The Management of Rheumatoid Arthritic Pain: Preliminary Observations

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Rheumatoid arthritis remains one of the most disabling diseases of the skeletal system in terms of pain and crippling. The causative agent remains unknown and treatments are largely symptomatic and often inadequate in improving the patient's well-being or in limiting his disability. Nevertheless, it is a well-established fact that psychological factors can influence the course of as well as the patient's response to the disease (Hollander, 1966; King and Cobb, 1959; Cobb, et al., 1939; Patterson et al., 1943). Although more investigations are needed to determine the exact relationship between psychological factors and the pathogenesis of the disease, study of the effects of certain psychophysiological procedures on the patient's arthritic pain is of more immediate therapeutic relevance.

Pain has both psychological and physiological components. The psychological determinants of pain perception include tension, anxiety, and suggestion (Melzack, 1973). Headache pain has been reduced by EMG feedback training (Budzynski, Stoyva and Adler, 1969; Wickramasekera, 1973a, 1974a), and the hypothesized mechanism of reduction was the correlated decline in muscle tension. Pain may also be reduced through the mechanism of suggestion (Barber, 1969; Hilgard, 1969). Both logically and empirically there is reason to believe that biofeedback training can increase
suggestibility. Logically the biofeedback training situation is similar to the sensory restriction (deprivation) situation, and there is evidence (Pena, 1963; Sanders and Rayher, 1968; Wickramasekera, 1969, 1970) that sensory restriction increases suggestibility. In fact, it is likely that the subject imposed (withdrawal of attention and focus on a single stimulus) sensory restriction that occurs in biofeedback will be more effective in increasing suggestibility than the type of externally imposed sensory restriction that occurs with the paraphernalia of sensory deprivation studies. Empirically several studies have demonstrated that both EMG and alpha biofeedback training are associated with increases in suggestibility (London, Hart and Lebovitz, 1968; Engstrom, London and Hart, 1970; Wickramasekera, 1971, 1973b), and in fact it has been hypothesized (Wickramasekera, 1974c) that any feedback procedure (EMG, temperature, heart rate) that induces a state of low arousal will increase suggestibility. This is not to imply that the informational feedback variable is unimportant in producing low arousal states but rather to suggest that its effects may be inevitably confounded with those of escalating suggestion in biofeedback training.

Positive instructions (relief from pain expectation) administered before and during the EMG feedback training might harness and direct the inevitable suggestibility elevation that occurs in low arousal states. Hence, the ingredient of positive suggestion may be added to that of informational feedback in the clinical situation to potentiate further the pain reduction package.

Patients

The patients in this study were volunteers, diagnosed by both their family physician and a physiatrist as rheumatoid arthritics, with severe joint pain, and were referred to this pilot project through the Arthritis Foundation. All subjects chosen for participation exhibited pain at least in one knee.

The first subject (M.H.) was a 30-year-old married female housewife who had reported pain in her knee for 15 years. Rheumatoid arthritis was diagnosed 1 year ago. The severity of the pain reportedly varied, being intensified by cold, motion, and carrying heavy objects. The subject had taken 8-10 tablets (300 mg) of aspirin per day for the last year and a half, on the instructions of her physician.

The second subject (D.P.), a 61-year-old married female housewife, was diagnosed as a rheumatoid arthritic 12 years ago. She reported that her pain was intensified by excessive walking. The subject, at the instruction of her physician, took from 10-12 tablets (300 mg) of aspirin per day. No other analgesics were used by either patient.
Apparatus

An EMG feedback instrument which provided both auditory and visual feedback was used to measure integrated skeletal muscle tension. The instrument was constructed to insure a maximum of 20K unbalanced electrode resistance and a maximum of 30K resistance to ground for each active electrode. The electrodes used were standard surface electrodes. The instrument is constructed to eliminate several artifacts (EEG, EKG) and to minimize “noise” if used correctly.

A metal stimulus calibrated in tenths of kilograms was used to apply known quantities of pressure to select locations around the patient’s knee. The patient was instructed to report when she first perceived pain.

Procedure

The following is the flow chart of the study: (1) two initial interviews; first with the primary investigator, a psychologist, and the second, a medical interview with a consulting psychiatrist; (2) a battery of psychological tests for possible future correlational study; (3) a rationale for the experiment was given verbally to each patient and all questions concerning experimentation were answered; (4) patients were given popular articles on biofeedback (Time, Glamour, etc.) to read and were instructed to feel free to ask any questions. This fourth step was primarily used to structure positive expectations in the subjects and create motivation for active participation; (5) all patients were instructed on how to keep daily charts of pain intensity and were told to do so throughout their participation in the project. All charts were checked at each meeting with the participant.

The second phase was the collection of baseline EMG data once a week by female research assistants. Baseline data was collected in three consecutive sessions; each session consisting of premeasures of the pain perception threshold as reported by the patient in response to stimulus pressure to the knee joint and baseline EMG data from the frontalis area.

The third phase consisted of training the patients once a week to monitor the muscle tension in the frontalis muscle by means of an analog information feedback system. Three surface electrodes were applied to the forehead; the middle electrode was at the center of the forehead approximately one inch above the eyebrows. The subject, equipped with earphones, heard a tone with a frequency proportional to the frontalis activity. The subject was then instructed to keep the tone at a low intensity by relaxing the specified muscle group. As the subject gained better control, the loop gain of the feedback system was increased, requiring that the subject maintain a lower EMG activity level to hear the tone. The response of muscle relaxation
was then successively shaped by increasing the difficulty of the task by adjusting the sensitivity of the apparatus from low to medium and eventually to high. Pre and post measures of the pain perception threshold (K/pressure) were obtained before and after relaxation training.

The specific training procedure for each 30 minute session of frontalis relaxation consisted of 5 minutes of contingent feedback training interspersed with 2 minutes of verbal relaxation instruction (the autogenic phrases quiet, heavy, and warm, Schultz and Luthe, 1969). Thus, the subject received 5 minutes of contingent feedback (C.F.), 2 minutes of verbal relaxation (V.R.), 5 minutes of C.F., 2 minutes of V.R., and so on, for each 30 minute session.

Results

The results over a 26 week period for M.H. and a 28 week period for D.P. are shown in figs. 1 and 2. This period covers the winter and spring months when typically the pain is most marked, due to alterations in environmental humidity (Hollender, 1972). The mean level of frontalis activity during baseline for Subject 1 ranged from 5.0 to 6.8 μV, and for Subject 2 from 9.8 to 20.6 μV. Throughout the weeks of experimentation the frontalis level dropped gradually for both subjects, the first subject dropping to a low of 2.4 μV (fig. 1) and the second to a low of 4.3 μV (fig. 2).

The measures of perceived pain taken pre and post for each session are reported for both medial and lateral positions of the patella. Fig. 1 indicates that the subject (M.H.) consistently tolerated more pressure (K) after the frontalis session than before. This data also shows that the pain threshold continued to decline during the experimental period. The data (fig. 2) on pain perception for the second patient (D.P.) shows little overlap after the fifth session, indicating that the subject tolerated more pressure after the session than before.

The verbal report of subjective pain intensity shows in both cases a gradual decrease in the reported intensity of pain throughout the experimental period. Both subjects' anecdotal reports indicate more activities with less pain, since their participation in the project (e.g., bicycle riding, snow shoveling, driving long distances, dancing). The second subject also reported more restful sleep and a concurrent decline in blood pressure.

A record was also kept of the quantity of aspirin each subject took on a daily basis throughout experimentation. Subject 1 continued to take from 8 to 10 tablets of aspirin a day and Subject 2 from 10 to 12 per day. This pattern
Figure 1.
Figure 2.
of analgesic consumption was begun at the time the disease was diagnosed and was maintained at the instruction of the subjects’ physicians, presumably to control inflammation. Our intervention was directed at the pain perception threshold, and hence we ignored the underlying disease process. Anecdotally the procedure appears also to have an impact on the disease process, and in the next phase of this investigation we plan to monitor both pain perception and the disease process.

Discussion

Before we chose the frontalis muscle as the source of EMG feedback, we tried to use other skeletal muscles in the vicinity of the involved joint, since, from pure clinical considerations, they could be expected to be quite active through such clinically observed signs as muscular splinting and spasms. However, we found that these muscles exhibited very erratic levels of activities that could not be used for feedback training with any stability.

This clinical trial arranged conditions to increase patients’ relaxation skills and also to increase their suggestibility, thus confounding two related variables. No conclusions can be drawn from this study, but it appears to describe a promising set of procedures. At least 3 of the conditions arranged in this clinical trial are known to potentiate verbal instructions (suggestibility). These conditions are: (1) a credible rationale for the procedure (Borkovec and Nau, 1972; Caputo et al., 1973; McGlyn and McDonell, 1974; Diamond, 1974; Wickramasekera, 1974b); (2) structuring positive expectations (Diamond, 1974; Wickramasekera, 1974b); (3) EMG feedback assisted relaxation training procedures (Wickramasekera, 1971, 1973).

The above three conditions appear to potentiate the suggestion or “placebo effect” (Shapiro, 1971), and in this clinical trial we sought actively to direct and strengthen this powerful, but often unreliable, effect (Freud, 1959; Wickramasekera, this volume). It is hypothesized that the impact of other clinical methods can also be potentiated by paying careful attention to the conditions that increase suggestibility (Diamond, 1974; Wickramasekera, 1974b).
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