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BREATHING RETRAINING, EXPOSURE AND A COMBINATION OF BOTH, IN THE TREATMENT OF PANIC DISORDER WITH AGORAPHOBIA

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Summary—The present study investigates the differential effectiveness of three treatment packages for agoraphobia. Patients suffering from panic disorder with agoraphobia (DSM-III-R) received one of three treatments: Breathing Retraining with Cognitive Restructuring (BRCR), graded self-exposure *in vivo* (EXP), or a combination of BRCR and EXP. Treatments consisted of 8 sessions. Assessments consisted of self-report measures for panic, phobic anxiety and avoidance, depression, general anxiety, somatic complaints and fear of bodily sensations, and of two respiratory measures (respiratory rate and alveolar pCO_2).

The treatments resulted in a reduction in symptomatology on all self-report measures, except panic frequency, and in a decrease in respiratory rate. There was no evidence for a differential efficacy for any of the treatments on any of the variables. Contrary to expectation, and at odds with findings from earlier studies, BRCR had no significant effect on panic frequency. A detailed comparison of sample characteristics of patients in our study and previous studies, did not yield insight into possible causes for the failure to replicate earlier results. The limited effectiveness of breathing retraining in reducing panic, as observed in the present study, leads us to conclude that the role of hyperventilation in panic is less important than previously thought.

INTRODUCTION

The efficacy of exposure therapy in the treatment of agoraphobia is well established (Emmelkamp, 1982; Marks, 1987). Exposure therapy focuses on the avoidance behavior of the agoraphobic patient and is not explicitly directed at the debilitating panic attacks usually accompanying the disorder. Therefore, several authors suggest the use of specific antipanic medication, in particular, tricyclic antidepressants, to alleviate panic (Liebowitz, Fyer, Gorman, Campeas, Sandberg, Hollander, Papp and Klein, 1988; Sheehan, 1982). The drawbacks of (long-term) pharmacologic treatment, with adverse drug side-effects, relapse after discontinuation and danger of addiction, renders the development of psychological treatments for panic of great relevance.

Rapee (1987) reviews current panic treatments based on a cognitive/psychophysiological model of panic attacks, which has been similarly proposed by a number of authors (Clark, 1986; van den Hout and Griez, 1982; Rapee, 1987). Briefly summarized, these models posit that a panic attack results from catastrophic misinterpretation of bodily sensations, which are seen as indicative of serious physical danger or loss of control. The bodily sensations may stem from various sources, such as caffeine ingestion, exercise, emotional arousal, or hyperventilation (Clark, 1986). For hyperventilation, there is accumulating evidence that at least some panic attacks are accompanied by drops in alveolar (and arterial) carbon dioxide pressure (Hibbert and Pilsbury, 1988; Salkovskis, Warwick, Clark and Wessels, 1986). Between 61 and 83% of patients with agoraphobia with panic recognize the similarity of symptoms of voluntary hyperventilation and their usual panic attacks (Garssen, van Veenendaal and Bloemink, 1983; de Ruiter, Garssen, Rijken and Kraaimaat, 1989).

Treatments based on the cognitive/psychophysiological model of panic generally consist of either of three therapy techniques, or a combination of these: breathing retraining, cognitive restructuring, and exposure to bodily sensations. Studies conducted so far indicate positive effects of breathing retraining with panic and agoraphobic patients (Bonn, Readhead and Timmons, 1984; Clark, Salkovskis and Chalkley, 1985; Rapee, 1985; Salkovskis, Jones and Clark, 1986). The only controlled study among these (Bonn *et al.*, 1984) showed that breathing retraining plus exposure

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was as effective as exposure alone for agoraphobic patients, at posttreatment. However, at 6-month follow-up, *S*s who received breathing retraining demonstrated significantly more improvement on mean resting breathing rate, global phobia score, somatic symptom score and panic frequency, than *S*s who received exposure alone. Most of the respiratory treatments in these studies (Rapee, 1985; Clark *et al.*, 1985; Salkovskis *et al.*, 1986) included cognitive interventions, such as reattribution of panic attacks to hyperventilation and explanation about cause and maintenance of panic attacks. The majority of these treatments also incorporate exposure to bodily sensations in the treatment package, mainly in the form of voluntary hyperventilation. The beneficial effect of exposure to bodily sensations has been demonstrated using repeated sodium lactate infusions (Bonn, Harrison and Rees, 1973) and repeated CO_2 inhalations (Haslam, 1974; Griez and van den Hout, 1983, 1986). With Wolpe and Rowan (1988), we would like to suggest that breathing retraining and reattribution of symptoms to hyperventilation, offer patients with agoraphobia a means of coping with their panic attacks. Thus, we expect exposure with added breathing retraining/cognitive restructuring to be more effective in treating agoraphobia, than exposure alone.

The present study compares the effectiveness of three different treatment packages for patients fulfilling DSM-III-R criteria for panic disorder with agoraphobia (American Psychiatric Association, 1987). The first treatment, Breathing Retraining/Cognitive Restructuring (BRCR) consists of 8 sessions of breathing retraining with cognitive reattribution of symptoms to hyperventilation. The second treatment consists of 8 sessions of graded self-exposure *in vivo* (EXP). The third treatment (BRCR + EXP) consists of 4 sessions of the first treatment, followed by 4 sessions of the second treatment.

On the basis of earlier findings it is expected that BRCR will result in a significant decrease in panic frequency, and will perhaps also lead to a decrease in phobic avoidance behavior. Furthermore, the emphasis on cognitive reattribution of panic symptoms to hyperventilation, is expected to result in a greater reduction in fear of bodily sensations in patients receiving BRCR treatment, than in those receiving EXP and BRCR + EXP. On the contrary, EXP is expected to be mainly effective in reducing avoidance behavior. Of all three treatment packages, BRCR + EXP is expected to yield the largest reduction in panic frequency and avoidance behavior.

METHOD

Subjects

Patients referred to our research project came from the outpatient clinic of the psychiatric department of the University of Utrecht, from local outpatient mental health centers, or came themselves directly for treatment. All patients met DSM-III-R (American Psychiatric Association, 1987) criteria for Panic Disorder with Agoraphobia. Diagnosis was determined on the basis of the Anxiety Disorders Interview Schedule—Revised (ADIS-R; DiNardo, O'Brien, Barlow, Waddell and Blanchard, 1983; Dutch version: de Ruiter, Garssen, Rijken and Kraaimaat, 1987). Psychotic symptoms and substance abuse served as contraindications for inclusion in the treatment. Patients with concomitant unipolar mood disorder were not excluded from the study.

Prior to assignment to a treatment condition, all patients underwent a hyperventilation provocation test as part of an assessment procedure (for details, see: de Ruiter, Garssen, Rijken and Kraaimaat, 1989). Only patients who recognized the symptoms induced by voluntary hyperventilation as similar to their panic attacks were included in the study.

Forty-nine patients were randomly assigned to either of the three treatment conditions, except that we tried to achieve equal sex distributions across treatments. Of the 49 patients who entered treatment, 40 completed the program. Attrition rates were 4 (24%) for BRCR, 4 (24%) for EXP and 1 (6%) for BRCR + EXP. There were 6 men and 7 women in the BRCR group, 5 men and 8 women in EXP, and 5 men and 9 women in BRCR + EXP. Mean age of the total treatment sample were 34.0 years (SD = 9.2; range = 22–60). Mean duration of disorder was 61.6 months (SD = 70.0, range = 2–264). Nineteen (48%) patients were taking psychotropic medication: 14 a benzodiazepine; 2 a tricyclic antidepressant; 1 a benzodiazepine plus a tricyclic; and, 2 a nonpsychopharmacological medication. Prior to entry, patients had been taking these medications for extended periods of time, and they agreed to maintain the same dosage throughout the study.

Treatments

All treatments consisted of eight individual sessions lasting approx. 60 min. Patient's partner or other significant other attended the first session to receive information about treatment and his or her role in the treatment.

Breathing Retraining/Cognitive Restructuring (BRCR). This treatment is adapted from a treatment described by Clark and Salkovskis (1986). Treatment consisted of:

(1) Voluntary hyperventilation. To demonstrate that their panic symptoms are produced by hyperventilation, patients were asked to name the symptoms that accompany their panic attacks. These symptoms were written down. Subsequently they were asked to breathe rapidly for 90 sec. After this they were asked to report any symptoms they had experienced during the overbreathing, or were experiencing at that moment, which were again recorded. Similarities between the two lists of symptoms were pointed out.

(2) Explanation of how hyperventilation plus catastrophic cognitions cause panic attacks. A slightly modified version of a diagram developed by Clark, Salkovskis and Chalkley (1985, p. 24) was used to explain how hyperventilation causes panic. This diagram presents a feedback loop between overbreathing, which might be due to excessive worrying, inability to cope with stressful life events etc., bodily sensations and interpretation of these sensations as catastrophic. After a thorough explanation, including examples from the patient's life, a hand-out was given which summarized the explanation given by the therapist.

(3) Relaxation training and training in slow breathing. The actual breathing retraining was preceded by a brief training in progressive muscle relaxation (Wolpe and Lazarus, 1966). Rationale for inclusion of this technique was our clinical experience which suggested that indirectly influencing breathing patterns via muscle relaxation might be beneficial. Patients received an audiocassette of the relaxation exercise, in which they were instructed for home practice.

For training in slow breathing, a pacing tape was used. Breathing rate was adjusted for each patient and had to be slightly slower than his or her usual breathing rate. Patients were instructed to follow the tape for several minutes, and after the recording had ended, were asked to continue at the same rate. Slow, diaphragmatic breathing was further encouraged by suggesting patients put one hand on their abdomen, and breathing 'against the hand'. Relaxation and slow breathing were practised daily during the course of treatment, and patients were encouraged to apply their skills in daily situations.

All patients in this treatment condition were instructed not to change their frequency of exposure to phobic situations during the course of treatment.

Exposure therapy (EXP). Treatment consisted of graded self-exposure *in vivo*. The rationale for exposure therapy, as presented in the Client's Manual of Mathews, Gelder and Johnston (1981), was explained. Patients were provided with a copy of this manual. A detailed hierarchy of phobic situations was constructed during the first session. Patients received homework assignments to practice situations from the hierarchy, in increasing order of difficulty. Throughout treatment patients were encouraged to practise exposure for a minimum of 1 hr a day.

Breathing Retraining/Cognitive Restructuring plus Exposure therapy (BRCR + EXP). This treatment consisted of short versions of the first two treatments (4 sessions of BRCR + 4 sessions of EXP). The slow breathing was presented as a coping technique for panic attacks that would facilitate exposure to agoraphobic situations.

Therapists

Four junior clinical psychologists served as therapists in the study. They all had some prior experience with psychotherapy and were specially trained in the treatments used. Supervision by a senior clinical psychologist (the second author) was provided on a weekly basis.

Assessment

An assessment battery of self report inventories of phobic anxiety and avoidance, panic, fear of somatic symptoms, general anxiety, somatic complaints, and depression, was administered at baseline (4 weeks prior to treatment), pre and posttreatment. Respiratory measures were also taken at these times. The assessment battery included the following self-report measures.

Fear Survey Schedule-III (FSS-III). The FSS-III is a 76-item self report inventory of phobic anxiety (Wolpe and Lang, 1964; Arrindell, Emmelkamp and van der Ende, 1984). Items are rated on 5-point continua. It has five subscales, of which only the Agoraphobia subscale was used.

Phobic anxiety and avoidance scales. These scales each consist of 4 items (walking in a busy street; taking a bus ride; shopping in a supermarket or department store; being in a busy restaurant) which are rated on a 9-point fear or avoidance scale (Watson and Marks, 1971). The total score for each scale is the sum of the item scores.

Panic attack diary. Panic attacks were monitored daily throughout the entire baseline and treatment periods. Patients were requested to note the number and duration of their panic attacks on a sheet of paper twice a day. As a reminder, DSM-III-R symptom criteria for panic attacks were given on each sheet.

In the analyses, panic attack frequency during the last week of the 4-week baseline period will be compared with the frequency during the last week of treatment.

Fear of Bodily Sensations Questionnaire (FBSQ). The FBSQ asks *S*s to rate how fearful they are of each of 14 sensations (e.g. dizziness, heart palpitations, difficulty breathing). Answers are given on a 5-point scale ranging from 0 (not at all fearful) to 4 (extremely fearful). The total score—the sum of the item scores—ranges from a possible 0 to a possible 56. Cronbach's α for the total FBSQ score was 0.90 for a sample of 141 patients suffering from various anxiety disorders.

Symptom Checklist-90 (SCL-90). This questionnaire is a widely used and well-validated self-report inventory for measuring the severity of psychopathology in psychiatric outpatients and has been validated for Dutch populations (Derogatis, Lipman and Covi, 1973; Arrindell and Ettema, 1986). It has 8 subscales, of which only the subscales Agoraphobia, Anxiety, Somatic complaints, and Depression, were used in this study.

The following respiratory measures were assessed:

Respiratory rate (RR) and end tidal carbon dioxide pressure (pCO_2). Respiratory measurements took place in an experimental room, where the *S* was seated in a reclining chair while breathing normally through a mouthpiece for 10 min. The first 8 min were considered a habituation phase, and only during the last 2 min were RR and pCO_2 registered.

RR was measured using a Godart pneumotachograph. A large Fleish head (No. 4) was used, which is prescribed for accurate measurement of high flow rates occurring during hyperventilation. End tidal pCO_2 was measured with a Godart capnograph, calibrated before each session with a gas mixture (4.0% CO_2 in air) previously analyzed by the Lloyd method. The pneumotachograph and capnograph signals were fed into an amplifier and traced on a polygraph.

Unless otherwise specified results of probability tests are considered significant for $P \leqslant 0.05$.

RESULTS

Prior to performing outcome analyses, demographic characteristics of the three treatment groups were compared. The analyses revealed no differences between the three groups with regard to sex [χ^2 (2, N = 40) = 0.33, NS], age [$F(2,39) = 0.39$, NS] and duration of disorder [$F(2,39) = 0.74$, NS]. A dichotomous variable (yes vs no medication) was created, to compare medication usage across treatment groups. Frequency of use of psychotropic medication across groups was not significantly different [χ^2 (2, N = 40) = 3.25, NS].

It has been shown that the frequency of secondary mood disorders in agoraphobic patients is around 20% (Barlow, DiNardo, Vermilyea, Vermilyea and Blanchard, 1986; Lesser, Rubin, Pecknold, Rifkin, Swinson, Lydiard, Burrows, Noyes and DuPont, 1988; de Ruiter, Rijken, Garssen, van Schaik and Kraaimaat, 1989). Furthermore, secondary mood disorders may adversely affect treatment outcome in behavioral treatment of anxiety disorders (Foa, Grayson and Steketee, 1982; Klosko, Heimberg, Dodge and Kennedy, 1984). With this in mind, the frequency of secondary mood disorders (dysthymia and major depression) was compared across treatment groups. Frequencies were 4 in the BRCR group, 4 in the EXP group and 2 in the BRCR + EXP group. The difference was not significant [χ^2 (2, N = 40) = 1.32]. Other additional diagnoses in the three treatment groups were social phobia (BRCR = 0, EXP = 3, BRCR + EXP = 1) and simple phobia (BRCR = 6, EXP = 6, BRCR + EXP = 7).

Table 1. Means and standard deviations on self report measures at baseline, pretest and posttest for three treatment groups

Self report measure	Treatment group	Assessment phase: Baseline Mean	Baseline SD	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD
FSS Agoraphobia	BRCR	3.0	0.7	2.8	0.7	2.8	0.8
	EXP	3.1	0.6	3.1	0.6	2.6	1.0
	BRCR + EXP	2.8	0.7	2.7	1.0	2.2	0.8
Phobic anxiety scale	BRCR	18.9	7.5	19.6	9.2	17.3	8.3
	EXP	20.8	7.2	20.3	7.6	15.0	10.3
	BRCR + EXP	17.8	7.1	14.6	7.0	10.4	6.2
Phobic avoidance scale	BRCR	22.2	7.9	21.1	8.4	20.1	9.9
	EXP	23.5	7.4	22.2	8.2	15.4	9.7
	BRCR + EXP	21.6	6.8	17.9	9.7	10.7	8.4
Fear of bodily sensations questionnaire	BRCR	31.9	7.6	32.3	9.2	27.0	11.7
	EXP	29.4	7.9	30.3	8.0	23.7	11.2
	BRCR + EXP	31.5	11.8	26.6	12.5	18.6	9.5
Mean panic attack frequency/day	BRCR	—	—	1.89	2.18	1.43	1.68
	EXP	—	—	1.36	1.77	1.36	1.98
	BRCR + EXP	—	—	0.64	0.41	0.63	0.66
SCL-90 Agoraphobia	BRCR	25.8	7.4	24.4	6.9	21.5	7.4
	EXP	25.9	5.8	24.8	6.6	20.9	8.2
	BRCR + EXP	21.7	6.8	20.1	6.3	16.4	7.0
SCL-90 Anxiety	BRCR	31.8	8.2	30.7	10.0	28.8	11.4
	EXP	31.2	4.9	29.0	9.1	26.0	10.3
	BRCR + EXP	28.4	8.8	25.8	7.5	21.1	8.4
SCL-90 Depression	BRCR	44.5	12.0	42.4	12.8	39.5	19.3
	EXP	41.8	9.4	39.0	13.1	36.8	13.8
	BRCR + EXP	34.9	12.3	30.3	12.3	27.0	13.8
SCL-90 Somatic complaints	BRCR	33.5	8.5	33.0	10.5	32.5	11.5
	EXP	34.5	8.0	31.9	8.1	27.5	7.2
	BRCR + EXP	31.7	11.7	30.1	10.9	24.7	11.6

BRCR = Breathing Retraining/Cognitive therapy.
EXP = Exposure therapy.
BRCR + EXP = Breathing Retraining/Cognitive therapy plus Exposure therapy.

Self report measures

Table 1 presents means and standard deviations on the self report measures at baseline, pretest and posttest for the 3 treatment groups. As is evident from the table, but contrary to expectation, patients showed improvement between baseline and pretest. It is also apparent that the absolute mean decrease in symptomatology from pretest to posttest is rather small. For example, when scores are compared to the standard norms for Dutch psychiatric outpatients (Arrindell and Ettema, 1986), for SCL-90 Agoraphobia the mean at posttest for all treatment groups is still in the 'above average' to 'highly above average' range.

To examine treatment effects and to compare patterns across treatments, univariate 2-factor analysis of variance (ANOVA) with repeated measures on one factor (pretest–posttest) were performed. The baseline score on the variable was always used as a covariate in the analysis to control for differences between treatment groups. The results of the analyses for the self report measures are shown in Table 2. Statistically significant pre–post effects were obtained on all outcome measures, except panic attack frequency. Significant treatment effects were found on the

Table 2. Three (treatment groups) × two (assessment phases: pre–post) repeated measures analysis of covariance of self report measures, with baseline scores as covariate

Self report measure	Pre–post effect: F-ratio	Pre–post effect: P-value	Treatment group effect: F-ratio	Treatment group effect: P-value	Treatment group × pre–post effect: F-ratio	Treatment group × pre–post effect: P-value
FSS Agoraphobia	15.32	0.000	0.30	NS	3.37	0.047
Phobic anxiety scale	13.89	0.001	3.74	0.034	0.68	NS
Phobic avoidance scale	20.81	0.000	3.63	0.037	3.39	0.045
Fear of bodily sensations questionnaire	18.22	0.000	2.58	NS	0.25	NS
Mean panic attack frequency/day	0.96	NS	1.49	NS	0.97	NS
SCL-90 Agoraphobia	20.20	0.000	0.47	NS	0.18	NS
SCL-90 Anxiety	7.15	0.011	1.02	NS	0.45	NS
SCL-90 Depression	4.47	0.041	0.42	NS	0.06	NS
SCL-90 Somatic complaints	6.72	0.014	2.75	NS	1.23	NS

Table 3. Means and standard deviations on respiratory measures at baseline, pretest and posttest for three treatment groups

Respiratory measure	Treatment group	Assessment phase: Baseline Mean	Baseline SD	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD
Mean pCO_2*	BRCR	37.7	2.4	39.8	2.5	37.1	4.7
	EXP	36.8	4.0	36.7	3.9	35.0	4.7
	BRCR + EXP	37.3	2.9	36.5	2.8	36.2	2.6
Mean respiratory rate†	BRCR	15.1	3.4	15.1	3.2	12.7	2.3
	EXP	15.3	5.7	15.6	5.6	15.9	7.0
	BRCR + EXP	17.0	3.5	16.6	3.7	13.9	3.5

*pCO_2 = end tidal carbon dioxide pressure, measured in mmHg.
†Measured in cycles/min.
BRCR = Breathing Retraining/Cognitive Restructuring.
EXP = Exposure therapy.
BRCR + EXP = Breathing Retraining/Cognitive Restructuring plus Exposure therapy.

phobic anxiety and avoidance scales. Significant treatment group × pre–post interaction effects were observed for the FSS Agoraphobia subscale and the phobic avoidance scale. However, these interaction effects are nonsignificant when using a more conservative level of significance, controlling for multiple tests ($P = 0.05/9 = 0.005$).

Further analyses were performed to test specific hypotheses regarding the effectiveness of BRCR on panic frequency and the differential efficacy of EXP versus BRCR + EXP on agoraphobic avoidance.

To test the hypothesis that BRCR would result in a significant reduction in panic attack frequency, a paired t-test was performed, revealing no significant improvement [$t(11) = 1.82$, NS].

The hypothesis that BRCR + EXP would be more effective than EXP in reducing agoraphobic avoidance was tested in repeated measures ANOVAs for FSS Agoraphobia and the phobic avoidance scale. These analyses revealed no significant interaction effects. BRCR + EXP was thus not more effective than EXP in reducing avoidance behavior.

Respiratory measures

Table 3 shows means and standard deviations on respiratory measures at baseline, pretest and posttest for the three treatment groups. Contrary to the self report measures, the respiratory measures in general did not show improvement from baseline to pretest. Treatments that included breathing retraining techniques (BRCR and BRCR + EXP) seemed to result in a decrease in respiratory rate, but not in an increase in alveolar pCO_2.

To examine the significance of treatment effects and patterns across treatments, univariate 2-factor ANOVAs with repeated measures on the time factor were performed. The baseline score on the variables was always used as a covariate in the analyses. The analyses revealed a significant pre–post effect for respiratory rate (see Table 4). There were no significant group or interaction effects.

DISCUSSION

The aim of the present study was to investigate the *differential* efficacy of three treatments for panic disorder with agoraphobia. However, the findings do not support the differential effectiveness of the treatments.

Table 4. Three (treatment groups) × two (assessment phases: pre–post) repeated measures analysis of covariance of respiratory measures, with baseline scores as covariate

Respiratory measure	Pre–post effect: F-ratio	Pre–post effect: P-value	Treatment group effect: F-ratio	Treatment group effect: P-value	Treatment group × pre–post effect: F-ratio	Treatment group × pre–post effect: P-value
Mean pCO_2*	3.31	NS	2.72	NS	0.67	NS
Mean respiratory rate	8.16	0.008	2.02	NS	2.76	NS

*pCO_2 = end tidal carbon dioxide pressure.

BRCR, with its emphasis on breathing retraining and cognitive relabeling of bodily sensations, was expected to be effective mainly in reducing panic frequency and fear of bodily sensations, and to have limited effect on agoraphobic avoidance. EXP was expected to be mainly effective in reducing agoraphobic anxiety and avoidance behavior and to have a lesser impact on panic frequency and fear of bodily sensations. Both these hypotheses are not supported by the findings. On most variables all three treatments were equally effective, with the exception of phobic avoidance (measured by the FSS Agoraphobia subscale and the phobic avoidance scale), where BRCR was less effective than both EXP and BRCR + EXP. However, when controlling for multiple tests, this difference became statistically nonsignificant.

We also hypothesized that BRCR + EXP would be more effective than EXP alone in reducing avoidance behavior, because the addition of BRCR would provide patients with a means of coping with panic and would thus facilitate exposure. The data did not support this hypothesis, but this finding is in line with findings of Bonn *et al.* (1984). They found that patients treated with breathing retraining followed by exposure did not differ from patients treated with exposure alone at posttreatment. However, at 6 month follow-up the first patient group showed continued improvement, whereas the patients treated with exposure alone were worse than at posttest. A follow-up assessment of our patients at 18 months after termination should determine whether our breathing-retraining-plus-exposure patients also show improved functioning compared to those who received exposure alone.

Contrary to findings from earlier studies that used breathing retraining as a treatment for panic (Clark *et al.*, 1984; Rapee, 1985; Salkovskis *et al.*, 1986), we did not find a significant decrease in panic attack frequency as a result of the BRCR treatment. These earlier studies reported decreases in panic attack frequency from 10 to 4 per week (Salkovskis *et al.*, 1986) and even from 22 to 2 per 3 weeks in a single case study (Rapee, 1985). This discrepancy is all the more striking since the treatments in the Clark and Salkovskis studies consisted of only 2 or 4 treatment sessions, which contrasts with the 8 sessions in our BRCR treatment. Furthermore, treatment procedures used in the three studies are highly similar, as we based our treatment largely on Clark and Salkovskis' (1986) treatment manual. Aside from the absence of an effect on panic frequency, we were also unable to replicate the significant increase in resting alveolar pCO_2 reported by Salkovskis and colleagues (1986).

In search of a reason for the difference in findings between the earlier British studies and the current data set, we carefully examined sample characteristics of the studies. In the British studies, all patients in the sample were suffering from panic attacks which they considered their main problem. Although these investigators did not use DSM-III criteria, it may be assumed that these patients possessed symptomatology very similar to the patients in the current sample. A number of the British patients also suffered from phobic avoidance behavior, although this proportion is less than in the current sample. Mean duration of disorder was between 5.1 and 6.6 yr in all three studies, pointing to chronic populations across studies. Referral sources of the patients were also high comparable across the three studies (psychiatric outpatient departments and general practitioners). Frequency of use of medication was higher in the British samples (7 out of 9 patients and 15 out of 19 patients vs 19 out of 40 in the current sample). Whether this reflects differences in the practice of subscription of medication between the two countries or points to more severe symptomatology in the British patients is unclear.

In conclusion, the patient populations of the three studies are rather similar. The only difference of relevance is in the degree to which the panic patients also suffered from agoraphobia. All patients in the Dutch sample were agoraphobic, whereas only a portion of the patients in the British samples were. Recent studies have shown that there are important differences between panic patients who suffer from agoraphobia and those who do not. Patients with panic plus agoraphobia report more childhood anxiety and depressive disorders (Aronson and Logue, 1987), higher interpersonal sensitivity (Aronson and Logue, 1987; Pollard and Cox, 1988; de Ruiter and Garssen, 1989; Thyer, Himle, Curtis, Cameron and Nesse, 1985), higher fear of bodily sensations (de Ruiter and Garssen, 1989), more alcohol use (Thyer *et al.*, 1985) and less frequent remissions of panic symptoms (Thyer *et al.*, 1985) than panic patients without agoraphobia. Whether panic with agoraphobia is an altogether different disorder or merely a more severe type of panic disorder is not yet clear. However, it is possible, that panic patients without concomitant agoraphobia are more responsive

to short term breathing retraining treatment than panic patients with agoraphobia. However, this latter hypothesis is not supported by findings from the Clark and Salkovskis studies, since both found that panic attack frequency declined to a similar degree in 'nonsituational' (=nonagoraphobic) and 'situational' (=agoraphobic) panickers (Clark *et al.*, 1985; Salkovskis *et al.*, 1986). Another variable that might account for the differential efficacy of BRCR between the British studies and the current study is a difference in therapists.

Thus, the cause of the limited effectiveness of the BRCR treatment in the current study remains elusive. The lack of a significant effect on panic frequency is worth mentioning in relation to an earlier study (de Ruiter *et al.*, 1989). In this study, 83% of a sample of 84 patients with panic disorder with agoraphobia considered symptoms of voluntary hyperventilation similar to their usual panic attacks. From this it could be concluded that hyperventilation seems an important, possibly even causal, mechanism in the panic attacks of agoraphobic patients. However, the present study found breathing retraining plus cognitive restructuring ineffective in reducing panic. This leads us to conclude a less important role for hyperventilation in panic. Hyperventilation is perhaps best considered an epiphenomenon of panic, comparable to other signs of hyperarousal, such as heart rate accelerations and skin conductance fluctuations.

The magnitude of treatment effects observed in the present study is rather meager in comparison to those found in previous studies (Clark *et al.*, 1985; Marchione, Michelson, Greenwald and Dancu, 1987; Salkovskis *et al.*, 1986). Although the treatments led to improvement on all but two (panic frequency and mean resting alveolar pCO_2) variables, the clinical relevance of improvement was limited.

In conclusion, we found no proof of a differential efficacy of BRCR on panic frequency and fear of bodily sensations and for BRCR + EXP on avoidance behavior. All treatments seem to affect several aspects of the symptomatology of agoraphobic patients. At discharge, BRCR + EXP was no more effective than EXP alone, but it remains to be seen how this will be at follow-up.

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