Recent research on panic disorder: Review of Marburg studies

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Its severity, chronic course, and high prevalence make panic disorder a major health care problem. The authors review a series of studies on the etiology, diagnosis and psychological treatment of panic disorder. The example of the role of hyperventilation demonstrates that purely physiological explanations of panic attacks are not sufficient and that patient responses are strongly influenced by cognitive variables such as anxiety expectancy. Furthermore, it was demonstrated that anxiety can be induced in these patients by purely cognitive manipulations. Questionnaire and interview studies showed that panic patients are afraid of bodily sensations and tend to associate them with threat to their physical or mental health. Other patient characteristics probably involved in the development and maintenance of panic disorder include enhanced cardiorespiratory accuracy, selective attention towards physical threat, and early learning experiences due to observing illness behavior related to anxiety symptoms or chronic disorders. Besides the progress in basic research, advances have been made in the diagnosis of panic disorder, and the efficacy of cognitive treatment was demonstrated. Even though alternative explanations exist for single findings, our results consistently support psychological models of panic disorder and justify the use of psychological interventions which aim at a reappraisal of bodily symptoms in its treatment.

Over the course of the past decade, panic attacks have become the most widely investigated phenomenon in research on anxiety disorders. This may in part be due to alarming epidemiological data. Large scale community studies show that even when conservative diagnostic criteria are used, about 10% of the general adult population experience at least occasional panic attacks (Angst & Dobler-Mikola, 1985; Lee et al., 1985; Myers et al., 1984; Robins et al., 1984; Yeh, Hwu, Chang, & Yeh, 1986; Wittchen, 1988). In

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that panic attacks are entirely due to hyperventilation and, accordingly, prefer the diagnostic label "hyperventilation syndrome" over "panic disorder" (see Bass, Kartsounis & Lelliott, 1987; Ley, 1985, 1987; Lum, 1981; Magarian, 1982). There are a number of unresolved questions about the relationship of panic disorder and hyperventilation. Several studies showing that voluntary hyperventilation induces panic symptoms and that panic patients tend to hyperventilate are consistent with a causal role of hyperventilation in panic attacks (see Bass et al., 1987). On the other hand, not all panic patients respond by anxiety to hyperventilation and not all panic attacks are accompanied by hyperventilation. This pattern of results shows that hyperventilation cannot be the only explanation for panic attacks. However, it could play a significant role among other factors.

So far we have only discussed acute hyperventilation. Some authors, however, regard chronic hyperventilation as crucial for panic disorder. For example, Ley (1985, 1987) assumed that mild chronic hyperventilation leads to changes in the blood chemistry of panic disorder patients (i.e., reduced partial pressure of carbon dioxide, pCO₂, and elevation of pH). According to Ley, habituation prevents the perception of the corresponding minor symptoms but even small emotional or physical stressors suffice in pushing the pCO₂ and pH over a threshold beyond which symptoms of acute hyperventilation are experienced. The hypothesis of chronic hyperventilation is supported by Gorman et al. (1988) who found an elevated respiratory minute volume in panic patients. Similarly, Bonn et al. (1984) reported an increased respiration rate in agoraphobic patients with panic attacks. However, in both studies, subjects were investigated before undergoing a panic induction - procedure inhalation of CO₂ in the case of Gorman et al. (1988) and voluntary hyperventilation in the case of Bonn et al. (1984). Since subjects were aware of the procedure, it is possible that the group differences do not represent trait differences, but reflect a transient anticipatory response to the test. Panic patients may show a larger anticipatory response to panic induction procedures than controls. Furthermore, it is unclear whether the results are specific to panic disorder since comparisons with other patient populations are lacking.

In this paper, we will review recent research on the interplay of anxiety and physical symptoms in panic disorder patients with a special emphasis on recent studies completed at the University of Marburg that have not yet been published in English. Specifically, we will address the following points:

- Etiology of panic attacks: Studies on the role of hyperventilation and cognitive variables in inducing anxiety in panic patients, on the role of bodily sensations as triggers for "spontaneous" panic attacks, and on the learning history of panic patients regarding anxiety symptoms.

- Diagnosis of panic disorder: Advances in the assessment of panic attacks by structured interviews, and research on the differential diagnosis between myocardial infarction, "cardiac neurosis", and panic disorder.

- Treatment of panic disorder: Cognitive therapy of "spontaneous" panic attacks.

Etiology of panic attacks

Hyperventilation and cognitive variables

In spite of the many studies on the relationship between panic attacks and hyperventilation, it is still an open question whether hyperventilation induces anxiety automatically by some physiologic mechanism, or whether cognitive variables such as perception and appraisal of the symptoms induced by hyperventilation play a major role. In addition, possible cognitive confounds such as expectancy and demand characteristics (Orne, 1962) need to be controlled. In a recent study of the anxiogenic effects of prolonged CO₂-inhalation, we found that expectancy was an important mediating variable in panic disorder patients (Margraf, 1989). In this study, panic patients (N = 52) became anxious already when anticipating the CO₂-inhalation. The anticipatory anxiety was reflected in increases in self-report measures as well as in physiological measures of anxiety. In contrast, normal control subjects (N = 26) did not show an anxiety response while waiting for the CO₂-inhalation. The fact that patients show a specific anticipatory response is important in evaluating the findings of previous studies on hyperventilation. It can be assumed that all of these studies induced very negative expectations in patients because informed consent forms for legal reasons described the possible consequences of hyperventilation in a dramatic form.

We studied the effects of hyperventilation in a series of three studies while attempting not to induce any specific expectation of panic (Margraf, 1989; Margraf, Ehlers, Herber, Meisner, & Wrobel, 1991). In this "neutral expectancy" condition, panic patients and nonclinical subjects with panic attacks showed stronger responses to hyperventilation (60 cycles/min for 2 min) than controls on self-report measures of discomfort, but not on physiological measures. However, subjects reported little similarity between the effects of voluntary hyperventilation and naturally occurring panic attacks. Since subjects with social fears showed responses similar to those of subjects with panic attacks, the specificity of the findings for panic disorder is questionable. The results indicate that in the absence of high anxiety expectancy, hyperventilation is not sufficient for the induction of panic or strong physiological responses in panic disorder patients.

In two further studies, conducted in collaboration with Dr. Walton T. Roth, Stanford University School of Medicine, the subjects' anxiety expect-
tancy was manipulated directly by giving different instructions (Margraf, 1989). In the first study, 48 panic patients and 48 controls participated in a hyperventilation test (30 cycles/min for 6 min). Half of the subjects received the instruction that the test was a "biological panic attack test" which was likely to induce panic attacks in vulnerable individuals (high anxiety expectancy). The other subjects were informed that the test was a "fast paced breathing" task which might temporarily induce some harmless symptoms (low anxiety expectancy). The results showed that panic patients were more affected by anxiety expectation. In the "biological panic attack test" condition, panic patients showed larger increases in self-report measures of anxiety and physiological arousal (heart rate, blood pressure, electrodermal activity), and more often terminated the hyperventilation early in contrast to controls in both conditions and patients in the "fast paced breathing" condition. More interesting than the patients' larger response in the high anxiety expectancy condition, however, is the finding that patients showed responses similar to those of controls in the low anxiety expectancy condition. A simple cognitive experimental manipulation reduced the patients' responses to the level shown by control subjects. All groups were exposed to the same physiological stressor because analyses of respiratory parameters showed identical increases in respiration rate and volume. Therefore, the differential physiological (and subjective) response could have been due to different degrees of hyperventilation, but must have been mediated by the subjects' cognitions. It is important to note that controls were not "vulnerable" to the expectancy effects in this study. This could explain why in some studies using high anxiety expectancy instructions, reactivity differences between panic patients and controls to hyperventilation, CO₂-inhalations, sodium lactate infusions, or similar provocations were found.

A possible criticism of the above study is that expectancy effects were only shown for mild hyperventilation and less severely disturbed patients because the majority of patients had a diagnosis of panic disorder without agoraphobia. We therefore investigated the effects of differential instructions on the responses of patients with severe agoraphobia to pronounced hyperventilation (Margraf, 1989). For three minutes, patients had to hyperventilate at 60 cycles/min which is about the maximum frequency that can be maintained for more than a few breaths. Patients were 34 severely disabled agoraphobics with panic attacks who had all failed to complete a test walk through a shopping mall. Patients had to breathe through a modified spirometer ensuring a respiratory minute volume of 46 liters/min. The results of this second experiment replicate the importance of expectancy effects. Expectancy ratings confirmed that patients anticipated higher anxiety in the "biological panic attack test" condition than in the "fast paced breathing" condition. As in the first experiment, patients in the high anxiety expectancy condition showed stronger self-reported and physiological responses to the hyperventilation task. They also rated the effects of hyperventilation as being more similar to their naturally occurring panic attacks. Thus, the experiment replicated expectancy effects using extreme hyperventilation in severely disabled agoraphobics. Our results are in line with those of Sanderson, Rapee, and Barlow (1989) who, using CO₂-inhalation as challenge, found that the illusion of control attenuates the patients' anxiety responses.

In addition to the effects of acute hyperventilation, we also addressed the problem of chronic hyperventilation. Margraf (1989) studied 60 inpatients of a psychosomatic hospital who were diagnosed as having either panic disorder, depression, or bronchial asthma. Articular blood gases were measured during the first week after admission. In contrast to previous studies, patients did not anticipate any stress tests when the blood samples were taken. Other possible confounds such as room temperature, air pressure, time of day, age, and sex were controlled. The results showed no differences between the groups for partial pressures of oxygen and carbon dioxide, pH and base excess. The means of all groups were in the normal range. Thus, in the absence of anticipatory anxiety, there is no support for the hypothesis of chronic hyperventilation in panic disorder.

Bodily sensations as triggers for "spontaneous" attacks?

A hypothesis common to all recent psychological models of panic disorders is that the perception of bodily changes triggers anxiety in patients with panic disorder. Studies with structured interviews and standardized questionnaires provide indirect evidence for this assumption. Panic patients consistently reported more fear of physical symptoms that typically occur during panic, and indicated more thoughts about catastrophic consequences of these symptoms than clinical and nonclinical controls (for example, Chambless & Gracely, 1989; Reiss, Peterson, Gursky, & McNally, 1986). Panic patients rated panic symptoms, but not control symptoms, as more dangerous than patients with other anxiety disorders or controls without mental disorders (Ehlers, in press b). Hibbert (1984) and Zucker et al. (1989) conducted detailed structured interviews with panic patients about their recent panic attacks. Of special interest was the temporal sequence of the different symptoms that patients reported. Both studies found that the first signs of impending panic attacks were bodily changes such as an accelerated heart rate or slight dizziness. Consistent with the above hypothesis, such sensations preceded the anxiety. Furthermore, patients reported experiencing thoughts or images about disastrous consequences of these symptoms such as fainting, dying, or going crazy during the attacks.

Experimental evidence for the role of the perception of bodily changes in inducing anxiety in panic patients was presented by Ehlers, Margraf, Roth, Taylor, and Birbaumer (1988). Using false heart rate feedback, subjects were led to believe that their heart rate had significantly accelerated. Twenty-five panic patients and 25 normal controls were first given true acoustic feedback of their heart rate, i.e., they heard a tone with every heart beat. After five minutes of true feedback, the experimenter switched to false feedback.
without the subjects’ knowledge. The false feedback signal was controlled by a frequency generator. The experimenter increased the feedback frequency by 50 tones/min so that subjects had to assume that their heart rate had significantly accelerated. The great majority of subjects did not doubt the validity of the feedback. Panic patients, but not controls, who believed that the feedback reflected their heart rate, showed increases in their anxiety, heart rate, skin conductance level, and blood pressure. Thus, only the patient group responded in the direction of a positive feedback between perceived physiological arousal and anxiety. One patient even experienced a panic attack in response to the experimental manipulation (Margraf, Ehlers, & Roth, 1987).

The results were replicated by Clark et al. (1988) who demonstrated that a purely cognitive manipulation can suffice in inducing anxiety in panic patients. Similarly, Clark et al. (1988) found that untreated panic patients, but neither controls nor treated patients, panicked when they had to read pairs of words representing a body sensation (e.g., breathlessness) with a disastrous consequence (e.g., suffocation).

Ehlers, Margraf, and Roth (1988c) suggested that factors influencing interoception such as interindividual differences in interoceptive sensitivity and an internal attentional bias, could increase the probability that panic patients perceive body sensations and respond to them with anxiety. The research of Ehlers (1989a, 1989b, in press a) supports this assumption. In two studies, Ehlers & Breuer (in press) found that panic patients demonstrate a relatively good heart rate perception on a test developed by Schandry (1981). Subjects were instructed to count their heart beats silently during signalled intervals and to report the result to the experimenter at the end of the trial. The real number of heart beats occurring during the interval was determined from the subjects’ ECG. Patients with panic disorder (N = 65 in study 1, N = 13 in study 2) showed better heart rate perception as measured by a smaller error in heart beat counting than patients with specific phobias (N = 27, study 1), subjects with infrequent panic attacks (N = 50, study 1), controls without mental disorders (N = 46, study 1), or patients with depression (N = 16, study 2). Group differences in cardiac perception could not be explained by the subjects’ ability to estimate the length of time intervals. Patients with generalized anxiety disorder (N = 15, study 2) who have similarities with panic patients in that they also complain about many somatic symptoms and used to be diagnosed as having “anxiety states” or “anxiety neurosis”, did not differ from panic patients (N = 13) in their performance.

The significance of the group differences in the studies of Ehlers and Breuer is supported by results from a prospective longitudinal study with the subjects of study 1. In panic disorder patients who were in remission at the time of the test, good cardiac perception (low error score) predicted the reoccurrence of panic attacks during a one-year follow-up period (Ehlers, 1989a). An increased cardiac awareness may increase the probability that panic patients notice benign changes in the function of their heart and respond to them with anxiety or avoidance behavior. In the study of Ehlers & Breuer (in press), panic patients with agoraphobic avoidance showed a better performance on the heart rate perception test than patients with little avoidance behavior. However, the implications of the group differences found by Ehlers and Breuer may be limited by the fact that other measures of heart beat perception and other studies did not reveal a superior heart beat perception in panic patients (see Ehlers, in press a; Hartl, Nutzinger, & Strian, 1990). One possible explanation for the discrepant findings is that the patients’ increased cardiac awareness may only be demonstrated under conditions of low external stimulation. Paradigms that involved external stimulation such as feedback tones (e.g., Katkin, 1985) or other body postures than sitting (Hartl et al., 1990), did not show group differences. The pattern of results may help in explaining why panic attacks often occur when patients are resting or relaxing, because under this condition cardiac perception is enhanced. It also has to be taken into account that only a subgroup of panic patients demonstrated an increased cardiac awareness in the Ehlers and Breuer studies. It would be interesting to know whether the remaining patients show differences in other aspects of interoception, e.g., the ability to detect changes in respiratory resistance. Furthermore, it is possible that the group differences found with the Schandry paradigm do not reflect differences in the subjects’ general ability to perceive their heart beats, but differences in the habit of attending to bodily cues. Such an internal focus of attention would also enhance the probability of perceiving physiological changes.

That panic patients exhibit such attentional biases was shown by Ehlers, Margraf, Davies, and Roth (1988a) and Ehlers (1989a, 1989b). Patients with panic disorder shifted their attention towards words associated with physical threat (e.g., coronary, cancer; Ehlers et al., 1988a) or to alarming tactile stimuli (Ehlers, 1989a, 1989b) to a larger extent than controls. The studies of Ehlers et al. (1988a) used a modified version of the Stroop color naming task. Subjects were instructed to name the colors of threatening or neutral/positive control words of the same length and frequency as quickly as possible. Compared to controls (N = 24 in study 1, N = 18 in study 2), patients with panic disorder (N = 24, study 1) and nonclinical subjects with panic attacks (N = 18, study 2) took longer to name the colors of threatening words than those of neutral words, i.e., they demonstrated greater interference with threat words. Thus, subjects with panic attacks were less able to ignore the threatening word content. Ehlers (1989a, 1989b) demonstrated attentional biases for physical stimuli in subjects with panic attacks. A reaction time paradigm developed by MacLeod, Mathews, and Tata (1986) was adapted for tactile stimuli. Subjects had to indicate whenever they detected a slight vibration of one of their index fingers (target) by saying “now”. Reaction time was measured with a voice key. The experimental manipulation was to which hand threatening stimuli were given before the target occurred. In all trials, both of the ring fingers were slightly vibrated. Relevant for the data analysis were trials in which an electric shock was given to one of the ring fingers in addition to the vibration. The electric shock was
without the subjects’ knowledge. The false feedback signal was controlled by a frequency generator. The experimenter increased the feedback frequency by 50 tones/min so that subjects had to assume that their heart rate had significantly accelerated. The great majority of subjects did not doubt the validity of the feedback. Panic patients, but not controls, who believed that the feedback reflected their heart rate, showed increases in their anxiety, heart rate, skin conductance level, and blood pressure. Thus, only the patient group responded in the direction of a positive feedback between perceived physiological arousal and anxiety. One patient even experienced a panic attack in response to the experimental manipulation (Margraf, Ehlers, & Roth, 1987).

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individuality adjusted prior to the experiment and had an alarming quality, but was not painful. If subjects show an attentional bias towards the threat cue in this paradigm, they are expected to detect the target faster in trials in which the shock is given to the same hand, than in trials in which the target is given to the opposite hand. Patients with panic disorder (N = 61), infrequent panickers (N=45), and patients with specific phobias (N = 24), but not normal controls (N = 40), showed an attentional bias towards the threatening tactile stimulus. The results are in line with those of McNally, Foa, and Donnell (1989) and McNally, Riemann, and Kim (1990).

**Learning history regarding anxiety symptoms**

Ehlers (1989a) conducted an exploratory study of learning experiences concerning anxiety symptoms in subjects with panic attacks. She used a modified version of a questionnaire developed by Whitehead, Bush, Heller, and Costa (1986) to assess social learning influences on menstrual symptoms and illness behavior. In the panic version of the questionnaire, subjects are asked how often they experienced symptoms such as palpitations, breathlessness, dizziness, or severe nausea during their childhood or adolescence. They are then asked to rate how frequently their parents brought them special food or encouraged them to skip school, doing homework, or household chores. On this scale assessing encouragement of illness behavior when having anxiety symptoms patients with panic disorder (N = 121), infrequent panickers (N=86), and patients with other anxiety disorders (N = 38) reached higher scores than normal controls (N = 61). In contrast, no differences were found on a similar scale assessing encouragement of sick role behavior when having colds. Another scale assessed whether the subjects' parents had shown illness behavior when having anxiety symptoms during the subjects' childhood or adolescence. On this scale, only subjects with panic attacks differed significantly from normal controls. Similarly, patients with panic disorder and infrequent panickers, but not patients with other anxiety disorders, stated that they had lived together with a larger number of relatives who suffered from chronic diseases lasting more than 6 months.

Because of the retrospective nature of the data, the results remain preliminary and need to be substantiated by further research, preferably prospective studies. However, the findings point to a possible specificity in that subjects with panic attacks, but not patients with other anxiety disorders, seem to have more frequently observed illness behavior related to anxiety symptoms or chronic disorders in their homes than controls. These experiences may contribute to the panickers' evaluation that body sensations are harmful. Interestingly, subjects with infrequent panic attacks did not differ in their learning history from patients with panic disorder. This might point to a common vulnerability.

**Diagnosis of panic disorder**

*Structured interviews in the assessment of panic attacks*

Patients with panic disorder used to receive a large variety of different diagnoses such as neurasthenia, anxiety neurosis, agoraphobia, nervous heart syndrome, “Du Costa’s syndrome”, or “effort syndrome”. Which diagnosis a patient received depended on the specialist they consulted and on whether anxiety, avoidance behavior, or somatic symptoms constituted their primary complaint. The definition of diagnostic criteria in DSM-III and the development of structured interviews have considerably improved diagnostic reliability. Margraf, Schneider & Ehlers (1991) constructed the *Diagnostisches Interview bei psychischen Störungen (DIPS)*, which is a modified and extended German version of the *Anxiety Disorders Interview Schedule - Revised* (ADIS-R; DiNardo & Barlow, 1988). The DIPS assesses in a simple and systematic manner the mental disorders most relevant for psychotherapeutic work. Contrary to other structured interviews it is directly therapy oriented by collecting data relevant to treatment planning. The reliability and validity of the DIPS was tested in an unselected clinical sample of 201 patients with various mental and psychosomatic disorders. The test-retest-reliability for the diagnosis of panic disorder was 86% (kappa = .76) when patients were interviewed by two psychologists using a test-retest interval of one week (Schneider, Margraf, Spörkel, & Franzen, in press). In 86% of the cases, the interviewers agreed on whether panic disorder was the patients’ primary disorder. After good reliability had been established, validity was tested in a subsample of 172 patients (Margraf, Schneider, & Spörkel, 1991). DIPS-diagnoses were evaluated using a battery of questionnaires as well as body size and weight (for eating disorders). Results in this very heterogeneous population showed good validity for all major categories of disorders (anxiety, affective, somatoform, and eating disorders) as well as the exclusion of mental disorders. Individual disorders with sufficiently high base rates could also be validated. In addition to panic disorder, this was true for agoraphobia, generalized anxiety disorder, and social phobia. These results represent a validation of DSM-III-R and support the usefulness of the DIPS in treatment oriented diagnostics for applications in research and practice.

*Myocardial infarction, “cardiac neurosis”, and panic disorder*

Cardiovascular symptoms are among the most frequent and distressing manifestations of panic attacks, and many panic patients are afraid of having a heart attack. The differentiation between real and false "heart attacks" is a particularly intriguing diagnostic problem. Margraf, DeVries-Wehrbaan, and Sonnenstag (1991) conducted a study in which the “heart attacks” of patients with functional cardiac complaints and of patients with myocardial infar-
tion, were compared using structured interviews for cardiac complaints and mental disorders. A first goal of the study was to determine differences between the symptoms of panic attacks and myocardial infarction. Second, we wanted to investigate the degree to which patients with functional cardiac complaints fulfill the DSM-III-R criteria for panic disorder. Third, we wanted to compare the prevalence of mental disorders in the patients with functional and organic complaints. The sample consisted of 20 inpatients with functional cardiac complaints ("cardiac neurosis" as diagnosed by the clinicians in the psychosomatic hospital where the patients were treated), and 20 inpatients treated in a university hospital after acute myocardial infarctions (mean time since infarction 15 days). All patients were interviewed using the German version of the Structured Clinical Interview for DSM-III-R (SCID, Wittchen et al., 1990) and a special structured interview for cardiac complaints developed by Beu Danger, Van Dis, and Duyvis (1987).

In spite of some methodological limitations due to poor age and sex matching, our results indicated much more dramatic symptoms in the functional group than in the group who had actually experienced myocardial infarction (significant differences: higher number of symptoms, more palpitations, fear of dying, and trembling or shaking, pain deeper and more stinging rather than spastic). Furthermore, their localization of “cardiac” pain resembled the generally accepted picture for myocardial infarction much more than that of the patients with an actual infarction. Functional patients typically described left-sided pain which also included the left arm. Right-sided pain almost exclusively occurred in the myocardial infarction group (9 of 20 patients vs. 2 of 20 in the functional group). One explanation for this finding could be that functional patients were “better informed” than patients with myocardial infarction, and therefore “knew” where the pain had to be. Functional patients showed more help-seeking behavior (20 of 20 vs. 13 of 20 patients immediately sought medical help) and were less able to describe triggers for their attacks than patients with myocardial infarction (10 of 20 vs. 3 of 20 patients indicated no triggers). Functional patients largely met DSM-III-R diagnostic criteria for panic disorder as established by the SCID (11 met full DSM-III-R criteria, 4 met all criteria except the frequency of attacks, and the remaining 5 reported only situational panic attacks) and had a higher prevalence of other psychological disorders (mean of 3.5 DSM-III-R diagnoses vs. 0.05 diagnoses for myocardial patients). None of the myocardial patients had a history of panic attacks or panic disorder. These results argue in favor of the view that “cardiac neurosis” is a subset of panic disorder. Even though not every functional patient met full DSM-III-R criteria for panic disorder, all patients experienced panic attacks. Our results are consistent with those of Buller et al. (1987) who recently compared 31 patients with panic disorder and 31 patients with “cardiac neurosis”. They concluded that the latter was a subtype of the former. Another argument for this view is our finding that patients with functional cardiac complaints who did not meet all DSM-criteria for panic disorder were not different from those who did.

Cognitive treatment of panic disorder

The results presented in the section on the etiology of panic disorder above have direct implications for the treatment of panic disorder. Modern psychological treatments for panic disorder typically involve a combination of several components (see Margraf & Schneider, 1990, for a detailed treatment manual). While such compound treatments are typically very successful, it is still uncertain which components contribute to outcome. Two major candidates for “active ingredients” are reattribution of anxiety symptoms and habituation due to exposure. Our results presented in the previous sections suggest that cognitive factors are of crucial importance for the development or maintenance of panic attacks. If this is the case, one would assume that a cognitive therapy should be effective if it is designed to correct the patients’ tendency to associate internal cues with immediate threat.

To investigate the contribution of reattribution and exposure to treatment success, Margraf and Schneider (1991) compared pure cognitive therapy (no exposure to external or internal anxiety-inducing cues) with pure exposure treatment (no reattribution of anxiety symptoms) and combined cognitive/exposure treatment. All treatments focussed directly on panic attacks or the stimuli and cognitions associated with them. In addition, process measures were monitored and their relationship to therapeutic outcome studied. These measures were either non-specific (therapist-patient relationship, therapist competence and directivity, treatment credibility, patient expectancy) or specific with respect to panic disorder (self-exposure, specific cognitions).

All 80 Patients met DSM-III-R criteria for panic disorder and were not taking any psychotropic medication. As the study was not completed at the time this review was written, only preliminary analyses can be reported. Results so far show a very low drop-out rate as well as excellent outcomes on all measures including panic and exposure diaries, clinical ratings by patients and therapists, clinical questionnaires, ambulatory psychophysiological monitoring, and response to CO2 panic induction. The fact that no improvement was observed during a 4-week pre-treatment baseline as well as the lack of significant changes in the waiting list condition support the interpretation that improvements were true treatment effects. Treatment successes were stable during follow-up when 77% to 93% of all patients in the three treatment conditions were completely panic-free (7% in the waiting list condition). Process measures revealed a strong relationship between treatment success and panic-specific cognitive changes, whereas the amount of self-exposure apparently had no influence on outcome. The non-specific process measures showed significant positive relationships between success and therapeutic.
relationship, treatment credibility and therapist competence and directivity. Interestingly, there were only very few significant differences between the three active treatment conditions. This makes the interpretation of the process measures even more important.

The improvement obtained in this study concerned all symptom domains assessed as well as general measures of well-being and functioning. Thus, improvement was not limited to anxiety symptoms. Treatment not only led to statistically, but also to clinically significant improvement. After therapy, patients reached normal levels of functioning. The highly significant treatment effects were especially remarkable because 83% of the patients had received multiple previous treatments (in addition to general medical care) without success and had not demonstrated any trend towards improvement during baseline. The results are consistent with recent findings of Salkovskis, Clark, and Hackman (1991). They showed, in contrast to the assumptions of proponents of biological models, that panic disorder can be effectively treated with cognitive therapy without using medication, and extended the earlier findings of Clark, Salkovskis, and Chalkley (1985), Salkovskis, Jones, and Clark (1986), and Barlow, Craske, Cerny, and Klosko (1989). In addition, it might possibly be argued that our preliminary results support the role of reattribution more than that of habituation. A more definite conclusion, however, will have to await final completion of the study.

Summary and conclusions

Due to its severity, chronic course, and high prevalence, panic disorder represents a major health care problem. The etiology of the disorder remains unclear. While some authors assign a causal role to the patients' tendency to associate bodily sensations with threat and regard the patients' physiological anxiety responses and corresponding sensations such as rapid heart rate or breathing as a consequence of this psychological response, others hold that panic attacks are due to physiological dysfunctions such as hyperventilation and regard anxiety as secondary to the physical symptoms induced by hyperventilation. The results reviewed here shed light on the interaction of physiological and psychological processes. Consistent with a crucial role of hyperventilation in the etiology of panic disorder, signs of hyperventilation were observed in panic patients anticipating a panic induction procedure. However, when such anticipatory effects were ruled out and blood tests were taken during a stress-free phase, there was no indication of chronic hyperventilation. Moreover, expectancies created by experimental instructions had a strong effect on the patients' responses to voluntary hyperventilation. These results show that the relationship of hyperventilation and panic attacks cannot be explained by a simple physiological mechanism. They demonstrate the important role of cognitive variables in experimentally induced panic attacks.

By experimental manipulation of cognitions, anxiety responses can be enhanced or attenuated in panic patients. Our research showed that it is even possible to induce anxiety including bodily arousal in panic patients by a purely cognitive manipulation. When patients believed that their heart rate had accelerated they responded with increases in self-reported anxiety and several physiological indicators of arousal.

Thus, physiological changes induced by hyperventilation or other processes enhance the probability of an anxiety response in this patient population, but are neither necessary nor sufficient conditions for panic. Their effect is mediated by the patient's cognitive evaluation of the significance of the sensations. Questionnaire and interview studies indicate that this is also the case for naturally occurring panic attacks. Patients with panic disorder report having fear of physical panic symptoms. During their panic attacks, the patients have thoughts about disastrous consequences of these symptoms.

Our research program identified characteristics of panic disorder patients that may help to explain why these patients notice more bodily symptoms than other people, tend to respond with anxiety when they experience such symptoms, and tend to avoid situations in which such symptoms occur. Panic patients demonstrated an enhanced ability to perceive their heart rate (at least under conditions of low external stimulation), they tended to shift their attention towards physically threatening cues, and they rated bodily symptoms associated with anxiety and panic as more dangerous than controls. We have to bear in mind that the present findings are based on correlational designs, in which no data are available on whether these factors are present before patients develop panic attacks. Thus, cause-consequence relationships cannot be determined. Nevertheless, the characteristics described in this review may be involved in the maintenance of panic disorder. Our preliminary data on the relationship of good heart rate perception and relapse underline this point.

Overall, the results consistently support psychological models of panic disorder, even though alternative explanations exist for single findings. The data reviewed here are consistent with the hypothesis that the perception of bodily changes induces anxiety in panic patients. The results of the basic research and the preliminary data of the efficacy of cognitive interventions justify the use of psychological interventions which aim at a reappraisal of bodily symptoms as harmless in the treatment of panic disorder.

References


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