

# Perceptions of the clinical efficacy of laser therapy

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Adoption of therapeutic lasers has been widespread throughout Australia in recent years. A questionnaire survey was conducted amongst therapists in Victoria who were believed to have purchased this apparatus. The study sought to determine the extent of laser use in Victoria; the indications, techniques, dosage, expectations and outcomes; and the background knowledge about lasers possessed by the respondents.

The elbow and shoulder were the most commonly treated regions; tendonitis and ligamentous lesions the most frequently treated disorders; pain relief and wound healing the most commonly expected effects; and 30mm the average expected penetration. Although 57.9 per cent of respondents attended one or more seminars prior to purchasing lasers, journals and other reading were given as the most valuable source of knowledge.

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Low-level therapeutic LASERS (Light Amplification by Stimulated Emission of Radiations) has been introduced into physiotherapy practice in Australia relatively recently, despite its use elsewhere since the 1960s.

Electrotherapy devices have a record of high use in Australia (Dennis 1987) and are likely to be perceived by patients as playing a significant role in physiotherapy management. In reports on laser therapy, there is little objective physiological or clinical data that has been exposed to controlled and quantitative procedures (Kitchen and Partridge 1991). The aims of the studies are often poorly defined, parameters frequently not quantified, variables uncontrolled, assessment of the patient and outcome measures not described or inadequately described and patient numbers often small. Clinical and applied research has connotations of immediate value to the patient population and there appears to be a tendency for some clinicians to be over-enthusiastic in response to research even tentatively suggesting value to patients.

There has been extensive promotion of laser devices in Australia and anecdotal evidence suggests physiotherapists are anxious to learn more about the efficacy of lasers as a treatment modality.

Despite considerable clinical enthusiasm for the use of lasers in pain relief (Davies 1990), there is an inconsistent response from controlled studies. Walker (1988) cites responses of 70 per cent pain relief but other studies showed no superiority of real laser compared to sham laser treatment, for example that of Hansen and Thoroe (1990). In addition,

investigators such as Abergel et al (1987) and Enwemeka (1988) have observed a stimulating effect of therapeutic lasers on fibroblasts and collagen synthesis in several species including homo sapiens.

Enhanced wound healing in both mice and men has been claimed over many years (Mester and Mester 1989). More recently, reduction of inflammation and swelling, and enhanced neural repair, have been suggested (Rochkind et al 1988).

Prior to instigating the study, discussions with physiotherapists indicated a belief that lasers are valuable for the alleviation of pain, to enhance wound healing, to reduce inflammation and swelling, and to influence collagen synthesis and modelling. Therefore, the aim of this study was to survey Victorian physiotherapists to determine:

- ▲ penetration of the market;
- ▲ those practitioners who had access to therapeutic lasers;
- ▲ the disorders being treated with lasers; and
- ▲ sources of information pertaining to the use of lasers.

It was anticipated the information gained from this initial survey would assist in determining physiotherapists' educational needs in relation to lasers, identify perceived clinical usefulness of lasers and guide future clinical studies.

## Method

### Questionnaire

After preliminary discussions and a trial of suitable questions, a questionnaire was constructed and sent

### From Page 101

to 122 practitioners identified by lists from companies who supplied therapeutic lasers to physiotherapy and other health care professionals. Lists included purchasers and practitioners who previously had the opportunity to have a laser unit on trial in their facility. All practitioners who had not returned the survey form by the closing date were contacted by telephone and asked to do so.

### Disorders treated with lasers

The first section of the questionnaire asked practitioners to indicate whether a therapeutic laser was used and to identify the make and model. Next, the respondents were asked to record up to six disorders most frequently treated with lasers, ranked in descending order, and to report on these under several headings:

- ▲ name or type of disorder;
- ▲ stage of progress (ie acute, subacute, chronic);
- ▲ dosage;
- ▲ technique (eg spot, grid);
- ▲ frequency of patients with the specified disorder who were treated with lasers, ranging from none to all;
- ▲ results of treatment in the range useless to perfect, when lasers were used as part of the management; and
- ▲ number of treatment sessions before signs of improvement were identified.

### Effects from treatment with lasers

The magnitude of effect on six listed benefits of lasers was sought using a series of visual analogue scales. The effects investigated were those which physiotherapists previously indicated had therapeutic value: that is, pain relief, wound healing, reduced inflammation, enhanced collagen synthesis, reduced swelling and enhanced neural repair.

Respondents were asked what they perceived to be the depth of penetration of the laser energy into the tissues.

**Table 1.**  
**Make and models of lasers owned.**

Lasers	Make	Model
LasereX	16	
LTU 904		14
Unknown		2
MME 1400	10	
Space laser	9	
IR CEB 1 Mid Laser		5
IR CEB UP Mid Laser		2
Unknown		2
Chattanooga Intellect	4	
Biphasil Laser therapy unit	1	
Lawo AL 60914	1	

### Sources of knowledge about lasers

The final series of questions surveyed the practitioners' source of knowledge of lasers before and after purchase.

At the end of the questionnaire, respondents were invited to add any further comments.

### Further analysis

The questionnaire responses were collated and further analysis was undertaken on the six most common disorders identified. This analysis included stage of progress (acute, subacute, chronic), power range (in mW) used to treat these stages, treatment time (in seconds), mode of treatment (continuous, pulsed), laser frequency and technique of application.

Where appropriate, the following formula was used to aggregate information for the purpose of determining overall ranking:

$$\frac{\text{Aggregate score (per cent) for each region or pathology} = \frac{(1\text{st Pref count} \times 6) + (2\text{nd Pref count} \times 5) + (3\text{rd Pref count} \times 4)}{\text{Sum of all weighted counts}} \times 100$$

## Results

### Responses

Responses were received from 38 physiotherapists from 35 centres/practices. The telephone follow-up identified physiotherapists, medical practitioners and chiropractors who did not respond, and also those who did not own laser equipment or who previously only had a laser on trial. Many of these practitioners were not prepared to cooperate in the survey.

### Make and model

Table 1 identifies the brands of lasers owned by the centres and the total number of each brand. Five centres had more than one laser. One centre had three lasers and four centres had two lasers.

### Regions treated

Although not directly requested in the questionnaire, information provided by the respondents identified the region treated in 87 of 163 instances. The aggregate score for the most commonly treated region was elbow 21.2, shoulder 17.3, spine 15.8, ankle 9.1 and knee 8.5. All other regions scored between 5.8 (leg) and 1.5 (hip). These regions are indicated in Figure 1 with the elbow, shoulder and hand

represented as upper limb; hip, knee, leg, ankle and foot represented as lower limb; the pelvis and head as other areas; and the spine and trigger points alone.

**Disorders treated**

There were 140 citations of disorders within the six categories. Those disorders most frequently treated with lasers, according to aggregate score, were tendonitis 23.3, ligamentous lesions 21.3, pain 11.9, soft tissue disorders 10.3, muscle lesions 7.2, ulcers and circulatory disorders 5.8, osteoarthritis 5.8, and rheumatoid arthritis 5.6. The aggregate score for other disorders ranged from 2.9 (arthritis) to 0.2 (oedema).

The disorders under the six categories are displayed in Figure 2 with tendonitis, ligamentous lesions, soft tissue disorders and muscle lesions represented as soft tissue; osteoarthritis, rheumatoid arthritis and gout represented as arthritis; and bursitis, fasciitis, cyst, headache, amputation and oedema combined as other.

Information provided on responses to laser treatment indicated considerable dosage variation. It showed that tendonitis was the most frequently treated condition and was treated at all stages of its progress, followed by ligamentous lesion, pain and soft tissue disorders.

**Value of lasers**

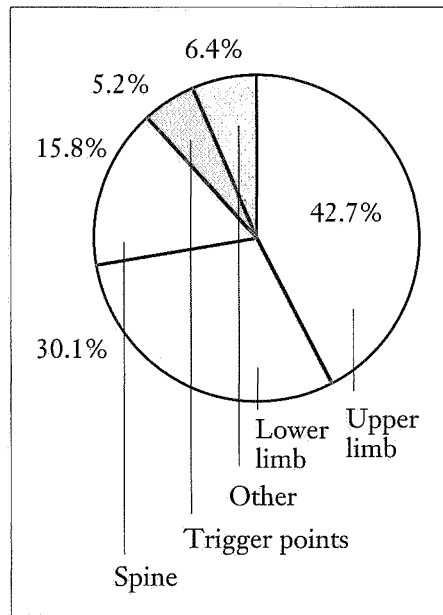
The therapists' perceived value of lasers in producing pain relief (mean plus and minus standard deviation) was  $70.1 \pm 19.2$ , enhanced wound healing  $55.3 \pm 28.7$ , reduced inflammation  $52.8 \pm 26.0$ , changes in collagen  $50.3 \pm 29.5$ , reduced swelling  $42.0 \pm 32.3$  and enhanced neural repair  $26.8 \pm 26.2$ . This is displayed in Figure 3.

**Depth of penetration of lasers**

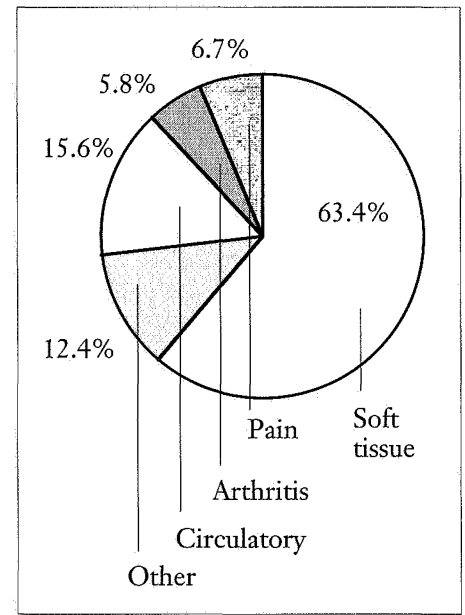
The therapists' perceived depth of penetration of energy from each type of apparatus is shown in Table 2.

**Knowledge of lasers**

Respondents were asked to indicate which of seven sources of knowledge



**Figure 1.** Combined aggregate scores for each region treated using lasers.



**Figure 2.** Disorders most frequently treated using lasers.

**Table 2.** Perceived depth of penetration of laser apparatus.

Model	Count	Mean (mm)	SD (mm)	Range (mm)
Laserex	15	30.9	24.28	2-100
MME	8	30.5	23.10	10-82
Space	5	33.2	3.03	30-36
Other	6	25.3	11.8	10-40

about lasers were used prior to purchase, and to rank these in order of value. Twenty-two of 38 respondents attended one or more seminars prior to purchasing laser apparatus. The average duration of these seminars was  $4.5 \pm 4.4$ h (range 1.5-19.0h). Seminars were provided by commercial companies and groups within the Australian Physiotherapy Association.

Eight of 38 respondents attended two seminars prior to purchasing laser apparatus. The average duration of these seminars was  $5.1 \pm 4.3$ h (range 2.0-12.0h). With one exception, private practitioners were the principal providers of educational seminars for

the laser suppliers. Physiotherapy educators conducted the educational sessions which were organised by physiotherapists.

Respondents were also asked to indicate which of the sources of knowledge about lasers applied after purchase, and to rank these in order of value. The aggregate score of the findings related to sources of knowledge is given in Table 3.

**Free comments**

Half of the 38 respondents took the opportunity to provide free comments. The following observations provide

**Table 3.**  
Rank order of sources of knowledge about lasers prior to and after purchase.

Source of Knowledge	Aggregate Score	
	prior to	after purchase
Journals or other reading	27.7	28.0
Hearsay from peers	24.8	24.6
Hearsay from manufacturers or suppliers	24.2	18.3
Continuing education seminars or conferences	13.8	18.6
Continuing education lectures	7.3	10.6

### From Page 103

insights not covered by the formal part of the questionnaire.

Seven respondents indicated difficulty in judging the value of lasers because of use in conjunction with other techniques of treatment. Despite owning lasers, seven respondents indicated they considered there was insufficient information available about lasers. Other pertinent observations were that short treatment time and one-to-one patient-therapist relationship were advantages of lasers, that placebo effects might be an important factor in results and that no compelling evidence exists to support the use of lasers.

## Discussion

During the period of preliminary discussions, it became evident to the authors that there was a strong suggestion that clinicians who possessed or who had previous access to lasers might have a limited knowledge of the theoretical bases or hypotheses supporting the use of lasers. For example, individual clinicians talked about possible indications for use in the same general language that is readily seen in commercial laser advertising literature. A conflict existed when constructing the questionnaire in respect to the most appropriate level of precise scientific questioning. The basis for

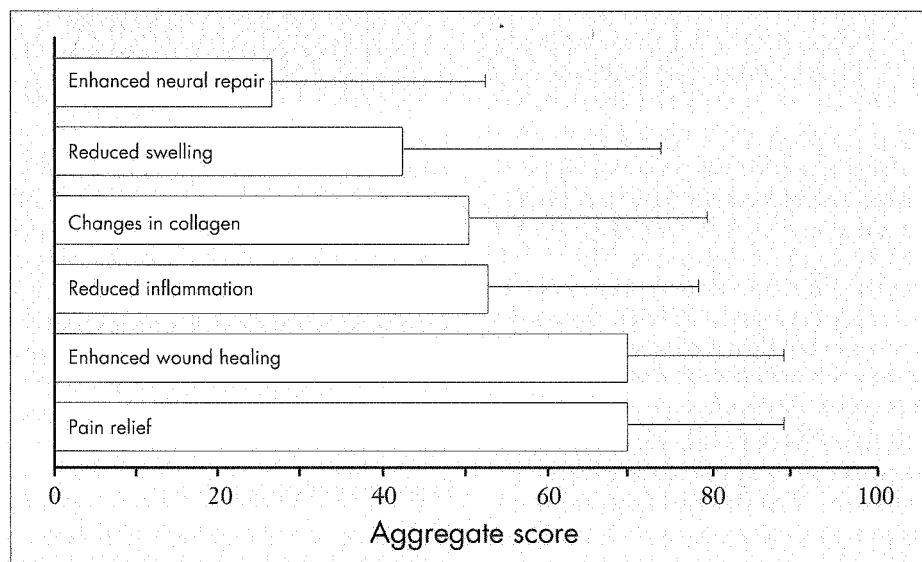
accurately describing and fully understanding the components of laser dosage is perhaps as complex as any other form of electrotherapy in the field of physiotherapy. Were questions to be asked of the respondents in respect to each component of a full dosage description, the authors feared one of three consequences:

- ▲ the respondents might have been led (reminded) to include information about dosage that would otherwise have been omitted;
- ▲ the respondents would have chosen to dismiss the questionnaire on the grounds that it was beyond their understanding or outside their list of priorities; or
- ▲ it would not have been possible to gauge the depth of the respondents' understanding of laser dosage.

Similar problems in respect to effects of lasers prompted the authors to itemise commonly cited effects, and to describe these effects in very general terms so as to allow the respondents every opportunity to fit their clinical caseload to the effects.

In summary, the authors attempted to construct a questionnaire which was a realistic compromise between a wide open questionnaire of the type "Write anything you like about your attitude to and use of lasers", and a precisely worded and necessarily lengthy multiple choice exam paper. In retrospect, it is evident that in general, the respondents found it difficult to provide precise responses to what was intended as a relatively low key questionnaire.

Recent studies have investigated the use of lasers in physiotherapy practice. Lindsay et al (1990) surveyed the use of electrotherapy modalities in private practices in Brisbane, showing 16.5 per cent of respondents owned a laser device. About 10 per cent of these practitioners used lasers at least once daily. Baxter et al (1991) reported the results of a clinical survey among physiotherapists in Northern Ireland. This group identified the main indications for lasers as wounds, soft



**Figure 3.**  
The respondents' perceived value of lasers in producing the effects shown.

tissue injuries, pain and arthritic conditions. As in the present study, the Baxter et al (1991) respondents expressed concerns about the paucity of information available - particularly in relation to dosage. It is clear that in Victoria, a wide range of doses is being applied to a variety of disorders and with treatment focused on the elbow, shoulder and spine. Tendonitis, ligamentous lesions and other soft tissue disorders were the main conditions treated. There was overlap in the soft tissue responses such that definitive classification was difficult and some judgements in categorisation were required. Whether the physiotherapist was treating a pathology such as inflammation, or a symptom of that pathology such as pain, has the potential to distort the results.

As with our study, the highest category of use of lasers reported by Baxter et al (1991) was also tendonitis. At 82.8 per cent, this was higher than the finding from the Victorian physiotherapists. Conversely, effective neural repair was not considered to be a major attribute. The research literature provides some support for the identified uses and beliefs.

Pain relief was considered to be achieved by 70.1 per cent of respondents. This is double the expectation from a placebo effect (Benson and Epstein 1975). Despite clinical enthusiasm for the use of lasers in pain relief (Davies 1990), as exemplified in our responses, recent controlled studies have shown no superiority of real laser compared with sham laser treatment for tennis elbow (Haker and Lundberg 1990), low back pain (Klein and Eek 1990) or orofacial pain (Hansen and Thoroe 1990). Devor (1990) argues that any proposed treatment for pain must be evaluated in controlled, blind trials and that it is irresponsible to use lasers for pain relief in the light of the present scientific research.

In this study, the perceived depth of penetration of the apparatus ranged from 2–100mm, with mode approximately 30mm, despite the biophysics literature supporting the

lower end of this range (Anderson and Parrish 1981, Haker and Lundberg 1990).

Respondents identified hearsay as a major source of laser knowledge and indicated that there is insufficient information available about lasers. The previously discussed surveys by Baxter et al (1991) and Lindsay et al (1990) also indicated a desire by practitioners for further information. Physiotherapists appear to be using lasers as advised by the manufacturers. It is clear that the responding physiotherapists are largely unaware of current research related to lasers. Clinicians need to carefully monitor ongoing research and reviews in this topic such as that by Laakso et al (1993) and others (Kitchen and Partridge 1991, Lehmann and De Lateur 1990). Seven years after the original citation, it remains generally agreed that "Because of the large number of positive reports and the innocuous nature of the treatments, further clinical evaluation of laser therapy is warranted." (Basford 1986, p. 674).

## Summary

A questionnaire was sent to all practitioners likely to have purchased lasers in Victoria. The responses indicated that these physiotherapists believe lasers are useful in pain relief, enhancing wound healing, reducing inflammation and swelling and changing collagen, and commonly use lasers in the treatment of tendonitis and ligamentous lesions, with an expectation of pain relief. There was a general concern from the respondents that there is insufficient information about the value of lasers. Rigorous controlled studies with systematic modification of treatment parameters are required to support or refute some of the perceptions held by clinicians for the efficacy of low-level laser therapy. The use of lasers in clinical physiotherapy practice without recourse to its thorough evaluation cannot be sanctioned.

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**From Page 105**

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