Pergamon

Journal of Anxiety Disorders, Vol. 12, No. 1, pp. 39–55, 1998

0887-6185/98 $19.00 + .00

PII S0887-6185(97)00048-0

Don't Worry and Beware of White Bears: Thought Suppression in Anxiety Patients

ENI S. BECKER, PH.D., AND MIKE RINCK, PH.D.

Dresden University of Technology

WALTON T. ROTH, M.D.

Veterans' Administration Medical Center, Palo Alto, CA

JÜRGEN MARGRAF, PH.D.

Dresden University of Technology

Abstract—The ability to suppress unwanted thoughts was investigated in patients with Generalized Anxiety Disorder (GAD; $n = 29$), Speech Phobics ($n = 25$), and nonanxious controls ($n = 28$). All participants spent 5 minutes thinking aloud about anything that came to mind while trying not to think of white bears. In another task, they thought aloud for 5 minutes while trying not to think of their main worry. Intrusions of unwanted thoughts were signaled by button presses and recorded on tape. In accordance with the disorder's definition and complaints of the GAD patients, they showed more intrusions of their main worry than of white bears. The opposite was true for other participants. Compared to a baseline measure, all participant groups were unable to reduce duration of main worry thoughts when trying to suppress them. © 1998 Elsevier Science Ltd

---

Preparation of this paper was supported by a fellowship from the German Academic Exchange Service (DAAD) to Eni S. Becker, a fellowship from the German Research Foundation (DFG) to Mike Rinck, and the support of the Veterans Administration to Walton T. Roth.

We would like to thank Gordon H. Bower for directing our attention to the work of D. M. Wegner, Cassandra Lehmann for recruiting and diagnosing the GAD patients, Cheryl Post for her help in conducting the experiment, Andrea Hähnel for rating the think-aloud protocols, and the anonymous reviewers for making helpful comments on earlier versions of the paper.

Ulrich Glowalla, Joachim Hasebrook, and Gilbert Fezzardi supplied the software used to conduct the experiment.

Correspondence and reprints requests should be sent to Eni S. Becker, Dresden University of Technology, Department of Clinical Psychology, D-01062 Dresden, FR Germany. E-mail: ebecker@rcs.urz.tu-dresden.de.

Worry is a familiar companion to many of us, and constitutes a symptom associated with many anxiety disorders, such as phobias, Panic Disorder, and Generalized Anxiety Disorder (Barlow, 1988; Rachman, 1982; Wells & Morrison, 1994). The phenomenon of worry has aroused considerable interest; therefore, it seems surprising that it has not been subjected to empirical study very often. One reason for this lack of research was suggested by Eysenck (1992), who pointed out that there is no generally accepted definition of the term *worry*. However, the different definitions proposed (Borkovec, Robinson, Pruzinsky, & DePree, 1983; MacLeod, Williams, & Bekerian, 1991; Mathews, 1990) agree on several characteristics of worries: (a) Worries are a cognitive phenomenon experienced as aversive, people worry about future events and potential catastrophes, and worries are very hard to control. Furthermore, worries differ from similar cognitive phenomena, such as obsessions (see Turner, Beidel, & Stanley, 1992, for a review). For instance, worries are typically related to realistic experiences of everyday life, whereas the contents of obsessions frequently include topics such as contamination, religion, sex, or aggression. (b) Worries are more frequently triggered and generally occur in the form of thoughts, whereas obsessions often occur as images and impulses. (c) Finally, although both are experienced as uncontrollable, worries are not as strongly resisted as obsessions.

The last characteristic of worries, their uncontrollability, is particularly important. The anxiety disorder most closely associated with the phenomenon of worrying is Generalized Anxiety Disorder (GAD), and its new definition according to *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV*; American Psychiatric Association, 1994) stresses that GAD patients' worrying is uncontrollable as well as excessive. Indeed, self-reports of GAD patients indicate that they feel they have very little control over their worrying (Craske, Rapee, Jackel, & Barlow, 1989), that they worry for a longer time than nonanxious controls (60% of each day compared to 18%; Craske et al., 1989), and they worry about more topics (Vasey & Borkovec, 1992). Regarding the most common topics, GAD patients report more worries about daily hassles and their health than nonanxious controls, whereas worries about family, personal relations, and finances seem to be common in both groups (e.g., Craske et al., 1989; Shadick & Roemer, 1991). So far, these conclusions are based on self-reports only. Therefore, the present study was conducted to provide an experimental test of GAD patients' complaints about the uncontrollability of their worries. In particular, we wanted to find out whether GAD patients' mental control is indeed impaired in comparison to control participants, and whether the impairment is limited to their worries or affects unwanted thoughts in general. We compared GAD patients to nonanxious controls as well as to patients suffering from Speech Phobia to determine whether the expected impairment is indeed specific to GAD or related to anxiety disorders in general.

In order to design an experimental test of mental control, we adopted a paradigm introduced by Wegner (1989). Wegner's conception of mental control comprises two processes: concentration on thoughts that one wants to think

of and suppression of unwanted thoughts (see Wegner, 1994, for an extensive theoretical discussion). In the case of GAD patients, the second process might be impaired: Their complaint of ''uncontrollable worries'' indicates that the worries cannot be successfully suppressed. Wegner developed an ingeniously simple method to study the suppression of thoughts (the ''white bear paradigm''). He asks his participants to spend 5 minutes thinking (aloud or silently) about anything they want, but NOT about white bears. Whenever the thought or image of a white bear comes to mind against the instruction, participants indicate this by saying so or by pressing a button. As one might expect, it is very hard NOT to think of something. Accordingly, an ''enhancement'' effect was observed repeatedly. The attempt to suppress thoughts of target objects, such as white bears, caused a considerable number of intrusions (i.e., unwanted thoughts of white bears) during the 5-minute period (Lavey & van den Hout, 1990; Muris, Merckelbach, van den Hout, & Jong, 1992). An enhancement of negative intrusive thoughts caused by suppression during a 4-day period outside the laboratory was reported by Trinder and Salkovskis (1994). More often than enhancement, a ''rebound'' effect was observed, that is, participants thought about the suppressed target objects more often during a subsequent period of unrestricted thinking or deliberate thinking of the target objects (Clark, Ball, & Pape, 1991; Clark, Winton, & Thynn, 1993; Wegner, Schneider, Carter, & White, 1987; Wegner, Schneider, Knutson, & McMahon, 1991; Wenzlaff, Wegner, & Klein, 1991). The exact conditions that determine whether enhancement or rebound effects are observed are still unclear (see Kelly & Kahn, 194; Mathews & Milroy, 1994; Roemer & Borkovec, 1994), however, the paradigm is obviously well suited for the investigation of mental control and the variables affecting it.

Several authors have pointed out the relevance of mental control for clinical disorders such as Obsessive-Compulsive Disorder, depression, and anxiety disorders. Surprisingly though, to our knowledge there have been no published studies that used the white bear paradigm to investigate mental control in clinical disorders.[1] Mathews and Milroy (1994) investigated the rebound effect following a period of worry, suppression of worry, or nonworrying thought. However, they compared a nonclinical sample of excessive worriers with nonworrying control participants. Other nonclinical participant groups include high-trait worriers (East & Watts, 1994), people attempting smoking cessation (Salkovskis & Reynolds, 1994) and nonclinical participants reporting distressing negative intrusions (Salkovskis & Campbell, 1994). In other studies, mood effects on thought suppression were studied using depressed (Wenzlaff, Wegner, & Roper, 1988) or dysphoric students (Conway, Howell, & Giannopoulos, 1991; Howell & Conway, 1992) as participants, or inducing happy ver-

[1] Zeitlin, Netten, and Hodder (1995) investigated thought suppression in spider-phobic students, using a procedure similar to the white bear paradigm. The results of this study have to be disregarded, however, because of incorrect data (see Zeitlin et al., 1995, p. 99).

sus sad moods (Howell & Conway, 1992; Reynolds & Salkovskis, 1992). These studies found mood-congruent effects (e.g., participants in a sad or dysphoric mood exhibited more negative intrusions and participants in a happy mood more positive intrusions).

The white bear paradigm seems especially well-suited for the investigation of mental control in GAD, since it offers an opportunity to put their complaint of uncontrollable worries to an empirical test. Thus, we adopted the paradigm in the experiment reported here. GAD patients, Speech Phobics, and control participants first completed a 5-minute period of unrestricted loud thinking to familiarize them with the think-aloud task. Next, they spent 5 minutes thinking aloud, with the instruction not to think of white bears. Afterwards, they thought aloud for 5 minutes again, this time with the instruction not to think of their main worry. The order of the white bear task and the main worry task was reversed for half of the participants in each group. Intrusions, that is, thoughts of white bears in the bear task and thoughts of the main worry in the worry task, were recorded by having participants press the button of a computer mouse whenever an intrusion occurred. In addition to recording the intrusions by button presses, participants' verbalizations were recorded on tape. After finishing the think-aloud task, participants rated the anxiety, tension, and excitement they had felt during the experiment as well as the intensity of their wish to leave the situation.

METHOD

Participants

We recruited 29 GAD patients, 25 patients with Speech Phobia, and 28 nonanxious controls by advertisements in local newspapers. The GAD patients participated in a drug treatment study conducted by the third author at the Veterans' Administration Hospital, Palo Alto, California, and patients with speech phobia in a behavior therapy study at the same hospital. All participants completed the experiment reported here before receiving treatment. Control participants were paid for their participation. After an initial telephone screening, potential participants were interviewed using the ''Structural Clinical Interview for DSM-III-R, UpJohn Version'' (SCID-UP; Spitzer, Williams, & Gibbon, 1987), a highly reliable and valid diagnostic instrument yielding diagnoses according to *DSM-III-R* (American Psychiatric Association, 1987). Interviews were conducted by two trained interviewers supervised by the third author. Several potential participants were excluded for a variety of reasons, such as medical illness, substance abuse, and past or current psychotic episodes. In addition, control participants had to be free of psychological disorders except for mild specific phobias. GAD patients with both GAD and Speech Phobia were excluded, as were patients with both GAD and Panic Disorder. The three groups did not differ with regard to age (GAD: $M = 44.3$ years; speech phobia: $M =$

46.2; nonanxious controls: $M = 45.2$), gender (GAD: 43% female; speech phobia: 40% female; controls: 44% female), or education (GAD: $M = 16.4$ years of education and training; speech phobia: $M = 16.4$; controls: $M = 16.6$).

Procedure

The experiment reported here was embedded in the procedures of the patients' treatment studies. After the recruitment procedures, participants were interviewed about their everyday worries using a worry interview constructed for this purpose (Becker, 1992). Among other topics, participants were interviewed about the contents and duration of their worrying, emotional stress and physical symptoms caused by worrying, and their ability to control their worrying behavior. Participants also received several questionnaires to be filled out at home, including the Symptom Checklist 90 (SCL-90; Derogatis, Lipman, & Covi, 1973), the trait form of the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970), the Hamilton Rating Scales for Anxiety and Depression (HAM-A, HAM-D; Hamilton, 1959, 1960), and the Beck Depression Inventory (BDI; Beck, Ward, Mendelsohn, Mock, & Erbaugh, 1961). On the day of the experiment, participants first completed the state form of the STAI (Spielberger et al., 1970). Afterwards, they received instructions for the first part of the experiment, namely the think-aloud practice task: Participants were asked to think aloud for 5 minutes after the experimenter had left the room. They were asked to report everything that came to mind and to keep speaking for the 5-minute period. In the second part of the experiment, participants again had to think aloud for 5 minutes with the experimenter outside the room, but this time they were asked NOT to think of white bears (the ''bears task''). Before the third part, participants were interviewed about their current main worry. The third task was identical to the second one, except that now participants were asked NOT to think about their main worry (the ''worry task''). During all three tasks, participants' verbalizations were recorded on tape and the experimenter reentered the room after 5 minutes. The practice task was always administered first, while the order of the bear task and the worry task was varied. Half of each participant group received the worry task last, the other half the bears task.

The number and timing of intrusions of unwanted thoughts (white bears in the bear task and the main worry in the worry task) were recorded by a computer running the *SHOW IT* software (Glowalla, Hasebrook, & Fezzardi, 1992). During the bear task and the worry task, participants held the mouse of the computer in their hand and pressed the mouse button whenever the unwanted thought came to their mind. Thoughts of white bears in the worry task and of worries in the bear task were neither encouraged nor discouraged and did not count as intrusions.

After finishing the third task, participants gave four retrospective ratings of their emotional state during the experiment. On rating scales ranging from 0

(labeled ''Not at all'') to 10 (labeled ''Extremely''), they rated their levels of excitement, tension, and anxiety during the experiment, and how much they would have liked to leave the experimental situation (avoidance). Afterwards, they completed the state form of the STAI a second time. Finally, they were debriefed about the purpose of the experiment. The whole procedure lasted for 30 to 45 minutes. After the experiment, the recorded think-aloud protocols were divided into intervals, each 4 seconds long. The contents of each interval was analyzed and classified by two independent raters into one of the following categories: white bear, main worry, other worries than the main worry, thought of the experimental room, thought of speech anxiety, thought of some other topic, or pause. The two raters agreed on 94% of the verbalizations. Ambiguous and incomprehensible verbalizations were recorded as missing values.

RESULTS

The most important dependent variable was the number of intrusions during the bear task and the worry task as recorded by the button presses. This variable was analyzed with a mixed-factor analysis of variance (ANOVA), including the between-subjects factors ''experimental group'' (GAD patients, speech phobia patients, nonanxious controls), ''order of tasks'' (bears-worry vs. worry-bears), and the within-subjects factor ''task'' (white bears, main worry), yielding a 3 $\times$ 2 $\times$ 2-design. In addition, the participants' recorded think-aloud protocols during all three tasks of the experiment were analyzed with respect to the duration of intrusions, pauses, thoughts about the experimental room, other worries, speech anxiety, and other topics, as well as regarding to the number of topics mentioned. The *f*-values reported below were determined according to Cohen (1988), with values of .10, .25, and .40 indicating small, medium, and large effects, respectively.

Questionnaire Data

The mean scores of all three participant groups in the STAI-Trait, HAM-A, HAM-D, and BDI questionnaires as well as the overall SCL-90 scores are given in Table 1. Since not all participants returned all questionnaires, each analysis is based on slightly different sample sizes, which are given in Table 1. As the table indicates, GAD patients showed significantly higher scores than Speech Phobics and nonanxious controls in all five questionnaires. However, even the GAD patients' mean SCL-90 score of .87 was still quite low, indicating a generally low level of psychopathology. This was due to the requirements of the drug treatment study: Potential participants with multiple disorders were excluded from the experiment. For a similar reason, the speech phobics' SCL-90 scores were low: Most of them suffered exclusively from speech phobia. For the interpretation of the results reported below, this is very helpful because it renders alternative explanations based on comorbidity unlikely. The GAD patients'

TABLE 1
MEAN SCORES (WITH STANDARD DEVIATIONS [*SD*] AND SAMPLE SIZES [*n*]) OF GAD, SPEECH PHOBIA, AND CONTROL PARTICIPANTS IN THE SCL-90, STAI, HAM-A, HAM-D, AND BDI QUESTIONNAIRES

	GAD	Speech Phobia	Control	One-Way ANOVA	GAD vs. Speech	GAD vs. Control	Speech vs. Control
SCL-90	.87	.40	.25	$p < .001$	*	*	
SD	(.41)	(.26)	(.20)				
n	24	23	28				
STAI-Trait	51.2	38.8	35.1	$p < .001$	*	*	
SD	(9.8)	(10.0)	(10.5)				
n	21	24	28				
HAM-A	18.4	4.3	3.2	$p < .001$	*	*	
SD	(7.0)	(4.5)	(2.5)				
n	26	21	28				
HAM-D	12.9	3.8	2.8	$p < .001$	*	*	
SD	(5.6)	(3.8)	(2.6)				
n	22	21	28				
BDI	9.8	3.7	3.0	$p < .001$	*	*	
SD	(5.0)	(3.1)	(3.5)				
n	20	24	28				

Note. Explanations of abbreviations are given in the text. Asterisks indicate that pairwise comparisons using Scheffé tests are significant at the .05 level. GAD = Generalized Anxiety Disorder; ANOVA = analysis of variance; SCL-90 = Symptom Checklist-90; STAI = State-Trait Anxiety Inventory; HAM = Hamilton Rating Scale for Anxiety; HAM-D = Hamilton Rating Scale for Depression; BDI = Beck Depression Inventory.

mean HAM-D and BDI scores were similar to the SCL-90 scores: These indicated mild levels of depression, with the other two participant groups reporting significantly fewer symptoms of depression. As expected, GAD patients' scores in the HAM-A and the trait form of the STAI indicated substantial levels of anxiety, whereas speech phobics and nonanxious controls scored significantly lower on these trait measures of anxiety.

Emotional State Before and After the Experiment

Table 2 shows how participants rated their emotional state before and after the experiment using the STAI state form and four subjective rating scales. As expected, GAD patients reported significantly more anxiety in the STAI state questionnaire than the two other groups both before and after the experiment. After the experiment, the difference between Speech Phobics and nonanxious controls was significant as well. Table 2 also shows that in all three participant groups, STAI state scores changed very little during the course of the experiment. Accordingly, the two-way ANOVA of the STAI state scores yielded a strong effect of participant group, $F(2, 78) = 35.71$, $p < .001$, $f = .82$, whereas

TABLE 2
MEAN STAI-STATE SCORES AND EMOTIONAL STATE RATINGS (WITH STANDARD DEVIATIONS [*SD*]) OF GAD, SPEECH PHOBIA, AND CONTROL PARTICIPANTS

	GAD	Speech Phobia	Control	One-Way ANOVA	GAD vs. Speech	GAD vs. Control	Speech vs. Control
STAI-State before	50.3	34.0	28.3	$p < .001$	*	*	
SD	(11.7)	(7.66)	(7.6)				
STAI-State after	45.9	35.7	27.5	$p < .001$	*	*	*
SD	(12.4)	(12.7)	(7.1)				
Excitement	2.9	2.7	2.1	ns			
SD	(2.7)	(3.0)	(2.0)				
Tension	4.3	3.4	1.1	$p < .001$		*	*
SD	(3.0)	(3.4)	(1.4)				
Anxiety	4.2	4.0	1.0	$p < .001$		*	*
SD	(3.1)	(3.6)	(1.3)				
Avoidance	4.7	4.7	2.6	$p < .001$			
SD	(3.9)	(4.1)	(3.1)				

Note. Explanations of abbreviations are given in the text. Asterisks indicate that pairwise comparisons using Scheffé tests are significant at the .05 level. GAD = Generalized Anxiety Disorder; ANOVA = analysis of variance; STAI = State-Trait Anxiety Inventory; ns = not significant.

the time of measurement (before vs. after the experiment) did not reach significance, $F(1, 78) = 1.35$, ns, $f = .06$. The interaction was marginally significant, $F(2, 78) = 2.99$, $p < .06$, $f = .12$. Also as expected, both GAD and speech phobia patients rated themselves to be significantly more tense and anxious than nonanxious controls. With regard to excitement and the wish to leave the situation, the three participant groups did not differ significantly from each other. Thus, these results do not confirm the hypothesis that the thinking-aloud task was particularly stressful for speech phobics, rather, it was more stressful for both patient groups compared to the control participants.

Number of Intrusions

The number of intrusions during the bear task and the worry task are depicted in Figure 1; Table 3 also contains the corresponding standard deviations. Please note that during the bear task, only thoughts of white bears were counted as intrusions, and intrusions during the worry task are limited to thoughts of the main worry. The order of the two tasks did not affect the number of intrusions observed. Thus, the following results are reported averaged over both orders. As Figure 1 suggests, GAD patients exhibited significantly more intrusions during the worry task than the bear task, $t(28) = 2.12$, $p < .05$. For the other participants, the opposite was true: Both speech phobics, $t(24) = 2.79$, $p < .01$, and control participants, $t(28) = 3.05$, $p < .01$, suppressed thoughts of

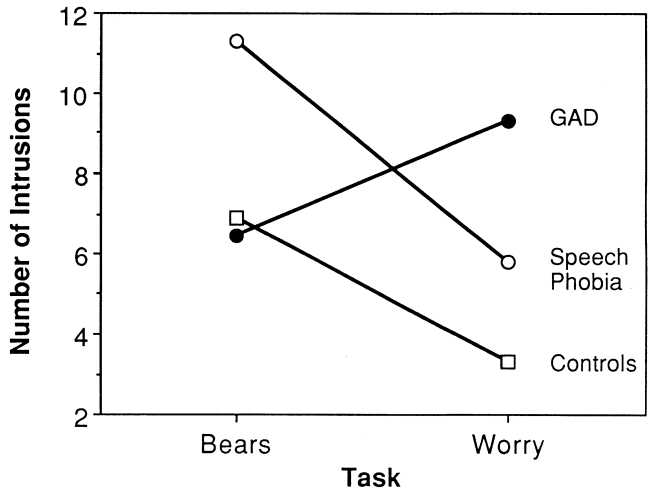

FIG. 1. MEAN NUMBER OF INTRUSIONS DURING THE BEAR TASK AND THE WORRY TASK BY GAD PATIENTS, SPEECH PHOBICS, AND CONTROL PARTICIPANTS.

their main worry more effectively than thoughts of white bears. Consequently, we observed the expected significant interaction of task and participant group, $F(2, 79) = 7.03$, $p < .01$, $f = .25$. The main effect of task also reached statistical significance, $F(2, 79) = 4.69$, $p < .05$, $f = .14$. Overall, more intrusions occurred during the bear task. The main effect of participant group was marginally significant, $F(1, 79) = 2.72$, $p < .10$, $f = .21$, indicating that both patient groups tended to exhibit more intrusions than the control group.

As noted above, GAD patients showed significantly higher scores than speech phobics and nonanxious controls in all questionnaires administered, that is, the SCL-90, HAM-A, HAM-D, BDI, and STAI-Trait, as well as the STAI-State before and after the experiment. Therefore, it might be the case that the pattern of intrusions observed in this experiment was caused by different levels of general psychopathology rather than specific characteristics of GAD. To test this alternative explanation, two analyses of covariance (ANCOVAs) were computed, using questionnaire scores as covariates. In the first ANCOVA, the SCL-90 total score was the only covariate because it is the best indicator of general psychopathology measured in this study, and because the other questionnaires were highly correlated with it (between $r = .63$ for the HAM-D and $r = .82$ for the BDI). In the other ANCOVA, the two STAI-State scores as well as their difference were used as covariates in order assess the effect of state anxiety and its change during the course of the experiment. Both these ANCOVAs yielded results that were almost identical to those of the ANOVA reported above. Most importantly, the interaction of task and participant group was significant both in the first ANCOVA, $F(2, 72) = 4.78$, $p < .02$, and in the second one, $F(2, 78) = 6.98$, $p < .01$. Moreover, correlations of the covariates and the

TABLE 3
MEAN NUMBER AND DURATION OF INTRUSIONS, NUMBER AND DURATION OF TOPICS MENTIONED, MEAN DURATION OF PAUSES (WITH STANDARD DEVIATIONS [*SD*]) OF GAD, SPEECH PHOBIA, AND CONTROL PARTICIPANTS DURING THE PRACTICE, BEAR, AND WORRY TASKS OF THE EXPERIMENT

	GAD	Speech Phobia	Control
Number of intrusions			
Bears in bear task	6.4	11.3	6.9
SD	(6.2)	(9.2)	(7.4)
Main worry in worry task	9.3	5.8	3.3
SD	(9.5)	(6.3)	(3.2)
Duration of intrusions			
Main worry in practice task	25.6	22.9	18.7
SD	(37.2)	(55.6)	(48.1)
Bears in bear task	19.9	42.7	26.4
SD	(22.4)	(49.1)	(29.0)
Main worry in worry task	26.1	22.2	16.8
SD	(38.5)	(39.1)	(20.9)
Number of topics			
Practice task	7.9	7.6	8.5
SD	(4.8)	(4.5)	(5.2)
Bear task	7.4	6.3	6.6
SD	(3.7)	(4.5)	(3.8)
Worry task	6.7	5.9	6.4
SD	(3.6)	(3.5)	(4.2)
Duration of other topics			
Practice task	187.8	188.3	217.1
SD	(74.5)	(80.9)	(69.0)
Bear task	213.3	153.6	182.1
SD	(73.8)	(84.8)	(85.0)
Worry task	204.0	192.0	223.5
SD	(71.4)	(90.5)	(61.1)
Duration of pauses			
Practice task	26.7	33.9	37.9
SD	(40.3)	(44.4)	(45.9)
Bear task	23.6	35.0	24.3
SD	(34.4)	(47.0)	(40.6)
Worry task	28.1	25.6	30.7
SD	(38.0)	(37.2)	(49.0)

Note. Durations are given in seconds. GAD = Generalized Anxiety Disorders.

dependent variable (number of intrusions) were generally low; the highest one was found for the STAI-State measured after the experiment ($r = .23$, $p < .01$). Thus, it seems unlikely that the pattern of intrusions reported above can be explained by the GAD patients' higher level of general psychopathology. Moreover, the differences in GAD, speech phobia, and control participants' ability to suppress thoughts of their main worry cannot be attributed to different topics of the main worries. Across all three groups, most participants worried about their occupation and personal relations, followed by daily hassles and health.

Think-Aloud Protocols

As mentioned, participants' recorded verbalizations should be interpreted with caution. In addition to the problems mentioned above, four protocols were lost because of technical problems or experimenter error. Thus, all analyses reported here are based on think-aloud protocols of 27 GAD patients, 24 speech phobics, and 27 control participants. Despite these limitations, however, some results seem quite stable and worth considering. Moreover, for the practice task, the think-aloud protocols are the only data available. Since this task was used as a baseline estimate of the participants' thoughts, it had to be as unrestricted and unaffected by data collection procedures as possible. Thus, no button presses in reaction to any kind of thought could be collected. The results obtained by analyses of the protocols are reported in Table 3. First, pause durations did not differ between tasks or participant groups (all $F < 1.96$, ns). The mean time per task spent on pauses was 29.5 seconds, that is, about 10% of the total 5 minutes. This result indicates that participants generally followed the instruction not to stop verbalizing quite well. In addition, an average of only 7 seconds per task had to be coded as missing values due to incomprehensible verbalizations or disagreement between the two raters. Thus, sufficient data were available for analyses of the protocols. As expected, participants spent most of the time thinking about topics other than white bears or worries (see Table 3). On the average, this amounted to 196 seconds per task, that is, about two thirds of the time allocated for each task. As expected, only speech phobia patients ever thought about speech anxiety, and they did so during all three tasks of the experiment, for a mean time of 12 seconds per task.

Most importantly, the pattern of results observed for duration of intrusions matched the number of intrusions reported above, although the effects were somewhat weaker. Speech phobics tended to spend more time thinking about white bear intrusions than intrusions of their main worry, $t(23) = 1.82$, $p < .10$. The same was true for the control participants, $t(26) = 1.73$, $p < .10$. GAD patients, however, showed no significant difference between the durations of white bear intrusions and worry intrusions, $t(26) < 1$, ns. If anything at all, the difference observed for this group is reversed, in accordance with the number of intrusions reported above. Accordingly, the two-way ANOVA of the intrusion

durations yielded a marginally significant interaction of participant group and task, $F(2, 75) = 2.5$, $p < .10$, $f = .16$. The main effects of participant group, $F(2, 75) = 1.26$, ns, $f = .14$, and task $F(1, 75) = 2.67$, $p < .11$, $f = .12$, missed statistical significance. Again, the order of the bear task and the worry task did not have any significant effect. The strong correspondence between number and duration of intrusions is further exemplified by significant correlations between the two variables, both in the bear task ($r = .69$, $p < .01$) and the worry task ($r = .58$, $p < .01$).

The results presented so far seem to indicate that GAD patients' mental control is impaired particularly for their worries. They show more intrusions of their main worry than of white bears, whereas the opposite is true for the other participants. GAD patients, however, might have a very high baseline rate of worries, so their average rate of nine intrusions during the worry task could actually indicate a significant reduction. In order to test this hypothesis, the duration of main worry intrusions during the worry task was compared to the time the participants spent thinking about their main worry during the unrestricted practice task. The results of this analysis are given in Table 3. No difference between the practice task and the worry task was observed for any of the participant groups (all $t < 1$, ns). Thus, the two-way ANOVA of these intrusion durations revealed no significant main effect of task, $F(1, 75) < 1$, ns. The main effect of participant group, $F(1, 75) < 1$, ns, and the interaction, $F(2, 75) < 1$, ns, were not significant either. These results indicate that speech phobics and nonanxious controls were just as unsuccessful as GAD patients when they tried to avoid thinking about their main worry. For thoughts about white bears, the corresponding ANOVA was rendered impossible by a lack of variance: As expected, no participant ever thought spontaneously about white bears during the practice task. Thus, all white bear intrusions during the bear task appear to constitute an increase over the base rate.

As Wegner (1989) suggested, thinking about the experimental room should be a particularly bad strategy to avoid intrusions because the room might prime the unwanted topic. However, analyses of the protocols revealed that after thoughts of the experimental room, intrusions did not occur more often than after any other type of verbalization. Likewise, the probability of an intrusion was not increased after pauses. Another plausible hypothesis is that intrusions might be particularly frequent at times when participants change topics. Therefore, intrusions should occur more often if participants change the topic of their thinking frequently, thereby increasing the number of topics per task. However, analyses of the number of topics mentioned in the bear task and the worry task did not reveal any significant differences (all $F < 1$, ns, compare Table 3). Furthermore, when the number of topics mentioned by each individual participant in the bear and worry task was correlated with the participant's number of intrusions in that task, no significant correlations were found ($r = .03$ for the bear task and $r = .07$ for the worry task, both ns). The only strong effect on the number of topics mentioned concerned the practice task (see Table 3).

All participants thought about more topics during the unrestricted practice task than during the other two tasks, $F(2, 150) = 6.36$, $p < .01$.

DISCUSSION

From the complex pattern of results reported here, several conclusions regarding mental control in GAD can be drawn. The intrusions signaled by button presses indicate that patients with GAD do indeed suffer from a lack of mental control regarding their worries. They had more intrusions of their main worry than intrusions of white bears, whereas the opposite was true for nonanxious control participants and patients with a different anxiety disorder, namely speech phobia. As indicated by the ANCOVAs reported above, this pattern of results seems to be caused by specific information processing characteristics of GAD rather than differences in general psychopathology. Corresponding results were observed for the duration of intrusions during the bear task and the worry task. These results indicate that it is indeed harder for GAD patients to suppress thoughts of their worries than thoughts of a neutral stimulus.

The results do not imply, however, a complete lack of mental control in GAD. First, GAD patients might think about their main worry even more often in everyday life than they did during the main worry task. In that case, their control attempts would have been at least partially effective. To test this possibility, the duration of main worry thoughts during the worry task was compared to the duration during the practice task. Thoughts of the topics later identified as the participants' main worries occurred during this unrestricted task, and—interpreted cautiously—the duration of these thoughts can be used as a baseline measure of worrying. When we compared this baseline duration to the duration of main worry thoughts in the worry task, we found practically identical mean durations. This was true for all three groups of participants. Our results are in accord with the definition of GAD used in the *DSM-IV* as well as with statements of GAD patients who complain that they cannot control their worrying. However, this lack of control does not seem to be a specific characteristic of GAD because the same was true for patients with speech phobia and for control participants. The second argument against a unique lack of mental control in GAD comes from the intrusions during the white bear task. GAD patients were as able (or unable) to suppress thoughts of a neutral stimulus—white bears—as speech phobics and nonanxious controls. Compared to the complete lack of white bear thoughts during the practice task, all participant groups showed comparable increases of these thoughts during the bear task. The fair number of white bears and worries that intruded into the participants' thoughts is another confirmation of Wegner's (1989, 1994) claim that is generally impossible not to think of a given topic if one intends to suppress thoughts of it.

Finally, when comparing speech phobia patients to nonanxious controls, we found that both groups exhibited similar patterns of intrusions. However, Speech Phobics showed more intrusions overall, and the think-aloud task was

more stressful for them than for control participants. This result confirms Wegner's (1989) hypothesis that mental control will be impaired under stress. However, stress cannot be the sole explanation for the pattern of results observed in this experiment because GAD and speech phobia patients—although showing comparable levels of anxiety, tension, excitement, and avoidance—exhibited different patterns of intrusions.

In this study, the results regarding the frequency of intrusions were supplemented nicely by results from the think-aloud protocols. The protocols indicate that the time participants spent thinking about intrusions matched the frequency of these intrusions rather well. Of course, the reliability of think-aloud protocols can be questioned for a number of reasons. The problems associated with introspective data obtained by think-aloud protocols are well documented (see Ericsson & Simon, 1993), and several of them might have affected this study. Participants cannot quickly verbalize everything that comes to mind, they tend to stop speaking if they are not reminded of the instruction, and they sometimes produce verbalizations such as ''Oops,'' which are hard to interpret. In addition, some verbalizations might be difficult to classify and others incomprehensible because participants were not forced to speak directly into the microphone. Because of these general limitations, our procedure of collecting the verbal protocols followed the recommendations given by Ericsson and Simon (1993) and others (Payne, 1994; Wilson, 1994): The protocols were collected on-line as think-aloud protocols; we asked participants to verbalize every thought that occurred without emphasis on any particular one. The experimenter waited outside while participants verbalized, and we used a second methodology to measure intrusive thoughts, namely the button presses. Furthermore, classification of verbalizations chosen in this study turned out to be very reliable, leaving little room for ambiguity.

In general, think-aloud protocols collected in this study (and others such as Roemer & Borkovec, 1994) provided a considerable amount of additional information that augmented the data collected by button presses. Taken together, button presses and the protocols indicate that GAD patients were unique in that they had more intrusions of their main worry than of white bears, whereas the opposite was true for the speech phobics and the nonanxious controls. The three participant groups did not differ from each other, however, in their inability to reduce the duration of main worry thoughts and white bear thoughts when the practice task was compared to the worry task and the bear task. Thus, if the inability to suppress worry thoughts is not unique to GAD, we are left wondering what might be unique about the worrying behavior of GAD patients. The answer to this question will have to be left to future research. Maybe it will be found in the amount of worrying. As several studies showed, GAD patients report that they spend much more time worrying than other people (Craske et al., 1989). Thus, being unable to reduce the time spent worrying might appear especially stressful to GAD patients.

The experiment reported here was designed as a first step toward understanding worries and mental control in clinical disorders. Obviously, many questions are left unanswered. Most importantly, the present experiment only showed that the GAD patients' inability to suppress thoughts of their main worry is not unique to GAD, and that GAD patients—unlike speech phobics and nonanxious controls—found it harder to suppress thoughts of their main worry than thoughts of a neutral stimulus. However, it is important to determine whether the observed lack of mental control extends to unpleasant stimuli or emotional stimuli in general. In order to do this, future experiments should use pleasant and unpleasant unwanted topics in addition to the neutral and disorder-relevant topics investigated here. Moreover, thinking about the white bears used in this experiment and in the studies of Wegner and his colleagues (e.g., Wegner et al., 1981, 1987) most probably involves imagery, whereas thinking about worries might be predominantly verbal. Since the difference between imaginal and verbal processes might be particularly important in GAD worries (Borkovec & Inz, 1990), future studies should also compare high-imagery topics to low-imagery ones independently of their disorder relevance. Also, the present experiment investigated mental control processes operating over only a few minutes. Further studies are needed to find out if the results will generalize to processes operating over longer intervals, for example, several days.

The present experiment investigated enhancement effects caused by the attempt to suppress unwanted thoughts, since these correspond most closely to GAD patients' complaints. Our experiment was not designed for observing rebound effects because the third task was not unrestricted, that is, participants were not free to think of anything that came to mind. Instead, they tried to avoid thoughts of either white bears or their main worry. Accordingly, the think-aloud protocols of the third task (bear or worry) contained hardly any thoughts of the topic suppressed during the second task (worry or bear). However, the characteristics of GAD patients' mental control might affect rebound phenomena as well (but see Kelly & Kahn, 1994; Mathews & Milroy, 1994), and they should be investigated in future experiments.

Finally, mental control is an important factor in other clinical disorders as well, such as obsessive-compulsive disorder, major depression, and posttraumatic stress disorder. The white bear paradigm used here seems well suited to investigate the role of mental control in the occurrence and maintenance of these disorders, since disorder-relevant stimuli can be contrasted easily with other stimuli. Furthermore, this can be done in tasks testing suppression of unwanted thoughts as well as in tasks testing concentration on wanted thoughts. The latter task seems particularly interesting because it is relevant to recent developments in therapy of GAD. Brown, O'Leary, and Barlow (1993) developed a promising therapy in which the patients have to elaborate on their worries instead of trying to suppress them.

REFERENCES

American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders* (3rd ed., Rev.). Washington, DC: Author.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

Barlow, D. H. (1988). *Anxiety and its disorders: The nature and treatment of anxiety and panic*. New York: Guilford Press.

Beck, A. T., Ward, C. H., Mendelsohn, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, **18**, 561–571.

Becker, E. S. (1992). *The worry interview*. Unpublished manuscript, Stanford University.

Borkovec, T. D., & Inz, J. (1990). The nature of worry in generalized anxiety disorder: A predominance of thought activity. *Behaviour Research and Therapy*, **28**, 153–158.

Borkovec, T. D., Robinson, E., Pruzinsky, T., & DePree, J. A. (1983). Preliminary explorations of worry: Some characteristics and processes. *Behaviour Research & Therapy*, **21**, 9–16.

Brown, T. A., O'Leary, T. A., & Barlow, D. H. (1993). Generalized anxiety disorder. In D. H. Barlow (Ed.), *Clinical handbook of psychological disorders* (pp. 137–188). New York: Guilford Press.

Clark, D. M., Ball, S., & Pape, D. (1991). An experimental investigation of thought suppression. *Behaviour Research & Therapy*, **29**, 253–257.

Clark, D. M., Winton, E., & Thynn, L. (1993). A further investigation of thought suppression. *Behaviour Research & Therapy*, **31**, 207–210.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Conway, M., Howell, A., & Giannopoulos, C. (1991). Dysphoria and thought suppression. *Cognitive Therapy and Research*, **15**, 153–166.

Craske, M. G., Rapee, R. M., Jackel, L., & Barlow, D. H. (1989). Qualitative dimensions of worry in *DSM-III-R* generalized anxiety disorder subjects and non-anxious controls. *Behaviour Research and Therapy*, **27**, 397–402.

Derogatis, L. R., Lipman, R. S., & Covi, L. (1973). SCL-90: An outpatient psychiatric rating scale. Preliminary report. *Psychopharmacological Bulletin*, **9**, 13–25.

East, M. P., & Watts, F. N. (1994). Worry and the suppression of imagery. *Behaviour Research & Therapy*, **32**, 851–855.

Ericsson, K. A., & Simon, H. A. (1993). *Protocol analysis: Verbal reports as data*. Cambridge, MA: MIT Press.

Eysenck, M. W. (1992). *Anxiety: The cognitive perspective*. Hove: Lawrence Erlbaum Associates.

Glowalla, U., Hasebrook, J., & Fezzardi, G. (1992). SHOW IT—Eine Experimentalsteuerung zur Darbietung von Text, Bild und Ton in rechnergestützten Kursen und Experimenten. *Zeitschrift für empirische Pädagogik*, **2**, 193–201.

Hamilton, M. (1959). The assessment of anxiety states by rating. *British Journal of Medical Psychology*, **32**, 50–55.

Hamilton, M. (1960). A rating scale for depression. *Journal of Neurology, Neurosurgery and Psychiatry*, **23**, 56–62.

Howell, A., & Conway, M. (1992). Mood and the suppression of positive and negative self-referent thoughts. *Cognitive Therapy and Research*, **16**, 535–555.

Kelly, A. E., & Kahn, J. H. (1994). Effects of suppression of personal intrusive thoughts. *Journal of Personality and Social Psychology*, **66**, 998–1006.

Lavey, E. H., & van den Hout, M. (1990). Thought suppression induces intrusions. *Behavioural Psychotherapy*, **18**, 251–258.

MacLeod, A. K., Williams, J. M. G., & Bekerian, D. A. (1991). Worry is reasonable: The role of explanations in pessimism about future personal events. *Journal of Abnormal Psychology*, **100**, 478–486.

Mathews, A. (1990). Why worry? The cognitive function of anxiety. *Behaviour Research & Therapy*, **28**, 455–468.

Mathews, A., & Milroy, R. (1994). Effects of priming and suppression of worry. *Behaviour Research & Therapy*, **32**, 843–850.

Muris, P., Merckelbach, H., van den Hout, M., & Jong, P. de (1992). Suppression of emotional and neutral material. *Behaviour Research & Therapy*, **30**, 639–642.

Payne, J. W. (1994). Thinking aloud: Insights into information processing. *Psychological Science*, **5**, 241–248.

Rachman, S. (1982). Unwanted intrusive cognitions. *Advances in Behaviour Research and Therapy*, **3**, 89–99.

Reynolds, M., & Salkovskis, P. M. (1992). Comparison of positive and negative intrusive thoughts and experimental investigation of the differential effects of mood. *Behaviour Research and Therapy*, **30**, 273–281.

Roemer, L., & Borkovec, T. D. (1994). Effects of suppressing thoughts about emotional material. *Journal of Abnormal Psychology*, **103**, 467–474.

Salkovskis, P. M., & Campbell, P. (1994). Thought suppression induces intrusion in naturally occurring negative intrusive thoughts. *Behaviour Research and Therapy*, **32**, 1–8.

Salkovskis, P. M., & Reynolds, M. (1994). Thought suppression and smoking cessation. *Behaviour Research & Therapy*, **32**, 193–201.

Shadick, R. N., & Roemer, L. (1991). *The nature of worrisome thoughts*. Paper presented at the 25th Convention of the Association for the Advancement of Behavior Therapy, New York.

Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. (1970). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press.

Spitzer, R. L., Williams, J. B., & Gibbon, M. (1987). *Structured clinical interview for DSM-III-R*. New York: New York State Psychiatric Institute.

Trinder, H., & Salkovskis, P. M. (1994). Personally relevant intrusions outside the laboratory: Long-term suppression increases intrusion. *Behaviour Research and Therapy*, **32**, 833–842.

Turner, S. M., Beidel, D. C., & Stanley, M. A. (1992). Are obsessional thoughts and worry different cognitive phenomena? *Clinical Psychology Review*, **12**, 257–270.

Vasey, M. W., & Borkovec, T. D. (1992). A catastrophizing assessment of worrisome thoughts. *Cognitive Therapy and Research*, **16**, 505–520.

Wegner, D. M. (1989). *White bears and other unwanted thoughts. Suppression, obsession and the psychology of mental control*. New York: Viking Press.

Wegner, D. M. (1994). Ironic processes of mental control. *Psychological Review*, **101**, 34–52.

Wegner, D. M., Schneider, D. J., Carter, S. R., III, & White, L. (1987). Paradoxical effects of thought suppression. *Journal of Personality and Social Psychology*, **58**, 409–418.

Wegner, D. M., Schneider, D. J., Knutson, B., & McMahon, S. R. (1991). On polluting the stream of consciousness: The effect of thought suppression on the mind's environment. *Cognitive Therapy and Research*, **16**, 141–152.

Wells, A., & Morrison, A. P. (1994). Qualitative dimensions of normal worry and normal obsessions: A comparative study. *Behaviour Research and Therapy*, **32**, 867–870.

Wenzlaff, R. M., Wegner, D. M., & Klein, S. B. (1991). The role of thought suppression in the bonding of thought and mood. *Journal of Personality and Social Psychology*, **60**, 500–508.

Wenzlaff, R. M., Wegner, D. M., & Roper, D. W. (1988). Depression and mental control: The resurgence of unwanted negative thoughts. *Journal of Personality and Social Psychology*, **55**, 882–892.

Wilson, T. D. (1994). The proper protocol: Validity and completeness of verbal reports. *Psychological Science*, **5**, 249–252.

Zeitlin, S. B., Netten, K. A., Hodder, S. L. (1995). Thought suppression: An experimental investigation of spider phobics. *Behaviour Research & Therapy*, **33**, 407–413.