores on the relevant items of the dentist-situation of the MBSS (range 4–20).

Dental anxiety was measured with the Dental Anxiety Scale [DAS (Corah, Gale & Illig, 1978)]. The DAS is a reliable and valid four-item measure that has been widely used in studies on dental anxiety. Items are scored on a scale of 1–5 and summed to give an overall anxiety score ranging from 4 (not anxious at all) to 20 (extremely anxious).

Levels of trait anxiety were assessed using the State-Trait Anxiety Inventory [STAI (Spielberger, Gorsuch & Lushene, 1970)]. STAI-trait anxiety scores range between 20 (almost never anxious) and 80 (almost always anxious).

Procedure
Ss were first shown a card with 10 words (one, two, three, four, five, father, mother, brother, sister, cousin) printed in the five colours (see above), and given standard instructions: "During this experiment, I will present a series of cards. Each card contains rows of words printed in different colours. I want you to name the colours, not the words, from left to right, as fast as possible." Thereupon, Ss were given the (pre-experimental) standard Stroop task. Timing started when the first colour was named and stopped when the last colour was named.

Next, Ss completed the questionnaires (MBSS, STAI and DAS). Then, the remaining Stroop tasks were presented in the same order for all Ss: neutral task and dentist task. The dentist task was presented last for two reasons. First, a study by McKenna (1986) showed that presenting emotional stimuli before neutral stimuli produces a carry-over effect in which performance on the neutral stimuli is also retarded. Second, to control for an alternative explanation for decrements in performance on the dentist task in terms of a practice effect. Any practice effect here would tend to go against the hypothesis (see Dukic & Furnham, 1989 who also used this procedure). Prior to each task, Ss were asked to rate their level of tension on a 200 mm visual analogue scale (VAS) ranging from –100 (not tense at all) to +100 (extremely tense).

Subsequently, Ss were exposed to the dentist slides and sounds. After the slide and sound presentation, Ss rated their level of tension again on a VAS. Then, they were asked to do the dentist Stroop task for a second time.

Thereafter, Ss rated frightfulness of the dentist slides and sounds on 10-point scales (1 = not at all frightening; 10 = very frightening). Finally, they were debriefed.

RESULTS AND DISCUSSION

Tests of internal consistency showed that all questionnaires produced satisfactory Cronbach's α: 0.88 for DAS, 0.90 for STAI, 0.77 for MBSS monitoring and 0.72 for MBSS blunting. Furthermore, Pearson product-moment correlations between questionnaire scores only revealed a significant, positive relationship between DAS and STAI: r(45) = 0.40, P < 0.01.
Mean performance times, in seconds per 100 words, of the total group for the standard Stroop, the neutral Stroop, the first dentist Stroop and the second dentist Stroop were 93.7 (SD = 13.7), 72.6 (SD = 11.1), 78.1 (SD = 12.6) and 66.1 (SD = 9.3), respectively. With respect to these performance times, three conclusions can be drawn. Firstly, in line with previous studies (see e.g. Watts et al., 1986; Dawkins & Furnham, 1989), Ss had most retarded time on the standard Stroop. Secondly, Ss showed a significant decrement in performance on the first dentist Stroop, i.e. colour-naming of the first dentist Stroop was slower than colour-naming of the neutral Stroop (t(88) = -2.2, P < 0.05). It is plausible to interpret this result in terms of an interference effect due to the threatening content of the dentist words. Finally, Ss exhibited a marked improvement in performance on the second dentist Stroop (t(88) = -5.1, P < 0.001), a finding that can best be regarded as a practice effect.

TheVAS scores of the total group revealed that levels of tension during the experiment were moderate: 6.2 (SD = 40.7) before the neutral Stroop, -12.9 (SD = 38.0) before the first dentist Stroop, and -11.9 (SD = 39.6) before the second Stroop. Most importantly, the experimental manipulation did not result in an increased level of tension (t(88) < 1).

In order to investigate the relationship between copying style, dental anxiety and trait anxiety on the one hand and attentional bias on the other hand, Ss were classified as (1) high monitors (n = 21) or low monitors (n = 24), (2) high dentist-monitors (n = 23) or low dentist-monitors (n = 22), (3) high dental anxious (n = 19) or low dental anxious (n = 26), and (4) high trait anxious (n = 18) or low trait anxious (n = 27). This was done by means of a mean split procedure on the basis of the respective questionnaire scores. Mean scores of the several questionnaire scores were 57.0 (SD = 7.4) for MBSS monitoring, 11.5 (SD = 3.1) for MBSS dentist monitoring, 9.2 (SD = 3.1) for BAS and 38.5 (SD = 11.4) for STAI. Differences between groups were analysed as follows: (a) t-tests were used to examine whether there were pre-experimental differences in colour-naming between groups on the standard Stroop task. (b) 2 (group) X 3 (Stroop: neutral, dentist 1, dentist 2) analyses of variance (ANOVA) with the last factor being a repeated measure were carried out to investigate differences in performance times on the experimental Stroop tasks.

The two conclusions can be drawn from these results. Firstly, monitoring (i.e. vigilance) and blunting (i.e. avoidance) were not related to attentional bias as indexed by a modified Stroop task. Neither MBSS total monitoring and blunting scores nor MBSS situation specific (i.e. dentist) scores were associated with colour-naming performance. The most plausible explanation for this null result is that attentional bias and monitoring/blunting coping styles pertain to processes which occur at different points of time during a stressful encounter. According to most information processing theorists, such encounter is composed of several stages. During a very early stage of processing, the individual scans the stimuli in his environment in order to select the significant, threat-relevant cues. Attentional bias can best be considered as the result of this pre-attentive process that is relevant to the detection of threat. Once the individual has become aware of the stimulus, he has to evaluate it and to decide whether it poses a personal threat. Finally, the person may think about how to deal with it: either he can choose to seek more information about it or he tries to avoid further thought on the subject. Mathews (1993, p. 120) pointed out that “it is probably only this final voluntary, or controlled stage, that is capable of being tapped by self-report measures of coping strategy.” Mathews further suggests that vigilance (i.e. attentional bias) during an early stages does not necessarily imply a similar cognitive bias (i.e. monitoring) at later stages. The present findings confirm this line of reasoning.

A second conclusion pertains to the specificity of the attentional bias phenomenon. A review of attentional bias studies that used the modified Stroop paradigm leads Eysenck (1992) to the conclusion that anxious patients are mainly slowed with those threatening words that are relevant to their predominant fears and concerns. The current data are consistent with this conclusion: the colour-naming of dentist-related words was only retarded in those Ss who exhibited high levels of dental anxiety and not in Ss who had high levels of trait anxiety.

Why was the attentional bias effect only present on the first dentist Stroop, but not on the second dentist Stroop? It was

<table>
<thead>
<tr>
<th></th>
<th>Neutral Stroop</th>
<th>Threat Stroop 1</th>
<th>Threat Stroop 2</th>
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</thead>
<tbody>
<tr>
<td>High monitors</td>
<td>73.0 (11.0)</td>
<td>79.2 (11.9)</td>
<td>66.9 (9.4)</td>
</tr>
<tr>
<td>Low monitors</td>
<td>72.3 (11.4)</td>
<td>77.1 (13.3)</td>
<td>65.3 (9.4)</td>
</tr>
<tr>
<td>High dentist-monitors</td>
<td>72.0 (10.3)</td>
<td>77.6 (10.7)</td>
<td>64.6 (8.7)</td>
</tr>
<tr>
<td>Low dentist-monitors</td>
<td>73.2 (12.1)</td>
<td>78.6 (14.5)</td>
<td>67.6 (10.0)</td>
</tr>
<tr>
<td>High dental anxious</td>
<td>74.2 (11.6)</td>
<td>82.7 (14.0)</td>
<td>67.1 (9.6)</td>
</tr>
<tr>
<td>Low dental anxious</td>
<td>72.2 (10.7)</td>
<td>75.3 (11.1)</td>
<td>65.5 (9.3)</td>
</tr>
<tr>
<td>High trait anxious</td>
<td>72.8 (11.6)</td>
<td>79.1 (13.3)</td>
<td>65.4 (9.4)</td>
</tr>
<tr>
<td>Low trait anxious</td>
<td>72.5 (11.0)</td>
<td>77.4 (12.3)</td>
<td>65.9 (9.5)</td>
</tr>
</tbody>
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Standard deviations are given between parentheses.

* Note that MBSS monitoring scores were used for these classifications. Classifications on the basis of blunting scores essentially revealed the same results, and in the interest of space they are not presented in the further course of this article.
expected that dentist-fearful Ss, after being confronted with the dentist slides and sounds, would show heightened levels of tension, and hence would exhibit a further decrement in colour-naming performance on the second Stroop task. One explanation for the failure to obtain such finding might be that the experimental manipulation (i.e. exposure of Ss to slides and sounds) had not been successful. Yet, two findings counter this explanation. Firstly, high dental anxious Ss rated the dentist slides and sounds as more frightening than low dental anxious Ss, means being 5.0 (SD = 2.3) vs 3.5 (SD = 2.1) \[t(43) = -2.5, P = 0.01\] for the slides, and 5.5 (SD = 2.5) vs 3.5 (SD = 2.2) \[t(43) = -2.5, P = 0.01\] for the sounds. Furthermore, inspection of the tension ratings revealed that, directly after the experimental manipulation (i.e. prior to the second dentist Stroop), high dental anxious Ss were more tense than low dental anxious Ss, means being 5.9 (SD = 40.9) and 21.7 (SD = 36.0), respectively \[t(43) = -2.3, P = 0.05\]. An additional 2 (high vs low dental anxious) \times 2 (high vs low tension) \times 3 (Stroop) ANOVA was carried out in order to investigate whether subjective tension was related to attentional bias. However, this analysis revealed no main effect of tension nor an interaction of tension with dental anxiety. In the light of these data, it seems more appropriate to ascribe the absence of attentional bias on the second dentist Stroop to the design of the present study. Note that the first and the second dentist Stroop were identical tasks, and that Ss generally exhibited a marked improvement in colour-naming performance. It may well be the case that this strong practice effect overshadowed the attentional bias effect on the second dentist Stroop.

To summarize, the present study provides further evidence for the attentional bias phenomenon. That is, high dental anxious Ss were slower in colour-naming dentist-related words than low dental anxious Ss. In addition, monitoring and blunting were found to be unrelated to attentional bias. Research on coping with threats has generally aimed to find out which attentional strategy (i.e. vigilance or avoidance) is best under what conditions (Miller, Combs & Kraus, 1993). However, most of these studies have predominantly relied on measuring vigilant and avoidant coping styles by means of self-report questionnaires. The present data suggest that such questionnaires only map a part of the vigilant and avoidant processes that take place during a stressful encounter. When a person indicates on a questionnaire that he wants to know more about a possible threat, this does not necessarily correspond to the actual attention paid to that threat. In other words, it is possible that a person reacts vigilantly as well as avoidantly, although at different stages of the stressful encounter.

REFERENCES


