PAIN PERCEPTION IN PSYCHIATRIC DISORDERS: A REVIEW OF THE LITERATURE

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Summary—Aberrations of pain experience occur frequently in psychiatric disorders and hence pathological alterations in the basic mechanisms underlying pain experience can be expected. Nevertheless, pain perception, as one of the most important basic mechanisms of pain experience, has rarely been assessed experimentally in psychiatric disorders. The authors review the relevant experimental studies on pain perception in patients with anxiety disorders, schizophrenia, depression, eating disorders and personality disorders and suggest lines for future research. Finally, they point out that the experimental study of pain perception is useful not only in understanding aberrant pain experiences in psychiatric disorders but also in elucidating pathophysiological mechanisms because pain perception is controlled by neurochemical and neurohormonal functions known to be affected by psychiatric disease processes.

Introduction

THERE is ample evidence that a change in pain experience occurs in conjunction with certain psychiatric disorders. Thus, for example, the prevalence rate for chronic pain problems is increased in depression and panic disorder (von Knorring et al., 1983; Kuch et al., 1991) and delusional pain complaints can be observed in psychotic disorders such as schizophrenia and delusional depression (Merskey, 1990). One of the basic mechanisms underlying pain experience is pain perception and therefore its investigation seems imperative. Furthermore, the study of pain perception promises to provide new insights into the pathophysiology of psychiatric disorders because the psychiatric disease process can affect neuro-psychobiological systems that are involved in pain signaling and that are regulated by, amongst others, adrenergic, serotoninergic and opioidergic actions. Finally, the description of psychiatric syndromes in terms of neurobiological abnormalities, including abnormalities of pain perception, may be a useful addendum to the traditional classification, which is based solely on psychopathological features. Nevertheless, during the past 15 years systematic studies on pain perception in psychiatric disorders have been almost nonexistent. Recently, however, there has been a renewed interest in pain perception in psychiatric patients, stimulated by empirical advancements in the neuropsychobiology of pain and by improved technology for measuring pain perception.

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In this article we review the systematic studies that have been conducted on pain perception in psychiatric disorders, most of which have involved patients with schizophrenia, depression, anxiety, and eating and personality disorders.

Anxiety

The influence of even non-pathological levels of anxiety on pain perception is an elusive topic. Whereas pain-relevant anxiety, e.g. the anticipation of pain, appears to increase pain perception, pain-irrelevant anxiety, e.g. fear of failure, seems to have no effect on it (Al Absi & Rokke, 1991; Weisenberg et al., 1984). The findings of Arntz and colleagues (Arntz & De Jong, 1993; Arntz et al., 1991) suggest that the main effect of anxiety is that it either attracts one's attention to pain or distracts one from it. From this perspective the effect of anxiety on pain perception depends more on the resulting direction of attention than on anxiety per se.

The foregoing refers mainly to situations in which anxiety is the predominant emotional state. However, an anxiety reaction may be embedded in a general stress reaction, with the consequence that a stress analgesia develops despite the presence of anxiety (Willer & Ernst, 1986). An interesting finding with clinical relevance was reported by Pitman and co-workers (1990), who investigated eight patients with post-traumatic stress disorder resulting from military combats. While watching a combat video, these patients developed both enhanced fear and stress analgesia. Since the analgesia could be reversed by the opiate antagonist naloxone, an opioidergic causation can be assumed.

Considering these observations on the effects of non-pathological anxiety on pain perception, it is not surprising that the few studies on patients with anxiety disorders have yielded contradictory results. As early as 1944, Chapman observed that during heat pain stimulation patients with anxiety neurosis winced and withdrew earlier than patients with other psychiatric disorders. In a more systematic study, Hall and Stride (1954) investigated 39 patients with anxiety disorder and the same number of depressive patients, using a similar method. Up to about age 50, the patients with anxiety disorder had lower pain thresholds, or in other words were more sensitive to pain, whereas beyond that age the two groups did not differ in this respect. In contrast, at no age was there any difference in warmth perception.

Merskey (1965), using a pressure algometer, assessed pain and tolerance thresholds in 45 patients with anxiety disorder, 115 patients with other psychiatric disorders (depression, hysteria or hypochondriasis) and 35 healthy subjects. The thresholds of the anxiety patients appeared to be lower than those of the control subjects but about the same as those of the other psychiatric patients. However, as soon as the gender of the patients and the presence of clinical pain were also taken into consideration, the findings were less clear. The short-comings of these early studies were the lack of explicitly defined diagnostic criteria and of a detailed clinical description of the patients. Hence, relatively little is known about the types of anxiety disorders under investigation in these studies.

To our knowledge, there are only two contemporary studies on pain perception in anxiety disorders. (Although some investigations have been done on persons with increased levels of anxiety [Arntz & De Jong, 1993; Arntz et al., 1991; Klepac et al., 1980; Malow et al.,

1987, 1989], the anxiety was not diagnosed clinically but only assessed by self-assessment scales and would probably not have been strong enough for a diagnosis of anxiety disorder.) Roy-Byrne et al. (1985), using electrical stimulation, studied a mixed group of 18 anxiety patients with panic disorder and agoraphobia (according to RDC criteria). They did not find any differences between the patients and the healthy controls on several pain parameters. Nor were there significant correlations between the pain parameters and the present level of anxiety or the number of anxiety attacks in the recent past. Similarly, Kopp and Gruzelier (1989) did not observe any differences in electrical pain threshold between a mixed group of 32 anxiety patients (panic disorder, agoraphobia and generalized anxiety disorder according to the DSM-III criteria) and healthy controls. Only those patients classified as "electrodermally labile," i.e. with a low electrodermal habituation rate and an increased number of nonspecific electrodermal responses, exhibited lower pain thresholds.

It is unclear why the early and more recent studies had different outcomes, showing either increased pain sensitivity or no change in anxiety patients. Therefore, some suggestions for future research ought to be made. Disorders with more or less continuous anxiety such as generalized anxiety or post-traumatic stress disorder have to be separated from those with intermittent anxiety, for example panic disorder. In the latter case, pain perception should be studied before, during and after the attack as well as in the symptom free interval. Furthermore, the source of anxiety, if present (e.g. malignant illness), has to be considered with respect to its relationship to pain. Finally, other affective states besides anxiety have to be included in the analysis because concurrent depression or stress reactions, for example, may have opposing influences on pain perception. If these points are taken into account, it should be possible to obtain a more complete and valid picture of the effect of clinically relevant anxiety on pain perception and of the neuropsychobiological links in this relationship.

Schizophrenia

There have been a number of impressive reports on changes in pain responsiveness in schizophrenia. For example, schizophrenic patients with severe burns or acute abdomen due to gastrointestinal perforations were reported to show only minor indications of pain. Furthermore, schizophrenic patients were found to have an increased incidence of silent myocardial infarction (Bickerstaff et al., 1988; Chaturvedi, 1989; Jakubaschk & Böker, 1991; Rosenthal et al., 1990). These observations suggest that the processing of acute pain is disturbed in schizophrenic patients. Moreover, in populations of chronic pain patients the diagnosis of schizophrenia is less frequent than expected (Fishbain et al., 1986; Magni & Merskey, 1987; Merskey et al., 1987).

But the conclusion that schizophrenia represents "a psychiatric form of analgesia" is hampered by conflicting results in other studies. For example, Delaplaine and co-workers (1978) investigated the frequency of pain complaints amongst psychiatric patients and as expected the patients with anxiety disorders, depression, personality disorders and alcoholism ranked highest. But 38% of the schizophrenic patients complaining of pain is more than one would suppose if schizophrenia is in fact an "analgesic" disorder. Recently Torrey (1989) pointed out that headache may be an early symptom of schizophrenia.

It is certainly often difficult to interpret pain complaints in schizophrenic patients especially in connection with other physical complaints. But even if the pain has clearly delusionary characteristics, which is true in only a small number of patients (Merskey, 1990), it would be inappropriate to disregard the complaints as not indicating real pain. It should be noted that recent definitions of pain do not require noxious events but only a subjective state of pain, which may but is not necessarily caused by noxious events (International Association for the Study of Pain, 1986). Hence, it is safer to state that pain experience in schizophrenia is disturbed or distorted than absent. Considering the conflicting evidence, it is surprising that only a few and mainly early experimental studies have addressed the issue of pain perception in schizophrenia.

Hall and Stride (1954) found considerable intra- and interindividual variations in the pain responses of 14 schizophrenic patients. However, for the group as a whole the pain and tolerance thresholds were above normal. The authors related this finding to a general indifference to external stimuli and an inappropriate mental set for this kind of test. Thus neither interpretation involves arguments specific to pain perception. Findings by Collins and Stone (1966) also favored the idea of a rather generalized perceptual disturbance because they did not observe changes in the electrocutaneous pain and tolerance thresholds but did see increases in detection thresholds in 18 patients with chronic schizophrenia. Hence, "schizophrenic analgesia" is clearly not an inevitable finding under controlled experimental conditions.

Some observations of Merskey et al. (1962) should be mentioned here. These authors found that the pinprick responses of 80 chronic schizophrenics covaried with age. However, this covariation seemed to be due to differences in medication in the different age groups, with the less sensitive patients receiving more phenothiazines. Neuroleptics may play an intricate role in this context because they may act as analgesics in short-term use and may cause pain complaints in connection with extrapyramidal symptoms after long-term use (Decina et al., 1992). Moreover, clinical reports on hypalgesic responses in schizophrenic patients date back to a time when neuroleptics were not available. Merskey et al. also found that patients with paranoia or paraphrenia tended to be less sensitive than those with hebephrenia and that hyper- and hypoactive patients tended to be more sensitive than those with a normal level of activity. This result contradicts early assumptions (e.g. Bleuler, 1911) that catatonia is the predominant cause of hypalgesia in schizophrenia. The relevance of Sappington's study (1973), which suggests that chronic schizophrenics are less pain sensitive than acute patients, is unclear because the report lacks necessary information about psychopathology and experimental method.

The most advanced approaches in the assessment of pain perception in schizophrenia are those used by Davis and colleagues (Davis & Buchsbaum, 1981; Davis et al., 1980, 1982). In one of their studies they compared 17 patients with either schizophrenia or schizoaffective illness (RDC criteria) and healthy controls. The patients were poorer at discriminating between noxious and non-noxious electrical stimuli; however, their pain thresholds did not differ from those of the control subjects. The somatosensory evoked potentials of the patients were characterized by reduced amplitudes for some components of the potentials (e.g. N120). However, these differences compared to the amplitudes of the controls were already present at non-noxious stimulus intensities. Hence, the findings

can be interpreted as a decrease in somatosensory discrimination ability rather than as a diminished intensity of pain sensation. In a group of five patients naltrexone, a long-acting opiate antagonist, was administered for several days. The results were somewhat ambiguous but seemed to show a trend to normalization. In 26 schizophrenic patients CSF opiate binding was assessed. Surprisingly, a high-binding subgroup had lower pain thresholds than a low-binding subgroup. Davis and colleagues hypothesized a disturbance of the normal relationship between central opioids and pain perception in schizophrenia.

To summarize, in contrast to the expectations evoked by some impressive clinical reports, hypalgesic changes in schizophrenia have not been verified unequivocally under experimental conditions. Furthermore, most of the findings can also be explained by rather general disturbances in somatosensation or perception. Consequently, the causes of the perceptual deficits tended to remain obscure. Studies are needed on medication-free patients whose schizophrenia is described sufficiently with respect to type, severity and stage. Suitable methods for assessment of pain perception, e.g. laser stimulation techniques (Bromm & Treede, 1991), are now available, which allow simultaneous measurement of subjective and objective pain responses. Valid objective measures, such as pain-evoked brain potentials, are particularly important in psychotic patients. After a descriptive phase of research, in which these methodological improvements are used, it will be possible to address the issue of neuropsychobiological causes of altered pain perception on a more solid basis than is currently the case.

Depression

Depression and chronic pain appear to be closely related. On the one hand, depression constitutes a state of increased vulnerability to pain problems and changes the way one deals with such problems (Haythornthwaite et al., 1991; von Knorring et al., 1983). On the other, chronic pain is frequently accompanied by depressive symptoms and sometimes leads to a full-blown depressive disorder (Brown, 1990; Dworkin & Gitlin, 1991). Hence, one would expect increased pain sensitivity to be associated with depression. As will be shown, however, just the opposite has been observed in several studies.

Hall and Stride (1954) were among the first to report an increased heat pain threshold in depressive patients. This phenomenon was especially prominent in patients classified as endogenously depressed. The authors discussed two causes: first, depression might represent a general state of perceptual unresponsiveness, with diminished pain perception being only one example. Second, depression might produce an affective indifference to aversive stimulation not based on a truly sensory deficit.

In support of the second explanation, Ben-Tovim and Schwartz (1981) observed that in a group of 10 depressive patients only the two with the symptom "emotional indifference" had increased electrical pain thresholds. Von Knorring and Espvall (1974) found no difference between 21 depressive patients and 12 healthy controls in the electrical detection threshold but a significant difference in the electrical pain threshold, suggesting that the state of depression specifically affects pain perception. Interestingly, however, pain tolerance was not altered, which is incompatible with an "emotional indifference" hypothesis.

Von Knorring and Espvall (1974) assumed that the degree of retardation or inhibition is

important and presented some tentative data supporting this assumption. This idea found
additional support in a study by Bezzi et al. (1981) in which, among 26 patients classified
as having endogenous depression of the unipolar type, the "retarded depressives" had
higher electrical pain thresholds than the "agitated depressives"; the former group differed
from the healthy control subjects but the latter did not. The influence of the type of
depression on pain perception was also shown in a later investigation by von Knorring
(1978), which demonstrated that depressed patients with psychotic symptoms ($n = 41$) had
higher electrical pain and tolerance thresholds than those without ($n = 59$); again, no group
differences in detection thresholds were observed.

Although findings presented so far point to a pain-specific deficit rather than a general
perceptual deficit, one recent study initially appears to provide evidence to the contrary. In
a comparison of thresholds for electrocutaneaous stimulation in 16 patients with major
depression (DSM-III-R criteria) and healthy controls, Adler and Gattaz (1993) found that
the patients had significantly increased detection thresholds but showed a trend to increased
pain thresholds. However, their definition of pain as "unpleasant itching and prickling" is
rather unusual. Furthermore, their claim that pain sensitivity is in fact increased in
depression, which they support by computing a quotient between the pain and detection
thresholds, appears problematic because such a quotient ties together two different
measures, one of mechanoception (detection threshold) and the other of nociception (pain
threshold).

Davis and co-workers (1979), using electrical stimulation and signal detection analysis
of the results as they did in their studies on schizophrenic patients (Davis & Buchsbaum,
1981; Davis et al., 1980, 1982), tried to find out whether sensory and perceptual deficits or
a tendency to stoic pain behavior underlie the putative pain insensitivity in depression.
Their results, obtained from 66 patients with unipolar or bipolar depression (RDC criteria),
are compatible with the view that there is a change in the criterion for a pain response in
depression with a tendency to more stoic behavior. In a subsequent study Davis et al. (1982)
found that this response tendency in depressed patients was correlated with CSF opiate
binding, although the opioid activity did not differ between depressed patients and healthy
controls. The result of a positive relationship between subjective pain response and CSF
opiate binding is in contrast to the already cited finding in schizophrenic patients, where
such a relationship was not found.

Whether the observation of a tendency to stoic pain responses constitutes corroboration
of the "emotional indifference" hypothesis by a signal detection approach is still unclear.
There are three reasons for this uncertainty. First, in a later study with the same method-
ology Buchsbaum et al. (1981) could not replicate the findings of their first study. Second,
Clark and co-workers (1986) reported not only a change in the criterion for a pain response
but also a decrease in the discrimination ability for noxious heat stimuli, suggestive of
sensory or perceptual problems in psychiatric patients; the depressive patients ($n = 24$) in
their sample did not differ from the other diagnostic groups in this respect. Finally, the
early and straightforward interpretations of signal detection pain parameters as indicators
of a sensory and perceptual component on the one hand and a response component on the
other have subsequently been challenged for methodological reasons (Rollman, 1992).

Buchsbaum et al. (1980) investigated somatosensory evoked potentials in 85 patients

with affective disorders (RDC criteria), 75 of whom were depressed. The amplitude of the N120 component was lower than in healthy controls, mainly at painful stimulus intensity levels. This contrasts with the findings in schizophrenic patients (Davis et al., 1980), where a lowering of the amplitudes also occurred at non-painful stimulus intensities.

Although the cause of the pain insensitivity in depression is still far from clear, it appears highly likely that a certain degree of illness severity is necessary for there to be an effect on the pain system. Further evidence supporting this view is provided by the studies of Hall and Stride (1954) and von Knorring (1974), who observed a normalization of pain perception after recovery from depression. Moreover, Otto et al. (1989) did not find a change in experimental pain parameters in very mild forms of depression assessed only with depression scales.

A study by Merskey (1965) raised two methodological issues. Merskey used a pressure algometer, and, in contrast to the authors just cited, he found that depressive patients had lower pain tolerance thresholds than healthy controls. Hence, the type of pain stimulation method may influence the results. Furthermore, Merskey found differences in pain perception between depressed patients with and without clinical pain. This suggests that clinical pain should be considered in this context.

Investigations by Lautenbacher et al. (1994b) on depressive patients dealt with questions relating to the exact type of perceptual disturbance and its relationship to symptomatology and opioidergic mechanisms. In patients with a DSM-III-R diagnosis of major depression heat pain thresholds were assessed by two threshold methods that differed in the impact of reaction time on the results. With both methods the pain thresholds were significantly increased in the depressive patients. However, no relationship was found to various symptoms of depression as assessed by psychopathometric scales. In contrast to the pain thresholds, the thresholds of skin sensitivity to non-noxious stimuli (warmth, cold, vibration) were only slightly increased. The administration of the opiate antagonist naloxone (5 mg IV) in a double-blind, placebo-controlled design did not produce any systematic changes in pain thresholds. These findings suggest, first, that the decrease in somatosensory sensitivity in major depression is specific to pain and not due to an increased reaction time and, second, that it is not related to a naloxone-sensitive mechanism, making an opioidergic causation unlikely. Finally, the idea, derived from earlier studies, that the severity of depressive symptoms influences the degree of change in pain perception was not substantiated; one explanation might be that these relationships appear only if different diagnostic subgroups of depression, such as dysthymia, major depression and adjustment disorder with depressed mood, are grouped together.

The following ideas may be useful for future research. All theoretical arguments have to acknowledge that the influence of depression on the pain system appears somewhat paradoxical because both a decrease in experimental pain sensitivity and an increase in clinical pain problems have been observed. We think that a diminished processing of nociceptive stimuli at spinal and subcortical stages can be responsible for both phenomena because such a deficiency may lead not only to hypalgesia but also to an insufficient activation of pain inhibitory systems. Such a hypothesis can be derived from the observation that central analgesics both reduce pain perception and dampen natural forms of pain inhibition (Le Bars et al., 1992). This pathological processing of nociceptive stimuli is not

necessarily evident when depressive patients are tested in the usual way, with brief pain stimuli; deficient pain inhibition is more likely to become apparant when sustained pain stimuli are applied.

Neuroendocrine dysfunctions, which are known to be present in depression (e.g. Holsboer, 1992), are worth consideration as possibly being involved in the altered processing of nociceptive stimuli. Haier (1983) presented some data suggesting that dexamethasone nonsuppression in depressive patients may be related both to pain insensitivity and to a lack of sensory inhibition. Furthermore, in healthy subjects dexamethasone attenuates both excercise-induced secretion of ACTH and analgesia (Kemppainen et al., 1990). Hence, increased levels of hypothalamic–pituitary–adrenal hormones may cause the hypothesized diminished nociceptive processing.

It should be emphasized that all this is still speculative and has to be verified in future studies. An alternative explanation for an increase in clinical pain problems and a decrease in pain sensitivity in depression was proposed by Ward et al. (1982), who hypothesized that different parts of the spinothalamic tract are involved in the processing of clinical and experimental pain and that the part mediating clinical pain may be affected by an imbalance between noradrenergic and serotoninergic mechanisms, whereas the part mediating experimental pain may be affected by an increase in the activity of endogenous opioids.

Anorexia Nervosa and Bulimia Nervosa

Interest in pain perception in eating disorder patients has arisen because of a number of observations: there have been several reports on disturbances of visceroception and proprioception in eating disorder patients (e.g. Bruch, 1962; Garfinkel et al., 1978). Furthermore, when studying a patient with bulimic behavior Abraham and Joseph (1987) found an increase in pain tolerance during vomiting; this increase could be prevented by the administration of the opiate antagonist naloxone. Finally, Kaye and co-workers (1982) observed an elevated CSF opioid activity in anorexic patients (a finding however, which has been challenged by more recent results from the same research group [Kaye et al., 1987; Lesem et al., 1991]).

On the basis of these observations, Lautenbacher et al. (1990, 1991b) hypothesized an opioid-mediated alteration of pain perception in patients with anorexia and bulimia nervosa and tested this hypothesis with a methodological approach similar to the one they later used in their study on depressive patients (Lautenbacher et al., 1994b). Both the patients with anorexia nervosa and those with bulimia nervosa (DSM-III-R diagnoses) had significantly higher heat pain thresholds than the healthy control subjects. In a study of 27 bulimic patients Faris et al. (1992) were able to confirm the finding of pain insensitivity, whereby these authors used pressure instead of heat as the pain stimulus. Since recovered anorexic patients ($n = 23$) did not show a reduced pain sensitivity (Krieg et al., 1993), the change in pain perception appears to be confined to the acute state of the eating disorder—at least in anorexia nervosa.

The core hypothesis that the reduced pain sensitivity in anorexia and bulimia nervosa is opioid-mediated was found to be rather unlikely, however, since a normalization of the increased pain thresholds could not be achieved by administration of the opiate antagonist

naloxone (5 mg IV) (Lautenbacher et al., 1990). An alternative hypothesis, that the reduced pain sensitivity is a consequence of general somatosensory deficits due to a subclinical malnutrition neuropathy, also had to be rejected since other sensory modalities, such as warmth, cold and vibration sensitivity, were either not affected or showed only minor, non-pathognostic impairments (Pauls et al., 1991). A third possible explanation for the change in pain sensitivity was that the fasting state, which is characteristic of both acute anorexic patients and acute bulimic patients (Pirke et al., 1985), is by itself enough to cause the reduced pain sensitivity. However, a 3-week 1000-kcal diet did not influence pain sensitivity in 11 healthy volunteers even though the diet induced a fasting state comparable to that found in eating disorder patients (Lautenbacher et al., 1991a). A further hypothesis, relating to anorexia nervosa only, was formulated on the basis of the observation that there is an unusual, strong and negative correlation between pain threshold and local skin temperature in anorexic patients during the acute phase and the phase of recovery (Krieg et al., 1993; Lautenbacher et al., 1991b). This hypothesis, which has yet to be tested, assumes that the altered pain perception in anorexia nervosa is associated with an abnormal coupling of peripheral thermoregulation and pain sensitivity, which is due to a sympathetic dysregulation.

In bulimia, no clear clues regarding the causation of altered pain perception have yet been found. However, the frequently claimed pathogenetic relationship between bulimia nervosa and depressive disorder and the non-opioid mediated pain insensitivity found in both disorders suggests possible directions for further research.

Finally, it can also be postulated that the short-term metabolic and endocrine adjustment reactions to excessive changes in food intake are sufficient to produce hypalgesia. Such an assumption is supported by animal studies (Bodnar et al., 1978) and the finding that a considerable percentage of chronic dieters, who like eating disorder patients, shift frequently between reduced and excessive eating, show increased pain thresholds (Krieg et al., 1993).

Personality Disorders

There have been only two studies on pain perception in patients with personality disorders but both of them demonstrate to perfection the benefit of such studies especially in patients with borderline personality disorder. Using the cold-pressor test, McCown et al. (1993) assessed pain tolerance in 20 patients with borderline personality disorder, 20 patients with other personality disorders (schizoid, schizotypal, paranoid, antisocial, etc.) and 20 healthy control subjects and found no group differences. Since these authors hypothesized that patients with borderline personality disorders are more likely to develop stress analgesia, they had all their subjects undergo a stressful procedure involving an uncontrollable cold pain stimulation. There was an increase in pain tolerance in all subjects but the increase was most pronounced in the patients with borderline personality disorder, resulting in significantly elevated tolerance thresholds compared to the other two groups. The authors' interpretation that patients with borderline personality disorder develop stress analgesia more readily due to their previous traumatic experiences is called into question by the lack of an experimental control condition. Nevertheless, it is interesting that in this study patients

with borderline personality disorder, who engage frequently in self-injurious behaviors, adapted most quickly to repeated pain stimulation.

Russ et al. (1992) addressed the question of whether the intensity of pain experience during self-injurious behavior is related to pain sensitivity. They divided a group of 22 patients with a borderline personality disorder into those who had and those who had not experienced pain during their self-mutilating behavior. The latter group had significantly lower pain ratings during a cold-pressor test than either the former one or a control group. Interestingly, only those patients who were obviously pain-insensitive also showed a decrease in negative emotions, such as "depression," "anxiety" and "anger," and an increase in "vigor" after the cold pain stimulation. One can conclude that in a subgroup of self-injurious patients this aberrant behavior is reinforced by a contingent improvement in the affective state, which is not counteracted by negative experiences because these are attenuated by a decrease in pain sensitivity; in the other subgroup the self-inflicted injuries may lead to affective consequences similar to those healthy persons would experience. Also of interest, Russ et al. (1993) recently reported that the pain-insensitive patients had higher levels of psychopathology, i.e. impulsiveness, dissociation and suicide attempts, and were more likely to have a history of sexual abuse.

Whether the findings obtained by Russ et al. (1992) of a primary pain insensitivity in a subsample of patients with borderline personality disorder and those obtained by McCown et al. (1993) of an increased adaptation to repeated pain stimulation in all such patients can simply be combined is unclear. This is because McCown et al. did not use a standard diagnostic procedure and by using a specifically designed screening procedure excluded any other form of psychiatric morbidity, whereas Russ et al. used the DSM-III-R criteria for borderline personality disorder, with the consequence that 36% of their patients also fulfilled the diagnostic criteria for depressive disorder and 23% for bulimia nervosa.

Conclusions

Both chronic pain complaints and pain unresponsiveness are symptoms that are frequently found in patients with various psychiatric disorders, and altered pain perception may be one of the factors contributing to these symptoms. This article reviews the literature on experimental assessment of pain perception in psychiatric patients. The results of the relevant studies indicate that pain perception is indeed altered in certain groups of these patients. In the following discussion it is worthwhile to consider these changes in pain perception from two perspectives, the perspective of symptomatology and the perspective of underlying neuropsychobiological mechanisms.

Experimental investigations in psychiatric disorders can detect or verify the existence of an altered pain perception as a symptom and can also provide new ideas about its behavioral consequences. For example, would anyone have expected hypalgesia in eating disorder patients? But if the existence of altered pain perception can be demonstrated, it is then fruitful to inquire whether this has any relationship to other perceptual disorders, e.g. the well-known disturbances of "body image" and body scheme. Moreover, the observation of normal pain perception in some self-injurious patients with borderline personality may help to disprove the idea that autoaggressive behavior is always an attempt at self-experience in a person who cannot sense his or her own body.

In addition, the experimental approach can correct or refine certain beliefs, which stem mainly from clinical observations and studies. Thus, patients with schizophrenia are clearly not necessarily protected against pain and cases of extreme pain unresponsiveness seem to be the exception (even though they have attracted great interest). The well-known co-morbidity of depression and chronic pain has led to the erroneous conclusion that all types of pain are augmented in depression. As was shown experimentally, however, just the opposite is the case when acute pain is applied.

But the major advantage of studying pain perception in psychiatric disorders is the possibility of gaining insight into underlying neuropsychobiological dysfunctions. We think that experimental pain research may become as important in psychiatry as sleep research already is. Sleep was chosen as a behavior relevant for psychiatric research because it is quantifiably disturbed in psychiatric disorders and is regulated by neuronal and hormonal systems, which are assumed to play key roles in the pathogenesis of such disturbances (Benca et al., 1992; Gaillard et al., 1989). Pain perception can also be quantified by psychophysical and electrophysiological methods in such a way that peripheral and central components can be disentangled (Handwerker & Kobal, 1993). Furthermore, and most important, pain perception is influenced by opioidergic, adrenergic and serotoninergic neurotransmitter systems (Thomas et al., 1993; Tura & Tura, 1990) and by the neuro-endocrine limbic–hypothalamic–pituitary system (Hargreaves et al., 1990), dysregulations of which are considered to be involved in the pathogenesis of psychiatric disorders. Given all this, it is not surprising that psychopharmaceutics, such as tricyclic antidepressants, improve mood and sleep and have analgesic properties (Onghena & Van Houdenhove, 1992) and that mood, sleep and pain perception are disturbed concomitantly in certain chronic pain conditions, e.g. fibromyalgia (Boissevain & McCain, 1991; Lautenbacher et al., 1994a).

Of course, some progress still has to be made before experimental pain research attains a methodological position in psychiatry similar to the one now held by sleep research. But because of the multiple functional roles of the various neurotransmitter and neuroendocrine systems there is clearly a strong need to establish new functional indicators for neuro-biological alterations in psychiatric disorders.

As the studies on pain perception were performed on patients who were recruited according to conventional diagnostic classification systems, we reviewed the results separately by diagnostic category. Future studies on pain perception might, as has been done for sleep, investigate patients who are assumed to share a certain pathophysiology, e.g. a deficiency of functionally active serotonin. Such an approach might be of help in developing and refining new pathogenetic concepts, on the basis of which psychiatric disorders could then be classified according to neurobiological features in addition to the psychopathological features already used.

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