

8. NON-PHARMACOLOGICAL TECHNIQUES

8.1 PSYCHOLOGICAL INTERVENTIONS

The role of psychological interventions in the management of acute pain is generally seen as adjunctive to somatic modalities, but evidence for the value of their contribution is strengthening.

Psychological interventions can be grouped under a number of headings, but, by their very nature, they share some common features. Some of these features may also apply to effective pharmacological and physical interventions. Typically, the treatment provider is encouraged to firstly establish a degree of rapport or acceptance with the patient as well as give some information about the purpose and nature of the intervention and reasonable expectations the patient should hold for their outcome. These aspects may be seen as necessary to gain both the informed consent of the patient for treatment, as well as their active cooperation. Interestingly, one of the conclusions that can be drawn from the available studies is that good psychological preparation for surgical interventions can enhance the outcome of such procedures, including length of hospital stay. Thus, skilled combination of psychological and medical/surgical modalities may lead to better outcomes than either alone.

Psychological interventions may be divided into four broad categories: information provision (procedural or sensory); stress/tension reduction (relaxation and hypnotic strategies); attentional strategies; and cognitive-behavioural interventions. It should be emphasised that these are rarely 'stand-alone' interventions and elements of each may form a single intervention.

8.1.1 Provision of information

Procedural information is information given to a patient before any treatment that summarises what will happen during that treatment. Preparatory information has been found to be effective in improving postoperative recovery and reducing pain reports, pain medication use, and length of hospital stay (Johnston & Voegelé, 1993) (see also Section 3.1.1).

Sensory information is information that describes the sensory experiences the patient may expect during treatment. Sensory information given alone has some positive, albeit inconsistent, effects compared with no instruction (Suls & Wan, 1989 **Level I**). This review also found that sensory information reduced self-rated pain more than procedural information; however, the effect sizes were variable. Sensory information had no significant effect on postoperative pain perception in patients who underwent two types of elective surgery (Campbell et al, 1999 **Level II**).

Combined sensory-procedural preparatory information yielded the strongest and most consistent benefits in reducing negative affect, pain reports and other related distress (Suls & Wan, 1989 **Level I**). This finding was replicated in a controlled study of ear-piercing in children. In this case, those children whose parents were provided with accurate information about the procedure and sensory (pain) expectations reported significantly less pain and more accurate expectations than controls (Spafford et al, 2002 **Level II**).

However, a recent meta-analysis of 28 trials of different psychological interventions for procedure-related pain in children concluded the evidence for the efficacy of information/preparation is only tentatively supportive; the evidence is not sufficient to make firm recommendations (Uman et al, 2006 **Level I**).

In some patients, especially those with an avoidant coping style, giving too much information or asking them to make too many decisions may exacerbate anxiety and pain (Wilson, 1981 **Level II**). However, later evidence suggested that this may not be a strong effect (Miro and Raich 1999 **Level II**). Nevertheless, it may be useful to assess a patient's normal approach to managing stress to identify the best option for that patient. A more recent study with over 3000 surgical patients identified four information factors that were each associated with global evaluations — surgical information, recovery information, general information and sensory information (Krupat et al, 2000 **Level III-3**).

8.1.2 Stress and tension reduction

Relaxation

Relaxation training usually involves teaching a patient ways of reducing their feelings of stress/tension by various techniques. The techniques may be taught by recorded audiotape, written or spoken instructions. The use of audiotapes often includes the use of suitable (calming) music. The use of relevant imagery (mental pictures of relaxing scenes) is also often encouraged as an element of relaxation techniques. Typically, all methods require the patient to practise the technique regularly, especially when feeling stressed. Some methods focus on altering muscle tension, often sequentially, while others focus on altering breathing patterns (eg emphasising releasing tension with exhalation). Relaxation techniques are closely related to, and often indistinguishable from, forms of meditation and self-hypnosis.

A systematic review of relaxation techniques, when used alone for the management of pain after surgery and during procedures, concluded that there was some (weak) evidence to support the use of relaxation in these settings — three of the seven studies reported significant reductions in pain and distress (Seers & Carroll, 1998 **Level IV**). Methodological shortcomings in the studies included in the review meant that a meta-analysis was not possible, limiting the strength of the findings. Similar conclusions were made in another systematic review which found that eight of fifteen studies (again, most had weaknesses in methodology) demonstrated reductions in pain; the most supported methods were progressive muscle relaxation for arthritis pain and a systematic relaxation technique for postoperative pain, little evidence was found for autogenic training, and no support for rhythmic breathing or other relaxation techniques (Kwekkeboom & Gretarsdottir, 2006 **Level IV**). Another review of studies using relaxation techniques for burns pain also found insufficient high quality evidence to draw any conclusions, but did recommend further research into the use of a technique that combined focusing on breathing and jaw muscle relaxation (de Jong & Gamel, 2006 **Level IV**). There was no difference found in pain scores after surgery in patients given either relaxation training or routine information prior to spinal surgery; however morphine use was higher in the relaxation group (Gavin et al, 2006 **Level II**).

In contrast, studies of relaxation techniques with cancer patients (with acute pain) provided moderately strong (clinical) support for its effectiveness in improving nausea, pain, pulse rate and blood pressure, as well as emotional adjustment variables (depression, anxiety and hostility) (Luebbert et al, 2001 **Level I**).

Hypnosis

Hypnosis shares many features of relaxation with imagery and has a long history of use in acute pain conditions. While there are many versions of hypnosis, they share the common feature of one person responding to suggestions made by another on experiences involving changes in perception, memory and voluntary actions (Kihlstrom, 1985). The variable or unstandardised nature of hypnotic procedures has made it difficult to compare studies or draw

general conclusions (Ellis & Spanos, 1994), although some more standardised (according to a manual) procedures have been reported (Lioffi & Hatira, 2003).

Until recently much of the literature on the use of hypnosis in acute pain has been based on studies with non-RCT designs (Patterson & Jensen, 2003). However, recent papers have displayed more experimental rigour.

Studies using hypnosis for pain control in both the laboratory and clinical settings (eight of the eighteen studies included pain populations) indicated that hypnosis for pain had a moderate to large effect size and provided substantial pain relief for 75% of laboratory and clinical participants (Montgomery et al, 2000 **Level I**).

A review of hypnosis in clinical pain settings (including pain associated with invasive medical procedures, burns wound care, labour and bone marrow aspiration) provided moderate support for the use of hypnosis in the treatment of acute pain (Patterson & Jensen, 2003 **Level I**). Eight of the nineteen studies showed hypnosis to be more effective on pain reports than no treatment, standard care, or an attention control condition; three studies showed hypnosis to be no better than such control conditions, and one study showed mixed results. Eight studies compared hypnosis with other psychological interventions (cognitive-behavioural intervention, relaxation training, distraction, emotional support), and hypnosis was more effective in reducing pain scores in four of the eight studies.

In relation to acute pain in cancer patients, some individual studies have found hypnosis to be superior to other psychological interventions in reducing pain reports (eg Syrjala et al, 1992 **Level II**). In many of the hypnotic studies with cancer patients, the focus has been on acute pain associated with procedures such as bone marrow aspiration, breast biopsy, or lumbar puncture. In each case the findings have supported the use of hypnosis to reduce pain (eg Wall & Womack, 1989 **Level II**; Lioffi & Hatira, 1999 **Level II**; Montgomery et al, 2002 **Level II**). A systematic review by Wild and Espie (Wild & Espie, 2004) of hypnosis in paediatric oncology pain concluded the evidence was not consistent enough for general recommendations, but that hypnosis was potentially useful.

8.1.3 Attentional techniques

A range of attention-based strategies have been reported, from those involving distraction from the pain through to attention to imagined scenes/sensations or to external stimuli such as music, scenes or smells. Some techniques also involve deliberately attending to the pain, but in ways intended to modify the threat value of pain (eg Logan et al, 1995 **Level II**). Attempting to alter the patient's emotional state, from stress or fear to comfort or peace, is also a common feature of many of these techniques. Commonly, these techniques are used in conjunction with relaxation methods and at times may be inseparable (Williams, 1996).

There is some evidence to support the benefit of some attentional techniques, often in combination with relaxation, in acute postoperative pain (Raft et al, 1986 **Level II**; Daake & Gueldner, 1989 **Level II**; Good et al, 1999 **Level II**). In children and adolescents, a systematic review concluded that distraction is effective in needle-related procedure-related pain (Uman et al, 2006 **Level I**). A more recent comparison of two interventions, guided imagery and relaxation, did not result in any difference in pain relief or analgesic use in elderly patients after colorectal surgery (Haase et al, 2005 **Level II**).

Using thermal pain stimulation in volunteers and measuring pain-related brain activity with fMRI, both opioids and immersive virtual reality (VR) distraction led to reductions in pain unpleasantness and pain-related brain activity; the combination was more effective than opioid alone (Hoffman et al, 2007 **Level III-2**). VR distraction has also been reported to provide

effective analgesia in clinical situations, for example, in burns patients (Hoffman et al, 2000 **Level III-2**; Das et al, 2005 **Level III-2**).

The use of certain music to divert attention from pain and to promote a sense of relaxation and well-being has long been a popular approach. A Cochrane review, which included studies published up to and including 2004, concluded that listening to music reduced pain intensity and opioid requirements after surgery, but that the magnitude of benefit was small (Cepeda et al, 2006 **Level I**). Later systematic reviews of studies investigating the use of music found that pain and anxiety in the perioperative period were reduced in half of the studies examined (Nilsson, 2008 **Level I**) and that anxiety and pain were reduced in children undergoing medical and dental procedures (Klassen et al, 2008 **Level I**).

There is some evidence that rather than shifting attention away from the pain, instructions to focus attention on the pain site can alter pain perception, but possibly mainly among sub-groups of patients (Baron et al, 1993 **Level II**; Logan et al, 1995 **Level II**). The study by Haythornthwaite et al (Haythornthwaite et al, 2001 **Level II**) provides further support for this approach.

The use of mindfulness meditation is a type of attentional technique that includes noting pain sensations. This approach encourages the patient to deliberately experience their pain as calmly as possible, as just another sensation (ie without judging it as good or bad), often while engaging in slowed breathing styles (Kabat-Zinn, 2003). This approach derives from ancient Buddhist methods and was initially described as a stress-reduction technique by Kabat-Zinn. While this technique has been used in people experiencing chronic pain (McCracken et al, 2007 **Level IV**), and has been shown to increase experimental pain tolerance (Kingston et al, 2007 **Level II**), there are no reports on its use in the management of acute pain.

8.1.4 Cognitive-behavioural interventions

Typically, cognitive-behavioural interventions involve the application of a range of behaviour-change principles, such as differential positive reinforcement of desired behaviours, identification and modification of unhelpful thoughts, and goal setting, in order to achieve change in targeted behaviours. In the context of acute pain this could include encouraging the appropriate use of the techniques outlined above.

Cognitive-behavioural methods focus on both overt behaviours and cognitions (thought processes) in patients, but interactions with environmental factors are often also addressed. This means that interactions between patients and others, especially medical and nursing staff as well as families, may need to be specifically changed to support the desired responses in the patient. The latter may entail displaying a calm and reassuring manner, and encouragement to persevere with a given task or procedure. Specific training in skills (eg relaxation and other coping strategies), other behavioural techniques (eg modelling and systematic desensitisation), information provision and reconceptualisation of the experiences of the patient may also be provided as part of this approach.

Cognitive-behavioural interventions are usually aimed at reducing the distressing or threat value of pain and enhancing a patient's sense of his or her ability to cope with pain. In this context, coping usually refers to acceptance of pain rather than pain control or relief. Effective coping with pain may be reflected in minimal pain-related distress or disability. If patients are able to perceive their pain as less threatening, they might also evaluate their pain as less severe. But in this context reduced severity would be seen more as a by-product rather than the primary goal.

Critically, in using cognitive-behavioural methods, the patient is necessarily an active participant in the process, rather than a passive recipient, as he or she must apply the methods taught as needed.

Applying pain coping strategies within a cognitive-behavioural intervention

Generally, while some responses by patients to their pain may be helpful, others may not. For example, those who respond with overly alarmist (or catastrophic) thoughts tended to experience more pain and distress, compared with those who did not respond in this way (eg Jensen et al, 1991; Haythornthwaite et al, 2001 **Level II**; Sullivan et al, 2001). Identifying unhelpful responses, whether they are cognitive or behavioural, and changing these responses is a key feature of cognitive-behavioural interventions. Thus, identifying and reducing catastrophic thoughts about pain has become a key intervention within this approach, whether the pain is acute or persistent (Sullivan et al, 2006). It has also been recognised that a given coping strategy may not always be useful and that this may depend upon circumstances and timing (Turk & Monarch, 2002). For example, ignoring or denying the presence of pain may be useful when first injured (to reduce distress), but if it means that appropriate help is not sought it could place the person in danger.

In preparation for surgery, painful medical procedures and postsurgical pain and distress, training in cognitive coping methods and behavioural instructions, in addition to relaxation training and procedural information, improved pain measures and reduced postoperative use of analgesics. These interventions were effective in achieving improvements in measures of negative affect, length of stay (not cognitive methods in this case) and recovery (Johnston & Voge, 1993 **Level I**).

A review of studies (randomised and non-randomised) using cognitive-behavioural interventions in the treatment of procedure-related pain in children and adolescents concluded that cognitive-behavioural interventions may be considered a well-established treatment in this setting. Treatments included breathing exercises and other forms of relaxation and distraction, imagery and other forms of cognitive coping skills, filmed modelling, reinforcement/incentive, behavioural rehearsal and active coaching by a psychologist, parents, and/or medical staff member (Powers, 1999 **Level IV**).

Another review included studies (all non-randomised) that used behavioural interventions in the care of children and adolescents with cancer pain undergoing a wide range of cancer-related diagnostic and treatment procedures including bone marrow aspiration, lumbar puncture, venipuncture, and chemotherapy. The behavioural interventions included hypnosis, relaxation, procedural information, distraction techniques, modifications of children's fears, anxiety and pain, contingency management, systematic desensitisation and behavioural rehearsal. Experience of pain during diagnostic and treatment procedures was included as an outcome measure in nine of the twenty-three included studies; all nine studies found a clinically significant reduction in pain following behavioural intervention (DuHamel et al, 1999 **Level IV**).

A further review examined the effectiveness of behavioural intervention methods in studies (randomised and non-randomised) looking at the control of aversive side effects of cancer treatment, including pain (Redd et al, 2001 **Level IV**). The most commonly used behavioural interventions included hypnosis, relaxation and distraction via guided imagery. Of the twelve studies investigating the impact of behavioural interventions on cancer treatment-related pain, five were randomised clinical trials with either no treatment or attention control conditions; four of these five supported the efficacy of behavioural intervention and all of the remaining seven studies, incorporating a variety of designs, found a reduction in pain following behavioural intervention. These authors concluded that although a variety of behavioural methods have been shown to reduce acute treatment-related pain, the methods are not equally effective, and hypnotic-like methods, involving relaxation, suggestion and distracting imagery, hold the greatest promise for pain management in acute treatment-related pain (Redd et al, 2001 **Level IV**).

Reports of benefit after surgery are less common. A study of three cognitive-behavioural interventions for reducing postoperative anxiety and pain following spinal fusion surgery for scoliosis in adolescent patients showed that information plus training in coping strategies achieved the greatest pain reduction (35%) compared with information only, coping strategies only, and a control condition; the effect was most evident in those subjects aged 11 to 13 years, compared to those in the 14 to 18 year age range, where no differences between interventions were found (LaMontagne et al, 2003 **Level II**).

Key messages

1. Listening to music produces a small reduction in postoperative pain and opioid requirement (**N**) (**Level I** [Cochrane Review]).
2. The evidence that information is effective in reducing procedure-related pain is tentatively supportive and not sufficient to make recommendations (**Q**) (**Level I**).
3. Distraction is effective in procedure-related pain in children (**N**) (**Level I**).
4. Training in coping methods or behavioural instruction prior to surgery reduces pain, negative affect and analgesic use (**U**) (**Level I**).
5. Evidence of benefit of hypnosis in the management of acute pain is inconsistent (**W**) (**Level I**).
6. Immersive virtual reality distraction is effective in reducing pain in some clinical situations (**N**) (**Level III-2**).
7. Evidence for any benefit of relaxation techniques in the treatment of acute pain is weak and inconsistent (**N**) (**Level IV**).

8.2 TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION

A systematic review published in 1996 concluded that transcutaneous electrical nerve stimulation (TENS) was not effective for the relief of postoperative pain (Carroll et al 1996). The authors noted that non-randomised studies overestimated the beneficial effects of TENS. A later Cochrane review included only RCTs looking at the benefit of TENS in the management of acute pain generally and concluded that there were inadequate data on which to perform a meta-analysis (Walsh et al, 2009). However, these authors excluded studies where TENS was used in combination with other treatments such as analgesic drugs. Hence, only one of the 12 included studies, but 62 of the 116 excluded studies related to postoperative pain.

It had been argued by Bjordal et al (Bjordal et al, 2003 **Level I**) that some of the studies reporting no benefit from TENS may have used ineffective treatment doses — low and possibly ineffective current intensities or sensory threshold intensity. They performed a systematic review of publications using TENS after surgery where ‘assumed optimal TENS parameters’ were used; that is, if TENS was administered at an intensity described by the patients as ‘strong and/or definite subnoxious, and/or maximal non-painful, and/or maximal tolerable’, or at a current amplitude of greater than 15 mA. They concluded that strong, subnoxious intensity TENS significantly reduced postoperative analgesic requirements.

The superiority of high-intensity TENS compared with low-frequency TENS, regardless of frequency used, has been demonstrated in further clinical (Olsen et al, 2007 **Level II**) and experimental (Aarskog et al, 2007 **Level II**; Claydon et al, 2008 **Level II**) pain studies.

Use of high-intensity (strong but comfortable) TENS improved pain relief after inguinal herniorrhaphy (DeSantana et al, 2008 **Level II**), laparoscopic tubal ligation (Desantana et al, 2009 **Level II**) and thoracotomy (Erdogan et al, 2005 **Level II**).

TENS was of value in the treatment of primary dysmenorrhoea (Proctor et al, 2002 **Level I**).

Overall, there appeared to be no good evidence for any analgesic effect of TENS during labour although severe pain was less likely to be reported in women receiving TENS to acupuncture points (Dowswell et al, 2009 **Level I**).

Key messages

1. Overall, there is no evidence that TENS is effective for the treatment of pain during labour (**N**) (**Level I** [Cochrane Review]).
2. Certain stimulation patterns of TENS are effective in some acute pain settings (**S**) (**Level I**).

8.3 ACUPUNCTURE

Acupuncture compared with sham controls reduced postoperative pain (at 8 hours and 72 hours) and opioid consumption as well as nausea (not vomiting), sedation, pruritus and urinary retention (Sun et al, 2008 **Level I**). There was wide variability in the types of surgery and acupuncture regimens (including type of acupuncture, time of application, and type and duration of stimulation) in the studies included in this review and the magnitude of benefit was small. Another review looking specifically at auricular acupuncture for postoperative pain control concluded that a meta-analysis was not possible because of the heterogeneity of the primary studies (Usichenko, Lehmann et al, 2008).

Reviews of the effectiveness of acupuncture in other acute pain settings suggest that it may be useful for managing pain during childbirth (analgesic requirements were reduced) (Smith et al, 2006 **Level I**) and dental pain (Ernst & Pittler, 1998 **Level I**).

A meta-analysis of trials comparing acupuncture (traditional- and electro-acupuncture) with placebo acupuncture for the treatment of pain in general concluded that it does result in a small analgesic effect (4 mm on a 100 mm VAS), but that this seemed to lack clinical relevance and could not clearly be distinguished from bias resulting from incomplete blinding (Madsen et al, 2009 **Level I**). The analgesic effect of placebo acupuncture compared with placebo was moderate but very variable, and considerable heterogeneity in the included trials was noted.

Acupressure

Acupressure is a technique derived from acupuncture, where physical pressure is applied to acupuncture points.

Acupressure performed during prehospital transport using 'true points' led to better pain relief than acupressure using 'sham points' (Kober et al, 2002 **Level II**; Barker et al, 2006 **Level II**; Lang et al, 2007 **Level II**) or no acupressure (Kober et al, 2002 **Level II**).

Key messages

1. Acupuncture reduces postoperative pain as well as opioid-related adverse effects (**N**) (**Level I**).
2. Acupuncture may be effective in some other acute pain settings (**U**) (**Level I**).

8.4 OTHER PHYSICAL THERAPIES

8.4.1 Manual and massage therapies

Most publications relating to manual (eg physiotherapy, osteopathy and chiropractic) and massage therapies involve the use of these treatments in low back pain and other musculoskeletal pain. The evidence for these therapies is covered in detail in *Evidence-based Management of Musculoskeletal Pain*, published by the Australian Acute Musculoskeletal Pain Guidelines Group (2003) and endorsed by the NHMRC. For a summary of some of the key messages from this document see Sections 9.4 and 9.5.

There is little consistent evidence of any benefit for the use of massage in the treatment of postoperative pain. Foot massage and guided relaxation did not lower pain scores after cardiac surgery (Hattan et al, 2002 **Level II**). Similarly, massage after abdominal or thoracic (via a sternotomy) surgery did not reduce pain scores or analgesic use, although a significant reduction in the unpleasantness of pain (the affective component of pain) was reported (Piotrowski et al, 2003 **Level II**). However, after a variety of major operations, massage therapy reduced postoperative pain intensity and unpleasantness (Mitchinson et al, 2007 **Level II**). In patients after abdominal surgery, the use of a mechanical massage device which leads to intermittent negative pressure on the abdominal wall resulted in significantly lower pain scores and analgesic use on the second and third days after surgery as well as reduced time to first flatus (Le Blanc-Louvry et al, 2002 **Level II**).

8.4.2 Heat and cold

Evidence for any benefits from postoperative local cooling is mixed. Significant reductions in opioid consumption and pain scores after a variety of orthopaedic operations have been reported (Brandner et al, 1996 **Level II**; Barber et al, 1998 **Level II**; Saito et al, 2004 **Level II**); other studies have shown no such reductions (Leutz & Harris, 1995 **Level II**; Edwards et al, 1996 **Level II**; Konrath et al, 1996 **Level II**). Similarly, no benefit in terms of pain relief or opioid requirements was seen after total abdominal hysterectomy (Finan et al, 1993 **Level II**) or Caesarean section (Amin-Hanjani et al, 1992 **Level II**).

There was limited evidence to support the use of local cooling for pain relief from perineal trauma after childbirth (East et al, 2007 **Level I**) and no good quality evidence for its use in the treatment in low back pain (French et al, 2006 **Level I**).

There is moderate evidence from four trials that heat wrap therapy results in a small short-term reduction in pain in patients with acute or sub-acute low-back pain (French et al, 2006 **Level I**).

8.4.3 Other therapies

There is no evidence to support the use of static magnet therapy for the treatment of pain generally (Pittler et al, 2007 **Level I**) and the use of this therapy had no effect on postoperative pain or analgesic requirements (Cepeda et al, 2007 **Level II**).

Postoperative transcranial magnetic stimulation used in patients after gastric bypass surgery led to significant lower PCA opioid requirements (Borckardt et al, 2006 **Level II**).

There was no difference in postoperative analgesic requirements following use of millimetre wave therapy after total knee arthroplasty (Usichenko, Edinger et al, 2008 **Level II**) or healing touch after coronary artery bypass surgery (MacIntyre et al, 2008 **Level II**), although postoperative anxiety was significantly reduced in the latter study.

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