

Behavioral and educational modalities

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General agreement has emerged in the scientific literature that behavioral and educational modalities are useful and effective in the management of chronic pain conditions. Behavioral and educational treatment modalities constitute a component of virtually every established chronic pain treatment program. It has been demonstrated that management of temporomandibular disorders has benefited from such behavioral interventions as well. The label "biobehavioral" refers to proven, safe methods that emphasize self-management and acquisition of self-control over not only pain symptoms but also their cognitive attributions or meanings and maintaining a productive level of psychosocial function, even if pain is not totally absent. A large collection of treatment modalities is subsumed under the label of biobehavioral treatments; the most commonly studied of these include biofeedback, stress management, relaxation, hypnosis, and education. An NIH Technology and Assessment Conference held in 1995 comprises the best available summary of the state of the art concerning the suitability of biobehavioral methods as useful approaches to ameliorate chronic pain, including TMD. Educational methods have also been demonstrated to be efficacious in the self-management of headache and back pain, but only limited data are available for TMD. By and large, when biobehavioral treatments are used in the management of TMD, effects are virtually always positive and in the hypothesized beneficial direction. While effects are often moderate in size, these methods show the potential for producing long-lasting benefits when compared with usual clinical treatment for TMD. Research has as yet failed to establish one biobehavioral modality as superior to another. It is important to note that much the same situation is present with regard to the scientifically established validity of many biomedically based TMD treatments. (*Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1997;83:128-33)

General agreement has emerged in the scientific literature that behavioral and educational modalities are useful and effective tools in the management of chronic pain conditions.¹⁻⁴ Behavioral and educational treatment modalities constitute a component of virtually every reported chronic pain treatment program.¹ The majority of studies establishing the efficacy of psychologically based treatments for chronic pain have focused on the two most common chronic pain conditions, namely, back pain and headache; however, the management of temporomandibular disorders (TMDs) has benefited from such behavioral interventions as well.²

The label "biobehavioral" has gained acceptance as a collective term that refers to treatment approaches for chronic pain that are derived from the application of behavioral science theories and methods to change the perception and appraisal of pain and to ameliorate or eliminate the personal suffering and psychosocial dysfunction that often accompanies persistent pain conditions.^{1,2} Biobehavioral pain management modalities (Table I) are drawn more specif-

Table I. Biobehavioral modalities for chronic pain

Electromyographic biofeedback
Relaxation
Behavior modification
Cognitive behavior therapy
Education
Hypnosis

Table II. Common behavioral characteristics of patients with TMD and other chronic pain conditions

Poor correspondence of pathology with pain and suffering
Transient psychological distress
Potential for clinical depression, anxiety, and somatization
Dysfunctional "chronic pain behaviors"
Interference with daily activities
Misuse of health care

ically from the field of psychotherapy; the methods most heavily investigated and scientifically validated are derived largely from cognitive-behavioral and behavioral psychotherapeutic approaches. The efficacy of psychodynamic and psychoanalytic treatment approaches for management of chronic pain has not yet been scientifically validated.

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Table III. Pain/psychologic-behavioral variables of TMD and other common chronic pain conditions

	Primary care patients		
	TMD	Headache	Back pain
Pain Variables (Mean)			
Average pain intensity	5.0	6.0	4.7
Disability (days)	10.4	10.1	19.8
Days in pain	91.7	55.2	78.5
Years since onset	6.0	17.5	12.3
Psychologic/behavioral variables (% of patients)			
Elevated depression	25.6	28.4	22.0
Health rated as fair-poor	12.8	13.7	9.9
Frequent pain visits	7.5	9.2	8.1
High pain impact	23.8	35.4	32.8

BIOBEHAVIORAL MODALITIES

Biobehavioral interventions are viewed as safe, reversible, and noninvasive, and for the most part they emphasize strategies under the patient's control. The label "biobehavioral treatments" encompasses a large collection of treatment modalities; the most commonly studied of these modalities include biofeedback, relaxation, hypnosis, cognitive-behavioral methods, and education.²⁻¹⁴ Overwhelmingly, the common objectives of these methods are self-management and the acquisition of self-control over pain symptoms and the cognitive attributions or meanings given to those symptoms, and most importantly, these methods emphasize maintaining a productive level of psychosocial function even if pain is not totally absent.^{3, 15}

Several lines of evidence provide support for recommending that educational and behavioral modalities be incorporated into the management of TMDs. Although they vary in anatomic site, chronic pain conditions have in common a well-established set of behavioral and psychosocial characteristics (Table II). The available evidence (much of it gathered by contributors to the National Institutes of Health [NIH] Technology Assessment Conference on Management of TMDs) abundantly confirms that from behavioral, psychological, and psychosocial perspectives, TMD is a chronic pain condition, and however else TMD may be treated, its management justifiably includes the same biobehavioral methods universally applied to the management of other types of chronic pain.

In other words, TMD is more like other chronic pain conditions than it is different when it comes to biobehavioral factors (Table III). Turk and Meichenbaum,³ with use of their Multidimensional Pain Inventory (MPI), have shown that patients with TMD who seek treatment have psychological and psycho-

Table IV. Studies of psychological and psychosocial predictors of TMD treatment outcome

Risk factors identified
Pain intensity
Depression
Somatization
Anxiety
Self-esteem

Table V. Biobehavioral modalities for TMD: cognitive-behavior therapy

Few well-designed studies
Moderate improvement in pain, jaw mobility, mood, use of self-coping methods
Generally multimodal, variable sessions, methods comparable with other pains

social profiles that are quite similar to those of patients with chronic headache and back pain. Similarly, in my own previously reported population and clinic-based studies,¹⁶ I have shown that patients with TMDs are affected by their pain condition in a manner comparable to that of patients who have chronic headache and back pain, as reflected by reported levels of pain intensity, pain interference, psychosocial disability, and presence of depression.

Several workers, including Rudy et al.,¹² Friction and Olsen,¹⁷ Krogstad et al.,⁹ Kinney et al.,¹⁸ and McCreary et al.,¹⁹ have demonstrated clear relationships between behavioral, psychological, and psychosocial risk factors and TMD treatment outcome (Table IV). Especially salient were the presence of depression, somatization, self-esteem, and anxiety, which were identified as predictors of outcome for treatment of TMD. Although these studies vary in methodologic rigor and sophistication of statistical analyses used, they all conclude, whether for U.S. or Scandinavian clinic samples, that for many patients, management of behavioral and psychological factors is a requirement if long-term management of TMD is to be successful. Conversely, it seems fair to conclude from the scientific literature that no existing studies demonstrate that physical pathology variables are better than are psychological variables for predicting positive TMD treatment outcome—which, again, is similarly acknowledged for headache and back pain.

A recent NIH Technology and Assessment Conference entitled "Integration of Behavioral and Relaxation Therapies Into the Treatment of Chronic Pain and Insomnia" comprises the best available summary of the state of the art concerning the suitability of biobehavioral methods as useful approaches to ame-

liorate chronic pain and its debilitating psychosocial sequelae.² With regard to TMD, reference is made to specific studies establishing the relative efficacy of relaxation, biofeedback, hypnosis, and cognitive-behavioral methods in the management of TMDs.

ELECTROMYOGRAPHIC BIOFEEDBACK

Among the biobehavioral interventions for TMD, the earliest and most thoroughly investigated behavioral modality, which has been studied through clinical trials, has been electromyographic biofeedback, which couples muscle relaxation with feedback continuously provided to the patient about levels of masticatory muscle activity. Electromyographic biofeedback has been most extensively investigated with patients who have chronic headache. Most electromyography trials with patients who have TMD have been limited to patients with masticatory muscle (as opposed to joint) disorders. Reviews of these studies conclude that electromyographic biofeedback has been shown to be superior to symptom monitoring and, in one poorly controlled study, equivalent to occlusal splint therapy.² In a carefully conducted trial by Flor and Biraumer,⁸ biofeedback showed longer lasting effects than cognitive behavioral treatment or conventional medical treatment. Overall, reductions in electromyographic levels associated with electromyographic biofeedback are moderate in the more carefully controlled trials. Although many electromyographic biofeedback reports are found in the TMD literature, no comprehensive review exists, and only a few studies have used adequate control groups and appropriate sample sizes. During approximately the past 5 years there has been a marked decline in published studies using electromyographic biofeedback for chronic pain in general, and this decline has been even more pronounced for TMD.

COGNITIVE-BEHAVIORAL THERAPY

Randomized clinical trials and well-controlled experimental interventions that have used cognitive-behavioral therapy (CBT) for patients with TMDs have not been conducted nearly as extensively as those that have used CBT for patients with other chronic pain conditions. Cognitive-behavioral approaches, which encompass stress management interventions, seem to be the model treatment modality used at major pain centers around the world for all pain conditions. A careful clinical trial conducted by Rudy et al.¹² demonstrated that patients with TMDs classified according to extent of psychosocial distress differentially benefited from a cognitive-behavioral treatment, which also included biofeedback, provided in a large multidisciplinary pain clinic. The effects of biofeed-

back and relaxation were not distinguished in the report from the overall success of the cognitive-behavioral interventions incorporated to reduce negative thinking and the perceived impact of TMD symptoms. Long-lasting positive effects of the cognitive-behavioral intervention, compared with use of an intraoral appliance only, continued to be observed at 1-year follow-up.

A CBT trial incorporating either hypnosis or relaxation in comparison with a no-treatment control group found comparably significant reductions in self-reported pain, abnormal joint sounds, and limitations in jaw mobility for both treatment groups.¹⁴ In a CBT that included relaxation, self-monitoring of stressors, and cognitive coping strategies that was directed at patients with TMD for whom prior treatment had failed, Oakley et al.¹⁰ observed that, compared with waiting list control subjects, the CBT intervention proved effective in reducing pain and alleviating dysphoric mood, especially anxiety, in a group previously recalcitrant to available biomedical treatments for TMD.

In a study evaluating long-term outcome associated with behavioral management of chronic pain and excess psychosocial disability, Roberts et al.¹¹ reported that a 15- to 20-session outpatient behavioral rehabilitation program yielded statistically significant and clinically meaningful reductions in pain and improvement in patient ability to function at work and in the home. Most interestingly, the same behavioral methods—which included sessions devoted to reducing reinforcements for pain and disability among family members of the patient with pain, physical and occupational therapy, relaxation, and varying amounts of biofeedback together with stress management—were applied to unselected patients with pain ($n = 354$) who presented with widely distributed complaints of pain, including pain related to the head, back, gastrointestinal system, and arthritis. Despite the heterogeneity of the treatment population, all patients were treated similarly and positive benefits continued to be observed at 2-year follow-up.

Compared with usual treatment, waiting list control subjects, and placebo, these CBT methods, taken together, are currently understood to achieve moderate reduction in the report of pain, achieve increased physical activity and level of psychosocial function, ameliorate negative affect and thinking, and enhance personal strategies for coping with pain (Table V). Evidence also exists that benefits gained from CBT methods are maintained at 1-year follow-up, even in cases in which the benefits do not appear to be superior to those gained by control groups immediately upon completion of the CBT intervention.^{7, 12, 15}

CBT and all other biobehavioral modalities are noninvasive, reversible, and emphasize long-term self-management for TMD and other chronic pain conditions; in addition, some evidence indicates that CBT interventions are cost-effective in terms of impact on overall clinic visits and dollar costs. Caudill et al.¹² analyzed an outpatient biobehavioral program representing 109 clinic patients with a broad cross-section of pain problems. The study has its limitations, principally because the design did not include a suitable control group—patients were compared to themselves over time to assess outcomes—and because, as the authors point out, patients could have received care outside the study HMO, and these costs could not be documented. Pretreatment data for 1 year were gathered from patient records to determine visits per month per patient in the year preceding the onset of the biobehavioral program. Similar data were gathered 1 year after treatment on these 109 patients, and data from 70 patients were available at the time of the report for assessment 2 years after treatment.

An overall decrease of 77% in clinic visits was observed for these 109 patients in the 12 months after participation in the program. The finding was noted across all groups of patients who participated and was stable even after two years. The 77% reduction in clinic visits after intervention was projected to total 711 fewer clinic visits in the year after intervention. For this same program,²⁰ visits were translated into health care costs in dollars for the year before the program began and for the first 2 years after the program. The estimated cost of the intervention was placed at about \$11,000 for the first year, and the savings realized by the program were projected at \$27,000, leaving a net savings in the first posttreatment year of approximately \$12,000. These savings are projected to increase 2 years after the program to \$27,000, because the cost of the program was absorbed earlier. Again, these data are not provided because they are exhaustive but because they demonstrate the potential for making such determinations when CBT is used for patients with chronic pain.

EDUCATIONAL MODALITIES

The use of educational approaches for modifying TMD-related pain and dysfunction has not been extensively studied, and no comprehensive review of such approaches is available. Educational methods have been demonstrated to be efficacious in the self-management of headache and back pain, using both group and individual approaches to deliver the educational interventions.⁵⁻⁷ One careful clinical trial⁷ conducted by my colleagues and myself introduced a two-session psychoeducational group intervention

Table VI. Biobehavioral modalities for TMD

Moderate to strong efficacy noted
CBT most common and relaxation strongest modality
Methods/efficacy largely comparable and well-defined across chronic pains
Multimodal treatments typical
Effects consistently in positive direction
Pain reduction, increased jaw function, enhanced psychosocial coping
Only a few well-controlled trials conducted in each modality for TMD
Biobehavioral modalities partially incorporated in conservative treatment for pain reduction
NIH Consensus Conference on "Behavioral and Relaxation Therapies. . ."
Available data support use of these therapies without making conclusions about differential effectiveness or mechanisms and note barriers to integration

that was modeled after cognitive-behavior interventions for chronic pain and was conducted before usual TMD treatment began for these subjects at the University of Washington's Orofacial Pain and Dysfunction Clinic. A modest effect in reducing TMD pain-related interference with psychosocial function was demonstrated with this brief small-group intervention compared with usual treatment; the benefits gained continued to be present at 1-year follow-up.

SUMMARY

By and large, when biobehavioral treatments are used in the management of TMDs (Table VI), effects are virtually always positive and occur in the hypothesized beneficial direction, although effects are often moderate in size. However, these biobehavioral methods, especially those subsumed under the label "cognitive-behavioral," appear to have the potential to produce long-lasting benefits when compared with usual clinical treatment for TMD. Conservative, noninvasive approaches to TMD management are increasingly being advocated as the preferred overall treatment approach for this hard-to-understand chronic pain problem.²¹ These so-called "conservative" treatments generally incorporate many of the same elements (i.e., relaxation, stress education, and habit behavior modification) found in cognitive-behavioral and behavioral therapies for TMD. Thus, both usual clinical treatment for TMD and biobehavioral treatment use multimodal approaches, and it does not yet appear possible to determine which of the multiple therapeutic components are most efficacious. If one method had to be singled out, it is relaxation that seems to emerge consistently as an effective method for chronic pain management across a wide variety of pain conditions and over a wide va-

Table VII. Biobehavioral modalities for TMD research issues

Randomized controlled trials to validate biobehavioral modalities
Assess multimodal approaches for length and efficacy of components
Integrate into clinical dental practice
Cost-effective mix of intervention personnel: DDS, PhD, Registered Dental Hygienist, other
Efficacy of interventions "tailored" to research diagnostic criteria (biomedical) or biobehavioral assessment

riety of clinical settings. In any event, the combined biobehavioral methods commonly used in clinical practice and in research have as yet failed to establish one method as superior to another.

It is important to note that much the same situation is true with regard to biomedically based TMD treatments. Little is known about the superiority of any one of the multiple methods commonly used to biomedically manage TMD—no strong scientific evidence exists to substantiate invasive versus noninvasive treatments or pharmacologic treatments that emphasize analgesics versus those that stress antidepressants or muscle relaxants. It is the absence of compelling evidence to the contrary that has led many clinical researchers to advocate conservative, reversible therapies for the majority of patients with TMD.

Much more research is needed before it is possible to adequately evaluate how biobehavioral interventions achieve their desired effects and which components of the multimodal approaches now in common use are most potent (Table VII). Perhaps of greatest interest is the need to develop treatment approaches tailored to both the physical and the behavioral status of the patient, as recently advocated with the introduction of the Research Diagnostic Criteria for TMD.²² These criteria, although in use in the United States and abroad, require further reliability and validity assessment; they comprise a dual axis diagnostic and classification scheme that uses one axis to diagnose the physical subtype of TMD (e.g., muscle disorder or joint disorder) and a second axis to assess the behavioral, psychological, and psychosocial status of the patient.

At present, treatment of TMD appears to be driven largely by the physical diagnosis alone; the personal or psychosocial impact of TMD pain or the patterns of coping with TMD used by patients are not addressed. Although TMD is regarded by many persons as a condition in which psychosocial factors influence the course of the condition,^{12, 16, 23, 24} clinical research has directed little attention to assessing how psychological or psychosocial factors influence treatment outcome and whether successful clinical out-

come is associated with improved psychosocial function. It seems fair to say that outcome assessment for TMD, except for assessment of self-report of pain, is focused almost exclusively on assessment of physical factors, such as range of jaw motion or joint sounds; the few exceptions have been cited in this article.

Recently interest has been shown in developing biobehavioral treatment approaches that differ according to the differing levels of psychosocial functioning or the level of cognitive or emotional disturbance. Biobehavioral treatments would be tailored to follow from assessment of the patient's psychological and psychosocial level of adaptation, much as most biomedical treatment is tailored to follow from the physical diagnosis.^{4, 12} Such an approach would involve development of clinical decision-making criteria that would engage physical and psychosocial variables and, of necessity, treatment outcome measures capable of assessing change along both physical and psychosocial dimensions.^{4, 22}

RESISTANCE TO BIOBEHAVIORAL TREATMENTS

Although the following comments on resistance to biobehavioral treatments are not an official or scientifically based portion of this review, it nevertheless seems important to note that, historically, psychologically based therapies for the medically ill have met with resistance among some patients and health care providers. Resistance to incorporating biobehavioral treatments seems largely to have been resolved by the medical profession, as evidenced by the large number of psychologists and behavioral medicine specialists employed in scientific research and rehabilitation of patients who have had a stroke or cardiac diseases, cancer, and other chronic diseases, including, as already noted, patients with chronic pain who are treated in major multidisciplinary pain centers. However, no review of the efficacy and potential role for biobehavioral interventions incorporated into the management of TMD would be complete without a frank acknowledgement that resistance to such approaches remain.

A recommendation for including psychologically based treatment for TMD is still too often accompanied by well-documented resistance. For some persons such a recommendation seems to carry the negative and clearly undesirable implication that TMD problems must be "all in the head" or somehow "psychological," and hence "not real." No such destructive implication is ever intended when behavioral medicine specialists advocate biobehavioral treatment. TMD-related pain and distress are as real as the distress associated with any other chronic condition, and people vary in their capacity to endure, let

alone thrive, under such difficult physical conditions. It is unfortunate if unhealthy and unwarranted negative patient misapprehensions prevent any patient with TMD from being helped through the use of readily available, scientifically sound and safe methods that integrate biomedical and biobehavioral treatments for TMD.

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