THE NATURAL HISTORY AND EFFICACY OF
TREATMENT OF CHRONIC PAIN ARISING FROM
MUSCULOSKELETAL INJURY

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INTRODUCTION

Work injury and pain are costly. They exact a heavy toll upon workers financially, psychologically, physically and socially, and they consume considerable societal and employer resources (Spitzer, 1987). In 1996, for example, the Ontario Workers’ Compensation Board reported that 103,080 workers claimed a work-related injury/disease for which time was lost. Approximately 31% of these claims were associated with an injury to the back (Workers’ Compensation Board of Ontario, 1996). Most, approximately three-quarters, workers who sustain a work-related back injury return to work within two to three weeks (Spengler et al, 1986; Spitzer et al, 1987). About seven percent, however, do not return to work by 6 months and this minority of claimants consumes considerable resources. In fact, the research suggests that this minority accounts for 75% of costs to the system, such as lost hours, indemnities, and costs related to the use of health care services (Spitzer et al, 1987; Spengler et al, 1986; Snook, 1987; Webster and Snook, 1990; Volinn et al, 1988).

The personal, societal and industrial costs of pain-related occupational injury, and the disproportionate costs of the minority of claimants, have engendered considerable interest in persistent pain and its effective and efficient treatment. This paper offers a critical review of the current understandings of persistent pain and current treatment modalities. Specifically, the objectives of this critical review are to: (a) describe and critically review the natural history and current uni-modal and multi-modal therapies used in the management of chronic musculoskeletal pain; (b) assess which approaches in the literature have been determined to be effective and efficacious through appropriate and rigorous research methods, and; (c) synthesize the research findings into a clear, concise summary of the relative efficacy and effectiveness of each treatment modality.

In order to search for relevant publications, searches were performed in Medline/Pubmed and in the Cochrane Library. There was no specified time limit. Searches were performed with respect to clinical disorder, publication type, intervention type, and “related articles”. The categories for clinical disorder were; pain and chronic disease, back pain, neck pain, and cumulative trauma disorders. The categories for publication type were; meta-analysis, systematic review, RCT, follow-up studies, treatment outcome studies, and practice guidelines. The categories for intervention type were; cognitive therapy, combined modality therapy, multi-modal, manipulation, chiropractic, patient education, psychotherapy, behavior therapy, and cognitive therapy. The “related articles” option was chosen in Medline/Pubmed. Language choice was English.

While the main strategy was to retrieve quality systematic reviews and meta-analyses to perform a review of reviews, the literature on injection therapies for “myofascial pains” and soft tissue pain has only a few RCTs. Hence, these RCTs were used for the section on “injection therapies”.

The retrieved articles were handsearched for articles that may have been missed by the computer searches. Other experts were consulted for other articles that might have been missed.
Inclusion criteria were systematic reviews or meta-analytic reviews of non-surgical treatment of non-malignant chronic musculoskeletal pain. Exclusion criteria were narrative reviews, reviews that did not include either natural or clinical course, or treatment. Some retrieved citations were rejected on the basis of published abstracts, and a few were rejected after the authors scanned the retrieved articles for inclusion criteria.

Meta-analytic and reviews were independently rated by the authors using the criteria of Oxman and Guyatt (1991). There was complete agreement in the ratings on three-point scale of acceptable, borderline and unacceptable. RCTs were rated by one author using the criteria of Jadad et al. (1996). Author blinding was not used. Tables were constructed to summarize the significant findings from this review of reviews. These tables are presented in Appendix 1.

**NATURAL HISTORY OF POST-TRAUMATIC MUSCULOSKELETAL PAIN**

The temporal course of post-traumatic musculoskeletal pain has heretofore eluded comprehensive conceptual description. The process of recovery and/or development of disability are understood, primarily, from two rather simplistic biomedical perspectives.

In the first biomedical perspective, illness is believed to be solely due to biological pathology (Leibowitz, 1991; Turk, 1991), and injury is understood as a linear sequence from casual factor, to pathology, to symptoms or manifestations (Haldeman, 1990). Symptoms and disability, according to this view, are directly related and proportionate to the physical pathology (Waddell, 1987). Elimination of the pathological causes, accordingly, is assumed to lead to cure or improvement. In reality, however, a pathological explanation of pain cannot be made in over 85% of work-related injury cases of low back pain (Spitzer et al, 1987), and, further, the explanation fails to predict disability.

Another perspective on the process of recovery and the development of disability is grounded in the assumption that wounds heal and do so according to a predictable timeline. According to this perspective, normal healing of damaged musculoskeletal soft-tissue follows a three stage process: inflammation, laying down of scar tissue, and remodeling of scar tissue (Caillet, 1988; Fess and Philips, 1987). The assumption that wounds heal in this fashion and that any pain persisting past usual wound healing time is “chronic”, is convenient, but based on an arbitrary assumption that distinguishes complex physiological, psychological, and functional phenomena on a unitary time dimension. The healing process can be affected by a number of mediating factors, such as systemic disease. It is also thought that psychological reactions to injury can have physiological effects on healing (Holden Lund, 1988), although “complementary healing” in a controlled trial did not apparently improve wound healing (Wirth and Barrett, 1994). The downside of the wound healing model is the dismissal or suspicion of persistent pain sufferers on grounds that the injury “ought to have healed by now”. Another downside is the assumption that those who will recover will be a majority and will do so within the
usual bracket of simple wound healing, and those who do not conform to the proposed
time-frame will be a simple minority who will become the long-term chronics.

Research to clarify the clinical course of post-traumatic musculoskeletal pain has been
undertaken. Early research seemed to offer a favorable prognosis for persistent
musculoskeletal pain. Panel studies of primary-care-based based samples, for example,
suggested that 90% of patients seeking treatment for back pain will be pain free within 1
month (Kelsey and White, 1980; Nachemson, 1985; Deyo and Tsui-Wu, 1987).
Overestimation of favorable outcome within the early research may have been due, in
part, to the outcome variables examined and/or the study design employed. Certain types
of outcome measures, such as return-to-work (RTW), may reflect some but not all factors
needed to evaluate outcome (Mitchell and Carmen, 1990; Butler et al, 1995). Further,
retrospective research designs employed in much of the research, particularly in the study
of the evolution of back pain, can lead to overestimation of favorable outcome for often
the populations ultimately examined do not include those for whom prognosis is poor.
Prospective studies are more revealing (Wahlgren et al, 1997; Crook et al, 1998, in
press). More recent research challenges the earlier findings of favorable outcome.

Recent work by Baldwin et al (1996) highlights the “fallacy” of favorable outcome
created by use of initial return-to-work as sole outcome measure. First return-to-work
after injury marks a return to stable employment for less than 40% of injured workers. If,
as Baldwin et al note, initial return to work had been the sole objective in their survey of
Ontario workers with permanent impairment, they would have had to assume that 85% of
the workers recovered and returned to work. In fact, they found that 61% of the workers
who initially returned to work incurred periods of work absence related to the original
up study of injured workers, that if the worker had not returned to work (RTW) by three
months, there was a 50% probability that he/she would be off work at 15 months, and a
22% probability that he/she would remain on work disability and not make any attempt to
State Workers’ Compensation, 17.5% of all initial disability claims were found to involve
at least 6 months of lost time. A further 12 % involved one year of lost time, and 7.4%
involved at least 2 years of lost time (Cheadle et al, 1994).

Current research in the area of musculoskeletal injury and pain has sought to elucidate,
among other things, the natural history and trajectory of recovery, prognostic factors, and
outcome measures. The research has employed a variety of designs, including
epidemiological survey follow-ups, long-term prognostic examinations of specific
conditions/problems, and long-term follow-ups of treatment with control groups, in the
investigation of these issues. This body of research is discussed below.
The Research on Natural History and Trajectory of Recovery

Investigation into the process of recovery and/or development of disability has yielded considerable information on the natural history of post-traumatic musculoskeletal pain. At this juncture, there appears to be four critical findings. First, the research suggests that there is a higher level of persistent pain and functional disability than previously assumed (Wahlgren et al, 1997; Von Korff and Saunders, 1996; Von Korff et al, 1993). Von Korff, in a study of primary back pain patients, reported that 24% of recent onset patients and 36% of non-recent onset patients experience a fair to poor outcome in the long-term (i.e., at one year follow-up). Approximately 33% of primary care patients with back pain experienced back pain of at least moderate intensity and 15% reported severe intensity back pain. Twenty to twenty-five (20 to 25) percent of patients, the research suggests, will continue to report substantial activity limitation (Von Korff and Saunders, 1996). Wahlgren et al (1997) conducted a cohort study of 76 males experiencing a first episode of back pain. Follow-ups were made at 2, 6 and 12 months. At 6 and 12 months post-pain onset, most (78%, 72% respectively) continued to experience pain. Twenty-six (26) percent at 6 months, and 14% at 12 months, reported marked disability. Follow-up measurement revealed greater change in the cohort in the 2 to 6 month interval than in later assessments. By 6 and 12 months, there was relative stability. The authors suggest that individuals at risk for marked symptoms one year after the initial episode of back pain can be identified early. Unwarranted assumptions based on administrative data on return to work, or on health care utilization, do not provide an accurate reflection of the natural history of back pain. All acute problems do not completely dissipate within 6 months. Many individuals return to work or do not seek medical care but may continue to experience moderate to severe back pain (Von Korff, 1994; Linton, 1997).

A number of studies suggest that there is high variability in sub-acute and chronic pain conditions (Turk and Rudy, 1988; Von Korff et al, 1992; Klapow et al, 1993; Tunks, 1990) and trajectories (Crook et al, 1989; Crook and Moldofsky, 1996). The course of back pain, for example, has been found to be highly unpredictable and unstable (Von Korff and Saunders, 1996; Linton and Hallden, 1997). It is now clear that there is a wide range of outcomes in workers whose injuries initially appear similar. A majority of injured workers will achieve full recovery; however, others will suffer recurrent episodes and a small minority will go on to chronicity and disability.

The research into pain trajectory reveals the impact of treatment upon the clinical course of post-traumatic pain. Comparing untreated to treated conditions in long-term of one or more years, untreated conditions were found to show not dissimilar trajectories of recovery of pain, disability and return to work, although treated groups had an initial advantage (Lindstrom et al, 1992; Mitchell and Carmen, 1990). An increase in other musculoskeletal morbidity with time was noted even in treated individuals, but more in those untreated (Lindstrom et al, 1992; Harkapaa et al, 1990).

A body of current research suggests that there is a “perseveration” effect in the clinical course of musculoskeletal pain (i.e., some workers will fail to get better but not get worse while others will improve) (Philips and Grant, 1991a,b; Philips et al, 1991). Wahlgren et
al (1997) suggest that problems associated with chronic pain may not reflect a progressive worsening of symptoms, but rather a failure of symptoms to resolve after onset (Von Korff and Saunders, 1996). Other research challenges this notion of “perseveration” of injured workers. Change, according to this body of research, is far more multi-dimensional than the “perseveration” effect would suggest. Crook and Moldofsky (1996), for example, demonstrated that some variables improved equally over time and other variables tended not to improve very much, or to improve rather unequally over time. McArthur et al (1987) also found considerable variability in outcome measures, not the simple dichotomy of better-worse suggested by the perseveration effect. McArthur et al (1987) conducted a 5 year follow-up of treatment outcome of a cognitive behavioral program for chronic low back pain patients. They reported that 12% of the cases had completely favorable outcomes on 6 behavioral measures; RTW, not in litigation, low self-rating of pain, pain does not prevent activity, not using pain medications, and not hospitalized for pain. On average 7% of the cases reported a complete lack of favorable outcome. On certain measures, such as RTW and Use of Medication, the results indicated a steady improvement over time for participants of the treatment program. In other areas, such as the Impairment of Activity, the results were not consistent over time. At the first long-term follow-up, a small but significant proportion of participants reported favorably on all 6 measures. At all subsequent follow-ups, the majority of these successful participants reported no change in status. In addition, a number of unsuccessful participants no longer reported any unfavorable outcomes. A few cases in later follow-ups, however, reported one or more unfavorable outcomes, and a large percentage of the sample never presented a completely successful picture at any observation. Maruta et al (1998) followed a cohort of patients with chronic pain 13 years after treatment in a pain management center. As there was no control group, comparisons were not made and any inferences would be speculative; nevertheless, several observations are of interest. First, there was improvement in employment status on follow-up (from 12% employed pre-treatment to 25%). Second, there was long-term stability in reports of bodily pain (68% of the respondents), and problems with work or other daily activities, social functioning and physical functioning were attributed to this pain.

**PROGNOSIS**

*Risk and Prognosis*

Factors associated with a higher rate of back pain have been reported to include heavy, unpleasant, and dangerous work (Major, 1970; Spitzer et al, 1987) higher age and lower wage (Volinn et al, 1991), and previous pain sicklistings (Goertz, 1990; Pederson, 1981).

The desire to predict injury, disability and handicap has led to a multitude of studies, each claiming to have found a significant explanatory variable. A distinction, however, must be made between factors related to an increase in the risk of incurring injury or an incident of pain and those related to the clinical course of an injury already sustained. The two have separate foci and, more importantly, different related factors –i.e., the factors associated with an increased risk for injury are not necessarily the same as those
associated with a worse prognosis (Crook, 1994). Some factors, e.g. heavy work/labor/construction, may be both a risk factor for back injury and a prognostic factor for continued work loss. A discussion of the risk factors of injury is outside the scope of this paper. For information regarding risk factors for an incident of pain or injury, the reader is referred to one of the following published reviews: Battie and Bigos, 1991; Borenstein, 1990; Hulshof et al, 1987; Taylor, 1989; Pope, 1989; Yu et al, 1984; Frymoyer and Cats-Baril, 1991; Frymoyer and Pope, 1978; Frymoyer et al, 1983; Troup, 1984; Heliovaara, 1989.

Prognostic Factors

The probability of return to work decreases with months off the job. At 2 months it is about 70%, at 6 months 50%, at 12 months 30%, and at 2 years 10% (Waddell, 1992). As noted supra, several studies have independently confirmed that it is the small number of chronic claimants who accrue most of the back injury costs (Spitzer et al, 1987; Spengler et al, 1986; Snook, 1988; Webster and Snook, 1990; Volinn, 1991). Little is known about those workers who are at high risk for developing a chronic problem and continued work disability. A number of studies have identified many potential factors associated with a worse prognosis in musculoskeletal pain. Unfortunately, few of the studies met accepted methodological standards for studies of prognosis. The most serious methodological shortcomings were: (a) a failure to distinguish between etiologic and prognostic factors; (b) a failure to control for the time at which subjects were enrolled, and; (c) a failure to perform multivariate analysis (Crook, 1994; Crook and Moldofsky, 1998). Given the methodological quality of the studies, the evidence suggests that, out of the hundreds identified, only the following factors may affect recovery; socio-demographic factors, work factors, compensation factors, physical impairments, psychological impairments, functional disabilities, and social support (See Appendix for “Factors Summary”).

Socio-demographic Factors

Socio-demographic factors have been examined by several researchers. Increasing age has been positively associated with increased work disability (Rossignol et al, 1988; Goertz, 1990; Volinn et al, 1991; Cheadle et al, 1994; Butler et al, 1995). Lower levels of education were more likely to result in lower rates of returning to work (Deyo and Diehl, 1988; Butler et al, 1995). Similarly, lower socioeconomic status and lower wage have been reported as important factors in work disability (Deyo and Tsui-Wu, 1987; Volinn et al, 1991).

The influence of gender on work disability has also been examined. In worker surveys, women had fewer injuries than men, but a significantly increased risk of having a high cost injury claim (Spengler et al, 1986). However, the pattern was not noted by Rossignol et al, 1988, Coste et al, 1994 nor Cheadle et al, 1994. Females had one-third the rate of return to work of males, although they were more likely to remain at work once they returned (Crook and Moldofsky, 1994). This finding was in contrast to that of Butler et al (1995), whose results showed that gender does not affect the probability of
returning to work, but among those who return, women are much more likely than men to experience multiple spells of work absence and unsuccessful returns-to-work.

**Work Factors**

Length of time out of work (Gallagher et al, 1989), strenuous work, the overall working environment and conditions, the interaction of job demands, and the physical limitation experienced in performing work, have been associated with an increase in the duration of work disability (Yelin et al, 1986). Job dissatisfaction and adversarial relationships on the job have also been implicated (Bigos et al, 1991), although work dissatisfaction may also be a function of the inability to perform the job (Dehlin and Berg, 1977) or the symptoms experienced during activity (Feuerstein et al, 1985; Sandstrom and Esbjornsson, 1986). Conversely, job availability (Polatin et al, 1989), ease of changing occupations (Gallager et al, 1989; Hewson et al, 1987), use of aids, and modified job requirements to promote a fit between worker’s capacity and the job requirements are important factors in decreasing work disability (Yelin et al, 1986; Crook et al, 1998, in press). The availability of a modified job was found to be positively associated with return to work rates. The rate was doubled in instances where a modified job was available to injured workers upon their return to the workplace. Some of the ways employers modified jobs were through a change in the physical or cognitive demands of the job, shorter hours, more/longer rest periods, modification of machinery, and/or a decrease in expected output (Crook et al, 1998, in press). The number of times work re-entry is tried increases the likelihood of success in returning to work (Crook, 1994). Larger firms had shorter durations of disability (Cheadle et al, 1994).

**Compensation Factors**

Some authors have regarded compensation as being a prognostic factor in the perpetuation of pain disability (Fordyce, 1995; Battie and Bigos, 1991), but this viewpoint has not been universally accepted. Dworkin et al (1985) found that differences in pretreatment disability were a key variable. Those who were not working had poorer outcomes than those who still worked, and when employment and compensation were used to predict outcome in a multiple regression analysis, only employment was significant. Flor et al (1992) found, in a meta-analysis, that virtually no significant correlations were found between effect sizes of treatment, compensation and litigation, pain duration, treatment duration, or age. Some clinicians have recommended legal settlement before beginning rehabilitation (Sternbach, 1987). This serves only to delay treatment and to decrease likelihood of favorable outcome.

**Physical Impairments**

The prognostic importance of pain characteristics has been examined by several researchers. The site of symptoms (Rossignol et al, 1988; Cheadle et al, 1994; Butler et al, 1995), the number of painful sites (Crook et al, 1998, in press; Von Korff et al, 1988), pain grades (a measure based on pain intensity and number of disability days) (Von Korff, 1991), and pain behavior (Crook et al, 1998, in press) were found to be
prognostically important. Previous pain sick-listings have also been implicated (Goertz, 1990).

Several measures of health, for example general health (Biering-Sorenson, 1986), and overall health status (Von Korff, 1991), affected the probability of work loss. Fatigue was also identified as an important factor in relation to work disability (Linton et al, 1989).

**Psychological Impairments**

Comorbidity of persistent pain with psychological factors, particularly depression and anxiety or dysthymic conditions, is an important clinical and prognostic factor (Dworkin et al, 1986; Valfors, 1985; Crook et al, 1988; Tunks, 1986). There are several studies that demonstrate almost a three-fold risk of development of depression in the approximately 2 years from onset of chronic pain (Atkinson et al, 1988; Brown, 1990; Magni et al, 1994; Breslau et al, 1994). The presence of depression is an important factor in increasing pain intensity, impairment, and behavior (Haythornwaite et al, 1991). For this reason, identification and treatment of depression is an important factor in the selection factors that brought persistent pain sufferers to specialty clinics. These factors also importantly influenced prognosis on follow-up (Crook et al, 1986) and return to work (Crook et al, 1998, in press).

**Functional Disability**

The prognostic importance of functional disability in relationship to work disability appears well-established from early studies (Berkowitz, 1976; Nagi, 1976). Limitations in specific physical functions, namely walking, bending, and climbing, contributed to work disability (Yelin et al, 1986). Activities of daily living (Sandstrom and Esbjornson, 1986) or discomfort in activities (Turner et al, 1983) were also identified as prognostically important.

**Social Support**

Social support has been suggested as a buffer or modifier of the effects of injury. There is descriptive evidence that chronic pain sufferers experience continuing stressors, particularly in the areas of diminished social functioning, role changes, financial, marital and sexual strain. These factors have not been examined in methodologically sound studies so their influence on chronicity or work disability remains suggestive only.

**Changes in Prognostic Status as a Function of Time**

Time dependent covariates describe changes in workers’ prognostic status as a function of time. The importance of time-dependent models lies, partly, in their ability to identify changes that occur over time. One cohort study of workers with musculoskeletal injuries who had not returned to work by 3 months (Crook et al, 1998, in press) has dealt with the effects of variables that may change over the follow-up period. The variables examined
were: pain, physical and psychological impairments, functional and social disability, and the resulting handicaps. These variables were entered into time-dependent models. Functional disability and handicap for physical independence were negatively associated with return to work rates.

**How Prognostic Indicators can be Interpreted on an Individual Clinical Basis**

While the above indicators show significant relationships to outcome, and are useful and important flags, it is seductive and erroneous to use them in a prescriptive fashion in individual casework. An adjudicator who finds report of multiple predictive factors at two months should not use this to disallow further treatment/claims, since these predictions hold for groups, and not necessarily for individuals. However, red flags can be useful in early identification of those who require special attention, more vigorous multimodal assessment/treatment, or interpretation of treatment failures.

Crook and Moldofsky (1996) developed cluster groupings of workers who had not returned to work by 3 months post-injury based on prognostically important clinical variables; pain sites, functional limitations and pain behaviors. Their purpose was to divide the original cohort into subgroups of injured workers who were similar in their prognostic expectations in relation to future work disability. Those considered high level impaired (25%) had the highest number of painful sites, the highest number of functional limitations and pain behavior. When followed over time, the highest level impaired injured workers tended to demonstrate the greatest emotional distress and interference in occupational, social, familial and recreational roles, and these difficulties increased over time. Pain, sleep disturbance, fatigue, and overall impairment increased over time in the high risk group. The ability of these three variables to predict RTW in injured workers who were sick-listed for 3 months was deemed valid.

**SYSTEMATIC REVIEW OF REVIEWS:**

In order to search for relevant publications, searches were performed in Medline/Pubmed and in the Cochrane Library. There was no specified time limit. Searches were performed with respect to clinical disorder, publication type, intervention type, and “related articles”. The categories for clinical disorder were: pain and chronic disease, back pain, neck pain, cumulative trauma disorders. The categories for publication type were: meta-analysis, systematic review, RCT, follow-up studies, treatment outcome studies, and practice guidelines. The categories for intervention type were; cognitive therapy, combined modality therapy, multimodal, manipulation, chiropractic, patient education, psychotherapy, behavior therapy, cognitive therapy. The “related articles” option was chosen in Medline/Pubmed. Language choice was English.

While the main strategy was to retrieve quality systematic reviews and meta-analyses to perform a review of reviews, the literature on injection therapies for “myofascial pains” and soft tissue pain, and on opioids for nonmalignant pain, has only a few RCTs. Hence, these RCTs were used for the section on “injection therapies”, and on “opioids”.
The retrieved articles were hand-searched for articles that may have been missed by the computer searches. Other experts were consulted for other articles that might have been missed.

Inclusion criteria were systematic reviews or meta-analytic reviews of non-surgical treatment of non-malignant chronic musculoskeletal pain. Exclusion criteria were narrative reviews, reviews that did not include either natural or clinical course, or treatment. Some retrieved citations were rejected on the basis of published abstracts, and a few were rejected after the authors scanned the retrieved articles for inclusion criteria.

Meta-analytic and reviews were independently rated by the authors using the criteria of Oxman and Guyatt (1991). RCTs were rated by one author using the criteria of Jadad et al. (1996). Author blinding was not used. Tables were constructed to summarize the significant findings from this review of reviews, and this was employed for the study and algorithm. There was complete agreement between independent raters on the quality of studies, and on those which should be included or excluded. Table 1 summarizes the included studies, and Table 2 summarizes the three excluded studies.

**Physical Therapies for Chronic Nonmalignant Pain**

Outcome assessment in the selected meta-analyses did not reflect a uniform strategy. This is often due to a wide diversity in experimental design and the plethora of outcome measures in this field, but also has to do with other factors such as poorly designed studies.

Four of the meta-analyses used the judgment of whether the physical therapy were more effective than the comparison treatment,
one used Odds-Ratios,
one used pooled p-values,
one used the calculated mean difference and confidence intervals between the physical therapy and comparison condition,
and one used Effect sizes.

**Manipulation and Manual Therapy**

Beckerman et al. (1993) and Koes et al. (1991) found that some studies on chronic back or neck pain showed a favorable outcome with respect to comparison condition, on measures of function, and sometimes on pain measures. Better studies tended to not demonstrate a significant difference between the manual/manipulative therapy and comparison treatment. Hurwitz et al. (1996) found that the pooled Effect Size for the manipulation condition outcomes approached significance on measures of pain relief (ES = 0.42). The evidence leans to a conclusion that manual therapies/manipulation are probably efficacious, for pain and/or function, in chronic neck/back pain, but the efficacy has not been demonstrated to be pronounced or universal.
Ultrasound

Beckerman et al. (1993) concluded that the evidence for ultrasound vs. comparison treatment for chronic MSK pain was inconclusive. Ultrasound cannot be recommended for chronic MSK (back/neck) pain.

Soft Laser

(Because the Beckerman et al. 1993 meta-analysis recapitulates and enlarges on the Beckerman et al. 1992 meta-analysis, only the 1993 study is discussed here.)

Beckerman et al. (1993) noted that soft laser appeared in several studies to be more effective than placebo, but efficacy was not apparently linked to dose. Gam et al. (1993) concluded that the best studies showed no evidence for effect on MSK pain, though some benefit was reported in poorer quality studies. Gross et al. (1997a) concluded that soft laser was not effective. Soft laser cannot be recommended for chronic MSK (back/neck) pain.

Therapeutic Exercise

Spitzer et al. (1987) concluded that active exercise was helpful for LBP of greater than 7 weeks duration. Beckerman et al. (1993) however found 6 years later that the evidence was inconclusive, whereas Gross et al. (1997a) concluded that there was some positive advantage for active exercise, in comparison to passive exercise/treatment. The balance of the evidence points to active exercise being effective for persistent LBP, in contrast to passive physical therapies.

Electromagnetic Therapy

Gross et al. (1997a) concluded that the studies they reviewed appeared to demonstrate some benefit at about 3-4 weeks, but not at 6-12 weeks. Beckerman et al. (1993) noted that of 18 trials retrieved, 9 were of better quality. Of these 9, one demonstrated the efficacy of electromagnetic therapy vs. placebo. On the basis of this evidence, one cannot conclude that electromagnetic therapy is effective.

Transcutaneous Electrical Nerve Stimulation (TENS or TNS or ALTENS)

(Note that ALTENS or “acupuncture-like TNS” actually refers to low-frequency TNS, as opposed to the higher frequencies that are often used in TNS. One should not confuse ALTENS with acupuncture. The above are all forms of electrical stimulation applied to the skin.)

Spitzer et al. (1987) concluded that for LBP of greater than 7 weeks duration, TNS was effective in pain relief. Gadsby and Flowerdew (1996) used Odds Ratios to compare studies of TNS and ALTENS and comparison treatments. On pain measures, they found an Odds Ratio of 1.6 comparing TNS with placebo. They found Odds Ratio of 2.11
comparing TNS/ALTENS vs. placebo, but with no improvement of functional status by SIP. For ALTENS vs. placebo, they found an Odds Ratio of 7.22 for pain relief, and 6.61 for improved range of motion. Gross et al. (1997a) found no significant differences in results of studies comparing TNS with conservative physical therapy. In persistent MSK pain, TNS offers at least short-term relief, but not better than the relief from conservative physical therapy. Low-frequency stimulation offers a greater efficacy with regard to pain and improved range of motion at least in the short-term. (Author’s note: low-frequency stimulation is often more intense and some patients do not tolerate it well.) However, Malone and Strube (1988) did not find TNS to have a higher percentage of patients improved than with control condition, and Effect Size for TNS was 0.46.

TNS may be recommended in certain cases, but is probably inadequate by itself, and needs to be complemented by other avenues to deal with function.

**Traction**

In the meta-analysis by Gross et al. (1997a), comparing studies of traction vs. conservative physical therapy for neck pain, no significant differences were found to support traction as treatment for MSK pain of the neck. Traction cannot be recommended for chronic spinal pain.

**Bed Rest**

In their systematic review in 1987, Spitzer et al. reported that bed rest of not more than two days could be recommended for acute back pain without radiation to a leg (sciatica), but bed rest could not be recommended for more persistent back pain conditions. Prolonged bed rest should not be recommended for back pain.

(There is more recent evidence, noted in the narrative review in a later section, that bed rest for acute back pain is less effective than advice to continue activity within tolerance, in hastening recovery.)

**Systemic Medication**

NSAIDs, analgesics, and muscle relaxants, were found by Spitzer et al. (1987) to be efficacious for LBP of less than 7 days, and not for LBP of longer duration.

**Epidural Cortisone (for sciatica)**

Watts and Silagy (1995) reviewed the evidence for efficacy of epidural cortisone injection for LBP with sciatica. In this systematic review, they calculated Odds Ratios to combine results across studies. The Odds Ratio for short-term relief by epidural cortisone was 2.67, for near complete relief was 2.79, and for long term relief the Odds Ratio was 1.87. Both caudal and lumbar injection route were found to be effective.

For sciatica associated with LBP, epidural cortisone injection can be recommended.
Antidepressant therapy for Pain Relief

Onghena and Van Houdenhove (1992) were able to calculate Effect Sizes in order to combine the results of many antidepressant studies. They concluded that TCA (tricyclic antidepressants) were more effective than comparison conditions (ES = 0.69). The Effect Size for heterocyclic antidepressants vs. comparison conditions was 0.36. Antidepressants were more effective for pains in the head region (ES = 0.93) than in other body regions (ES = 0.44). The analgesic effect was unrelated to organic vs. psychogenic diagnosis, or to the presence of comorbid depression or to an apparent antidepressant effect of treatment, and unrelated to the presence or absence of sedation. It was noted that drugs with a “less selective” biogenic amine reuptake inhibitory effect appeared to be associated with a higher Effect Size (ES = 0.73), than drugs with a more selective effect on biogenic amines (ES 0.32 to 0.40).

Antidepressants can demonstrate analgesic effects, and not just antidepressant effects, in chronic pain conditions.

Psychological Treatments for Chronic Pain

Unimodal Psychological Treatments

Malone and Strube (1988) calculated Effect Sizes in order to examine the efficacy of various psychological treatments in comparison to no treatment. Effect size for “autogenic training” was 2.74, for biofeedback was 0.95, for relaxation was 0.67, and for “placebo” was 2.23. (That is, placebo was more effective than no treatment, and was comparable to some psychological treatments.) However, they also found that operant therapy had effect size of 0.55, which is scarcely different from the control condition.

Patient Education and Back/Neck School

For LBP of greater than 7 days duration, Spitzer et al. (1987) found that “Back School”, or “functional training” or “ergonomic intervention” could be recommended. Cohen et al. (1994) found that reports on patient education for back/neck pain showed inconsistent outcomes. In acute LBP, education interventions reduced pain duration and initial sick-leave in one of two relevant studies. For chronic LBP, relevant studies were inconsistent with regard to pain and function as outcomes of the education intervention. In their review, Cohen et al. concluded that education was more effective than passive treatment or no treatment, but exercise and active treatment was as effective as or better than patient education. DiFabio (1995) found that patient education was not as effective as multimodal therapy with regard to pain and functional outcomes. Gross et al. (1997b) found that education with or without associated medical or physical therapy did not significantly alter pain outcomes.

Although patient education plays a useful role in therapist-patient interaction, and education is a standard part of multimodal therapy, by itself it is an inadequate treatment for chronic neck and back pain.
Multimodal Pain Management Programs

Malone and Strube (1988) found an Effect Size of 1.33 in comparing the efficacy of multimodal programs to no treatment. Flor et al. (1992) found that multimodal therapies in comparison to controls had effect sizes of 0.62 (for shorter duration pains) and 0.81 (for longer duration pains). With regard to return to work as an outcome, they found a mean Effect Size of 0.67, (reflecting a combined return to work in 68% of multimodal-treated patients and in only 36% of control patients.) Multimodal techniques were more effective than single-modality treatments. The greatest efficacy difference was seen in comparing multimodal with placebo/no treatment, and smaller differences were seen in comparing multimodal with physical therapy. DiFabio (1995) found that multimodal therapy combined with “patient education” was more effective than patient education alone with respect to improving pain and function. Studies of inpatient multimodal programs demonstrated greater effect sizes than comprehensive outpatient multimodal programs.

These results strongly indicate the efficacy of multimodal pain management programs. There is no evidence for the superiority of any particular psychological therapy “school” in the operation of multimodal programs. There is adequate demonstration that “back school” alone is not adequate as treatment unless it is combined with other active modalities which usually include goal-setting, active exercise by quotas, some form of tension control training or coping skills training, vocational counselling, and usually social systems intervention. The intensity of the treatment itself is probably an effective ingredient for this therapy, which is indicated for patients who do not show the expected pattern of recovery from persistent pain.

SYSTEMATIC REVIEW OF INJECTION THERAPIES FOR CHRONIC PAIN

Additional RCTs were retrieved using the above search strategies and including the terms injection, anesthetic-local, chronic pain, and related citations. Bibliographies were handsearched for additional articles. Data bases were the same as for the above review of reviews. All 12 retrieved articles were graded for quality according to Jadad et al., (1996). No article was discarded on quality alone, since the number of RCT’s was not large. All are summarized in Table 3. Of the twelve RCTs located, three were graded at 5 on a scale of 0-5, where 5 is the highest score. One was graded at 4, seven were graded at 3, and one at 2. (See table 3)

Injections into soft tissue for chronic back and neck pain and myofascial pain

Nine dealt with injections into soft tissue. Of these, two were graded at 5, one at 4, five at grade 3, and one at 2. Ongley et al. (1987) reported a study of a rather complex treatment consisting of injection of a proliferant (sclerosing) agent plus cortisone and lignocaine, plus manipulation: this was compared to a control condition of saline, lignocaine, and minor manipulation. The experimental treatment was more effective than the control. This was
one of the better studies, but it does not allow one to decipher the relative efficacy of the components of the treatment.

The three studies that compared soft tissue saline injection to comparison treatment came to contradictory results. The best of these three studies favored saline to lignocaine injection in a period up to two weeks.

The study by Sonne et al. (1985) favored lignocaine plus cortisone over cortisone alone on self-report and pain up to 2 weeks. The three studies of lignocaine vs. comparison injection came to contradictory results, but the best of these studies (Frost et al., 1980) favored saline over lignocaine up to 2 weeks. One of the best studies (Garvey et al., 1989) failed to show an advantage of invasive treatment (either injection or acupuncture) over non-invasive treatment (vapocoolant and acupressure).

These results do not support the efficacy of injection therapies over control treatment for chronic back, neck, and myofascial pain.

Injections into spinal facet joints for low back pain

Of the three studies in this group, one was graded 5 and two were graded 3. The best study by Carette et al. (1991) found that at six months, but not at one and three months, patients who had the cortisone injection into facet joints fared better than those with saline injection to facet joints, on pain and function measures. However, Marks et al. (1992) found that those with facet blocks were significantly better only at one month than those who had blocks around but not in facets, but significant advantages were not found at other times up to three months followup. Lilius et al. (1989) found that there were no advantages of facet over non-facet injections, or of cortisone over non-cortisone injections.

Facet injection for chronic back pain is not supported by these studies.

Injection of cortisone vs. comparison for low back pain

In this group, two studies were graded 5, and three were graded 3. The two best studies (Garvey et al., 1989; Carette et al., 1991) came to contradictory results. Of the five studies in the group, three came to the conclusion that cortisone injections (with or without anesthetic) was significantly better than comparison treatment on measures of pain and self-report.

Injection of non-cortisone agents vs. comparison for back/neck/muscle pain

Of the seven studies in this group, two were graded at 5, one at 4, three at 3, and one at 2. Inconsistent results were found for saline vs. lignocaine (two studies), and for saline vs. sterile water (two studies). Garvey et al. (1989) did not demonstrate greater efficacy for invasive treatments, while Ongley et al. (1987) demonstrated efficacy for a complex intervention that involved both invasive and noninvasive components.
Injection therapies for pain in the upper back/neck or the lower back

Three studies involved upper back/neck pain, while eight involved lower back pain. The best studies tended to involve lower back pain, but there were no studies comparing outcomes in pain relief in upper vs. lower back. There did not appear to be any trend for either upper or lower back studies to reflect a greater success rate of experimental vs. control condition.

Injection therapies for pain greater than or less than three months

Eight studies concerned patients with pain of three months or more, one concerned "acute" myofascial pain, and from three studies it was not possible to clearly determine pain durations of subjects. There did not appear to be trend for shorter or longer duration pain to reflect a greater success rate of experimental vs. control condition.

Although injection therapy of anesthetic or cortisone into chronic back or neck soft tissue or facet joints is a widespread clinical practice, the evidence for efficacy for injection of anesthetic, saline, sterile water, or cortisone into painful soft tissues or facet joints is at best inconsistent and contradictory.

OPIATE FOR CHRONIC NON-MALIGNANT PAIN

Although there is a growing literature which increasingly favors the practice of prescribing opiates for some patients with non-malignant chronic pain, to date most of the literature has depended on uncontrolled studies and extrapolations from palliative care practice (Portenoy, 1994). Consensus guidelines have also been drawn up in several jurisdictions for opiate use in nonmalignant pain, including Alberta College of Physicians and Surgeons (1993), the British Columbia College of Physicians and Surgeons (adopting the Alberta Guidelines, 1995), the joint guidelines of the American Academy of Pain Medicine and the American Pain Society (1997), the Medical Board of California (1994), and the American Society of Anesthesiologists (1997).

A search of the literature only retrieves two RCTs to date that specifically deal with this issue. Both are good studies. Arkinstall et al. (1995) report an RCT double blind study of 30 patients with diagnoses mostly of a variety of MSK disorders. Although the illness duration is not given, the mean opiate duration use was 72.6 +/- 65.8 mos. Moderate doses of sustained release codeine were compared to placebo, over a week, with a further 19 weeks of unblinded use for followup. The outcomes significantly favored the codeine on pain, PDI, self-report, and use of rescue doses, and efficacy was not apparently lost during the further unblinded use.

Moulin et al. (1996) conducted an RCT double-blind study on 46 patients with a variety of musculoskeletal disorders, of duration 4.1 years (0.75-21 yr). Moderate doses of sustained release morphine were compared to active placebo (benztropine) over a study duration of 9
weeks (before crossover). The morphine group did significantly better on pain, but other measures including PDI, drug liking, and a mood scale failed to show significant difference. A sequence effect was noted at the end of the first arm of the trial, influencing the results of the second arm of the trial.

The conclusion from the above is that there is some evidence that a mixed diagnostic group of chronic MSK patients will experience at least pain relief, if not self-report of functional improvement, in nine to nineteen weeks of followup, using sustained release opioids in moderate doses. Whether a more liberal view towards the use of opioids in nonmalignant pain leads to longer-term problems of analgesic failure, complication, or misuse, in this population is still to be ascertained by further studies.

MEASUREMENT ISSUES IN OUTCOMES

Flor et al. (1992) found greater differences in outcomes by using less subjective measures, and more objective and functional measures, in studies of multimodal treatment. Malone and Strube (1988) found that reported symptoms, mood, and EMG recordings consistently showed improvement, and the least variation, as outcomes for psychological interventions.

Measures and Clinical Indicators

Numerous measures exist and no one measure can be generally recommended for all administrative or clinical purposes. There are no gold standard measures for psychological comorbidity, physical function, or pain-distress. However, in every case where differences are demonstrated, the differences can be accounted for by these three variables (for example, see Harkapaa et al., 1990): i.e., it is good counsel to advise a validated measure in each of these three categories.

Time is also a factor that must be considered in interpreting studies. Numerous studies demonstrate that between two and six months, those who have not yet recovered are highly likely to have persistent significant problems at one year or more (Von Korff, 1988; Wahlgren, 1997; Barnsley et al, 1994).

Measures serve different purposes and must be chosen accordingly. Scientific studies depend on widely accepted objective standardized measures designed for the population under study. These same measures may be useful as flags in individual cases, though no one objective measure recommends itself for all individual cases. However, self-report measures, and those with more of a subjective quality, may be more helpful in certain clinical situations, in individual case management/decision making by clinicians (i.e., pain drawing, pain scales, disability rating, depression/psychological distress scales, etc).

The choice of an outcome variable is almost inevitably a compromise based on the interplay among several factors:
**The Precision of the Measures**

Measures that are subject to a large degree of random variation or individual interpretation are less useful than measures that are more precise and reproducible. So-called “objective measures”, such as radiology, have high error rates. In addition, results of commonly used diagnostic measures have often been found to bear little relationship to symptoms, function, well-being and/or vocational/employment status. Measures should be valid and reliable (Flor et al, 1992; Gross, 1997; Beckerman et al, 1993).

**Importance**

The outcome variable(s) should possess relevance to the burden of illness on the injured worker, and/or compensation system(s), and/or the workplace, and/or society in general (Feine and Lund, 1997).

**Sensitivity/Responsiveness**

For a variable to be useful, there must be some reasonable chance that it is related to, or likely to change with, the independent variable under study (Beckerman et al, 1993).

**Appropriate**

The outcome variable(s) must be appropriate to the research goals and to the treatment being tested.

**Decision Rules If Several Outcome Measures Are Used**

A multi-dimensional model of outcomes is needed (Malone and Strube, 1988). Priority of the outcomes must be specified prior to the research where several outcome measures are used, since by chance some outcomes may change while others do not change.

**Choosing Optimal Points for Measurement of Outcomes**

Prior to undertaking research, investigators must consider the relative importance of the outcome variables in relation to the “natural” clinical course of the illness/injury (Cohen et al, 1994). To accomplish this, one must have access to relevant epidemiological research regarding similar clinical groups, in order to establish the expected course of similar patients with or without the intervention under study. Consider these examples. The natural history of musculoskeletal injury is variable, with a wide range of outcomes in patients whose injuries initially appear similar, often due to associated clinical factors that may or may not be clearly identified (Crook and Moldofsky, 1996). Overestimation of favorable prognosis of persistent musculoskeletal pain may be due, in part, to short term clinical results combined with considerable natural fluctuation in musculoskeletal pain giving an appearance of rapid recovery (von Korff and Saunders, 1996; Wahlgren et al, 1997). Inadequate understanding of the highly variable course of back pain can lead to false conclusions about the need for and the benefits of therapeutic interventions (Von Korff, 1994; Linton, 1997).
**Blinded Outcome Measures should be Used**

Blinded outcome measures reduce expectation bias; that is, blinded measures prevent the situation where the assessor finds the results he/she expects, or outcomes favoring the treatment s/he prefers.

Measure chosen should have been validated in samples of people who are similar to those on whom the measure is to be presently used.

Different instruments may alter the description, intervention and prioritization of musculoskeletal injuries (Beaton et al, 1996).

**Outcome Measures must be Comparable to Draw General Conclusions across Studies**

Collaboration among researchers often depends on ability to use the same standardized outcome instruments, across studies that target different interventions, industries, or occupations. These outcome measures can generally categorized into patient variables, work disability and benefit status variables, and health care utilization variables.

**Outcome Variables:**

1. **Patient Variables** - Patient variables include: pain (duration; recurrences; severity; persistence) (Schierhout and Myers, 1996); adjustment & quality of life (Pransky and Himmelstein, 1996); functional ability and increased activities of daily living; success/improvement (good vs. poor responders); chronicity (defined in a variety of ways), and psychological disturbance/depression.

2. **Work Disability** – Work disability is, generally, assessed by: time away from work, length of sickness absence, work days lost, RTW, recurrent absenteeism, and/or benefit status (Burdorf et al, 1997; Pransky and Himmelstein, 1996; Baldwin et al, 1996).

3. **Health Care Utilization** – Health care utilization is often gauged by referrals and visits to health care professionals, and/or medication use.

**MISUSE OF EVIDENCE**

It may be tempting for someone looking for a quick answer to a difficult problem to take an uncritical view of good quality evidence. The evidence is good, but the meaning can be distorted. A few examples are pertinent.

- Unimodal therapies are less efficacious than multimodal for chronic pain (Bigos et al., 1994; Flor et al., 1992; Crook and Tunks, 1996). One cannot assume from this that all chronic pain patients should be treated in multimodal programs. The
economics and logistics of this would be prohibitive. But this serves as a yardstick for relative efficacy that can guide policies regarding the need for multimodal clinics as an option when triaging patients to the most appropriate treatments.

- Active therapy superior to passive (Bigos et al., 1994), but this does not mean that passive therapy is not helpful, or that it is harmful, if it is combined with multimodal (Gross et al, 1996).

- There is no evidence that any one type (or “school”) psychological treatment is superior as a component of multimodal therapy (Altmaier et al., 1992; Turner et al., 1990). One cannot extrapolate from this that “the cheaper the better”, and set a policy that restricts multimodal programs to use only the least intensive or most generic of therapies, since type of therapy still needs to be matched to the quality of the clinical problem and capacity of the patient.

- Apart from secondary prevention for those who have already had a pain episode, no literature shows any method effective for prevention (Daltroy et al., 1997). Back schools/education are not efficacious unless they are a component in multimodal treatment (DiFabio, 1995). But it does not follow that patient education should be abolished, since it is still an essential ingredient in factors such as patient compliance, the doctor-patient relationship, and the patient’s rights to be informed.

- Patients with high pain reports, high functional impairment, widespread pain, and psychological comorbidity, have a poor prognosis (Crook and Tunks, 1996). But an adjudicator or adjustor cannot correctly extrapolate from this statistical observation to the case of a single individual and deny appropriate treatment on the grounds that “groups with these characteristics tend to do poorer”—individuals within a group do not necessarily have the identical outcome to the group as a whole.

Most clinicians are aware that there are now widely accepted guidelines, based on good scientific studies, that work-injured patients should be treated with active therapies such as exercise, and expectations that they should make an early attempt to return to work. These guidelines are presented in many publications, including Bigos et al (1994). It is important not to misconstrue the guidelines or the evidence on which they are based. For example, see below.

- For acute low back pain, Malmivaara et al (1995) assigned patients randomly either to two days of bed rest, or to prescribed exercise, or to being advised to continue their routines as much as permitted by their back pains. At one and two weeks, the normal activity group had significantly faster recovery than the bed rest or exercise groups, but at twelve weeks there were no differences between the groups. This means that the normal activity approach is significantly better in the short-term, and is recommended during the first month after injury, but one cannot conclude from this that “expecting normal activity and return to work” has the identical effect on longer-term outcomes.
• Lindstrom et al (1992) studied workers with back pain of about 2 months duration. The patients were randomized to 2 groups; one which had treatment by their family doctors only, and the other groups which had functional capacity measurement, a work-place visit, back care education, and a program of increasing active exercise with expectation that they should return to work as soon as possible. The active rehabilitation group did better on several measures. Forty-two (42) % of the active treatment group had no back pain recurrences in the second year follow-up, while 21% of the control group had no recurrences in the second year follow-up. This shows that in the first two months of back pain occurrence, an emphasis on improved function increases a positive outcome, which can be measured even in the second year, but it cannot be assumed that the active approach guarantees a positive outcome; indeed, about 60% of the positive outcome group had had recurrences. An agency should not make the assumption that if a patient is sent for appropriate treatment, that they must necessarily recover or be deemed unmotivated.

• Mitchell et al (1990) compared outcomes of injured workers (back pain of a few months duration) referred to active treatment (exercise with expectation of return to work), and workers treated only by their own physicians. By the end of the study period, about 85% of workers treated by the active treatment clinics had returned to their jobs, while about 75% of those treated by their own physicians had returned. By about a year, the proportion of workers returned to work was gradually becoming more similar in the two treatment groups. One cannot assume that because the active treatment group returned their patients to work earlier, they must have had a better result, since forcing returning to work without followup does not ensure that patients are fit for work and will continue at work.

• Mayer et al. (1985) studied workers who had had chronic back pain an average of 2 years. Some were treated with a program of education, active and increasing exercise, and expectation of return to work, while the others were not eligible for treatment or dropped out of treatment. At one year, 85% of the active treatment group had returned to work compared to 45% of the untreated group, and the active treatment group had half the rate of health care utilization, and were significantly more fit, compared to the other groups. This shows the superiority of an active multimodal program of exercise and education for chronic back pain, but it also demonstrates that a positive response to such treatment is more probable, rather than guaranteed.
Key Issues

- Rigid application of simplistic models of recovery do injustice to proper intervention and evaluation.
- Important indicators include time, dysfunction, pain-distress, and comorbidity - all should be considered all along the way.
- True prevention is still undemonstrated.
- Problems that recover slowly probably are multifactorial and require multimodal intervention.
- There is still no gold-standard for the most essential elements of multimodal treatment; therefore, how to “ensure quality control” if a greater dissemination of such services is contemplated?

New Avenues in Light of WCB Realities

- Need for flexible system of decision-making, using indicators and red flags to aid disposition but not to use clinical care maps or algorithms rigidly or prescriptively.
- Need to promote a more responsive clinical approach that can adjust to indicators on individual basis.
- Knowing when to not intervene further, because it is harmful for the patient, and wasteful for the agency. Research is needed into the “red flags” for lack of consent, lack of engagement, and identification of factors that contraindicate chronic pain treatment.
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APPENDIX 1

META ANALYSES AND REVIEWS
## REVIEWS OF THERAPIES FOR CHRONIC PAIN

**Therapy: Multimodal Pain Treatment**

<table>
<thead>
<tr>
<th>AUTHORS</th>
<th>POP. STUDIED</th>
<th>N</th>
<th>QUALITY OF METHODS</th>
<th>N OF STUDIES INCLUDED</th>
<th>RESULTS: OUTCOME - EFFECT SIZE</th>
<th>DIRECTION OF EFFECT</th>
</tr>
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<tbody>
<tr>
<td>Flor H, Fydrich T, Turk D, 1992</td>
<td>Chronic Pain</td>
<td>3089</td>
<td>Acceptable</td>
<td>65 of 300 met inclusion criteria</td>
<td>Time: Follow-up Between - group ES (S.D.)</td>
<td>ζ30% improvement more than control ζ38% improvement more than control</td>
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<tr>
<td></td>
<td></td>
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<td>Assessor 1 =</td>
<td></td>
<td>&lt; 6 months = .62 (.47) &gt; 6 months = .81 (.66)</td>
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<td></td>
<td></td>
<td></td>
<td>Acceptable</td>
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<td></td>
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<td>Assessor 2 =</td>
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<td></td>
<td></td>
<td></td>
<td>Acceptable</td>
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<td>Multimodal compared to single modality: To Medical = .83 (.56) To Placebo = .97 (.13) To Physical Therapy = .41 (.30)</td>
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<td></td>
<td>Multimodal treatments more effective than single treatments</td>
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<td></td>
<td></td>
<td></td>
<td>By Outcome Measures: Between - group ES</td>
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<td>} Greater between group differences measured improvement by using less subjective measures and objective or functional measures</td>
</tr>
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<td></td>
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<td>Psychopysiological = .84 (.26) Behavioral = .65 (.70) Pain = .70 (.66) Interference = 1.10 (.67) Mood = .63 (.33) Other Subjective = .47 (.48)</td>
<td></td>
<td></td>
<td>} Greater between group differences measured improvement by using less subjective measures and objective or functional measures</td>
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<td></td>
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<td></td>
<td>Return to Work = .67 (.55) Medication = .61 (.63) Health Care Use = .47 (.51) Activity = .63 (.87) Pain Behavior = .61 (.85) Pre-treatment vs. Post-treatment = 1.35</td>
<td></td>
<td></td>
<td>ζ treated patients more likely to RTW (68% vs. 36% for control) ζ 65% vs. 35% improvement ζ (missing) ζ 65% vs. 35% improvement ζ 65% vs. 35% improvement ζ 56% improvement</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Correlations with Effect Size: Age, pain duration, litigation or compensation, treatment duration or study quality</td>
<td></td>
<td></td>
<td>ζ Not significant correlations</td>
</tr>
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</table>
# REVIEWS OF THERAPIES FOR CHRONIC PAIN

## Therapy: Physical Medicine

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<thead>
<tr>
<th>AUTHORS (Year)</th>
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<th>N</th>
<th>QUALITY OF METHODS</th>
<th>N OF STUDIES INCLUDED</th>
<th>RESULTS: OUTCOME MEASURE POOLED P-VALUES</th>
<th>DIRECTION OF EFFECT</th>
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<tr>
<td>Gross AR, 1997a</td>
<td>Neck Pain</td>
<td>750</td>
<td>Assessor 1 = Acceptable</td>
<td>13 Randomized Controlled Trials</td>
<td>1 Clinical Trial: Spray and Stretch – NS</td>
<td>ç no benefit (Note - small sample size and/or small number of studies)</td>
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<td></td>
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<td>Assessor 2 = Acceptable</td>
<td>1 Randomized Controlled Trials</td>
<td>1 Clinical Trial: Infared Light Therapy – NS</td>
<td>ç no benefit (Note - small sample size and/or small number of studies)</td>
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<td></td>
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<td>3 Clinical Trials: Laser Therapy – NS</td>
<td></td>
<td>ç no benefit (Note – small number of studies)</td>
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<td>2 RCTs: (n-60) Electromagnetic field – pooled p value = 0.0089</td>
<td>2 RCTs: Electromagnetic field - pooled p value = N.S.</td>
<td>ç benefit @ 3 – 4 weeks</td>
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<td></td>
<td>2 RCTs: Acupuncture – data could not be extracted or compared</td>
<td>ç no benefit @ 6-12 weeks</td>
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<td>3 RCTs: Traction vs. conservative therapies</td>
<td>3 RCTs: Traction vs. conservative therapies</td>
<td>ç both reported positive effect</td>
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<td></td>
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<td>2 Studies: Exercise vs. comparison conservative treatment (data could not be extracted)</td>
<td>2 Studies: Exercise vs. comparison conservative treatment (data could not be extracted)</td>
<td>ç no significant effect in 2 studies, and less effective than comparison treatment in 3rd study</td>
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<td></td>
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<td>1 Study: TENS vs. conservative therapy</td>
<td>1 Study: TENS vs. conservative therapy</td>
<td>ç 1 of 2 studies reported significant benefit for active exercise compared to passive treatment</td>
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<td></td>
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<td></td>
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<td>ç no significant difference</td>
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</table>
## REVIEWS OF THERAPIES FOR CHRONIC PAIN

**Therapy: Epidural Corticosteroids**

<table>
<thead>
<tr>
<th>AUTHORS (Year)</th>
<th>POP. STUDIED</th>
<th>N</th>
<th>QUALITY OF METHODS</th>
<th>N OF STUDIES INCLUDED</th>
<th>RESULTS: OUTCOME – ODDS RATIOS AND (95% CONFIDENCE INTERVALS)</th>
<th>DIRECTION OF EFFECT</th>
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<tbody>
<tr>
<td>Watts RW, Silagy CA, 1995</td>
<td>Sciatica Pain</td>
<td>907</td>
<td>Assessor 1 = Acceptable</td>
<td>13 Randomized Controlled Trials</td>
<td>Treatment vs. Placebo: OR = 2.61 (95% CI 1.80 – 3.77) OR = 2.79 (1.92 – 4.06) OR = 1.87 (1.31 – 2.68)</td>
<td>75% better improvement in the short term near complete relief of pain relief of pain in long term</td>
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<td></td>
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<td>Assessor 2 = Acceptable</td>
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<td></td>
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<td>Caudal vs. Lumbar: Caudal: OR = 3.80 (1.36 – 10.6) Lumbar: OR = 2.43 (1.77 – 3.74)</td>
<td>efficacy is independent of injection route</td>
</tr>
</tbody>
</table>
## REVIEWS OF THERAPIES FOR CHRONIC PAIN

**Therapy: Antidepressant-Induced Analgesia**

<table>
<thead>
<tr>
<th>AUTHORS (Year)</th>
<th>POP. STUDIED</th>
<th>N</th>
<th>QUALITY OF METHODS</th>
<th>N OF STUDIES INCLUDED</th>
<th>RESULTS : OUTCOME - EFFECT SIZE (S.E. of ES)</th>
<th>DIRECTION OF EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onghena P, Van Houdenhove B, 1992</td>
<td>Chronic Non-Malignant Pain</td>
<td>1740</td>
<td>Assessor 1 = Acceptable</td>
<td>39</td>
<td>Drug vs. Comparison:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Assessor 2 = Acceptable</td>
<td></td>
<td>Mean ES = 0.64 (0.59)</td>
<td>a median of 58% reported at least 50% pain reduction</td>
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<tr>
<td></td>
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<td></td>
<td>Range – (1.94 to –0.74)</td>
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<td></td>
<td>Tricyclic vs. Heterocyclic Drugs:</td>
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<td></td>
<td>34 Trials</td>
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<td></td>
<td>Tricyclic: Mean ES = 0.69</td>
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<td>Heterocyclic – Mean ES = 0.36</td>
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<td>Region:</td>
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<td>Pain in Head region – Mean ES = 0.93</td>
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<td></td>
<td>Pain in Other Regions – Mean ES = 0.44</td>
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<td></td>
<td>5 HT, NR, or mixed inhibition:</td>
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<td></td>
<td>Serotonergic ES 0.32 (0.21)</td>
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<td></td>
<td>Noradrenorgic ES 0.40 (0.16)</td>
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<td></td>
<td></td>
<td>Mixed ES 0.73 (0.12)</td>
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<td>Sedative/NonSedative:</td>
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<td></td>
<td>ES ranging from 0.46 – 0.67</td>
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<td>NS – pain of organic vs. psychogenic basis</td>
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<td></td>
<td>NS – presence or absence of depression</td>
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<td></td>
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<td></td>
<td>NS – presence or absence of antidepressant effect</td>
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</tbody>
</table>

}
## REVIEWS OF THERAPIES FOR CHRONIC PAIN

*Therapy: Comprehensive Rehabilitation Programs and Back Schools*

<table>
<thead>
<tr>
<th>AUTHORS (Year)</th>
<th>POP. STUDIED</th>
<th>N</th>
<th>QUALITY OF METHODS</th>
<th>N OF STUDIES INCLUDED</th>
<th>RESULTS: OUTCOME - EFFECT SIZE</th>
<th>DIRECTION OF EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Di Fabio R, 1995</td>
<td>Low Back Pain</td>
<td>2373</td>
<td>Assessor 1 = Acceptable</td>
<td>19</td>
<td>Comprehensive Program vs. Back School:</td>
<td>Comprehensive programs were superior to primarily back school programs with respect to pain reduction, increased spinal mobility, and increased strength</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Assessor 2 = Acceptable</td>
<td></td>
<td>Comprehensive Program, incl. Back School (d = 0.28) Back School (d = -0.18)</td>
<td>Work/vocational and disability outcomes were not improved beyond control levels</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Inpatient programs (d = 0.32)</td>
<td>Chronicity did not play role in magnitude of effect size</td>
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<td></td>
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<td></td>
<td>Outpatient programs (d = 0.01)</td>
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<td></td>
<td>Outpatient programs providing comprehensive rehab (d = 0.26)</td>
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</tbody>
</table>
### REVIEWS OF THERAPIES FOR CHRONIC PAIN

**Therapy: Laser Therapy**

<table>
<thead>
<tr>
<th>AUTHORS</th>
<th>POP. STUDIED</th>
<th>N</th>
<th>QUALITY OF METHODS</th>
<th>N OF STUDIES INCLUDED</th>
<th>RESULTS : OUTCOME – SIMPEL COMPARISON</th>
<th>DIRECTION OF EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beckerman H, et. al., 1992</td>
<td>Disorders of the Musculo-skeletal System or Skin Disorders</td>
<td>1704</td>
<td>Assessor 1 = Acceptable</td>
<td>36 Randomized Controlled Trials</td>
<td>7 of the Best RCTs: 3 showed positive results 2 showed negative results 2 the analysis was incorrect</td>
<td></td>
</tr>
</tbody>
</table>
REVIEWS OF THERAPIES FOR CHRONIC PAIN

Therapy: Manipulation and Mobilization

<table>
<thead>
<tr>
<th>AUTHORS</th>
<th>POP. STUDIED</th>
<th>N</th>
<th>QUALITY OF METHODS</th>
<th>N OF STUDIES INCLUDED</th>
<th>RESULTS: OUTCOME - EFFECT SIZE</th>
<th>DIRECTION OF EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hurwitz El, et al., 1996</td>
<td>Neck Pain: Subacute and Chronic</td>
<td>327</td>
<td>Assessor 1 = Acceptable</td>
<td>6 Randomized Control Trials</td>
<td>2 Studies:</td>
<td>One study showed pain threshold improvement – neither showed convincing significant changes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Assessor 2 = Acceptable</td>
<td></td>
<td>RCT - Manipulation and Mobilization</td>
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<tr>
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<td></td>
<td>3 Studies:</td>
<td>Non-significant benefit for manipulation</td>
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<td></td>
<td>2 RCT – Muscle relaxant vs. Muscle relaxant and manipulation</td>
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<td></td>
<td></td>
<td>1 RCT – Manual therapy vs. other conservative therapies</td>
<td>Non-significant pain improvement and modestly significant function improvement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3-pooled effect size 0.42 (-.005, 0.85)</td>
<td>1 Study:</td>
<td>Almost significant effect size for pain relief</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>RCT – Salicylate and mobilization vs. other treatments</td>
<td>Mobilization better re pain a 4 weeks (mobility unchanged)</td>
</tr>
</tbody>
</table>
# REVIEWS OF THERAPIES FOR CHRONIC PAIN

**Therapy: Patient Education**

<table>
<thead>
<tr>
<th>AUTHORS</th>
<th>POP. STUDIED</th>
<th>N</th>
<th>QUALITY OF METHODS</th>
<th>N OF STUDIES INCLUDED</th>
<th>RESULTS: OUTCOME – STANDARD MEAN DIFFERENCE- (95% CONFIDENCE INTERVAL)</th>
<th>DIRECTION OF EFFECT</th>
</tr>
</thead>
</table>
| Gross AR, 1997b | Adults with Mechanical Neck Disorders | 271 | Assessor 1 = Acceptable | 3 Randomized Controlled Trials: 1 RCT of Group Education and 2 RCTs of Individual Teaching | Group Instruction + Exercise vs. Group Education + Psychological Counselling + Exercise:  
Group education: SMD = 0.366 (-0.95, 0.219)  
Group education + Counselling: SMD = 0.073 (-0.513, 0.659) | } did not reduce pain report  
} were not found to be more effective than control or placebo treatments (Note – low statistical power) |
## REVIEWS OF THERAPIES FOR CHRONIC PAIN

### Therapy: Non-Medical Treatments

<table>
<thead>
<tr>
<th>AUTHORS</th>
<th>POP. STUDIED</th>
<th>N OF STUDIES INCLUDED</th>
<th>QUALITY OF METHODS</th>
<th>RESULTS : OUTCOME – EFFECT SIZE (S.D.)</th>
<th>DIRECTION OF EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malone M, Strube M, 1988</td>
<td>Chronic Pain</td>
<td>48 out of 109</td>
<td>Assessor 1 = Borderline</td>
<td>Type of Treatment:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Not Reported</td>
<td>Mean Sample Size = 53</td>
<td>Assessor 2 = Borderline</td>
<td>Autogenic 2.74 (1.95)</td>
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<td></td>
<td></td>
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<td>Pill Placebo 2.23 (2.13)</td>
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<td></td>
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<td></td>
<td>Package 1.33 (1.59)</td>
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<td>Biofeedback 0.95 (1.16)</td>
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<td></td>
<td></td>
<td>Relaxation 0.67 (0.82)</td>
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</tbody>
</table>

### Outcome Measures:
- Symptoms 1.12 (0.40)
- Mood 1.91 (0.92)
- EMG Recordings 0.67 (0.40)

> All treatments were successful when compared to no treatment controls. Effect size by cognitive operant conditioning, relaxation and TENS were no larger than the effect size for control conditions. Hypnosis was based on 1 study.

> These three outcomes consistently showed improvement and the least variability.
# REVIEWS OF THERAPIES FOR CHRONIC PAIN

**Therapy: Transcutaneous Electrical Nerve Stimulation (TENS) and Acupuncture like TENS (ALTENS)**

<table>
<thead>
<tr>
<th>AUTHORS</th>
<th>POP. STUDIED</th>
<th>N</th>
<th>QUALITY OF METHODS</th>
<th>N OF STUDIES INCLUDED</th>
<th>RESULTS: OUTCOME –</th>
<th>DIRECTION OF EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gadsby JG, Flowerdew MD, 1996</td>
<td>Chronic Low Back Pain</td>
<td>288</td>
<td>Assessor 1 =</td>
<td>6 of 69 identified</td>
<td>TENS vs. Placebo: 4 Trials</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Acceptable</td>
<td></td>
<td>OR of 1.62 (95% CI 0.90, 2.68)</td>
<td>} The use of TENS and ALTENS is more effective than placebo for reducing pain.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Assessor 2 =</td>
<td></td>
<td>ALTENS vs. Placebo: 2 Trials</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Acceptable</td>
<td></td>
<td>OR of 7.22 (95% CI 2.60, 20.0)</td>
<td>} The use of TENS/ALTENS is more effective than placebo for reducing pain.</td>
</tr>
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<td></td>
<td>TENS/ALTENS vs. Placebo: 6 trials</td>
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<td></td>
<td>OR of 2.11 (95% CI 1.32, 3.38)</td>
<td>} The use of TENS/ALTENS is more effective than placebo for reducing pain.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>ALTENS vs. Placebo: 2 Trials</td>
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<td></td>
<td></td>
<td></td>
<td>OR of 6.61 (95% CI 2.36, 18.55)</td>
<td>} The use of ALTENS was more effective than placebo for improving range of motion (ROM).</td>
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<td></td>
<td>Positive Response:</td>
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<td></td>
<td></td>
<td>TENS/ALTENS – 45.5% (39.6% - 51.3 %)</td>
<td>} Positive response at end of trials.</td>
</tr>
<tr>
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<td>TENS – 46% (37%, 55%)</td>
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<td></td>
<td>ALTENS – 87% (80%, 93%)</td>
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<td>Placebo – 36.4% (28%, 44%)</td>
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<td>TENS vs. Placebo: 1 Study:</td>
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<td></td>
<td>Functional status</td>
<td>} SIP – no significant differences between TENS and Sham TENS</td>
</tr>
</tbody>
</table>
## REVIEWS OF THERAPIES FOR CHRONIC PAIN

### Therapy: Physiotherapy

<table>
<thead>
<tr>
<th>AUTHORS (Year)</th>
<th>POP. STUDIED</th>
<th>N</th>
<th>QUALITY OF METHODS</th>
<th>N OF STUDIES INCLUDED</th>
<th>OUTCOME – SIMPLE COMPARISON OF OUTCOMES</th>
<th>DIRECTION OF EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beckerman H, et. al., 1993</td>
<td>Musculo-skeletal Disorders</td>
<td>31 Trials:</td>
<td></td>
<td>Assessment 1 = Borderline</td>
<td>180 Trials out of 400 Randomized Control Trials</td>
<td>Back and Neck Pain Manipulation</td>
</tr>
<tr>
<td>Assessor 2 = Borderline</td>
<td>Assessor 2 = Borderline</td>
<td>16 Trials:</td>
<td></td>
<td></td>
<td>Ultrasound</td>
<td></td>
</tr>
<tr>
<td>33 Trials (1592 Patients):</td>
<td>Poor Quality</td>
<td>Laser</td>
<td></td>
<td>Most Trials Poor Quality</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>16 Trials:</td>
<td>Exercise (for back pain) vs. other conservative treatments</td>
<td>18 Studies found positive effects</td>
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<tr>
<td></td>
<td></td>
<td>16 Trials:</td>
<td>Exercise vs. no exercise or placebo (for chronic LBP)</td>
<td>11 Studies had negative effects and these studies had higher methodological scores</td>
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<td></td>
<td>16 Trials:</td>
<td>Comparison of different types of exercise</td>
<td>1 Study favorable effect of exercise &lt; 3 months</td>
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<td>5 Studies: exercise no better than comparison condition</td>
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<td>2 Studies found favorable effects</td>
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<td>2 Studies no favorable effect</td>
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<td></td>
<td></td>
<td>1 Study favorable effect of exercise &lt; 3 months</td>
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<td>2 Studies – flexion better</td>
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<td>2 Studies – extension better</td>
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<td>4 Studies – no differences</td>
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<td>3 Best of 16 Studies – none showed benefit</td>
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<td>All 3 Studies showed no benefit</td>
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<td>9 Better Studies, one showed efficacy (of electromagnetic vs. placebo)</td>
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<td></td>
<td>31 Trials showed positive result</td>
<td></td>
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<td></td>
<td></td>
<td>32 Trials no positive result</td>
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</tbody>
</table>

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**Author:** Beckerman H, et al.

**Year:** 1993

**Population Studied:** Musculoskeletal Disorders

**Quality of Methods:** Assessor 1 = Borderline, Assessor 2 = Borderline

**Number of Studies Included:** 31 Trials (1592 Patients)

**Outcome:** Simple comparison of outcomes

**Direction of Effect:** 18 Studies found positive effects.
11 Studies had negative effects and these studies had higher methodological scores.
No convincing evidence.

**Therapy:** Physiotherapy.
### Therapy: Spinal Manipulation and Mobilization

<table>
<thead>
<tr>
<th>AUTHORS</th>
<th>POP. STUDIED</th>
<th>N</th>
<th>QUALITY OF METHODS</th>
<th>N OF STUDIES INCLUDED</th>
<th>RESULTS : OUTCOME – COMPARISON OF OUTCOMES</th>
<th>DIRECTION OF EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Koes BW, et. al., 1991</td>
<td>Back and Neck Pain</td>
<td>35</td>
<td>Acceptable</td>
<td>18 Studies</td>
<td>ζ favorable results for manipulation compared to reference treatment</td>
<td>ζ reported positive results in one or more subgroups</td>
</tr>
<tr>
<td></td>
<td>Assessor 1 = Acceptable</td>
<td></td>
<td>Randomized Controlled Trials</td>
<td>5 Studies</td>
<td>1 = manipulation better</td>
<td>2 = manipulation better in a subgroup</td>
</tr>
<tr>
<td></td>
<td>Assessor 2 = Acceptable</td>
<td></td>
<td>4 Studies with 50-60 points (out of 100)</td>
<td>11 Studies</td>
<td>1 = no better than reference treatment</td>
<td></td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td>ζ manipulation not better than reference. Negative studies tended to be of higher quality</td>
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</tr>
</tbody>
</table>

CONCLUSION: results are promising but efficacy still has not been convincingly shown. Better studies needed.
## REVIEWS OF THERAPIES FOR CHRONIC PAIN

### Therapy: Group Education Interventions

<table>
<thead>
<tr>
<th>AUTHORS</th>
<th>POP. STUDIED</th>
<th>N</th>
<th>QUALITY OF METHODS</th>
<th>N OF STUDIES INCLUDED</th>
<th>RESULTS : OUTCOME – EFFECT SIZE (S.D.)</th>
<th>DIRECTION OF EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohen JE, et.al., 1994</td>
<td>Acute and Chronic Low Back Pain</td>
<td>903</td>
<td>Assessor 1 = Acceptable</td>
<td>6 out of 13</td>
<td>2 Studies:</td>
<td>ζ In 1 study significantly reduced pain duration and initial sick leave duration in short term compared to placebo ζ At 1 year follow up, there was no significant evidence of any clinically important benefits</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Assessor 2 = Acceptable</td>
<td></td>
<td>4 Studies:</td>
<td>ζOnly 1 study found a significant positive short term effect on pain intensity compared to placebo ζ 1 study found significant long-term effect on functional status and spinal mobility compared to no treatment</td>
</tr>
<tr>
<td></td>
<td>Chronic Low Back Pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ζ For both the short and long term, results favored education if compared to passive or no treatment. Exercise and active treatment fared better than group education, or group education was not better than active control conditions</td>
</tr>
</tbody>
</table>
REVIEWS OF THERAPIES FOR CHRONIC PAIN

Therapy: Low-Level Laser Treatments

Gam AN, Thorsen H, Lonnberg F, 1993
Musculoskeletal Pain

<table>
<thead>
<tr>
<th>AUTHORS</th>
<th>POP. STUDIED</th>
<th>N</th>
<th>QUALITY OF METHODS</th>
<th>N OF STUDIES INCLUDED</th>
<th>RESULTS : OUTCOME – DIRECTION OF EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gam AN, Thorsen H, Lonnberg F, 1993</td>
<td>Musculoskeletal Pain</td>
<td>557</td>
<td>Assessor 1 = Acceptable</td>
<td>13 Controlled Trials</td>
<td>9 Double Blind Randomized Controlled Trials: d = 0.3% S.E. (d) = 4.6% C.I. = −10.3% − 10.9%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Assessor 2 = Acceptable</td>
<td></td>
<td>4 Insufficiently Blind Trials: d = 9.45% S.E. (d) = 4.5% C.I. = −2.9% − 21.8%</td>
</tr>
</tbody>
</table>

} no effect on pain in the musculoskeletal system
## REVIEWS OF THERAPIES FOR CHRONIC PAIN

### Therapy: Therapies for Low Back Pain

<table>
<thead>
<tr>
<th>AUTHORS (Year)</th>
<th>POP. STUDIED</th>
<th>N</th>
<th>QUALITY OF METHODS</th>
<th>N OF STUDIES INCLUDED</th>
<th>RESULTS: OUTCOME – EFFECT SIZE (S.D.)</th>
<th>DIRECTION OF EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spitzer et al, 1987</td>
<td>LBP &amp; Cervical Pain</td>
<td>Assessor 1 = Acceptable</td>
<td>RCT = 84 (14 very good, 33 good)</td>
<td></td>
<td>Acute low back pain with or without radiation</td>
<td>θ RCTs confirm utility of &lt; 2 days bed rest for LBP with/without leg radiation and utility of longer bed rest and radicular compression confirmed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assessor 2 = Acceptable</td>
<td>Controlled Studies = 116 (15 very good, 40 good)</td>
<td></td>
<td></td>
<td>θ RCTs confirm back school is helpful</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Descriptive Studies = 157 (8 very good, 38 good)</td>
<td></td>
<td></td>
<td></td>
<td>θ Controlled studies: systemic medication helpful for 7 days or less back pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reviews = 112 (13 very good, 38 good)</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>LBP over 7 weeks including LBP radiating to thigh and calf:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>θ TENS helpful for back pain &gt; 7 weeks, by controlled studies</td>
</tr>
<tr>
<td></td>
<td>Systemic medication</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>θ Strengthening exercise helpful for LBP over 7 weeks</td>
</tr>
<tr>
<td></td>
<td>Electroanalgesia</td>
<td></td>
<td></td>
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<td></td>
<td>Strengthening exercises</td>
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<tr>
<td></td>
<td>Postural information and functional training (if idle)</td>
<td></td>
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<tr>
<td></td>
<td>Modification of work environment</td>
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<tr>
<td></td>
<td>LBP with radiation and neurological signs over 7 weeks:</td>
<td></td>
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<tr>
<td></td>
<td>Systemic medication</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>θ Education appropriate for LBP &gt; 7 weeks</td>
</tr>
<tr>
<td></td>
<td>Electroanalgesia</td>
<td></td>
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<tr>
<td></td>
<td>Strengthening exercises</td>
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<td></td>
<td>Postural information and functional training (if idle)</td>
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<td>Modification of work environment</td>
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<tr>
<td></td>
<td>Chronic pain syndrome:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>θ Functional training and ergonomic intervention for LBP &gt; 7 weeks</td>
</tr>
<tr>
<td></td>
<td>Systemic medication</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>θ Education appropriate, by controlled studies</td>
</tr>
<tr>
<td></td>
<td>Electroanalgesia</td>
<td></td>
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<td></td>
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<td>Strengthening exercises</td>
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<td></td>
<td>Postural information and functional training (if idle)</td>
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<td></td>
<td>Modification of work environment</td>
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</tr>
<tr>
<td></td>
<td>In 1987, less evidence on neck pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>θ Conclusion re neck pain treatment similar to above, but with less evidence in 1987</td>
</tr>
</tbody>
</table>
## UNACCEPTABLE TRIALS AND/OR REVIEWS:
### RATINGS OF QUALITY OF METHODS

<table>
<thead>
<tr>
<th>AUTHORS (Year)</th>
<th>POP. STUDIED</th>
<th>QUALITY OF METHODS</th>
<th>THERAPY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guthrie E, 1996</td>
<td>Chronic Illness</td>
<td>Assessor 1 = Unacceptable</td>
<td>Psychotherapeutic Interventions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assessor 2 = Unacceptable</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Assessor 2 = Unacceptable</td>
<td></td>
</tr>
<tr>
<td>Feine J, Lund J, 1997</td>
<td>Chronic Musculoskeletal Pain</td>
<td>Assessor 1 = Unacceptable</td>
<td>Multiple Physical Therapies, including Ultrasound and Thermal Agents, Acupuncture, Low Intensity Laser, TENS, Manipulation, Stretching, and Exercise</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assessor 2 = Unacceptable</td>
<td></td>
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</table>
### RCTs: Additional Studies

<table>
<thead>
<tr>
<th>AUTHOR</th>
<th>N</th>
<th>DIAGNOSES</th>
<th>STUDY DESIGN</th>
<th>INTERVENTION</th>
<th>DURATION FOLLOW UP</th>
<th>RESULT (Measure)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garvey et al</td>
<td>5</td>
<td>LBP</td>
<td>Randomized</td>
<td>Lidocaine 13 Vs.</td>
<td>2 wks</td>
<td>(self-reported improvement) non-invasive treatment as effective as injection therapies</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>(14, 20, 16)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hong (1994)</td>
<td>2</td>
<td>Trapezius TPs</td>
<td>Randomized</td>
<td>TP lidocaine 26 TP dry needle 15 No twitch 17</td>
<td>Post-treatment 2 wks</td>
<td>(local twitch response, self-reported pain, dolorimeter, cervical lateral bending)</td>
</tr>
<tr>
<td></td>
<td>58</td>
<td>1 – 24 wks</td>
<td>? Randomized</td>
<td></td>
<td></td>
<td>No difference in lidocaine vs. dry needling on dolorimeter or ROM</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>(23)</td>
<td></td>
<td></td>
<td></td>
<td>Dry needling more painful than lidocaine</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No benefit unless local twitch evoked</td>
</tr>
<tr>
<td>Lilius et al</td>
<td>3</td>
<td>LBP</td>
<td>Randomized</td>
<td>Lidocaine, bupivacaine &amp; cortisone into facets 28</td>
<td>1 hour</td>
<td>(work attendance, pain self-report, VAS, lumbar movement [observer rated], disability [observer rated, unstandardized])</td>
</tr>
<tr>
<td>(1989)</td>
<td>109</td>
<td>&gt; 3 mos.</td>
<td>Rater blind</td>
<td>Vs. Bupivacaine &amp; cortisone around facets 39 Vs.</td>
<td>2 wks, 6 wks, and 3 months</td>
<td>Improvement generally on all measures for all groups but no significant differences between groups</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>(28, 39, 42)</td>
<td>patient blind</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marks et al</td>
<td>3</td>
<td>LBP</td>
<td>Randomized</td>
<td>Lidocaine &amp; cortisone to facets 42 Vs. Saline into facets 42</td>
<td>Immediate 2 weeks 1 month 3 months</td>
<td>(self-reported pain – on movement) facet blocks minimally better at all points but significant only at 1 month</td>
</tr>
<tr>
<td>(1992)</td>
<td>86</td>
<td>0.7-35 yrs</td>
<td>Double Blind</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>(median 10 yrs exper. group &amp; 7 yrs control group)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
RCTs: Additional Studies

<table>
<thead>
<tr>
<th>AUTHOR</th>
<th>STUDY QUALITY</th>
<th>N</th>
<th>DIAGNOSES</th>
<th>PAIN DURATION</th>
<th>STUDY DESIGN</th>
<th>INTERVENTION</th>
<th>DURATION FOLLOW UP</th>
<th>RESULT (Measure)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bourne (1984)</td>
<td>3</td>
<td>57</td>
<td>CLBP</td>
<td>Chronic</td>
<td>? Randomized</td>
<td>Cortisone &amp; lidocaine Vs. Lidocaine</td>
<td>2 wks &amp; 3 mos.</td>
<td>(duration, pain relief) Cortisone &amp; lidocaine sign. better than lidocaine (3 mos)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Single blind</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>30, 19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Byrn et al (1993) | 3             | 40  | Whiplash        | 4-6 yrs       | Randomized     | Saline Vs Sterile Water | Immediate 1 mos. 3 mos. 8 mos. | (pain, VAS, ROM °, self-reported improvement) 
sterile water improved immediately in VAS and ROM ° 
sterile water improved in all measures at 3 mos. 
sterile water better at 8 mos. in ROM° and VAS |
|                 |               | (20, 20) |                |               | Not blind       |                        |                    |                                                                               |
| Carette et al (1991) | 5             | 97  | CLBP            | Chronic, median 18 to 24 mos. | Randomized Double blind | Cortisone Vs Saline to facet joints | 1 mos. 3 mos. 6 mos. | (pain: VAS, McGill) 
function: SIP, limitation, trunk flexion) 
No signif. Differences at 1 & 3 mos. At 6 mos., cortisone group did better re VAS, self-report & physical disability |
|                 |               | (49, 48) |                |               |               |                        |                    |                                                                               |
| Collee et al (1991) | 3             | 41  | Iliac crest syndrome (low back pain) | Rheumatology group 8 yrs. General practice group 18 days | Randomized Double blind | Lidocaine Vs Saline | 0 days 7 days 14 days | (pain score self-report & % patients improved) 
Rheumatology, but not general practice patients, significantly improved on both measures at day 14 on lidocaine vs saline |
|                 |               | (21, 20) |                |               |               |                        |                    |                                                                               |
pain relief duration favored saline over mepivucaine (short lived), Other measures no differences |
## RCTs: Additional Studies

<table>
<thead>
<tr>
<th>AUTHOR</th>
<th>STUDY QUALITY</th>
<th>N</th>
<th>DIAGNOSES</th>
<th>PAIN DURATION</th>
<th>STUDY DESIGN</th>
<th>INTERVENTION</th>
<th>DURATION FOLLOW UP</th>
<th>RESULT (Measure)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ongley et al (1987)</td>
<td>5</td>
<td>81</td>
<td>LBP</td>
<td>Avg. 10 yrs.</td>
<td>Randomized</td>
<td>6 weekly injections: injecting proliferant solution &amp; cortisone, &amp; lidocaine &amp; manipulation 40 vs. injecting saline, &amp; lidocaine &amp; minor manipulation 41</td>
<td>Baseline, 1, 3 &amp; 6 months</td>
<td>(disability scores, VAS pain, pain drawings) -on all measures, outcomes significantly better in experimental group at 1.3 &amp; 6 months</td>
</tr>
<tr>
<td>Sonne et al (1985)</td>
<td>3</td>
<td>30</td>
<td>LBP</td>
<td>&gt; 1 month</td>
<td>Randomized</td>
<td>3 weekly injections to iliofemoral ligament vs. lidocaine &amp; cortisone vs. saline</td>
<td>2 weeks</td>
<td>(VAS, spinal flexion, self-assessment) Lidocaine &amp; cortisone significantly better in VAS pain &amp; self-assessment</td>
</tr>
<tr>
<td>Wreje &amp; Brorsson (1995)</td>
<td>3</td>
<td>116</td>
<td>Myofascial Upper body</td>
<td>All &gt; 3 months</td>
<td>Randomized</td>
<td>Sterile water 55 Vs. Saline 61</td>
<td>Immediate &amp; 2 wks</td>
<td>(VAS) No significant difference</td>
</tr>
</tbody>
</table>
APPENDIX 2

PROGNOSTIC FACTORS: A CONCISE SUMMARY

Prognostically important variables identified from the literature are summarized under the following headings:

_Sociodemographic factors:_ age, gender, education, SES, MS

_Work factors:_ type and size of employing company; physical demands of the job; work satisfaction; control of pace of work; length of time out of work; availability of a job; ease of changing occupations and modified work.

_Impairments:_

_Pain_ – site of symptoms; number of painful sites/wide area of body; pain grade (based on pain intensity and disability days); pain behavior;

_Physical Impairment Factors_ – health status; fatigue; sleep disturbance; previous episodes;

_Psychological Impairment Factors_ – depression; cognitive factors (catastrophizing); coping factors; alcohol/drug abuse.

_Disabilities:_

_Disability Factors_ – functional status; ADL capacity;

_Social Support Factors_ – change in marital satisfaction post-pain onset; decrease in social activities; financial and social strain.