LOOKING AT THREAT-RELEVANT STIMULI: THE ROLE OF ANXIETY AND COPING STYLE

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Results of numerous studies demonstrate that anxious subjects selectively attend to threat-related rather than to neutral stimuli. It has been argued that, as a result of this, anxious individuals more easily perceive and misattribute threatening stimuli in their environment, thereby creating a vicious circle of attention and anxiety. The evidence for this anxiety-linked attentional bias, however, is largely based on studies using subliminal or dichotic presentation of verbal stimuli. The present study sought to replicate these results by examining the relationship between anxiety and visual attention during prolonged exposure to threat-relevant (pictures of situations in a dental practice) and neutral (pictures of situations at a hairdresser salon) material with 45 women. No significant relationship emerged between dental trait anxiety and duration subjects directed gaze to the threat-relevant pictures. Neither self-reported state anxiety nor habitual coping style appeared to be significantly related to duration of visual attention for the threat-relevant pictures. Hence, no evidence was found supporting the hypothesis that high anxiety leads to a bias in attention towards emotionally threatening information. It is suggested that hypervigilance occurs in the early stages of the appraisal process.

KEY WORDS: Anxiety, dental fear, attentional bias, coping style.

An important feature of visual attention is its ability to detect impending danger in a potentially threatening environment. It has been argued that the primary function of anxiety is the detection of threat, thereby, facilitating escape from potential danger (e.g., Eysenck, 1992). According to Eysenck (1992) anxious persons are hypervigilant in many situations and demonstrate this hypervigilance by constantly scanning the environment and attending selectively to threat-related stimuli. Similarly, in their handbook on cognitive behavioural therapy, Hawton, Salkovskis, Kirk, and Clark (1989) state: “In situations which are perceived as threatening, patients selectively attend to aspects of the situation which to them appear to denote danger” (p. 56). They further claim that, once an individual has developed anxiety, attentional changes contribute further to maintenance of the problem by elevating the individual’s state anxiety which in turn would magnify or exacerbate a processing bias.

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The notion that individuals high in trait anxiety direct their attention to threat-related rather than nontreating information is largely derived from studies using the dichotic listening task (e.g., Mathews & MacLeod, 1986), the probe detection task (e.g., MacLeod, Mathews, & Tata, 1986), or the modified Stroop task (e.g., Mogg, Mathews, & Weinman, 1989). For example, in the modified Stroop task subjects are presented with words printed in different colours. The words have threatening or nontreating meanings. The task of the subjects is to name the colours as quickly as possible while ignoring the meaning of the word. A consistent finding is that anxious subjects are slower to colour name threatening words than to colour name neutral words. This phenomenon is considered to be indicative of an emotional interference effect due to an automatic tendency to selectively attend to threatening information (e.g., Williams, Watts, MacLeod, & Mathews, 1988). Other experimental studies have shown that such attentional bias becomes greater in magnitude as state anxiety increases. That is, high trait anxious individuals respond to state anxiety with an increased tendency to focus exclusively on threatening information from their environment. In contrast, low trait anxious persons show an increased tendency to avoid such information (e.g., MacLeod & Mathews, 1988).

Eysenck's (1992) proposal that anxious subjects show a tendency to allocate more attention to threatening than to nontreating information seems plausible. Meanwhile, experimental tasks such as the modified Stroop are concerned with the early stages of threat appraisal processes. Moreover, the typical attentional bias studies rely heavily on the presentation of threatening verbal stimuli. It remains to be seen whether the results of these studies can be generalized to situations in which individuals are exposed to real-life threat cues for a much longer time. It may well be the case that during the later processing stages, anxious subjects display controlled avoidance rather than automatic attentional bias.

Interestingly, studies on coping (see for example, Byrne, 1961; Miller, 1987; Kohlman, 1993) have shown that only a subgroup of anxious subjects show a tendency to attend to threat relevant cues. In the face of impending threat, some individuals appear to seek knowledge about the stressor, i.e., sensizers or monitors, while others have a tendency to avoid threat-relevant information, i.e., repressors or blunners. This suggests that the degree to which anxious subjects react to threatening situations may depend on an habitual coping style. Evidence to support this claim is provided by Halperin (1986). Following Haley (1974), Halperin examined individual differences in coping style by rating the amount of time that repressors and sensizers directed gaze to emotionally disturbing stimuli. More specifically, repressors and sensizers were exposed to series of injury, sexual, and neutral slides which were presented for one minute each. The results showed that sensizers directed gaze to the key areas of the emotionally provocative slides more than repressors, while groups did not differ with regard to their response to neutral slides. These results suggest that during the later processing stages, anxious individuals differ in the extent to which they attend to threatening material.

The aim of the present experiment was to examine the relationship between anxiety and duration of visual attention, i.e., gaze, during prolonged exposure to threat-relevant and neutral stimuli. The threat-relevant stimuli consisted of pictures related to dental treatment. Note that, dental anxiety is a common fear (Milgrom, Fiset, Melnick, & Weinstein, 1988; Stouthard & Hoogstraten, 1990) and
that visual information related to dental treatment is relatively easy to recognize. The hypothesis tested was that subjects with high dental fear exhibit an attentional bias for dental pictures even during the later phases of processing. The present experiment differs in three ways from previous studies concerned with attentional bias and anxiety. Firstly, to enhance ecological validity, pictorial rather than verbal stimuli were employed. Secondly, stimuli duration was relatively long to assess the later stages of processing. Thirdly, individual differences in coping style (i.e., monitoring and blunting) were taken into account.

METHOD

Subjects

Subjects were 45 female undergraduate psychology students from the University of Amsterdam. Their average age was 21.8 years (range 18–35). They received course credit for participation in the study.

Stimulus Materials

Two categories of slides were produced: 50 pictures of situations in a dental practice (D-slides) and 50 pictures of situations in a hairdressers’s saloon (HD-slides). The D-slides were straightforward, clearly recognizable pictures depicting single dental instruments, situations as they are seen from the patient’s point of view while in the dentist’s chair, persons whose hair is cut, the dental treatment environment, or blood and decayed teeth. HD-slides showed hairdresser’s devices, situations as they are seen from the customer’s viewpoint, persons while being treated, the hairdresser’s saloon, or hair.

In a pilot-study, all slides were shown to a group of 18 (14 women) undergraduate psychology students. The slides were presented in random order and were projected with a Kodak Carousel onto a white wall, 4 m in front of the subjects. The projected image was approx 2 by 2 m. Projection duration was 10 s and inter slide intervals were 5 s. For each picture, the subjects were asked to indicate the category to which it belonged (D or HD-slide). In addition, the participants had to rate how frightening the picture was on a five-point scale in Likert format (1 = not at all frightening; 5 = extremely frightening). Pilot results indicated that D-pictures showing blood or decayed teeth were rated as most frightening, while pictures of the dental treatment environment were perceived as less frightening. Lowest ratings were given to the HD-pictures. For the D-pictures, the correlation between individuals’ ratings of frightfulness and their scores on a measure of dental trait anxiety (S-DAI) was positive and significant ($r_{18} = 0.78$, $p < .005$). The correlation between dental anxiety scores and ratings of HD-pictures did not attain significance.

On the basis of the pilot-study, two new categories of pictures were created. The following two inclusion criteria were used, (a) pictures correctly indicated as D or HD-related by at least 90% of the subjects; (b) D-pictures rated as relatively frightening (i.e., average rating > 3). Based on these criteria, 29 D-pictures were selected. HD-pictures were matched with D-pictures. Criteria for matching were complexity (e.g., number of instruments), size of objects shown, colour, etc. Only
HD-pictures that were rated as relatively low-frightening (average rating < 2) were selected.

Procedure

The subjects were tested individually in a sound proof room. Upon arrival in the room, they were invited to take place on a chair. The chair was located exactly between two slide projectors (Singer Caramate II. SP) with day-light screens (0.22 × 0.22 m). The screens were placed at eye-height, one on the left and the other on the right side of the person. Only one screen could be watched at the time. Directly behind the person, a third slide projector was placed. This projector was connected to both other projectors and showed the trial number of each slide pair.

Next, the subjects were provided with the written instructions: "This experiment consists of a slide presentation of about 20 minutes. On your left and right side, you see two screens on which pairs of slides will be presented simultaneously. Half of the slides pertain to activities of a hairdresser, the other half pertain to dental treatment. We request you to pay attention to both slides when they occur. However, you don't need to care about the details of the slides. Getting a general impression is sufficient. Once, you have this general impression of both slides, you are free to study one or both slides in more detail. Afterwards no questions will be asked about the slides."¹

The subjects were visible from the adjoining room through a one-way screen. As soon as they had finished reading the written instructions, they were asked via a telephone if they had any questions. When all instructions were clear the computer program for slide projection was started. Both slides of each pair were presented at the same time, one on the left screen and one on the right screen. The slide sequence was determined randomly. Thus, some D-pictures occurred on the right, whereas others appeared on the left. The same was true for the HD-pictures. A microcomputer controlled onset and offset of the slides. Each slide pair was presented for 30 s and inter slide intervals were 2 s (black image). During slide presentation, the direction of gaze was recorded by a Sony camera, which was situated exactly opposite to the S on a distance of 3 m. The video recordings contained a time-display (in seconds). On the basis of this time display, it was possible to compute the period of time a person attended to the slides. The slide pair number, displayed on a third projector, was also recorded on video.

Immediately after the presentation of the slides the subjects were asked to rate their average anxiety level during the experiment on a 100 mm Visual Analogue Scale (VAS), ranging from not at all anxious to extremely anxious. Next, they had to fill out a booklet consisting of a number of questionnaires (see below). The total duration of the session was about 50 minutes.

Video recordings were evaluated by two independent observers. Recordings were replayed at half speed, enabling precise analysis of the data. On the video recordings, subjects' head and the three projector screens were visible. Since the two day-light screens were set square with the camera, the observers were unable to see the pictures. A person was supposed to have watched a slide, if his/her eyes were directed to either the left or the right screen. The amount of time that this person

¹One of the aims of these instructions was that the subjects first got a general impression of both slides and that not too much time would be spent on looking at the first slide alone.
attended neither the left nor the right screen was also measured. The total viewing time for each type of slides was calculated by adding up the seconds the person had attended to each of the slides. The total amount of time that each subject directed gaze to the D-slides was expressed as a percentage of the maximum amount of time for watching the series of slides (i.e., the sum of the number of seconds the subjects attended to D-slides, to HD-slides and to neither of both slides: $29 \times 30 = 870$ sec). For example, if a subject directed gaze to the D-slides for 435 s, the percentage of time this subject paid attention to the D-slides would be 50%. In other words, the higher the percentage, the more subjects watched at the threat-relevant D-pictures. In the further course of this article, this percentage will be called threat-viewing time. Six randomly selected video-recordings independently scored by the two observers yielded an interrater product-moment correlation of 0.96.

**Questionnaires**

After slide presentation the research participants were asked to fill out a booklet that consisted of the following five questionnaires: (a) the short version of the Dental Anxiety Inventory (De Jongh & Stouthard, 1992; Stouthard, Mellenbergh, & Hoogstraten, 1993), (b) the Dental Anxiety Scale (Corah, 1969; Corah, Gale, & Illig, 1978), (c) the Blood-Injury scale of the Fear Questionnaire (Marks & Mathews, 1979), and two measures of habitual coping style: (d) the Miller Behavioural Style Scale (Miller, 1987), and (e) the Mainz Coping Inventory (Krohne, 1989).

The short version of the Dental Anxiety Inventory (S-DAI) contains 9 statements concerning situations related to dental treatment. Respondents are asked on a 5-point scale on Likert format whether or not the statement is true for them ($1 = \text{totally untrue}; 5 = \text{completely true}$). The total score is the sum of all ratings (range 9–45). Higher scores indicate higher dental anxiety.

The Dental Anxiety Scale (DAS) consists of 4 items which are to be rated on a 5-point scale. The scores are summed to give a single index of dental trait anxiety ($4 = \text{not anxious}; 20 = \text{extremely anxious}$).

The five items of the blood-injury scale of Fear Questionnaire (FQ-BI) assess fear of medical affairs such as hospitals, blood, etc. Scores range between 0 (not phobic) and 40 (extremely phobic).

The Miller Behavioural Style Scale (MBSS) was designed to assess two coping dimensions, monitoring (seeking out threat-relevant information) and blunting (avoiding threat-relevant information). Subjects are asked to imagine four hypothetical stress-evoking scenes (dentist, hostage, dismissal, and airplane). Each scene is followed by four monitoring and four blunting options. One is asked to indicate to what extent each options is applicable to them ($1 = \text{not at all}; 5 = \text{very much}$). Two scores are derived from this scale. A total monitoring and a total blunting score can be obtained by summing the relevant items (range for each scale 16–80).

The Mainz Coping Inventory (MCI) also consists of four hypothetical stress-evoking situations. Each situation is followed by 18 statements about ways of dealing with it. One half of the items forms the vigilance scale, the other half forms the avoidance scale. Respondents are asked to rate on a 5-point scale to what extent each statement is applicable to them ($1 = \text{not at all}; 5 = \text{very much}$). Total vigilance scores and avoidance scores are obtained by summing up the ratings on corresponding items (both ranging from 36 to 180).
RESULTS

The average percentage of threat-viewing time was 47.1% (SD = 10.1). This indicates that subjects watched nearly half of the available time to the threat-relevant D-slides. To assess relationships between anxiety and coping measures and threat-viewing time, Pearson product-moment correlations were computed. As can be seen from Table 1, scores on the blood-injury scale of the FQ were strongly associated with subjects’ state anxiety (VAS: r[45] = 0.67, p < .001) and with both measures of dental trait anxiety (DAS: r[45] = 0.55, p < .001; S-DAI: r(45) = 0.57, p < .001). Further, significant positive correlations emerged between the monitoring/vigilant coping style (MBSS-M and MCI-V) and anxiety measures.

Most importantly, however, correlations between threat-viewing time and indices of anxiety and coping style were weak and did not reach significance. Only the negative correlation between FQ blood-injury and threat-viewing time came close to the 5% significance level (r[45] = −0.27, p < .10, two-tailed): in other words, the higher blood-injury fear, the more subjects tended to avoid looking at the threat-relevant D-slides.

Table 1 Statistics (Lower Part) and Pearson Product-moment Correlations (Upper Part) Between Various Measures of Anxiety and Coping Style, and Threat-Viewing Time (N = 45)

<table>
<thead>
<tr>
<th></th>
<th>S-DAI</th>
<th>DAS</th>
<th>VAS</th>
<th>FQ-BI</th>
<th>MBSS-M</th>
<th>MBSS-B</th>
<th>MCI-V</th>
<th>MCI-A</th>
<th>Threat-Viewing Time</th>
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<tbody>
<tr>
<td>S-DAI</td>
<td>.68*</td>
<td>.50*</td>
<td>.57*</td>
<td>.28</td>
<td>-.03</td>
<td>.45*</td>
<td>-.19</td>
<td>-.14</td>
<td></td>
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<tr>
<td>DAS</td>
<td>.35*</td>
<td>.55*</td>
<td>.27</td>
<td>-.03</td>
<td>.56*</td>
<td>-.30</td>
<td>-.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAS</td>
<td>.67*</td>
<td>.35*</td>
<td>.05</td>
<td>.36*</td>
<td>-.19</td>
<td>-.24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FQ-BI</td>
<td>.36*</td>
<td>.08</td>
<td>.43*</td>
<td>-.26</td>
<td>-.27</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>MBSS-M</td>
<td>.00</td>
<td>.50*</td>
<td>.06</td>
<td></td>
<td>-.07</td>
<td>-.07</td>
<td></td>
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<tr>
<td>MBSS-B</td>
<td>.08</td>
<td>.33</td>
<td>.33</td>
<td></td>
<td>-.10</td>
<td>.09</td>
<td></td>
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<tr>
<td>MCI-V</td>
<td></td>
<td>.07</td>
<td>.13</td>
<td></td>
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<td>MCI-A</td>
<td></td>
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Mean 22.0 10.2 15.8 8.5 55.0 47.3 95.9 105.7 47.1
Mean 8.0 3.1 17.7 7.1 8.0 8.5 18.0 14.5 10.1

Note. *significant at p < 0.05 (two-tailed).
S-DAI = Dental Anxiety Inventory (short version), DAS = Dental Anxiety Scale, VAS = Visual Analogue Scale (state anxiety), FQ-BI = Fear Questionnaire (blood-injury scale), MBSS-M = Miller Behavioural Style Scale (monitoring scale), MBSS-B = Miller Behavioural Style Scale (blunting scale), MCI-V = Mainz Coping Inventory (vigilance scale), MCI-A = Mainz Coping Inventory (avoidance scale).

To control for quantitative differences that may exist between the patterns of selective attention shown by normal subjects and clinically anxious patients, the sample was divided into two extreme subgroups. This was done by applying the criterion of DAS scores of 13 or higher which is proposed as an indication of dental trait anxiety (Corah et al., 1978). A subsequent t test showed no significant difference (t[43] = 0.37, p = 0.70) in threat-viewing time between the high anxiety (DAS scores ≥13) and the low anxiety group (DAS scores < 13). Similarly, no differences in threat-viewing time were found between subjects showing relatively
high state anxiety (above 50 on the VAS) and those exhibiting relatively low ratings (below 50 on the VAS) ($t[43] = 0.84$, $p = .40$).

DISCUSSION

A number of recent studies demonstrate that anxious individuals direct their attention to threat-related rather than to neutral stimuli (e.g., Eysenck, 1992). However, these studies have two limitations. To begin with, they have strongly relied on verbal stimuli. Yet, anxious individuals are afraid of objects and situations rather than words. Therefore, the question arises whether an attentional bias also characterizes the cognitive processing of anxious individuals who are confronted with ecologically more valid representations of their fears, e.g., pictorial material. Secondly, thus far, attentional bias studies have focused on the attentional processes that occur within the first seconds during a confrontation with threat-related stimuli. However, in daily life, individuals are exposed to threatening stimuli for much longer periods.

In the light of these considerations, the present study was undertaken. More specifically, it was investigated whether an attentional bias emerges in persons who undergo a prolonged exposure to pictorial threat-related (i.e., slides about the dental situation) and neutral (i.e., slides about the hairdresser's situation) stimuli. Furthermore, it was examined whether attention for threatening stimuli was modulated by the coping styles of monitoring (i.e., seeking threat-relevant information) and blunting (i.e., avoiding threat-related information).

The results of the current study can be summarized as follows. Firstly, no indications were found for an attentional bias. That is, no relationship emerged between dental or blood-injury anxiety and the extent to which the subjects directed gaze to threat-related slides. Secondly, no evidence was found to suggest that monitoring and blunting modulate attentional processes.

As to the first finding, why did an attentional bias phenomenon not emerge? One explanation might be that the subjects in the present study were not anxious enough. Admittedly, the participants were normal undergraduate students rather than patients with anxiety disorders. Moreover, anxiety ratings indicated that levels of state anxiety were rather low, so one could argue that the experiment did not offer enough opportunity for the attentional bias phenomenon to emerge. However, the results of post hoc analyses cast doubts on this line of reasoning. These analyses indicated that those persons who had dental trait anxiety scores in the clinical range did not show an attentional bias. Similarly, individuals who indicated that they were stressed by the experimental procedure also displayed no attentional bias.

A second explanation for the failure to obtain an attentional bias effect pertains to the operationalization of attention in terms of threat-viewing time. As mentioned earlier, so far, studies of attentional bias made use of experimental tasks with very short exposure durations. In the present study, the subjects were exposed to threat-relevant stimuli for much longer time. So, it may well be the case that during the first stimulus seconds, an attentional bias towards threat-related slides did occur in anxious persons but was not reflected in the over-all threat-viewing time scores. Possibly, the phenomenon of attentional bias may be restricted to the early stages of the appraisal process.
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As to the second finding, the failure to obtain an association between monitoring or blunting and threat-viewing time was unexpected. On the basis of the definitions of these coping styles, one would predict a positive correlation between threat-viewing and monitoring, whereas a negative correlation would be anticipated with blunting (Miller, 1987). However, such relationships were not found. This may be due to the fact that monitoring and blunting processes not only take place on the observable behavioural level but also on an unobservable cognitive level (van Zuuren & Muris, 1993). Moreover, it is possible that questionnaires like the MBSS and the MCI do not adequately measure coping style. The finding that monitoring was related to indices of state anxiety (MCI-V), blood-injury anxiety (MBSS-M, MCI-V), and dental anxiety (MCI-V) indeed suggests that the MBSS and the MCI are not pure coping measures (see also Muris & de Jong, 1993). Another explanation for the absence of a relationship between habitual coping style and duration of visual attention for the threat-relevant pictures might be that the pictures used in this study were only mild stressors and that the experimental situation was not apt to provoke coping behaviour to a substantial degree. In other words, it might be that we did not manage to select a series of emotionally provocative slides in the pilot-study. On the other hand, a number of other studies also did not yield a relationship between habitual coping style and observable (coping) behaviour (Kohlmann, 1993; Lewinsohn, Bergquist & Breije, 1972; Muris, van Zuuren, & de Vries, 1994). Perhaps the construct of coping style is too simplistic. There are indications that irrespective of habitual coping style most individuals demonstrate a flexible way of coping and largely adapt their coping behaviour to the situational demands (Kohlmann, 1993).

In conclusion, in the present study no relationship was found between anxiety and visual attention during prolonged exposure to threat-relevant pictorial slides. This result seems to indicate that attentional bias is a characteristic for early stages of information processing. To elucidate this issue conclusively, researchers should include traditional measures of attentional bias (e.g., Stroop task) and measures that assess attentional processes during long exposure to threat-related stimuli (e.g., viewing time). Furthermore, although it is hard to see how all relevant factors could be kept under control, it would be worthwhile to study the relationship between emotions and attention in a situation in which dental patients high and low on anxiety are anticipating actual treatment.

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