PSYCHOLOGICAL EFFECTS ON SURGICAL STRESS AND RECOVERY

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TO MY PARENTS

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ABSTRACT

The role of psychological factors in recovery from surgery is not fully understood. Studies which examined surgical stress and psychological intervention were reviewed in chapters one and two, while methods of assessing surgical stress were discussed in chapter three. Studies of psychological and neuroendocrine parameters were undertaken in patients undergoing minor and major abdominal/perineal surgery.

The study in chapter four examined the possible relationship between state anxiety and emotional and physical recovery from both minor and major surgery. State anxiety was found to be related to a poorer recovery while arousal was associated with a better outcome.

The effectiveness of relaxation training given pre-operatively, in attenuating the stress response to major surgery and in reducing post-operative discomfort was examined in chapter five. The results suggest that the relaxation training improves surgical patients' rate of recovery.

The study in chapter six looked at the effects of relaxation training on endocrine responses and recovery from both major and minor surgery. The results show

cortisol and adrenaline responses. They also show that patients who had minor surgery and had listened to the relaxation tape had higher levels of adrenaline and cortisol during surgery than the control group. This result was not found in patients who had major surgery. Patients who had major surgery and relaxation training were however, discharged 3 days earlier than those in the control group.

The final study in chapter seven tested the ability of a different psychological intervention (relaxation with imagery) to influence the endocrine responses to and recovery from minor surgery. The results show that patients who received relaxation with imagery displayed higher levels of adrenaline and noradrenaline but lower cortisol levels, and their blood pressure and heart rate declined more than the control group.

It is concluded that pre-operative psychological intervention influenced recovery from surgery. The most effective type of intervention has been to provide patients with instruction in some form of cognitive strategy for managing physical or emotional distress associated with surgery and hospitalization.

The results are discussed in relation to the literature reviewed on physiological stress, psychoendocrinology and anxiety. Janis theory of the "work of worry" - The

in this thesis and is discussed as a conceptual framework for health psychology. Implications are drawn for the role of health psychology in designing health care delivery systems.

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CHAPTER THREE

"SOUL AND BODY, I SUGGEST, REACT SYMPATHETICALLY UPON EACH OTHER. A CHANGE IN THE STATE OF THE SOUL PRODUCES A CHANGE IN THE SHAPE OF THE BODY AND CONVERSELY A CHANGE IN THE SHAPE OF THE BODY PRODUCES A CHANGE IN THE STATE OF THE SOUL"

Aristotle 384-322 BC

INTRODUCTION

The scientific study of psychological aspects of patients' recovery from surgery has not been a subject of interest or concern until recently. In fact, most reviews cite Freud as the first psychologist to suggest the value of studying surgical patients. Another theorist from a psychoanalytic perspective, emphasized the psychodynamic significance of the removal of specific organs and of the invasion of the body's boundaries (Deutsch, 1942). She suggested that early childhood fears of loss, separation and castration were likely to be reactivated around the time of surgery.

Later Janis (1958), one of the leading theorists, studied surgical patients in order to support his theory of "work of worry". The recovery of surgical patients has therefore been seen as a problem to which psychological techniques could bring important benefits.

The research in this thesis falls within the broad field of health psychology. It extends previous work which has looked at the psychological theories concerning surgical stress and the efficacy of psychological interventions as ways of helping patients cope with the stress of surgery. It tries to identify the interrelationships between psychological and physiological responses to surgical operations. It is exclusively concerned with inpatient elective surgery in adults who require general anaesthesia. Particularly, the focus is on a relaxation technique as a way of reducing fear and anxiety and facilitating post-operative recovery.

CHAPTER ONE

FACTORS THAT INFLUENCE THE PATTERN OF SURGICAL STRESS

1.1 Source of Stress

Hospitalization for surgery is a potentially stressful and anxiety provoking experience which frequently creates demands on the patient's ability to function physically and psychologically (Langer et al., 1975; Mathews and Ridgeway, 1981). Studies in this area have clearly indicated that hospitalization for surgery is associated with high levels of psychological stress. Some studies using standardized self-report measures have shown that facing surgery elicits high anxiety scores which return to normal levels in the post-operative period (Auerbach, 1973; Spielberger et al., 1973). Other studies have suggested that anxiety is not subject to an automatic decline in the post-operative period, and that the period of highest anxiety may be in the week following surgery (Chapman and Cox, 1977; Visser, 1982; Johnston, 1982). Anxiety is therefore, viewed as the major manifestation of stress involving hospitalization for surgery.

The focus of patient anxiety ranges widely. From his analysis of unstructured interviews in four British hospitals, Raphael (1969) suggested that there were three broad categories of concern. These were the care of the patient, the physical environment and life in hospital. French's (1978) survey of 312 patients admitted to the general medical, surgical and urological wards of four hospitals indicated that such aspects of hospital life as fitting into hospital routine, the comparative lack of privacy and potential for embarrassment were causes of concern. Particularly worrying, when seeing others who were ill and needing help in doing things they would normally do for themselves.

Volicer and Bohannon (1975), Johnston (1976), Volicer (1978), and French (1978), noted as sources of anxiety in the patients they studied as separation from spouse and home, lack of information, problems with medications and unfamiliarity of surroundings. Wilson-Barnett (1976) interviewed 200 medical patients about 60 aspects of hospital life and found that 8 were especially disturbing - using a bed pan, night time, barium x-rays, anticipating a painful treatment, seeing a very ill patient, leaving usual work, being away from the family and the patient's condition or illness.

Studies in this area have covered a wide range of severity of surgery, from heart operations (Aiken and Henrich, 1971; Gruen, 1975) to minor surgery (Wolfer and Visintainer, (1975) and to some extent the psychological effects of surgical procedures reported in these studies have varied with the condition being studied (Henrichs et al., 1971; Weiss, 1966). The levels of anxiety experienced do not appear, however, to be associated with the severity of the condition, but with the hospital environment and the personality of the patient (Lucente and Fleck, 1972). Wallace (1985a) suggested that anxiety may differ between groups of patients undergoing the same procedure, but for different reasons.

Many operations are commonly reported to be associated with adverse psychological reactions. Lindemann (1941) reported agitation and insomnia, Drellich et al., (1956) non-specific anxiety, Dennerstein et al., (1977) reduced psychosexual functioning and Zervos and Papaloucas (1972) psychosomatic disorders. Not all writers nevertheless, report such adverse reactions (Mills, 1973; Hampton and Tomasky, 1974). Meikle's (1977) review of 21 relevant studies found that 15 reported undesirable psychological reactions followed a hysterectomy, whilst 6 did not. He suggests that the discrepancies may be attributed to differences in research design and method, with lack of standardized measures, lack of pre-operative assessment and mixed samples.

Particular operations may be expected to bring their own specific concerns about post-operative health or longevity. Many of these may be rational, for example many women facing gynaecological surgery for non malignant disease worry that cancer will be discovered (Steptoe et al., 1988).

From these studies it can be concluded that going into hospital for an operation is associated with high levels of psychological stress and that the areas of concern range widely, covering aspects of the illness and the operation itself, life in hospital, and separation from family and home.

1.2 Subjective Emotional State - Anxiety

Patients' emotional state has often been considered in terms of anxiety. It is regarded as a multidimensional construct that may be reflected in physiological response, observable behaviour and self-report (Lang, 1978). A number of scales have even been developed which assess patients' anxiety about various aspects of hospitalization (Lucente and Fleck, 1972; Wilson-Barnett, 1976). The greatest effort has therefore gone into investigating changes in anxiety.

The relationship between pre-operative anxiety and post-operative status has been a recurring theme in the literature on surgical stress. Interest in this issue in part derives from the findings of Janis of a curvilinear relationship between pre-operative fear and post-operative emotional disturbance, and from the model he proposed to explain this relationship (Janis, 1958; Janis and Leventhal, 1965).

There are also both theoretical and clinical reasons for studying anxiety in surgical patients (Johnston, 1982). Theoretically it is a variable of interest because hospitalization and having an operation presents the individual with a number of stresses, and it is of interest to determine whether anxiety is associated with other psychological states. Clinically it is of interest as anxiety is an uncomfortable emotional state which psychologists might usefully aim to alleviate. Finally it may be that pre-operative anxiety is related to physical indices of post-operative recovery.

Although one might assume that pre-operative anxiety would always impede the patient's recovery and that one should aim to minimize this state, (Janis, 1958) argued that anxiety reduction could potentially be detrimental to post-operative recovery. Using as subjects male college students who had recently undergone surgical operations and a small sample of surgical patients, he found a curvilinear relationship between pre-operative fear and post-operative anger, complaints and emotional disturbance. He also reported that patients who said they had had prior information about what was going to happen to them showed better pre- and post-operative adjustment than those who did not have such information.

Janis argued as a result of these findings that those individuals who were moderately fearful before their operation recognized the threat and thus had the opportunity to prepare themselves for it psychologically but were not so vigilant to threat that they were overwhelmed by it. Patients who were most fearful pre-operatively showed the greatest anxiety post-operatively and this was attributed to an over-sensitization to danger which effectively blocked adaptive, pre-operative patterns of behaviour. Low levels of fear before surgery resulted in subsequent anger and resentment, and it was suggested that this reflected a lack of preparation for danger and unrealistic expectations about the difficulties and discomfort that would be experienced.

The positive role of moderate fear in motivating the individual to prepare for and adjust to stress has been termed " the work of worry", (Marmor, 1958) and has led to the belief that a moderate amount of anxiety before an operation is associated with better outcome. Janis ' work can however, be criticized for its flawed methodology (Johnston, 1982) and subsequent studies generally do not support the notion of a curvilinear relationship between pre-operative anxiety and post-operative outcome, (Johnson et al., 1971; Cohen and Lazarus, 1973; Sime, 1976; Johnston, 1980; Ray and Fitzgibbon, 1981 and recently Wallace, 1986a). The hypothesis of a curvilinear relationship has frequently been extended to include additional indices of post-operative adjustment such as the speed of recovery, need for medication and pain. In some studies a simple linear relationship has again emerged (Chapman and Cox, 1977; Johnson et al., 1978), while in others evidence of neither a curvilinear nor a linear relationship has been found (Auerbach, 1973; Bruegel, 1971; Wolfer and Davis, 1970).

Overall, studies find that patients who are highly anxious after surgery, and those with low pre-operative anxiety also show low levels of anxiety after surgery. Johnston (1981) examined the possible mechanism underlying this relationship. She hypothesized that the trait of anxiety might explain the linear relationship between the pre- and post-operative anxiety state. Johnston tested this hypothesis by statistically controlling for trait anxiety whilst exploring the relationship between pre- and post-operative state anxiety. Evidence of a significant relationship between these two was no longer apparent which supported the idea that state anxiety levels before and after surgery are linearly related because both are related to trait anxiety.

Anxiety becomes of greater clinical relevance when one suggests that physical recovery after surgery might be related to pre-operative emotional state. Although the findings from research exploring this relationship differ, there are a number of positive outcomes, indicating a linear relationship between levels of pre-operative anxiety and physical indices of post-operative recovery. Again, there is no evidence supporting a curvilinear relationship.

Eighty men undergoing hernia repairs were used as subjects in Rothberg's (1965) study . He used the 16PF (Cattell, 1957) to assess anxiety level and found that anxiety factor scores were not significantly related to the recovery measures of gastric, urinary and bowel function. Bruegel (1971) reported that, in 85 adults having routine major abdominal surgery and hernia repair, anxiety levels were not significantly related to pain scores. Johnston et al.,'s (1971) subject sample was composed of 44 women having elective hysterectomies and 18 having cholecystectomies. She found no significant relationships between anxiety and subjective ratings of incisional pain, the number of analgesics taken and length of hospital stay. Wolfer and Davis (1970) reported no significant relationship between anxiety and diverse objective aspects of recovery in 76 gynaecological patients.

Hayward (1975) however, reported that, in patients expecting general surgery, a higher pre-operative anxiety level was correlated with a longer hospital stay, although not analgesic consumption or pain measure. Martinez-Urrutia (1975) additionally, reported that amongst 59 male patients undergoing general surgery, higher anxiety on the day before the operation was significantly associated with higher reported pain.

Another study showing positive significant correlations between pre-operative fear and post-operative pain is reported by Johnson et al., (1971). These observations could not be reproduced in subsequent studies (Johnston and Carpenter 1980; George et al., 1980; Ray and Fitzgibbon 1981; and Scott et al., 1983). High pre-operative anxiety was associated with greater post-operative medication consumption in the studies of Sime (1976) and George et al., (1983). Also positive associations were found between pre-operative anxiety and length of hospital stay by Johnson et al., (1971) and Sime (1976). Scott, Clum and Peoples (1983) reported that pre-operative anxiety predicted post-operative pain.

More recent studies include those by Wallace (1984, 1985a, 1986a), Wells et al., (1986) and Ho et al., (1988). Wallace's (1986a) study looked at two samples of patients undergoing elective minor gynaecological surgery. She found that there was a weak linear relationship between pre-operative and post-operative anxiety but not with post-operative outcomes such as pain or speed of returning to normal activities. She also found no evidence to suggest that patients with either high or low levels of pre-operative anxiety differed in appraisal or coping strategies.

On the other hand, Wells et al., (1986) found clearer correlations of anxiety with self ratings of pain and with analgesic use in a sample of patients undergoing various types of surgery. They used a questionnaire designed specifically to measure anxiety about events related to being in hospital (the Hospital Anxiety Scale : Lucente And Fleck, 1972).

Different findings may be attributed to inadequate anxiety or recovery measures or to the use of heterogenous subject samples (Mathews and Ridgeway, 1981). They have suggested a number of possible factors that could be mediating the significant relationships reported between high pre-operative anxiety and poor post-operative physical recovery. When only subjective ratings of post-operative outcome are used it could be that higher levels of anxiety could lead directly to more reported pain.

Another possibility to explain the different findings is that highly anxious patients are less diligent in carrying out activities they are advised to undertake to promote their recovery such as getting out of bed and taking gentle exercise, either because of their greater awareness of pain or their concern about possible damage.

Finally, the difference may be the result of the direct effects of excessive autonomic arousal on physical recovery (Selye, 1976; Boore, 1978). The research has not yet been done which would allow any conclusion to be drawn as to which variable or variables are operating.

1.3 Other Emotional States

Other emotional states have not been examined in such great detail as state anxiety. Where depression has been assessed repeatedly, in renal and general surgical patients, it has shown a similar pattern to anxiety, both increasing post-operatively (Chapman and Cox, 1977; Vogele and Steptoe, 1986). Anger and confusion are also increased (Vogele and Steptoe, 1986). Rose and King (1978) identified fatigue as a dimension of emotional feeling present during the post-operative convalescent period. Investigations of abdominal surgery patients have reported that feelings of fatigue were elevated up to 30 days post-operatively compared to pre-operative levels (Christensen et al., 1982, 1986). Vogele and Steptoe (1986) found a more rapid decline of fatigue to pre-operative levels in their sample of orthopaedic patients, together with a corresponding recovery in vigour.

The emotional states mentioned above therefore, show other ways of measuring patients' emotional state before and after surgery. However, more systematic studies have yet to establish how general these emotions are among hospitalized patients. It would also be more valuable to know how patients describe how they feel during recovery.

Investigations of Janis' (1958) theory that pre-operative worry prepares patients for surgery and thereby reduces its impact has been criticized. Because of the lack of evidence to support Janis' hypothesis of a curvilinear relationship between pre-operative emotionality and post-operative adjustment, it has been suggested that emotionality and coping behaviour are independent and parallel responses (Leventhal, 1970). Ray and Fitzgibbon (1981) examined this hypothesis by defining the individual's emotional response to an appraisal of the external environment as a 'stress factor', and orientation towards coping and control as an 'arousal factor'. Their findings showed high arousal (corresponding to Janis' optimal pre-operative state) to be associated with a positive post-operative outcome, and high stress with a negative outcome, suggesting that it is the work the individual does in response to the threat rather than the worry in which he engages that promotes adjustment. Ho et al., (1988) using 79 patients about to have their wisdom-tooth removed, found that higher levels of pre-operative arousal declined post-operatively.

Theoretically, therefore, psychological interventions aimed at alleviating worries could play a significant role in enhancing post-operative physical and emotional adjustment.

1.4 Physiological State

It is now well known that increased physical or psychological demands will usually tend to stimulate adaptive mechanisms in order to maintain a steady state in the body as homeostasis. The involvement of the endocrine system in this process dates back to the pioneering work of Cannon (1929) and some years later, Selye (1950). They focused on two neuroendocrine systems, the sympathetic - adrenal cortical system, and the pituitary - adrenal cortical system. Several adaptive hormonal responses are known to be caused by stress, and prominent among these responses are the secretion of catecholamines, coticosteroids and adrenocorticotrophin.

One of the dominant themes in adrenal cortical physiology has been the theory that the pituitary-adrenal axis participates prominently in the "non-specificity system reactions of the body which ensue upon long exposure to stress". As long ago as 1936, Selye called attention to the fact that "diverse nocuous agents" produced a rather stereotyped response in rats. He went on to describe the general adaptation syndrome (GAS) with its three stages of alarm reaction, resistance and exhaustion. It was this series of responses that Seyle referred to as stress.

Cannon (1929) was the first, however, to describe the effects of stress on catecholamines. Fifty years later Carruthers et al., (1970) examined blood samples from free-falling parachute jumpers, racing car drivers, city car drivers, public speakers before and during speeches and rock climbers. Other investigators looked at stimuli such as examinations (Frankenhaeuser et al., 1978; Allen et al., 1985), venesection (Davis et al., 1962), and mental tasks (Andren et al., 1982) performed in a laboratory. Researchers, like Henry (1982) and Cox (1983) have discussed the adrenal glands as central to "stress" physiology and theory.

This thesis will involve only selected aspects of the endocrinology of surgical stress with particular reference to catecholamine and cortisol secretion. But since most stressors alter anterior pituitary hormone secretion by changing the rate of secretion of the various hypothalamic hypophysiotrophic hormones (Delitala, 1987) a brief review of the other stress hormones, prolactin and growth hormone will also be presented.

1.4.1 Endocrine response to Anaesthesia and Surgery

The pattern of endocrine activation by surgery is regarded as a manifestation of Selye's (1936) stress response (Wilmore et al., 1976). This response has also been regarded as adaptive (Munck and Guyre, 1986).

1.4.1.1 Cortisol

The rise in cortisol has been studied in most detail. It starts to rise on incision, reaching its maximum during the hours after surgery, after recovery of consciousness; levels may remain elevated for five days or longer following major surgery (Plumpton and Besser, 1969; Plumpton et al., 1969; Nistrup Masden et al., 1978; McIntosh et al., 1981; Tsuji et al., 1983; Rutberg et al., 1984; Udelsman et al., 1987; Chernow et al., 1987; Oyama and Wakayama, 1988) fewer after minor surgery (Plumpton et al., 1969; Clarke et al., 1974).

Other researchers have reported different findings with major surgery. For instance cortisol concentration did not change significantly during craniotomy (Lines et al., 1971), but there was a slight increase in the plasma concentration during tympanotomy (Nistrup Madsen et al., 1976), local mastectomy, inguinal herniorrhaphy and varicose-vein surgery (Clarke et al., 1970) and during caesarian section (Namba et al., 1980). A number of studies reported the greatest response after thoracic and intra-abdominal operations (Thomasson, 1959; Clarke et al., 1970).

Most studies have shown that the agents used in modern anaesthetic practice do not stimulate adrenocortical activity, therefore the stimulus to the increased cortisol secretion is presumed to be the physical trauma of surgery. But some studies propose that type of anaesthesia has a contributory effect. Taylor et al., (1976) and Stanley et al., (1980) found that during closed mitral valvulotomy and open-heart surgery, the plasma cortisol concentration increased under conventional anaesthesia but not under high dose fentanyl anaesthesia. In a study (Haxholdt et al., 1981) of 25 patients undergoing major abdominal surgery, results showed that a high dose of fentanyl abolished the cortisol response to surgery. Similar findings were reported by Blunnie et al., (1983) in a study of 45 patients scheduled for abdominal hysterectomy. Clarke et al., (1974) study using minor surgery patients found that differences in the cortisol response were seen when different anaesthetics were used. By contrast the study by Engquist and Winter (1972) reported that during moderate and major surgery the dominant effect of surgical trauma obscured the differences in the cortisol response between various anaesthetics.

1.4.1.2 Catecholamines

Changes in adrenaline and noradrenaline are less consistent (Salo, 1982a). Some studies have reported no increases (Butler et al., 1977), or an increase in adrenaline but not much change in noradrenaline (Nistrup, Masden et al., 1978; Hall, 1985 and Udelsman et al., 1987). Oyama, (1973) found that premedication with morphine, morphine-hyoscine, pentobarbitone-atropine or hyoscine had no effect on urinary catecholamine excretion, but pentazocine premedication increased it. Other studies which used diethylether and cyclopropane (Price et al., 1959) and ketamine (Appel et al., 1979) found increased plasma catecholamine concentrations but the studies by Oyama (1973) and Tammisto et al., (1973) reported thiopentone, neurolept- and spinal anaesthesia to have no effect.

Differing results exist on the plasma catecholamine responses during surgery. Studies reported by Tammisto et al., (1973), and Halter et al., (1977) suggested that major abdominal surgery has increased plasma catecholamine concentration but studies by Butler et al., (1977) and Hirvonen et al., (1978) show reduced catecholamine levels.

Some patients with increased pulse rate and blood pressure were seen to have an increase in plasma catecholamine concentrations during operations (Nikki et al., 1972; Halter, Pflug and Porte, 1977). Sufficient administration of anaesthetics has been shown by Roizen, Shnider and Frazer (1980) to block the catecholamine response to skin incision by using enflurane, halothane and morphine anaesthesia. The response can also be blocked by epidural analgesia (Engquist et al., 1980).

With major surgery, catecholamine responses to surgery during the first post-operative hours have been reported to be clearer than during the operation (Nikki et al., 1972); Delius et al., 1975). Nikki et al., (1972) have also reported a post-operative increase of plasma proteins after painful operations but not after e.g. ophthalmic surgery.

Most anaesthetics and anaesthetic methods suppress sympathoadrenal responses to noxious stimuli (Nikki et al., 1972). Therefore, after recovery from anaesthesia the differing effects of various operations on the catecholamine response seem to become manifest (Salo, 1982a)

1.4.1.3 Prolactin

Surgery is also associated with a significant elevation in plasma prolactin (Kaufman, 1982). It usually rises after induction of anaesthesia and intubation, then peaks during operation and is still raised one day post-operatively. Noel et al., (1972) suggest that the prolactin rise which occurs during surgery itself is probably related to stimuli of cutting and manipulation of tissue, since similar prolactin rises are observed during spinal anaesthesia without intubation. Sowers et al., (1977) also found that minor surgical procedures such as gastroscopy or proctoscopy are accompanied by an increase in serum prolactin.

The type of surgical procedure is known to influence the pattern of prolactin secretion in response to surgery. Abdominal or vaginal surgery cause acute serum prolactin elevation which usually returns to normal within 24 hours and women exhibit greater prolactin changes than men (Noel et al., 1972; Sowers et al., 1977).

1.4.1.4 Growth Hormone

The growth hormone is also known to rise during surgical stress (Noel et al., 1972; Sowers et al., 1977). They found that the timing of this growth hormone is different from that of prolactin since growth hormone usually rises only during the operation itself, occurs later than that of prolactin, and ends 90-120 minutes post-operatively. There was however no significant increase in growth hormone with minor surgery, gastroscopy or proctoscopy.

1.4.2 Endocrine Responses to Stress

The physiological actions of elevated cortisol levels include anti-inflammatory properties, immunosuppressive actions, precipitating metabolic adjustment leading to the breakdown of protein, fat and carbohydrate stores and enhancing excretion of a water load (Fahey et al., 1981). It therefore, appears that within physiological limits, these endocrine-metabolic changes may facilitate wound healing and recovery which means cortisol is essential for normal body function.

Based on these observations, Munck et al., (1984) proposed that the physiological function of stress-induced increases in cortisol levels is to protect not against the source of stress itself, but against the normal defence reactions that are activated by stress and the cortisol levels accomplish this function by turning off those defence reactions, therefore preventing them from overshooting and themselves threatening homeostasis. This implies that the cortisol levels would protect against our own defence mechanisms, which could cause damage and endanger survival if they are activated for too long.

Walton (1978) and Salo (1982b) suggested that elevated circulating cortisol levels contribute to immunosupression and vulnerability to infections following surgery. Therefore, it has been debated that to reduce or block these endocrine responses would benefit the surgical patient (Kehlet, 1982; Ellis and Humphrey, 1982; Hole, 1984). Some have speculated that suppression of the 'stress response' and its catabolic and immunological consequences may reduce post-operative morbidity and mortality (Ellis and Humphrey, 1982; Kehlet, 1984; Hall, 1985). Indeed, others, having considered the data available on the adrenal response to surgery have found no support for its essential or 'favourable' nature and have discovered that with the use of epidural anaesthesia or very large doses of morphine, it is possible to abolish the cortisol hypersecretion that accompanies and follows major abdominal and cardiac operations without any apparent side-effects (Brandt et al., 1978; Rem et al., 1980; George et al., 1974). A number have proposed that cortisol and catecholamine responses are of special interest because of their sensitivity to psychological factors (Cox and Cox, 1985; Frankenhaueser, 1980).

There is evidence that hospital admission, without any physical insult can alone stimulate increased secretion of corticosteroids and of adrenaline and noradrenaline (Tolson et al., 1965), and that plasma corticosteroid levels may rise further during the days preceding surgery (Franksson and Leyzell, 1955). Brooks et al., (1986) found a correlation between self-perceived anxiety and cortisol secretion in patients admitted to hospital for routine operations. While Fell et al., (1985) found that increases in self-rated anxiety from before premedication to pre-induction of anaesthesia for minor surgery correlated with increase in adrenaline over this period. Where post-operative correlations of anxiety with cortisol, adrenaline, or noradrenaline have been examined (Salmon et al., 1986; Brooks et al., 1986; Ho et al., 1988) the correlations, however, tend to be less clear than pre-operative ones. In an earlier study pre-operative cortisol levels a day or more before herniorrhaphy correlated with ratings of 'discomfort-involvement' (Bursten and Russ, 1965). Czeisler et al.,'s (1976) study found that the 24 hour cortisol secretory pattern of a group of patients awaiting elective cardiac surgery was not different from that of normal subjects, but an acute event such as pre-operative preparation involving shaving the body and legs and the administration of an enema evoked a major cortisol secretion. Therefore, patients' cortisol levels in hospital may well be susceptible to psychological modification.

There is little indication whether emotional states other than anxiety would show stronger relationships with these endocrine responses. Mathews and Ridgeway (1981) suggested that trait-anxiety might impair recovery by increasing the endocrine responses to surgery. The latest evidence suggests that this is not the case. Salmon et al., (1988) found that although trait-anxiety predicted lower circulating adrenaline levels pre, per and post-operatively and lower cortisol levels post-operatively, it predicted higher circulating noradrenaline levels pre- and three days post-operatively. Cox and Cox (1985) suggested that the association of an anxious disposition with a lower cortisol response is hard to reconcile with existing evidence, but they propose that it is perhaps compatible with Janis' (1958) theory of stress- reducing effects of pre-operative worry.

A number of other studies, like Brady (1975), have looked at ways of coping and have proposed that distressing conditions where no coping behaviour is possible, are associated with cortisol and catecholamine release. Frankenhaeuser (1983) has suggested that effort without distress is accompanied by increased levels of catecholamine; effort with distress by elevations in cortisol and catecholamine secretion; and distress without effort (ie. giving up, helplessness) by elevations in cortisol alone. However, Mason (1975) noted that threatening situations are associated with increased excretion of noradrenaline, adrenaline and cortisols, whereas unpleasant but anticipated stimuli are associated with increases in cortisol and noradrenaline without increases in adrenaline.

Goldstein et al., (1987) suggested that sympathetic nervous activity, as indicated by plasma or urinary noradrenaline, is related to familiar, attention-demanding activity, especially involving actual skeletal muscle exertion, regardless of the amount of distress; whereas pituitary-adrenocortical system and adrenomedullary stimulation occurs during distressing conditions involving anxiety, limited coping options and unpredictability and when the subject continues to be distressed but no longer attempt to cope, the pituitary-adrenocortical system and parasympathetic activity predominate.

Studies in this area have mainly been correlational or concerned with experimental interventions which are chosen to increase immunological function (Rogers, Dubey and Reich, 1979; Amkraut and Solomon, 1975; and Bradley 1982). From most studies which have been done so far, it has become increasingly clear that there is no such hormone as a 'stress hormone', but rather that the neuroendocrine axis acts together with other physiological and psychological systems to preserve the subject in response to external demands and counteract the effects of disturbances. This integrated responsiveness appears to vary according to the stress and is generally adaptive, although not all of the changes are understood.

The importance of the adrenal response to surgery seems to be unclear. It is possible that relatively low levels of cortisol in plasma and tissue are necessary for the maintenance of normal functions. It is however, clear that morbidity is increased in hypoadrenal individuals who are subjected to surgery. But there has been no evidence so far to support the notion that reducing adrenal responses to surgery improves post-operative morbidity (Kehlet, 1984), although anaesthetists have tried to modify their response to surgery.

1.5 Personality Factors

Within the context of surgical stress and recovery from surgery a number of personality measures have been examined. The personality measures concerned with this thesis include, Trait anxiety, Type A personality, Locus of control and coping style. Coping style is a personality variable that has been increasingly researched over recent years and implies that individuals are thought to have typical ways of managing potentially stressful situations (Lazarus, 1966). These personality factors are described in detail in Chapter three. Evidence of the influence of these on physical ratings of recovery will be summarized below.

1.5.1 Locus of control

People with internal locus of control believe that they have influence over the outcome of events; those with external locus believe that events are out of their control. Studies which have distinguished internal from external control patients failed to show any correlations with indices of recovery (Johnson et al., 1970).

Johnson et al., (1971) using 62 female surgical patients, found that the Multidimensional health locus of control interacted with birth order such that first borns stayed in hospital longer and required more analgesia if they were in the high 'internal' group. Because of this inter-relationship it was difficult for Johnson and his co-workers to make claims for the impact of locus of control as a separate factor.

The subjects of Levesque and Charlesbois (1977) study were 82 cholecystectomy and 54 hysterectomy patients. No significant relationships were found between any of the dependent variables and the Multidimensional health locus of control. There is some suggestion that internals may benefit more from information (Auerbach et al., 1976; Pickett and Clum, 1982) but this has not been found in other studies (Wallace, 1983).

Friedlander et al., (1982) study found that patients who have weaker internal beliefs reported greater levels of state anxiety pre-operatively. A recent study (Salmon et al., 1988) found no correlations between the Multidimensional Health Locus of Control with endocrine indices. Thus locus of control has not yet been proven relevant to post-operative recovery (Mathews and Ridgeway, 1981). Where it is used, a clear pattern of results is unlikely to emerge until more situation-specific measures are employed. Because of the theoretical interest of locus of control in surgical patients, three measures have been included in this thesis to measure it, the Multidimensional health locus of control (Wallston et al., 1978), the Krantz health opinion survey (Krantz et al., 1980) and the Desire for control of health care (Smith et al., 1984). These are described in chapter three.

1.5.2 Trait anxiety

Trait anxiety has long been viewed as a predisposition to respond with an anxiety state to a wide variety of threatening situations. Studies which investigated Spielberger's state trait anxiety theory with hospitalized patients reported one consistent finding, namely that patients with a high A-trait experience higher levels of A-state than patients with a low A-trait (Spielberger et al., 1973; Auerbach, 1973; Martinez-Urrutia, 1975). But a measure of anxious personality may not be the most useful indication of patients likely to show intense anxiety states post-operatively. For instance a recent study (Ho, et al., 1988) found that high trait anxiety did not predict a greater response in patients who had wisdom-tooth removed.

Mathews and Ridgeway (1981) reported relatively consistent evidence that anxious personalities show greater distress than non-anxious post-operatively and recover more slowly when this is indexed by pain ratings, length of hospital stay and medication requests. Other studies have also indicated a poorer recovery of high trait anxiety patients, in particular, those with a highly anxious personality tended to experience greater pain (Chapman and Cox, 1977; Martinez-Urrutia, 1975).

It has also been suggested that trait anxiety might impair recovery by increasing the endocrine responses to recovery. Salmon et al., (1988) however, found that although trait anxiety predicted lower circulating adrenaline levels pre-, per- and post-operatively and lower cortisol levels post-operatively, it predicted higher circulating noradrenaline levels pre- and three days post-operatively.

It is therefore possible from the above literature that a measure of anxious personality needs further research to clarify its efficacy as a predictor of recovery rate following surgery (Wallace, 1987). The mechanisms which underlie factors of trait anxiety remain obscure and may depend on the precise index of recovery being employed (Steptoe, 1990).

1.5.3 Type A

There is a large and growing literature on the nature, correlates and effects of Type A behaviour pattern (Dembroski et al., 1978; Wright et al., 1985; Manuck et al., 1986). Glass (1977, 1985) has suggested that Type A behaviour represents an attempt to assert and maintain control over stressful aspects of the environment. Matthews and Siegal (1982) and Matthews et al., (1983) on the other hand, have suggested that Type A behaviour is the result of a strong desire for productivity and achievement combined with ambiguous standards for evaluating achievement. Therefore, situations which represent opportunities for achievement, but lack explicit standards, are likely to elicit the aggressive striving typical of Type As.

Magnusson and Endler (1977) proposed that Type As display competitive, hostile, impatient and achievement-orientated behaviour, as well as autonomic arousal, only when confronted with challenges or demands. Smith and Anderson (1986) later hypothesized that through cognitive and overt behaviours, Type A individuals construct a subjective and objective environment rich in those classes of stimuli known to elicit enhanced physiological reactivity.

Type A has been associated with greatly increased cardiovascular and catecholamine responses to psychologically stressful tasks and has been identified as a risk factor for coronary heart disease (Glass, 1985). Studies (Khan et al., 1980; Krantz et al., 1982) have demonstrated that Type As undergoing coronary artery bypass surgery, in comparison with Type B counterparts, show raised blood pressure during but not prior to surgery (i.e. under general anaesthesia). These findings suggest the possibility that Type As reactivity does not require conscious mediation. Instead they may reflect an underlying constitutional factor. These findings could not, nevertheless, be replicated in a subsequent report of herniorrhaphy and cholecystectomy patients (Kornfeld et al., 1985).

Salmon et al., (1989) study examined the endocrine responses which are major influences on blood pressure during surgery. They found that Type A correlated positively with adrenaline post-operatively, but negatively with noradrenaline during the operation and post-operatively. This suggests that Type A personality has different influences on sympathetic (noradrenaline) and adrenomedullary (adrenaline) activation.

It is possible that the influence of Type A personality is difficult to interpret owing to the wide variety of measures used to assess Type A. However, there is suggestive evidence that when faced with challenges, Type As showed enhanced cardiovascular and catecholamine reactions compared with Type Bs.

1.5.4 Coping

Research investigating coping style assumes individuals have typical methods of coping with potentially stressful situations. A few studies have explored the relationship between such stress responses and post-operative recovery. Most often researchers have divided subjects into those preferring vigilant defenses and those using avoidant strategies. The former are characterized by their tendency to actively focus on and seek information and think about the stress. Most approaches to the measurement of coping have therefore treated it as a dispositional or personality measure.

Cohen and Lazarus (1973), using sixty one surgical patients as subjects, reported that those classified as 'vigilant' in reaction to their surgical problem were found to take more medications. Delong's (1970) study also found that vigilant patients made the slowest recovery.

Other authors have looked at the interaction between the provision of preparatory information and coping style. Delong (1971) reported that giving patients specific as opposed to general information about their operation was significantly more likely to be associated with a smooth post-operative recovery and shorter overall length of hospital stay. This effect was especially marked for those classified as avoidant. Andrew (1970) also found that the effects of information provision varied with preferred coping style. Avoiders recovered better when they were not given information whilst vigilant subjects recovered better when they were given information. Andrew further reported that amongst the unprepared subjects, those classified as vigilant made the best recovery, which contrast with findings of Cohen and Lazarus (1973) and Delong (1970) described above. Nevertheless, Mathews and Ridgeway (1981) concluded that the evidence suggests that avoidant patients fare better post-operatively.

Miller and Marigan's (1983) study, using forty gynaecological patients about to undergo a diagnostic procedure (colposcopy) found that those given high levels of information showed more subjective tension, depression and discomfort during the anticipatory phase than those given minimal information, especially if their preferred coping style was avoidant.

Recently, Miller (1987) has validated a questionnaire for distinguishing between coping styles, which appear similar to those discussed above. She identified 'monitors' as people who habitually cope with sources of stress by finding out what they can; 'blunters' cope by distracting or relaxing themselves. Steptoe and O'Sullivan (1986) demonstrated some validity for this distinction as applied to gynaecological patients undergoing surgery. They found that monitors had learned more factual gynaecological details than blunters and engaged in more health related information-seeking behaviours, cervical smears and breast self-examination.

Rosenberg et al., (1987) proposed that passive, helpless coping with a variety of stressors impairs motivational state, while Frankenhaeuser (1980) asserts that it enhances the adrenocortical responses to stress.

As we make progress in our cognitive coping training efforts, we will have to have a better understanding of what patients do naturally (Jenkins and Pargament, 1988; Tarrier et al., 1983). Chaves and Brown (1987) assessed what dental patients did spontaneously to reduce distress prior to a fairly invasive dental procedure. About half of all the patients reported they used various forms of cognitive coping, some involving distraction, some re-appraisal. General nervousness, described by 37% of patients was associated with catastrophizing, whereas the expression of situational anxiety related more to the use of coping strategies. 19% of subjects could not report on their specific coping efforts. None of the techniques reported by subjects had an effect on pain ratings but the use of coping strategies was related to lower levels of stress.

Psychological coping responses have also been classified in a number of different ways (Cohen, 1987). Several authors have distinguished behavioural from cognitive coping and have suggested that coping may be focused either on the problem or on emotional factors (Steptoe, 1990). From the above literature review it is not certain which forms of coping are most adaptive in particular settings. There is already evidence that the use of different strategies changes across the stages of even a minor procedure (Wong and Kaloupek, 1986). Suls and Fletcher (1985) proposed that while avoidance was effective in the short term, attention-focused information-seeking is more adaptive in response to chronic stressors.

Although some findings conflict, the studies reported above highlight the importance of matching levels of preparatory procedure with individual preference for particular forms of coping style (Haan, 1982; Miller, 1987) if post-operative recovery is to be maximized.

1.6 Conclusion

A better understanding of the role and effects of factors that influence the pattern of surgical stress is emerging. We have seen from the above literature review that the trauma of surgery is not the only, or even the principal source of threat for surgical patients. Psychological factors, including anxiety and personality may differ between groups of patients undergoing the same procedure. Their anxiety may be influenced by the nature of their illness, fears of other illnesses being discovered (Steptoe et al., 1988), or their concerns about life after the operation. The conditions surrounding surgery are therefore complex. Perhaps to reduce anxiety, as well as enhancing other aspects of recovery, patients should be made to understand what will happen to them during and after surgery. There is however, a wide range of intervention procedures some of which are standardized packages and others are tailored to individual needs. These procedures will be reviewed in the next chapter. If interventions are successful they can carry direct benefits to both patients and staff.

Our understanding of patients' spontaneous coping strategies, their correlates and the endocrine responses to surgical stress is still growing, though the important question as to whether the acute response is functional or pathological still remains to be investigated further. In the review of the literature it is mentioned that a rise in cortisol levels is a normal response to surgery. A major issue is therefore, whether therapeutic efforts should be made to inhibit possible undesirable aspects of these responses. If the acute responses are undesirable, psychological manipulation in order to reduce or block endocrine responses and provide coping mechanisms could perhaps benefit the surgical patient.

There is nevertheless, still a need for more information about the relationship between these different aspects of recovery, about the effects of anaesthetic and psychological techniques on endocrine responses to surgery before more confident recommendations can be made.

CHAPTER TWO

PSYCHOLOGICAL PREPARATION FOR SURGERY

In chapter one we saw that Janis'(1958) hypothesized curvilinear relationship between pre-operative anxiety and post-operative status lacks empirical substantiation. It nevertheless, has great significance in that it raised the notion that post-surgical status could be influenced by carrying out interventions designed to affect the patient's emotional state and orientation to the operation prior to surgery taking place. The effects of pre-operative preparation have therefore, been examined repeatedly over the years (reviews: Auerbach and Kilman, 1977; Kendall and Watson, 1981; Anderson and Masur, 1983; Mathews and Ridgeway, 1984; Rogers and Reich, 1986; Schultheis et al., 1987).

As entering hospital for surgery fulfils all the criteria for being highly stressful, it has been suggested that it should be conceptualized as a crisis and this legitimizes the use of psychological intervention strategies as potential methods of coping, with the ability too of improving post-operative adjustment. For example, Auerbach (1973) and Auerbach and Kilmann (1977) suggest that invasive medical procedures can validly be conceptualized as crises because the typical surgical patient has little choice as regards the operation, and is suddenly faced with a disruption of his habitual lifestyle, and a situation typically involving pain, physical discomfort and even the threat of death. As one type of crisis situation, surgery readily allows the application and evaluation of different "crisis intervention" strategies since it is focalized and so is preceded and followed by relatively stable periods during which planned intervention procedures can be applied and patient outcome data collected.

An examination of the psychological means which have been used in order to help surgical patients show three approaches; a) changing factors within the patients, ie. their ways of coping or their pre-operative state, b) giving patients more control over their care and c) simply offering reassurance and support.

A survey of the relevant literature on psychological interventions therefore indicates that diverse procedures have been applied and evaluated and there is a degree of consensus over the relative efficacy of the different types of procedures. Results from studies of each of these categories will now be briefly reviewed.

2.1 Psychological Support

The strategy termed psychological support was perhaps the earliest of the major categories to be developed + includes a number of diverse approaches such as brief individual psychotherapy, group discussions to allow patients to express fears and anxieties, and puppet and play therapy with children.

The common factor uniting these approaches is that they aim to improve adjustment through giving patients reassurance and support. Although perhaps this was always an aspect of hospital care undertaken as a matter of course by doctors and nurses, systematic studies have looked at such planned interventions.

One of the first studies using psychological support is that by Schimitt and Woolridge (1973). Their intervention consisted of a one hour group discussion the evening before surgery during which patients discussed their feelings about the impending surgical procedure, reassured each other that their feelings and fears were normal and exchanged information about the procedure. Although the authors found that this intervention produced a significantly better recovery in experimental subjects compared with untreated controls, as well as lower anxiety on the morning of surgery, the experimental group also received procedural and behavioural information (e.g. proper breathing and coughing techniques) from group leaders and a one to one session on the morning of surgery which focused on the patient's immediate feelings and needs. It is impossible, therefore, to know which aspect(s) of the intervention produced the therapeutic outcomes observed.

The studies of both Lindemann and Stetzer (1973) and Surman et al., (1974) produced no evidence supporting the efficacy of psychological support as a means of enhancing post-operative recovery. However one of the better studies employing psychological support with medical patients is that of Gruen (1975). The treatment stressed good patient-therapist relationships, reflection of the patient's feelings, reassurance and reinforcement of normalcy and coping ability, and encouragement to more active participation in the patient's own medical regimen. Using myocardial infarction patients as subjects, he found that those patients who received brief individual psychotherapy of one half hour's duration daily throughout the period of their stay spent significantly fewer days in intensive care, less time 'on the monitor' and also tended to be discharged more quickly than did a similar group of patients who received no psychotherapy. Follow-up data indicated that the treated patients were less fearful of a second heart attack and had resumed normal life roles to a greater extent than did the non-intervention group. Although indicating the efficacy of the therapeutic intervention, Gruen's study has been criticized methodologically by Kendall and Watson (1981).

Another study which supports the efficacy of psychological support in this area is the study by Finch and Mettlin (1982). They reported that the amount of social and professional support enjoyed by breast surgery patients was significantly positively related to their psychological adjustment post-operatively. In contrast, a study by Morrow and Morrell (1982) found no significant differences between a supportive therapy group and no treatment control in the suppression of anticipatory nausea in patients undergoing chemotherapy for cancer.

The results of these studies are often difficult to interpret due to methodological weaknesses in terms of inadequate control groups or the confounding of treatment variables. Overall, therefore, the results are equivocal and would seem to indicate that although psychological support can be valuable as a technique for enhancing post-operative adjustment, it is perhaps best seen as an adjunct to other methods.

2.2 Information Provision

The idea of providing patients with information about their impending surgery derives directly from the work of Janis (1958) and Mamor (1958). These authors believed that giving patients such information would serve to increase patients' levels of awareness, if these were too low, so initiating the "work of worry", focus thoughts on the operation and also reduce excessive, unrealistic anxiety.

Two types of information have typically been given.

2.2.1 Procedural information

This kind of information concerns the nature of the medical procedure itself, and may cover the setting in which the procedure will take place, the expected duration and frequency, and identification of the specific health care provider and any risks to which the patient will be exposed.

Vernon and Bigelow (1974) used male hernia patients as subjects and reported that the provision of procedural information had very little effect in enhancing post-operative recovery. However, the authors suggested that this may have been because the patients did not, in fact, find the surgery particularly stressful.

Recently, Elsass et al., (1987a) has compared detailed versus routine information with 81 patients having surgery to repair varicose veins or inguinal hernia. Patients who received the amplified information, including details of the anaesthesia, were not significantly less anxious than those who received brief, standard messages.

Elsass et al., (1987a) divided the two information groups into those who had had previous surgeries and found this did not effect outcome. This finding suggests that experience is not a critical factor.

In a related study, Elsass et al., (1987b) concluded that it was the support from the anaesthetic nurse over the course of hospitalization that reduced patients' anxiety and not the detailed information, when nursing attention and type of information were controlled. They concluded that assigning more staff time for information-based preparation is not justified. They however, also presented evidence to show that the more completely informed group had fewer post-anaesthetic side effects and that lower state anxiety was associated with lower blood pressure, irrespective of brief versus longer contact (preparation took 20 minutes as compared to only a few minutes for the routine information).

2.2.2 Sensory information

Sensory information relates to the sensations the patient should expect to feel during the medical procedure (Williams and Kendall, 1985). In format, sensory information is likely to be comparable to imagery.

Egbert et al., (1964) compared a control group exposed to the usual hospital routine with an experimental group told what pain to expect and when. The authors reported that the experimental group consumed significantly fewer analgesics and were discharged significantly sooner. However, the experimental group also received behavioural skills training e.g. muscle relaxation and greater professional time and attention.

In Andrew's (1970) study of hernia patients, although hearing information about the forthcoming surgery facilitated recovery in certain patients there was, apparently, no correlation between this effect and the amount of the information which could be remembered.

Johnson et al., (1973) again using patients scheduled for a gastrointestinal endoscopy examination, reported that the two groups receiving either sensory or procedural information displayed fewer tension related hand and arm movements compared with controls.

Another study compared patients undergoing minor and major surgery; sensory information reduced distress (indexed by palmar sweating) only in the minor group (Lindeman and Stetzer, 1973)

Johnson and Leventhal (1974) used patients undergoing an endoscopy examination as subjects. All subjects were given procedural information. One group was additionally given sensory information. A second experimental group received behavioural skills training, including for example, instructions in how to breathe properly during tube insertion and a third were given both the sensory and behavioural types of information. The fourth group was given only the procedural information. On the whole, few group differences were found over a diverse range of dependent measures , there was some support for the value of providing sensory information in that this group did take significantly less medication than the controls.

Mohros (1977) used four groups of patients undergoing gastrointerstinal endoscopy examinations as subjects. One group received both reassuring and general sensory information, a second were given reassuring procedural information plus general sensory information, a third group were given general sensory information only, whilst a fourth group served as no information controls. It was found that the reassuring sensory plus general sensory information group did show a significant decrease in heart rate. Overall, the data offered little support for the effectiveness of any of these information provision interventions.

In a study by Leigh et al., (1977), they found that presenting pre-operative information face to face as a social encounter reduced post-operative anxiety more than by simply handing it over in a booklet. The quality of the interaction is important as might be expected.

Shipley et al., (1978) study of video-tape presentation of information to endoscopy patients found the stress-increasing effect of information (measured by an increase in heart rate) was diminished after repeated presentations of the information. 'Flooding' with multiple and intense exposure to information might therefore be more appropriate than a single exposure in cases where it is judged essential that an avoidant patient is informed.

Reading (1982) compared giving reassuring and informative pre-operative interviews with no treatment in women undergoing elective laporoscopy. Results showed similar levels of pain for all three groups, although significantly fewer prepared subjects requested post-operative analgesia. There was also a trend for prepared subjects to report a more rapid return to full health.

Hinshaw et al., (1983) compared patients given sensory and behavioural information with no treatment controls and found that total patient satisfaction, and satisfaction with their professional care differed significantly between the experimental and control groups. The experimental group also tended to experience less post-operative vomiting. However, it is not clear which aspect(s) of the experimental package were the crucial ones.

Devine and Cook (1983) used meta-analysis to review 49 studies which were all looking at the relationships between brief, pre-operative educational intervention and length of post-surgical hospitalization. Results showed that such intervention reduced hospital stay by approximately one and a quarter days. Again, however, the interventions they reviewed were often multi-component ones, providing the patient with information about what procedures, pain and sensations to expect, and also with some behavioural skills training.

In a recent study (Anderson, 1987) of patients undergoing major surgery information provision was apparently beneficial but the inclusion of filmed interviews with recovered patients could have contributed to this effect.

Anderson compared information with information plus behavioural instructions regarding post-operative exercise. The homogenous surgical group, 60 coronary artery bypass patients, derived equal benefit from each intervention. Both experimental interventions reduced pre-operative anxiety, compared with the control group. Post-operatively, few outcome variables showed significant changes despite quite a good array of measures, indicating that information is not as powerful as other forms of psychological preparation (mentioned below). Acute post-operative hypertension was reduced in both preparation groups. Nurses ratings of recovery progress up to the 7th post-operative day were significantly higher for both the information and information plus exercise training group.

Information was transmitted in a video-tape which showed the activities of a patient over the course of hospitalization, as well as presenting interviews with recovered patients. The only extra message given to the information plus instructions group was that the exercises (which both groups appear to have seen on film) were demonstrated in more detail. The final post-operative contact was on the 7th post-operative day. We therefore do not know if the additional emphasis on exercises could have had some effect at a later stage in recovery.

Although the results of these various studies are not in agreement, they do provide some support for the value of giving patients sensory information, which seems more useful than procedural information in reducing patient distress and promoting recovery. However, Ridgeway and Mathews (1982) believe that patients can value information as 'useful' even where its provision has had no detectable effect on outcome.

In practice it should be borne in mind, however, that patients differ in their desire for information (Krantz et al., 1980) and different types of surgery differ in the sort of information which is most valued by the patients (Berron, 1986).

2.2.3 Skills Training

This has often formed one part of a multi-component package, usually also incorporating information provision of some kind (Schmitt and Woolridge, 1973). It involves providing patients with specific instructions about behaviours to carry out to facilitate their recovery. Typically these might include instructions in proper breathing and coughing, ambulation, moving in bed, and leg exercises.

Some studies have used a research design that allows the efficacy of behavioural skills training alone to be evaluated. Healey (1968) found that surgical patients given instruction in deep breathing, coughing and bed exercises required fewer analgesics and were discharged earlier. The author however, failed to randomly assign his patients to instructed and non-instructed groups.

Lindeman and Van Aernam (1971) did compare 'structured' and 'unstructured' patient teaching. The former comprised systematic training in specific techniques of breathing, coughing, turning in bed etc., whilst the latter entailed giving patients the normal pre-operative teaching provided by nurses, such as general statements about the need to deep breathe, cough and turn post-operatively. Although the two groups did not differ in the number of analgesics required, the group given structured teaching were discharged significantly sooner.

Lindeman (1972) compared the relative effectiveness of providing this form of 'structured' training in either an individual or group format. Again there were no group differences in the number of analgesics required, but those patients given group as opposed to individual training were discharged in a significantly shorter period of time. It seems therefore that the patients benefit more from skills training if other patients are also present.

Johnson and Leventhal's (1974) study, which gave no support to the efficacy of a skills training approach, has already been described.

Overall it can be concluded that behavioural skills training has been shown to be effective in facilitating physical recovery, but not in reducing patients' anxiety and subjective distress.

2.3 Hypnosis

Medical use of hypnosis dates back to the early work of Mesmer (1734-1815). Recently it has been used to reduce anxiety and distress in hospital patients. McAmmond et al., (1971) compared hypnosis and systematic relaxation training, using highly anxious dental patients as subjects. It was found that both treatment groups showed less anxiety than controls, as measured by their skin conductance, but self-reported anxiety did not differ. Additionally, the hypnosis group were significantly more likely to have consulted a dentist again during the five month follow-up period.

Field (1974) used orthopaedic surgery patients and compared a taped pre-operative "hypnotic preparation" which included suggestions of relaxation, comfort, sleep, eye closure, quick recovery, confidence and absence of pain, with a control treatment. Although no significant group differences were found, the results did suggest that hypnosis may be of value for subjects high in 'hypnotic susceptibility'. Other positive advantages have been found for hypnosis in a variety of surgical procedures as well as debriment following severe burns

(Bonilla et al., 1961; Doberneck et al., 1959; Wakeman and Kaplan, 1978).

Redd et al., (1982) used deep muscle-relaxation hypnosis as a treatment for anticipatory emesis in patients undergoing chemotherapy for cancer. With six female cancer patients as subjects, they used visual-fixation-induced hypnosis, with suggestions of deep relaxation and therapist-induced imagery of relaxation scenes. They found that all patients reported decreased nausea before and during chemotherapy sessions after the treatment, and that anticipatory emesis was eliminated completely.

Similar findings have been reported by other researchers who have combined hypnosis with other interventions for example systematic desensitization (Hoffman, 1982-1983), imagery (Milne, 1982), covert modelling (Jackson and Francey, 1985), supportive ego-strengthening (Margolis, 1982-1983) and/or individual psychotherapy (Newton, 1982-1983).

Hypnosis may however, have some promise as a method of facilitating recovery in surgical patients. To date, however, there are few reported studies and the data are weak. Certainly, it would seem important to include an assessment of patients' hypnotic susceptibility.

2.4 Filmed Modelling

Modelling refers to a procedure by which an individual is exposed to the effects of observing another person's behaviour (Bandura, 1971). Melamed and her colleagues have conducted a number of studies using children as subjects. Melamed and Siegal (1975) found that filmed modelling was highly effective in reducing the distress of child surgical patients, as measured by physiological, self report and observer ratings. Both the studies conducted by Melamed et al., (1975) used children undergoing dental treatment as subjects. The results indicated no differences between the experimental and control groups in subjective ratings of anxiety, but the children who had seen a film of a child undergoing a similar treatment as their own were rated by observers and dentists as significantly less anxious and more co-operative.

A similar more recent study (Pinto and Hollandsworth, 1989) using 60 paediatric patients having first-time elective surgery found that patients undergoing preparation using the videotape model exhibited less arousal, less self-report anxiety and less behaviourally rated anxiety when compared to patients who did not view the videotape preparation.

Shipley et al., (1978) examined the use of a film of a patient undergoing gastrointestinal endoscopy. The experimental group, who saw the film, had a lower heart rate during the first five minutes after the insertion of the scope compared with the controls and medical staff rated them as less anxious. These subjects also reported lower subjective anxiety and required fewer anxiety reducing medications.

Kulik and Mahler (1987) study using a form of modelling evaluated cardiac patients responses to their fellow surgical patients. The main aim was to find out whether a patient would gain more information and reassurance from being with a patient at the same stage of their treatment or from one who had already been through surgery. Pre-surgical patients with a post-surgical room-mate were found to be significantly less anxious after surgery, ambulated more and were discharged earlier. Whether the room-mate was having the same operation was not a crucial factor in any improvements seen.

In another survey reported in the same paper, Kulik and Mahler asked patients about room-mates and found that a majority would choose to be with someone who had already had surgery. This preference might suggest that patients wish to have more post-operative information than pre-operative details. One is more likely to think that patients would prefer to be with others who face the same experience and who perhaps share their concerns, rather than witnessing post-surgical events before they have surgery.

The use of filmed modelling interventions has been shown to be highly valuable by the research conducted to date. However, it is important to note that these studies have used patients undergoing relatively minor medical interventions. Whether it would prove of equal value with more catastrophic medical procedures such as major abdominal or heart surgery is still an open question.

2.5 Cognitive Behavioural Interventions

What is actually meant by 'cognitions' is debatable. Different uses of the term are apparent within the field. Some cognitive theorists emphasize thinking 'styles'. Beck (1967) for instance argues that a pervasive negative set characterizes depressed individuals. Hence the development of cognitive behavioural therapies as a way of dealing with the maladaptive mood states found in depressed patients. Similar approaches have been used in the management of anxiety, and it is from this latter area that strategies have been drawn to be applied to the management of anxiety in individuals undergoing hospitalization and surgery.

The role of cognitions has increasingly become a factor of interest in psychological interventions. The cognitive perspective similarly concerns itself with internal processes, with how people acquire and interpret information and use it in dealing with daily life. The contribution to the determination of behaviour of the manner in which a person attends to, interprets and uses the information available in the environment has been highlighted by most theorists.

Langer et al., (1975) explored the efficacy of one of the cognitive interventions. This was based on the idea of using reappraisal as a coping strategy. Patients were taught to direct their attention to the more favourable aspects of the surgical situation whenever they were experiencing discomfort. The authors compared this with information provision, cognitive coping and information provision combined, and an attention control group. The two cognitive coping groups were rated by nurses as significantly lower in anxiety and higher in ability to cope compared with the other two groups. The information only group was rated as highest in anxiety and lowest in ability to cope. The cognitive coping groups also requested fewer analgesics and sedatives post-operatively. Thus the cognitive coping intervention appeared highly successful in reducing patients' pain and anxiety.

Kendall et al., (1979) explored the value of another type of cognitive intervention with patients undergoing cardiac catheterization. Their intervention was based on providing patients with a set of coping, anxiety-reducing cognitions that would be useful for dealing with stressful situations (Meichenbaum, 1976). This intervention was compared with an information provision group, an attention control group, and a group who received the typical conditions that all patients going into hospital would receive. It was found that, compared with the no treatment group, all three intervention groups had a significantly lower level of anxiety. During the catheterization procedure, however, only the two treatment groups had significantly lower anxiety. The cognitive behavioural group were rated as best adjusted during the procedure by medical staff.

Johnston (1982) explored the relationship between anxiety level and thought content in 20 gynaecological patients. These were divided into 2 groups of high and low anxious individuals, based on their anxiety level as measured by the State-Trait Anxiety Inventory (STAI). From analysis of responses to a checklist of 22 possible thoughts, it was found that the two groups did not differ in the number of thoughts endorsed, nor did they worry more about the thoughts they had. However, the highly anxious group were more likely to endorse unrealistic or imagined dangers rather than the obvious and realistic threats. It may be that those patients having more common worries are more likely to be reassured, hence their lower level of anxiety.

Ridgeway and Mathews (1982) used 60 hysterectomy patients as subjects in their study which compared information provision, a cognitive coping technique and attention control. It was found that the cognitive coping strategy was significantly better at facilitating patient recovery than either of the other two interventions.

Pickett and Clum (1982) compared relaxation training, relaxation instructions and an attention redirection approach in patients undergoing gallbladder surgery. It was found that attention redirection reduced post-operative anxiety relative to the other two interventions, although it was less effective in reducing post-operative pain.

However, a study of dental outpatients suggests that this might not prove to be the case (Martelli et al., 1987); it was the patients who preferred to have information who benefited most from a pre-operative training designed to facilitate problem-focused coping.

Mathews and Ridgeway (1984) suggested that one potential advantage cognitive coping procedures might have, is that they benefit vigilant and avoidant people equally. But little evidence in surgical patients bears on this.

Cognitions thus, seem a valid focus for interventions, and cognitive behavioural interventions have such a focus, seeking to affect patients' cognitive functioning.

Overall, therefore, it appears that cognitive behavioural interventions are a particularly effective means of reducing anxiety and facilitating patient recovery.

2.6 Relaxation

Training in relaxation skills, often following procedures described by Bernstein and Borkovec (1975), Jacobson (1979) and Snaith (1974) have typically formed aspects of a multi-component treatment package. Relaxation training has been used extensively in instilling self-initiated calmness in anxious patients. The patient is taught to recognize the sensations of muscular tension through first tightening and then relaxing muscle groups throughout the body.

Aiken and Henrichs (1971) used systematic relaxation as a nursing intervention with open heart surgery patients. Their results show that patients in a relaxation group had fewer psychotic episodes following surgery than did the control patients, although the patients in the relaxation group had somewhat less serious operations than did the controls.

Field (1974) studied the effects of tape recorded hypnotic preparation for surgery. He found that the depth of relaxation was related to an improved recovery. Miller (1976), again using highly anxious dental patients as subjects, compared electromyographic feedback and relaxation training. Both interventions proved effective in reducing EMG levels and subjective ratings of anxiety compared with controls.

Wilson (1977) reported that relaxation training was more effective in reducing subjective pain ratings and number of analgesics required in cholecystectomy and abdominal hysterectomy patients than was providing both sensory and procedural information. Both treatment groups had a significantly shorter hospital stay compared with controls. However, studies using as subjects patients undergoing more severe medical procedures, such as heart surgery, produce less optimistic outcomes e.g. Pearson (1976), Aiken and Henrichs (1971), see above.

Flaherty and Fitzpatrick (1978) used relaxation technique to increase comfort level of post-operative patients. Their results illustrate that patients who were taught to use deep breathing control and relaxation technique when attempting to get out of bed for the first time, reported less incisional pain and distress, and used less medication for pain than did the patients in a control group.

Wilson's (1981) study of cholecystectomy and hysterectomy patients, using systematic muscle relaxation found that the relaxation provides patients with a coping technique that reduces pain and decreases need for analgesia. Also that relaxation increases patients' feelings of strength and energy, interest in their surroundings, ability to move about and do things for themselves.

In studies by Burish and Lyles (1981) and Lyles et al., (1982) one group of patients reporting anticipatory nausea received instruction in progressive muscle relaxation, combined with therapist-guided imagery. On self-report measures of nausea, and on several physiological measures reflecting anxiety, the relaxation group fared better than either a no-treatment control or an attention-placebo group.

From these studies it can be concluded that, although the research in this area is just beginning, overall, it appears that relaxation training is an effective procedure for facilitating recovery in certain groups of patients.

2.7 Effects of Psychological Preparation on Endocrine Responses

As pointed out earlier, Walton (1978) and Salo (1982b) suggested that elevated circulating cortisol levels contribute to immunosuppression and vulnerability to infections following surgery. Therefore, it has been suggested that to reduce or block these endocrine responses would benefit the surgical patient (see chapter one, section 1.4.2).

Attention has so far been given to the use of anaesthetic techniques (reviewed in chapter 1) to reduce the hormonal stress to surgery (Bursten and Russ, 1965; Kehlet et al., 1979; Wilmore et al., 1976; Ellis and Humphrey, 1982). However, Mason (1971) had suggested a different approach to the attenuation of the stress response. He saw it as a response primarily to a set of psychological stimuli associated with threatening situations. He proposed that reducing the discriminability of the stimulus conditions associated with fasting or heat, had been found to extinguish the corticosteroid response to these noxious conditions in animals. He concluded that this view would therefore predict that the response to other physical stimuli, might also be susceptible to psychological modification.

There is also evidence that when aversive stimuli are under subject's control, corticosteroid output is reduced by comparison with that of groups without control, both in man (Ursin et al., 1978) and in animals (review by Steptoe, 1981)

A study by Boore (1978) combined each of the following; information provision, exercise instruction and counselling - in a treatment package given to patients before undergoing various major surgical operations. She found that urinary measurements of cortisol reached a maximum on the first measurement made post-operatively and on the second day post-operatively. She reported that the maximum level reached was reduced in experimental patients and following measurements reduced more rapidly, by comparison with the controls who received a similar duration of discussion unrelated to hospital matters. Boore therefore, showed that raised cortisol levels on post-operative days are possibly modified by psychological technique.

Wilson's (1981) study of cholecystectomy and hysterectomy patients, showed that information provision apparently worsened subjective physical state post-operatively while relaxation increased post-operative adrenaline levels. Increased levels of cortisol (Salmon et al., 1986) have recently been described in patients who had received pre-operative preparation designed to reduce distress. Other evidence is reviewed by Steptoe (1983) that active coping tasks which people find 'just manageable' can increase cardiovascular arousal or circulating catecholamine levels. This suggests that at least the prologation of the stress response beyond the period of surgery may be a reaction to threatening environment stimuli.

It is therefore, of practical and theoretical importance to examine the hormonal changes associated with stress responses to surgery and test the ability of a psychological procedure to alter these.

2.8 Conclusion

Many intervention methods are therefore, available which have different effects on different illnesses and surgeries. Most forms of psychological preparation for surgery involve conveying information in one way or another (procedural, sensation, behavioural instruction or modelling). Other methods attempt to reduce patients' anxiety, adverse symptoms and pain (relaxation training and hypnosis).

Different studies have used a wide range of measures, some of which failed to show significant results. Others have used preparation methods in combination, which makes it difficult to determine which components have the most effective impact. The data on the usefulness of information has shown that it appears to be weak or even negative, while there is evidence that relaxation can produce impressive results (Wilson, 1981). This suggests that the relevant mechanism may have more to do with the promotion of active coping behaviour than with simple anxiety and pain reduction *per se*.

CHAPTER THREE

MEASURES USED TO ASSESS SURGICAL STRESS

A wide range of measures have been used and these questionnaires can be found in the appendix. With such a plethora of ways to assess recovery from surgery, it is hard to decide which indices to measure when setting up studies or which indices to give weight when interpreting the results. One possible way to look at it is to regard all indices as manifestations of a single underlying recovery process.

In chapter one we have seen that surgical patients experience stress at emotional, cognitive and physiological levels. This view has therefore determined the choice of measures used in these studies in the assessment of recovery from surgery. Ways of evaluating surgical recovery have been divided into two separate broad levels. The first level, process measures include measurements of individual differences (personality traits) and measurements which evaluate strategies patients actually used while coping with the stressor (Folkman and Lazarus's 1988, Ways of Coping Checklist). The second level, outcome measures include emotional and physical adjustment during the post-operative period, such as state anxiety, pain, speed of recovery, and physical state (Auerbach, 1989).

3.1 Personality

Review of the literature has shown that patients on the whole generally differ in their reactions to surgery. Deutsch (1942) referred to the importance of the personal meaning of the operation within the framework of the patients' experience, way of life and value judgement while other researchers have focused their investigations exclusively on generalized personality constructs such as anxiety and other dimensions relevant to stress reactions and coping style.

3.1.1 Locus Of Control

Locus of control is a personality dimension which has been applied to surgical patients by most researchers because of its theoretical interest to psychologists. Rotter (1966) postulated that consistent individual differences exist with respect to a person's belief in the way his or her behaviour will affect the control of life events. These beliefs were referred to as " locus of control". Therefore, the locus of control construct refers to an individual's perceptions and generalized expectations concerning behaviour and the reinforcements resulting from it.

An individual who perceives his or her behaviour as being a direct cause of the reinforcement surrounding it is understood to have an internal locus of control. On the other hand the 'external' person characteristically expects behavioural outcomes to be directed by forces (reinforcements) such as chance, fate, societal imperatives and powerful others.

3.1.1.1 Multidimensional Health Locus of Control (MHLC)

For the purpose of this research measures of internality and externality were obtained using the Multidimensional Health Locus of Control (MHLC). Wallston et al., (1978) devised a MHLC scale following a trend towards the development of less general, more specific measures of assessment of health following the Rotter scale. The scale therefore measures expectancies about the ability to control one's health. The MHLC scale is a self report questionnaire consisting of 36 items designed to determine the way in which different people view certain important health related issues. It is divided into two parts: forms A and B. Beside each item i.e. 'I am in control of my health', is a scale which ranges from strongly disagree (1) to strongly agree (6). A psychometric investigation conducted by O'Looney and Barrett (1983) verified the validity and reliability of the MHLC. They administered the questionnaire to 70 male and 77 female British university students and found that forms A and B could be considered parallel with the dimensionality results being the same for both and the correlations between the forms being high. They also found high factor validity coefficients which indicated that the questionnaire items are not repetitious.

3.1.1.2 The Krantz Health Opinion Survey

Krantz et. al., (1980) assert that it is beneficial for patients to be active and informed participants in their health. They recognized that medical outcomes can be determined by the nature of interaction between doctor and patient, the patient's understanding of illness and his or her degree of participation in the health care process. They pointed out that it is generally assumed that more information and self-reliance are better. In this thesis it was therefore used to examine whether patients who prefer more information and are self reliant have a better recovery than those who do not want to be involved in self-care.

The Questionnaire is made up of 16 statements measuring two relatively independent subscales. One scale measures preference for information and assess the desire to ask questions and be informed of medical decisions (e.g. 'I usually ask the doctor or nurse lots of questions about the procedures during a medical exam', 7-items). The other scale measures preference for behavioural involvement in order to evaluate the desire for active involvement in one's medical care (e.g. 'Except for serious illness, it's generally better to take care of your own health than to seek professional help', 9-items) in medical care. Krantz et al., (1980) administered the test to 100 male and 100 female undergraduates at the University of Southern California. The total scale has a reliability of .77 and the test-retest reliabilities for the components were .74 and .71. Patients were given the 16 items preceded by the following instruction: ' Here are some statements about medical care. For each one please show whether you agree or disagree by placing a tick in the box under Agree or Disagree'. Scoring was reversed for negatively worded items.

3.1.1.3 The Desire for Control of Health Care Scale

Desire for control of health care (Smith et al., 1984) is a preference for behaviours that (1) allow direct influence on the process of health care, (2) provide relevant information about the health care situation, or (3) do both. The Desire for control Scale is a 14-item form answered with reference to what a patient wants in a specified health care situation. For purposes of research in this thesis a shorter 7-item scale was used. This is straight forward and easy to use. Patients were asked to 'Indicate the extend to which you agree or disagree with the following statements e.g. 'I want to have a say in what will be done to me'. Responses were on a 6-point Likert response format that ranged from 'strongly agree' to 'strongly disagree'. The assumption is that lack of control may cause stress or the lack of control itself may in fact be a stressor.

3.1.2 Type A Behaviour Pattern

Another personality dimension recently applied to surgical patients is the Type A personality which has already been described in chapter 2. The means used to measure personality type in these studies, is the Bortner (1969) scale which was developed as a short screening measure of the Type A Behaviour Pattern. Factor analyses of the scale shows that it measures four fairly separate factors i.e. speed, impatience, job involvement and hard drivingness. In form the scale is a behaviour inventory with a 14-item questionnaire which requires the subject to indicate, on a seven-point agree-disagree scale, to what extend their behaviour corresponds to either of two kinds of contrasting behaviours for example, 'never late for appointments- casual about appointments', 'can wait patiently- impatient when waiting', 'emphatic in speech - slow, deliberate talker'. Ratings are summed over the 14 items.

The scale has been shown to have both predictive (Heller, 1979) and face validity (Koskenvuo et al., 1981) and has been more highly correlated with the Structured Interview (.64) than has the Jenkins Activity Survey (Johnson and Shaper, 1983 ; Rustin et.al., 1976).

The Bortner Scale was also validated on a sample of 76 men and appears to have adequate concurrent validity and reliability statistics (test-retest reliability of .68). It has been used in recent Type A/B studies and shown to correlate significantly with other type A measures (Furnham et.al., 1985).

3.1.3 State Trait Anxiety Inventory (STAI)

It seems that a very important personality variable which is involved in determining the individual's emotional experience during hospitalization and surgery is his or her predisposition to experience anxiety and this is based on Spielberger's (1970) state trait theory of anxiety and the research which emerged from it about hospitalization (Spielberger et al., 1973 ; Auerbach, 1973; Martinez-Urrutia, 1975).

Spielberger differentiated between two kinds of anxiety, Transitory anxiety state (A-state) and anxiety as a Personality trait (A-trait). A person with a high A-trait is more prone than the one with low A-trait to experience anxiety under stress or in an anxiety-arousing situation. To provide a measure of these two aspects of anxiety, Spielberger et al., (1970) developed a State Trait Anxiety Inventory for adults (STAI).

The STAI is a self report questionnaire consisting of 40 items, half of which assess a general predisposition to anxiety (trait anxiety) with questions relating to how the individual feels generally, and the remainder assessing how the individual feels at the present moment (state anxiety).

The STAI was selected as a useful measure of anxiety because of its wide use by other researchers. Additionally it is highly correlated with other measures of anxiety such as the Multiple Affect Adjective Checklist (Zuckerman and Lubin, 1965) giving evidence of validity (Johnston and Hackman, 1977). The trait form of the STAI was used pre-operatively and the state form post-operatively.

Reliability data indicates that test-retest correlations are reasonably high for subjects in the normative sample, ranging from .73 to 86. Evidence of the validity of the scale is provided by a study of 977 undergraduate students given the test under actual and imagined examination conditions, and also by a study of 197 undergraduate students given the test whilst watching a stressful film and under normal relaxed conditions. Both studies indicate that anxiety scores are significantly higher under stressful conditions.

3.2 Recovery Inventory

A modified version of the Recovery Inventory (Wolfer and Davis, 1970) was used. It measures physical condition on six-point scales. Patients were asked to choose for each item the response which best describes how they had 'felt since bedtime last night' for, their 'sleep', 'appetite', 'strength and energy,' 'stomach condition', 'bowel condition', 'ability to do things for myself', 'ability to get out of bed and move around by myself', and 'interest in what's going on around me'. The scale comprised such ratings as very poor (1), poor (2), fair (3), good (4), very good (5), and excellent (6). Higher scores indicate better bodily state. This scale is used in this study as a measure of the patients physical state and progress.

3.3 Modified Somatic Perception Questionnaire (MSPQ)

As an addition to the Recovery Inventory, the MSPQ was employed. Main (1983) developed a 43 item modified MSPQ. He drew items from several anxiety questionnaires and selected those items which were rated independently by seven judges as measuring perception of body activity. He gave the 43 item questionnaire to 140 patients having a diagnosis of anxiety and to 100 consecutive hospital visitors. 32 items were retained as distinguishing satisfactorily between anxious patients and normals. The final set of items included cardiovascular, cortical, gastro-interstinal and muscular variables but not items of subjective anxiety. The scale was factor analyzed and had a high internal consistency (0.79) (Main, 1983)

Patients were asked to rate for each item the column which best describes how they had 'felt since bedtime last night'. Items include 'pounding of head', 'feeling faint', 'nausea', 'pain or ache in the stomach', 'bowel sensations', 'hands shaking', and 'difficulty in breathing'. The scales ratings were, not at all (4), a little slightly (3), a great deal/quite a bit (2), and extreme/could not have been worse (1). They were scored from 1 to 4 and summed to provide a total score, lower scores indicating better bodily state.

3.4 Pain Ratings

The use of rating scales to assess subjective feelings has a long history (Hayes and Patterson, 1921). One of the earliest attempts to obtain a measure of pain severity using such scales is by Hardy et al., (1952).

There are several commonly used pain measurement scales. There are category rating scales which may be either numerical (e.g. 1, 2, 3,----) or verbal (e.g. none, mild, moderate ----). There is the 11-point Box scale consisting of 11 numbers (0 through 10). The 6 point behavioural rating scale (BRS-6) consists of descriptive words with scores ranging from 0 indicating no pain to 5 indicating incapacitating pain. There is also the visual analogue scale (10 centimetre line ranging from no pain to unbearable pain) which represents a continuous dimension of pain intensity. The advantages of such scales are: they are simple to use, have a high face validity, good test-retest reliability and a high compliance rate (Boeckstyns and Backer 1989). Numerous other studies have found these visual analogue scales to be reliable and sensitive (Clarke and Spear, 1964; Woodforde and Merskey, 1972).

Visual analogue scales were used in these studies as they are simple to use. For the first question representing increasing intensity of pain, the patients were asked to place a cross on a 10cm line at the point which best shows ' how intense your pain has been overall since bedtime'. This was scored on a 100 point scale ranging from 1= 'none at all' to 100= 'the most intense I can imagine'.

The second question representing increasing distress caused by the pain, asked the patients were asked to place a cross on the line at the point which best shows 'how much distress the pain has caused you'. 1= 'none at all' and 10cm= 'the most distress I can imagine'.

The third question representing a scale of increasing success in coping with the pain, asked patients to place a cross at the point which best shows 'how well you best coped with the pain'. 1= 'not at all' and 100mm= 'I coped completely'.

A final question representing a scale of increasing strength of analgesia required, asked patients to place a cross at the point to' show the strength of the pain killer you need'. 1= 'none at all' and 100mm= 'the strongest possible'.

3.5 The Stress Arousal Checklist

As an addition to the state form of the STAI the Stress Arousal Checklist (Mackay et.al., 1978), was also used. This is derived from the one described by Thayer (1967) for the measurement of self-reported 'activation'. There are 19 stress and 15 arousal adjectives. Patients were asked to put a circle around the most appropriate answer indicating 'for each item, how you feel at the moment'. Items include, 'calm' and 'uneasy' to assess level of stress and adjectives such as 'active' and 'sleepy' to assess level of arousal. The scales ratings were definitely feel (++), feel slightly (+), uncertain (?), and definitely do not feel (-). If a (++) or (+) has been circled for a positive adjective the score is 1, otherwise it's 1. If a (?) or (-) has been scored for a negative adjective then the score is 1 otherwise it's 0. The scores were summed up to provide a total score for stress and a total score for arousal, lower scores indicating better psychological state.

3.6 Coping

To measure coping, the scale used was based on that devised by Billings and Moos (1981). Their checklist of coping activities was designed to allow a community sample to describe their coping with a specific personal crisis. In this thesis it was modified by discarding items which were inappropriate for inpatients (exercised more, ate more, smoked more). Additional items appropriate to surgical patients were included, as described by Ho et al., (1988); apart from one ('worried over what might happen'), these mainly concerned patients' feelings of dependence on staff ('did everything I was told by the doctors and nurses,' 'left everything to the doctors and nurses as they know best,' 'tried not to bother the doctors and nurses'). Scores were calculated for each of the subscales described by Billings and Moos.

Whereas the subdivision into scales by Billings and Moos was on rational rather than empirical grounds, a factor analytically derived subdivision identified (Kaloupek et al., 1984; Kaloupek and Stoupakis, 1985; and Wong and Kaloupek, 1986) through a principal components analysis of responses by 145 blood donors was used. Using this procedure they identified 5 coping factors, (some items contributing to more than one factor): Worry (e.g. 'I prepare for the worst', 7 items); Suppression (e.g. 'I try to reduce tension by not thinking about the situation', 7 items); Rational Cognition (e.g. 'I try to step back from the situation and be more objective', 4 items); Behavioural Action (e.g. 'I tried to relax myself', 3 items); and Denial (e.g. 'I didn't worry about it, figured everything would probably work out fine', 4 items).

3.7 Analgesia

The type of analgesia is detailed in each study. Analgesics were available upon request during the post-operative period and each administration was recorded by the nurse in the patient's drug chart. The number of administrations of pain medication was considered a behavioural index of the amount of pain experienced by the patient. Analgesics were however not equated for dose and type in this thesis. After the patients had been discharged, their medical records were examined and the number of analgesics received during the study period (defined in each study) was tabulated.

3.8.1 Endocrine Measures - Minor surgery

Pre-operative baseline venous blood samples were taken in the afternoon on the day of admission after the patient had given written consent. This was drawn from a peripheral vein before the patient was allocated to different treatment groups. Subsequent samples were drawn at induction and the recovery room sample immediately after the patient had been removed from the operating theatre into the recovery room. At this stage patients are usually drowsy from the anaesthetic but are quite rousable.

3.8.2 Endocrine measures - Major surgery

The first sample drawn from a peripheral vein was obtained following the patients' consent pre-operatively. Further samples were drawn immediately before induction of anaesthesia, the per-operative sample was taken through a central venous line 60 minutes post incision and the recovery room sample immediately after the patient had been removed from the operating theatre into the recovery room. Subsequent post-operative samples were obtained as close as possible to midday on the first, second and third post-operative days. The manner of obtaining the blood, storage and assaying is the same as that described in minor surgery above.

On each of the above mentioned occasions, 10ml. of blood were slowly withdrawn using a 21 gauge needle to minimize turbulence which in turn reduced haemolysis of red blood cells. The sample was then placed in a tube containing lithium heparin and mixed gently. The samples were centrifuged at 1500g for 10 minutes but where immediate centrifugation was not possible samples were stored no longer than 20 minutes at 4 degrees centrigade before they were centrifuged. Recently some studies have shown that catecholamines are stable for 3 hours (Weir, et. al., 1986) and for over 5 hours (Rumley, 1988) in whole blood at room temperature. Plasma was then separated with a pipette, placed in a glass storage tube labelled with the patient's name, date and time the blood was obtained and frozen immediately at -70 degrees centigrade. The samples were stored at this temperature until assayed.

3.8.3 Assays

Cortisol concentrations were measured in duplicate by radioimmunoassay (Farmos Diagnostica). Catecholamine levels were estimated by high performance liquid chromatography (HLPC) with electrochemical detection (Smith, et. al., 1985).

3.9 Blood Pressure and Heart Rate

Blood pressure during surgery was measured by an automatic, non-invasive blood pressure Datascope machine. Maximum intra-operative systolic and diastolic pressures and heart rate were abstracted from the intra-operative anaesthetic records.

The pre-treatment baseline estimate of systolic and diastolic blood pressure and heart rate was obtained after the patient had completed the first batch of questionnaires. Post-treatment blood pressure levels and heart rate were taken from the groups five minutes after listening to the tape.

Measures of blood pressure pre-operatively and post-operatively were obtained according to the Korotkoff (1905) method, where a patient sits comfortably in bed, the non-dominant arm fully extended, the elbow resting on a firm surface and the patient had rested for at least 5 minutes. Systolic blood pressure was determined by onset of Korotkoff sounds and diastolic blood pressure was determined by the fifth phase of the Korotkoff sounds. A mercury (random zero) sphygmomanometer and standard adult cuff were used throughout the studies. These types of blood pressure machines are widely used because they are portable, simple, reliable and accurate devices (Evans and Prior, 1970). They therefore have an enormous advantage that they can be understood and maintained easily (Jewell, 1987). The consecutive blood pressure and heart rate readings taken by the nurses on the pre-operative evening (18.00hr) , on the morning of the operation (06.00hr) and on the first post-operative morning (06.00hr) was also noted.

3.10.1 Tape Recordings - Relaxation Tape

As soon as patients agreed to participate they listened to progressive muscular relaxation exercises which followed closely Bernstein and Borkovec's (1975) adaptation of Jacobson's (1964) progressive muscle relaxation but without the tensing instructions. They were persuaded to focus on various muscle groups and to pay attention to feelings of tightness, coolness and warmth followed by the awareness of tension reduction. Gentle breathing exercises were also encouraged. Towards the end of the tape the patient was directed to continue lying quietly while enjoying "these feelings of relaxation". This relaxation procedure on a practical level, is, in itself, an important component of systematic desensitization. The tape lasted fifteen minutes. (Copy of relaxation training in appendix 5.3).

3.10.2 Tape Recordings - Control Tape

The control group was given a taped message describing the hospital and the different types of professional staff who might be involved in the care of the patient. It also described the ward routine and the procedures associated with surgery pre-operatively and post-operatively. (Transcript of the control tape is in appendix 5.6).

3.10.3 Monitoring of Tape Recorders

Each tape recorder had a monitoring meter housed in a sealed case. Metering was achieved by using an internal electric circuit which generated a pulse every 36 seconds (0.01hr) to advance the 1/100 hr digit wheel. The digits could be read before the patient listened to the tape and on the final day of the study, as a measure of the amount of time the tape recorder had been operating.

3.11 Additional Observations

Before the patients were discharged the investigator completed a demographic form which recorded information about age, sex, marital status, occupation, previous surgery, premedication, anaesthetic induction drugs, anaesthetic maintenance drugs, analgesia and antiemetic drugs. The frequency of administration of drugs per day rather than the dose was noted and the information was coded and stored in the computer for statistical analysis.

Certain indicators of surgical trauma were noted i.e., type of operation, volume of blood lost, volume of fluid replaced and duration of surgery, measured from incision to the time of entering recovery room. Length of hospital stay was also noted and assessed from the day of operation to the day of discharge.

In all the studies carried out, doctors, nurses, personnel assaying the blood samples and the anaesthetists involved in obtaining the blood were unaware of the groups the patients were assigned to.

3.12 Conclusion

There are thus, subjective, behavioural and physiological measures to assess patients' reaction to surgery. Many indices are self-report and therefore, are influenced by mood state. Objective measures such as, analgesia intake and length of hospital stay, provide additional measures for assessing patients' recovery from surgery. Medical and nursing staff often have to rely on self-reports by the patients when making decisions regarding the patient's care.

Physiological measures of surgical recovery are rarely used although they would provide unequivocal indications of the extent to which psychological factors may directly influence physical processes involved in recovery.

CHAPTER FOUR

Experiment 1

THE RELATIONSHIP OF STATE ANXIETY TO EMOTIONAL AND PHYSICAL RECOVERY FROM SURGERY.

4.1 Introduction

Most of the literature reviewed in the previous chapters shows that there is a relationship between state anxiety and emotional or physical aspects of recovery from surgery. Although one might assume that pre-operative anxiety would always impede the patient's recovery and that one should aim to minimize this state, Janis (1958) suggested that a pre-operative state of 'worry' facilitated recovery from surgical operations. In a study of patients undergoing a variety of types of surgery, Janis found that moderate levels of worry were associated with the least distress post-operatively.

But one of the problems in testing his theory is the difficulty of measuring worry. The use of a state anxiety questionnaire to assess worry dates back from 1973 studies (Spielberger et al., 1973; Auerbach, 1973; and Martinez-Urrutia, 1975). Some studies (Wolfer and Davis, 1970; Bruegel, 1971; Johnson et al., 1971; Cohen and Lazarus, 1973; Sime, 1976; Johnston and Carpenter, 1980; Wallace, 1986a) found no evidence that pre-operative anxiety was associated with better or faster recovery. In fact, the more anxious the patients were pre-operatively, the more anxious they were post-operatively.

Recently, it has been observed that the state of passive distress measured by Spielberger's state-anxiety questionnaire does not correspond to the state which Janis termed worry. He had described a state of active cognitive processing of information about the source of threat, and Ray and Fitzgibbon (1981) suggested that a distinction needs to be made between the anxiety associated with the work of worry and the active coping orientation that the notion "work of worry" also embodies. They conceptualized the former as a "stress" factor and the latter as an "arousal" factor. The stress factor was seen as the individual's response to an appraisal of the favourability of the external environment; adjectives loading on this dimension include 'tense', 'distress' and 'uneasy'. The arousal factor comprises adjectives such as 'lively', 'energetic' and 'active, and is associated with somatic and autonomic activation. Assessing both in 36 cholecystectomy patients, they found a positive association between levels of stress before surgery and pain and stress reported post-operatively, whilst pre-operative arousal was negatively correlated with pain, medication consumed and duration of stay in hospital. This finding suggests that rather than the worrying itself, it is the coping orientation aroused by worry that improves adjustment. More recent studies have found at most very limited post-operative benefits associated with pre-operative arousal (Ho et al., 1988; Salmon et al., 1988).

Another approach to measuring the extent to which patients cope actively with surgery is by looking at personality dimensions which have been designed to be sensitive to dispositional differences in coping. There is some evidence that trait anxiety is more predictive of post-operative recovery than state anxiety. Mathews and Ridgeway (1981) found that anxious personalities show greater distress than non-anxious patients post-operatively and recover more slowly when this is indexed by pain ratings, length of hospital stay or medication requests. High trait anxious surgical patients have also been shown to have greater state anxiety pre- and post-operatively in some studies (Spielberger et al., 1973; Auerbach, 1973; Martinez-Urrutia, 1975). Ridgeway and Mathews (1982) concluded that any relationship which these measures have with recovery could be accounted for by their known relationship with trait-anxiety. However, in a recent study of in patients having removal of wisdom teeth, Ho et al., (1988) found that high trait-anxious patients had greater state anxiety pre-operatively and not post-operatively.

A second personality measure which has been applied to surgical patients is locus of control. Patients with internal locus of control believe that they have influence over the outcome of events; those with external locus of control believe that events are out of their control. Wallston and Wallston (1978) devised more specific scales concerned with beliefs in control over different aspects of health and health care. The Multidimensional Health Locus of Control, is concerned with the belief that one's health is 'internal', 'external' or dependent on 'powerful others'. The relationship of these scales with emotional or endocrine indices has not yet been found (Salmon et al., 1988).

A third personality measure which might bear on an active coping style is Type A personality. There is already evidence that it can predict physiological aspects of the response to surgery (Kahn et al., 1980; Krantz et al., 1982) and, since it might be regarded as, in part, a disposition towards active attempts to cope with stress (Glass, 1977), it is also interesting to examine its relationship with arousal and the indices of coping.

There is a relationship between state anxiety and emotional or physical aspects of recovery from surgery. A patient who is highly anxious, worried or fearful is likely to remain anxious post-operatively and may be prone to more pain or a slower recovery in one or more respects. Perhaps we should seriously regard pre-operative state anxiety as a potentially important factor in predicting the way patients recover from surgery, at least in the early stages. The present study compared different measures as predictors of recovery from surgery, and examined their inter-relationships. Chapman and Cox (1977) reported that the response to surgery is affected by the type of surgery and the meaning attached to it. An attempt was made to determine whether psychological and physiological responses vary with severity of surgery by contrasting patients undergoing major and minor abdominal surgery. Specifically, the aims were to determine whether (i) state-anxiety would be associated with poorer recovery; (ii) arousal would be correlated with measures of active coping and better recovery; and (iii) to determine the role of locus of control, trait-anxiety, Type A personality and coping style on recovery from surgery.

4.2 METHOD

4.3 Experiment 1 (a) Minor Surgery

4.3.1 Subjects

Fifty three consecutive patients who were admitted for minor abdominal surgery were asked to take part in the study. Out of the 53 patients, thirteen were excluded; (4) because of difficulties with language and comprehension, (2) reluctance to participate, (3) judged by the nursing staff to be disorientated and unfit and (4) physically unable to complete the questionnaires after the operation. The final sample consisted of 24 men and 16 women, ranging in age from 17 to 67, with a mean age of 40. Patients were under the care of one of three surgical teams. Characteristics of patients in this group are presented in the appendix 4.15. All were fit to undergo minor surgery which meant they were free from any cardiovascular, respiratory and any other illnesses. Their main disorders were Crohn's disease, ulcerative colitis, cancer of the rectum and haemorrhoids.

All operations proceeded without complication and the main types of surgery were laying open of anal fistulae, closure of colostomy or ileostomy, anal sphincter repair and haemorrhoidectomy. The operations did not involve incising past the peritoneal cavity. The incision was usually superficial and often involved the pelvic region only. In this study all operations lasted 60 minutes or less and involved relatively little physical trauma.

Surgery was carried out between 08:30 HRS and 17:30 HRS. Nine patients had their operations in the morning and 31 in the afternoon. Patients were routinely given pethidine and atropine (2) or papaveretum and hyoscine (37) for premedication; one received none. Anaesthesia then followed standard procedures for minor surgery. Thiopentone was used for induction and nitrous oxide for maintenance. Halothane or isoflurane was administered as necessary to supplement the nitrous oxide. For 24-48 hours post-operatively intramuscular papaveretum or pethidine were prescribed but none of the patients requested intramuscular analgesia. Post-operative pain was controlled by paracetamol or distalgesics as required. Antiemetics were also prescribed post-operatively; 14 were given metochlopramide, 10 prochlorperazine and 16 had none.

4.4 Experiment 1 (b) Major Surgery

4.4.1 Subjects

Fifty-eight consecutive admissions for major abdominal/perineal surgery were approached. Of the eighteen who were excluded, three had died during surgery, four were immediately transferred to Intensive Care Unit after surgery, two were judged by the nurses to be too weak to complete the questionnaires, three withdrew after surgery saying they were too unwell, another three had difficulty with English and the final three simply declined to take part in the study.

Of the remaining forty patients there were 12 men and 28 women, aged between 18-85, with a mean age of 43 years. Their main illnesses were Crohn's disease, ulcerative colitis, rectal prolapse, and cancer of the rectum. Main types of surgery were colectomy, colostomy, ileostomy, rectoplexy, and anastomosis. Characteristics of patients in this group are presented in the appendix 4.16. All major operations lasted more than an hour and usually involved incising through the peritoneal cavity including the abdominal muscles and some internal structure.

Surgery began between 08.30 HR and 15.30 HR. Patients were routinely offered temazepam 10-20 mg. on the night before surgery. A standard premedication of 10 mg. and hyoscine 0.2 mg. or pethidine 50 mg. and atropine 0.6 mg. was given intramuscularly one hour before surgery. 26 patients had surgery in the morning and 14 in the afternoon.

Anaesthesia was induced with thiopentone 5-7 mg/kg. and suxamethonium 1mg/kg. to facilitate intubation. Maintenance was achieved with controlled ventilation of oxygen and nitrous oxide (N2O2/02) supplemented by enflurane or halothane. Muscle relaxation was maintained by atracurium 0.2mg/kg. as necessary. All patients received broad spectrum antibiotics of metronidazole 5mg/ml and gentamycin 80mg. intravenously during surgery.

For 24-72 hours post-operatively, patients were given continuous intravenous papaveretum or pethidine by programmable infusion pump to provide analgesia. If at any time analgesia was insufficient or the patient appeared over sedated, the infusion could be increased or decreased by half a ml.; this was at the discretion of the nursing and medical staff. Antiemetics were given if requested; 23 were given metochlopramide, 15 prochlorperazine and 2 had none. Intravenous fluid maintenance was provided by Hartmann's solution and blood loss during surgery was replaced by colloid and blood as necessary.

4.5 Measures

4.5.1 Outcome Measures

The measurements used are described in chapter three and are presented in the appendix. Anxiety was assessed by the state-anxiety version of the State-Trait Anxiety Inventory (Spielberger et al., 1970). The Recovery Inventory (Wolfer and Davis, 1970) provided a broad index of subjective physical state, while the Modified Somatic Perception Questionnaire (Main, 1983) provided an index of the frequency and intensity of general physical symptoms. Pain intensity, pain distress and pain coping was measured on 10-cm line visual analogue scales. The Stress-Arousal checklist (Mackay et al., 1978) was used as an addition to the state anxiety scale as they both assess feelings "at this moment". These questionnaires were administered in the pre-operative set and on each occasion post-operatively.

4.5.2 Process Measures

The state-anxiety scale and the stress-arousal checklist were also envisaged pre-operatively as process measures. Personality measures completed pre-operatively included the Multidimensional Health Locus of control (Wallston and Wallston, 1978), the Trait-anxiety scale of the STAI (Spielberger et al., 1970) and the Type A personality brief index (Bortner, 1969). The coping measure, completed on the 7th post-operative day was adapted from the coping scale by Billings and Moos (1981).

4.5.3 Blood pressure and Heart rate in theatre

Blood pressure during surgery was measured by an automatic, non-invasive blood pressure Datascope machine. It records blood pressure through a cuff which the machine automatically inflates at 5-minute intervals. It then displays the systolic and diastolic pressure readings on a digital display. Maximum intra-operative systolic and diastolic pressure and heart rate were subtracted from the intra-operative anaesthetic records.

4.6 Procedure

Patients were approached on the afternoon of the day of admission which was either one day before surgery (n=26 minor surgery, n=28 major surgery), for Tuesday operations or three days before (n=14 minor surgery, n=12 major surgery), for Monday operations. They were asked to participate in a study which assessed 'How soon patients recover after having an operation'. It was emphasized that the patient's decision would not influence subsequent treatment in any way. The patients gave written consent on this occasion.

At this meeting the patients completed 3 personality questionnaires, followed by the first of eight identical sets of questionnaires. The remaining sets were left with the patients for completion on the first seven post-operative days. Each patient was asked to complete the questionnaires as close as possible to midday. All patients were seen once before the operation and daily around noon to monitor compliance with completing questionnaires and to answer any questions. Intra-operative blood pressure and heart rate were retrieved from the theatre notes.

4.7 Statistical Analysis

Statistical analyses were computed using Genstat4 (Lawes Agricultural Trust 1980). Relationships between measures were assessed by Pearson product-moment correlation coefficients. Where isolated data were missing, degrees of freedom were correspondingly reduced for significance tests. Changes over time were assessed by repeated measures analysis of variance.

For simplicity correlation matrices have been reported only for the pre-operative day and for days 1, 3, 5, and 7 post-operatively. Coefficients reaching significance at $p < 0.05$ are cited.

4.8 RESULTS

4.9 Minor Surgery

4.9.1 Day to Day Changes

Figures 4.1(a) - 4.1(c) show mean values on a day to day basis. Symptoms (MSPQ), pain intensity, and pain distress increased post-operatively, reaching their peak on the 1st day following surgery. They then declined gradually

Fig. 4.1(a) Minor Surgery
Emotional and Physical State
Pre-operatively and on Successive Days

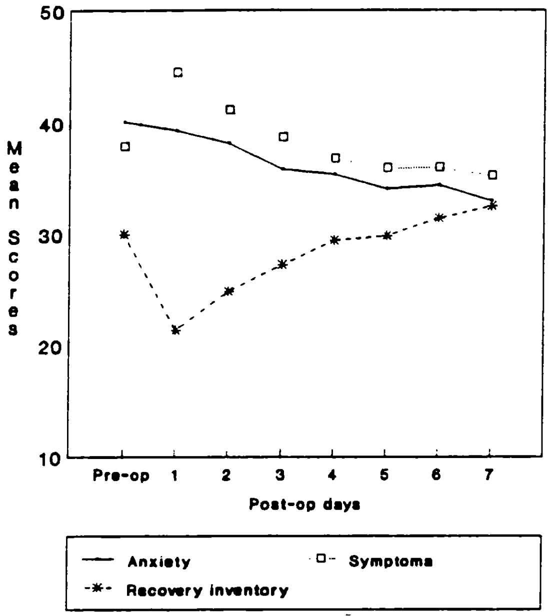


Fig. 4.1(b) Minor Surgery
Pain Experience Pre-operatively
And on Successive Days

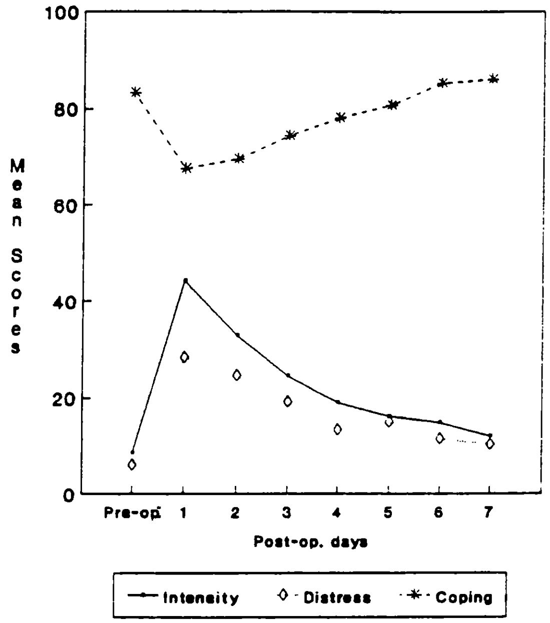
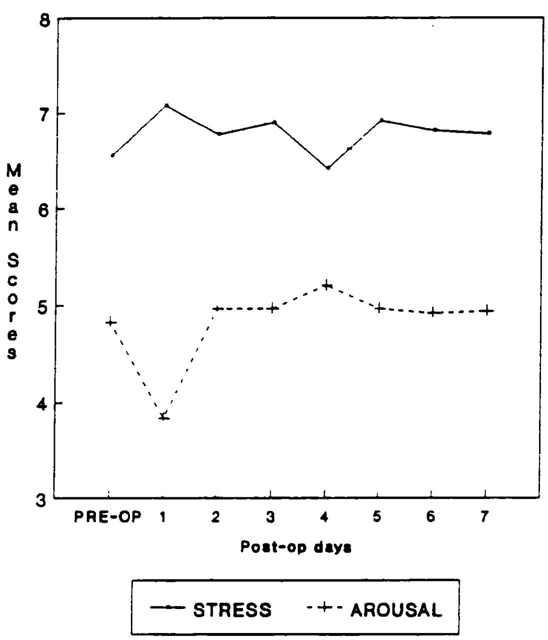


Fig. 4.1(c) Minor Surgery
Stress and Arousal
Pre-operatively and on Successive Days



over the post-operative period as the patients recovered from their operations.

In contrast state-anxiety, somatic state (RI), pain coping and level of arousal were high before surgery and gradually declined over the post-operative week. Analyses of variance to compare changes over time confirmed that most of these measures responded significantly to surgery (Table 4.1). Specifically, somatic state (RI), symptoms (MSPQ), pain intensity, pain distress, pain coping and arousal was lowest on the first post-operative day. Whereas state anxiety was higher pre-operatively than post-operatively. Stress levels did not show any significant variation.

Table 4.1

F-ratios from analyses of variance to compare changes over time of somatic state (RI), symptoms (MSPQ), state anxiety, stress, arousal, pain (intensity, distress and coping). Degrees of freedom 7, 258.

Outcome measures	F	P
Recovery Inventory	22.71	$p < 0.001$
Physical symptoms	26.96	$p < 0.001$
State anxiety	6.03	$p < 0.001$
Pain intensity	25.07	$P < 0.001$
Pain distress	10.38	$p < 0.001$
Pain coping	9.06	$p < 0.001$
Arousal	4.81	$p < 0.001$
Stress	1.16	$p > 0.10$

4.9.2 Relationships among subjective outcome measures

Somatic state (RI) and physical symptoms (MSPQ) show intercorrelations throughout the pre- and post-operative period (Table 4.2). State-anxiety and pain intensity indicate a similar pattern. Interrelationships increased over the post-operative week.

Although arousal was not related to a large extent to most of the other measures, it became modestly associated with better somatic state (RI) and lower levels of stress towards the end of the seven post-operative days.

4.9.3 Relationships of process measures with Outcome measures

4.9.3.1 Type A

Type A correlated with better somatic state (RI) pre-operatively and on the third and seventh days after surgery. It was also associated with fewer physical symptoms (MSPQ) before surgery and on the fifth and seventh days after operation (Table 4.3).

In addition, Type A was correlated with greater arousal pre-operatively and from the third day onwards after surgery. The relationship between stress and Type A was also strong. It was associated with lower levels of stress on every occasion of measurement. Type A was however, unrelated to state-anxiety. Of the

TABLE 4.2

INTERCORRELATIONS (p <0.05) OF OUTCOME MEASURES PRE-AND POST-OPERATIVELY IN MINOR SURGERY

PRE-OP	RI	MSPQ	PINT	PDIS	PCOP	STATE	STRES
MSPQ	-.52*						
Pain-int	-.34	.39					
Pain-dist	-.38	-	.58*				
Pain-cop	-	-	-.65*	-.45*			
State-anx	-.49*	.79*	-	-	-		
Stress	-.34	-	-	-	-	-	
Arousal	-	-	-	-	-	-	-.70*
POST-OP DAY 1							
MSPQ	-.45*						
Pain-int	-.33	.35					
Pain-dis	-	-	.85*				
Pain-cop	-	-	-.55*	-.52*			
State-anx	-	.61*	.52*	.67*	-.31		
Stress	.41*	-	-	-	.46*	-	
Arousal	-	.51*	-	-	.38	.42*	-
POST-OP DAY 3							
MSPQ	-						
Pain-int	-.34	.48*					
Pain-dis	-.44*	.57*	.88*				
Pain-cop	-	-.49*	-.70*	-.71*			
State-anx	-.45*	.49*	.41*	.51*	-.41*		
Stress	-.44*	-	-	-	-	-	
Arousal	.39	-	-	-	-	-	-.73
POST-OP DAY 5							
MSPQ	-						
Pain-int	-.37	.55*					
Pain-dis	-.38	.58*	.87*				
Pain-cop	.39	-.53*	-.81*	-.74*			
State-anx	-.69*	.33	.48*	.47*	-.50*		
Stress	-.38	.50*	.44*	.45*	-.40	.36	
Arousal	.48*	-.39	-	-.32	-	.33	-.82*
POST-OP DAY 7							
MSPQ	-.43*						
Pain-int	-	.57*					
Pain-dis	-.33	.70*	.85*				
Pain-cop	.38	-.57*	-.62*	-.79*			
State-anx	-.56*	.56*	.33	.47*	-.59*		
Stress	-.74*	.42*	.34	-	-.33	.31	
Arousal	.61*	-	-	-	-	-	-.82*

RI = Recovery Inventory, STATE= State Anxiety
MSPQ= Modified Somatic Perception Questionnaire,
PINT=Pain-intensity, PDIS=Pain-distress, PCOP =Pain-coping, STRES=Stress, AROS = Arousal

* = p <0.01

\- = not significant

TABLE 4.3
CORRELATIONS ($p < 0.05$) of PERSONALITY WITH OUTCOME MEASURES BEFORE AND AFTER MINOR SURGERY

			Post-op days.		
Post-op State	Pre-op	1	3	5	7
Type A Personality					
RI	.39	.31	.39	-	.56*
MSPQ	-.37	-	-	-.42*	-.41*
Stress	-.67*	-.66*	-.74*	-.75*	-.73*
Arousal	.51*	-	.55*	.68*	.70*
Trait Anxiety					
RI	-.40	-	-	-	-
MSPQ	.51*	.46*	.42*	-	-
State anxiety	.61*	.58*	.48*	-	-
Pain-intensity	-	.34	-	-	-
Pain-distress	-	.47*	-	-	-
Arousal	-.36	-	-	-.37	-.32
Chance locus of control					
RI	-	-	-.62*	-.60*	-.51*
Pain intensity	-	-	.34	-	-
Pain distress	.32	.34	.48*	-	.31
Stress	-	.39	.36	.38	.39
Arousal	-	-	-.34	-.41*	-.38

Internal locus of control

Post-op state	Pre-op	Post-op days 1	3	5	7
MSPQ	-	-	.30	-	-
Pain intensity	-	-	.32	-	-
Stress	-.39	-.36	-.39	-.37	-.40
Arousal	.31	-	.31	-	.38

Powerful others locus of control

RI	-	-	-.62*	-.60*	-.51*
Pain intensity	-	-	.34	-	-
Pain distress	.32	.34	.48*	-	.31
State anxiety	-	-	-	.34	-
Stress	-	.39	.36	.38	.38
Arousal	-	-	-.34	-.41*	-.38

RI = Recovery Inventory
MSPQ = Modified Somatic Perception Questionnaire
* = $p < 0.01$
\- = not significant

cardiovascular measures, Type A personality was associated with increased maximum diastolic blood pressure during surgery ($r = 0.36$, $p < 0.05$).

4.9.3.2 Trait Anxiety

Correlates of trait-anxiety were largely confined to the earlier part of the week (Table 4.3). As expected it was associated positively with state-anxiety pre- and post-operatively. It was also correlated with poor somatic state (RI), more physical symptoms (MSPQ) and worse pain experience (pain intensity and pain distress). Trait-anxiety was not related to stress but associations appeared with greater arousal.

4.9.3.3 Chance locus of control

Chance locus of control was correlated with better somatic state (RI) towards the later part of the week and with pain distress throughout the post-operative period. It was however unrelated to state-anxiety but post-operatively it was associated with lower arousal and greater stress (Table 4.3).

4.9.3.4 Internal locus of control

Internal locus of control showed minimum correlations with symptoms and pain intensity. Most of the associations were with lower stress levels and greater arousal pre-operatively and throughout the post-operative days. Correlations with belief in the importance of powerful others locus of control were mainly confined to the later part of the week. These correlations are shown in Table 4.3.

4.9.3.5 State Anxiety

State-anxiety had widespread post-operative positive correlates with somatic state (RI), symptoms (MSPQ), pain intensity and pain distress. Against this background it is notable that it bears little relation to stress or arousal or to coping with pain (Table 4.4).

4.9.3.6 Stress and Arousal

The only measure to bear any association with better post-operative state was arousal. This predicted better body state (RI) on the third, fifth and seventh days post-operatively (even though it was not associated with this measure pre-operatively or immediately post-operatively) and less stress. In contrast, stress was associated with less ability to cope with pain. Pre-operative stress predicted greater pain intensity during the later part of the week, and poor somatic state (RI) and more symptoms throughout the pre- and post-operative period. Table 4.4 represents the associations found.

4.9.4 Relationships among coping measures

Both methods of scoring the Kaloupek and the Billings and Moos scales (see chapter 3, section 3.1.6) were retained for analysis. The Kaloupek coping scales showed few intercorrelations. The clearest was denial with the presence of behavioural action (Table 4.5). By contrast,

TABLE 4.4
CORRELATIONS (p <0.05) BETWEEN PRE-OPERATIVE STATE and OUTCOME MEASURES IN MINOR SURGERY

State Anxiety

		Post-op. days			
	Pre-op	1	3	5	7
Post-op. state					
RI	-.49*	-.47*	-.53*	-.56*	-.48*
MSPQ	.79*	.73*	.77*	.50*	.55*
Pain-intensity	-	.44*	.39	.43*	.32
Pain-distress	-	.45*	.41*	.45*	.44*
Pain-coping	-	-	-.36	-.44*	-
State-anxiety	-	.62*	.78*	.54*	.48*

Stress

	Pre-op	1	3	5	7
RI	-.34	-.40	-.44*	-.47*	-.53*
MSPQ	.38	.34	.36	.45*	.39
Pain-intensity	-	-	-	.34	.37
Stress	-	.84*	.90*	.85*	.84*
Arousal	-.70*	-.62*	-.69*	-.66*	-.70*

Arousal

	Pre-op	1	3	5	7
RI	-	-	.39	.56*	.54*
MSPQ	-	-.46*	-	-.49*	-.35
Pain-intensity	-	-	-	-.41*	-.31
Pain-distress	-	-	-	-.32	-.31
State-anxiety	-	-.35	-	-.33	-
Stress	-.70*	-	-.69*	-.64*	-.65*
Arousal	-	-	.72*	.63*	.62*

RI= Recovery Inventory
MSPQ= Modified Somatic Perception Questionnaire
* = p <0.01

Table 4.5

INTERCORRELATIONS (p <0.05) AMONG COPING MEASURES IN MINOR SURGERY

	Wory	Sprs	Bact	Rtcg	Dnal	Atcp	Actb	Avod	Prbf	Emtf
Wory	-									
Sprs	-	-								
Bact	.48*	.39	-							
Rtcg	-	-	(.30)	-						
Dnal	-	-	.54*	-	-					
Atcp	.61*	-	.52*	.56*	-	-				
Actb	.63*	.36	.78*	-	-.42*	.44*	-			
Avod	.41*	.56*	-	-	-	-	-	-		
Prbf	.75*	.34	.81*	-	-.45*	.74*	.89*	-	-	
Emtf	.50*	.55*	-	.43*	.32	.54*	-	.80*	.31	-

The Kaloupek et al., (1984) Coping Scale. Items include;
Wory= Worrying, Sprs = Suppression, Dnal = Denial
Bact= Behaviour action, Rtcg = Rational cognition

The Billings and Moos (1981) Coping Scale. Items include;
Atcp = Active coping, Actb = Active behaviour
Prbf = Problem focusing, Emtf = Emotion focusing
* = $p < 0.01$

the Billings and Moos scales were more extensively intercorrelated; in particular, active coping correlated with active behaviour, emotion focusing and problem focusing. In addition, problem focusing correlated with active behaviour and emotion focusing with avoidance.

4.9.5 Relationships of personality with coping measures

Relationships between coping and personality measures are minimal. Trait anxiety did not correlate with any coping scales. Other correlates were isolated and marginal. Type A personality was associated with less worrying ($r = -0.39$, $p < 0.05$), and in the Billings and Moos scales, marginally with more active coping ($r = 0.31$, $p < 0.05$), avoidance ($r = 0.32$, $p < 0.05$) and emotion focusing ($r = 0.32$, $p < 0.05$).

Belief in the importance of powerful others correlated with less behavioural action ($r = -0.33$, $p < 0.05$), limited active coping ($r = -0.41$, $p < 0.01$) and reduced problem focusing.

4.9.6 Relationships of outcome measures with coping measures

Of the Kaloupek scales, behavioural action, suppression and rational cognition bore no clear relationships to post-operative state. Of the Billings and Moos scale, active behaviour and emotion focusing were similarly unrelated.

The clearest relationships were with denial. This was associated with less anxiety, better coping with pain and fewer symptoms at the end of the post-operative week. Active coping was related to better somatic state (RI) during the later part of the week (Table 4.6).

Stress and arousal were particularly closely related to mode of coping. Worrying correlated with lower levels of stress pre- and post-operatively and with greater arousal in the later part of the week. The Billings and Moos scales bore this out. Lower stress levels were associated with increased active coping, while greater arousal was correlated with more active coping, problem focusing and emotion focusing.

4.9.7 Relationship between coping and objective measures

Of the coping measures, only denial was associated with increased maximum systolic blood pressure ($r = 0.34$, $p < 0.05$) during surgery.

4.10 Major Surgery

4.10.1 Day to Day Changes

Most measures showed a similar time course to the ones in minor surgery. The main differences were that, with major surgery, worst symptom (MSPQ) reporting and poor somatic state (RI) were highest on the second post-operative day and pain coping lowest by the fourth day following surgery. Figures 4.2(a) - 4.2(c) illustrate the daily

Table 4.6

CORRELATIONS (P <0.05) OF COPING MEASURES WITH PRE- AND POST-OPERATIVE STATE (* = p <0.01) IN MINOR SURGERY

Denial

		Post-op.days			
Post-op. state	Pre-op	1	3	5	7
MSPQ	-	-	-	-	-.38*
State anxiety	-	-	-.37	-.36	-.37
Pain-distress	-	-	-	-	-.36
Pain-coping	-	-	-	.46*	.32
Arousal	-	-.41*	-	-	-

Avoidance

Post-op. state	Pre-op	1	3	5	7
RI	.44*	-	-	-	.38
MSPQ	-	-	-	-	-.42*
Stress	-	-.31	-	-	-.35

Worrying

Post-op. state	Pre-op	1	3	5	7
MSPQ	-	-	-.42*	-	-
Stress	-.42*	-.44*	-.51*	-.41*	-.56*
Arousal	.39	-	-	.48*	.55*

Active Coping

Post-op. state	Pre-op	1	3	5	7
RI	-	-	.50*	.31	.39
Stress	-.37	-.43*	-.41*	-.41*	-.52*
Arousal	.32	-	-	.32	.35

Problem Focusing

Post-op. state	Pre-op	1	3	5	7
RI	-	-	.37	-	-
Stress	-	-	-.40	-	-.41*
Arousal	.40	-	-	.41*	.44*

Emotion Focusing

Post-op. state	Pre-op	1	3	5	7
Stress	-.33	-.43*	-.31	-.44*	-.51*
Arousal	.33	-	-	.31	.31

RI = Recovery Inventory, - = not significant
MSPQ= Modified Somatic Perception

FIG. 4.2 (a) Major Surgery
Mean Scores for Emotional & Physical State Pre-operatively & Post-operative

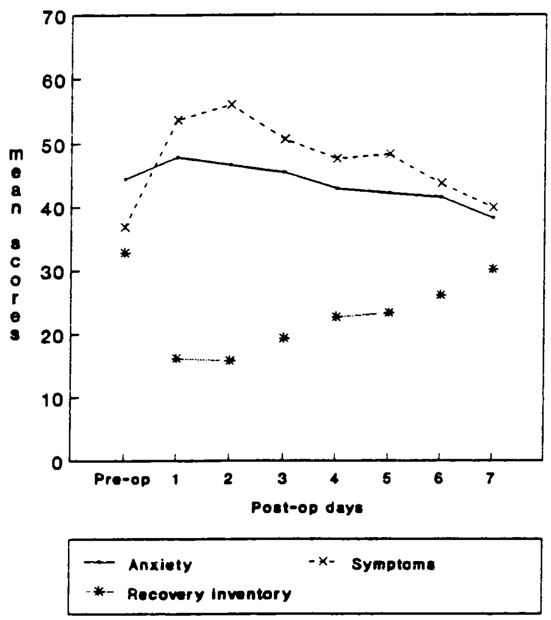


FIG. 4.2 (b) Major Surgery
Mean Scores for Pain Experience Pre-operatively and Post-operatively

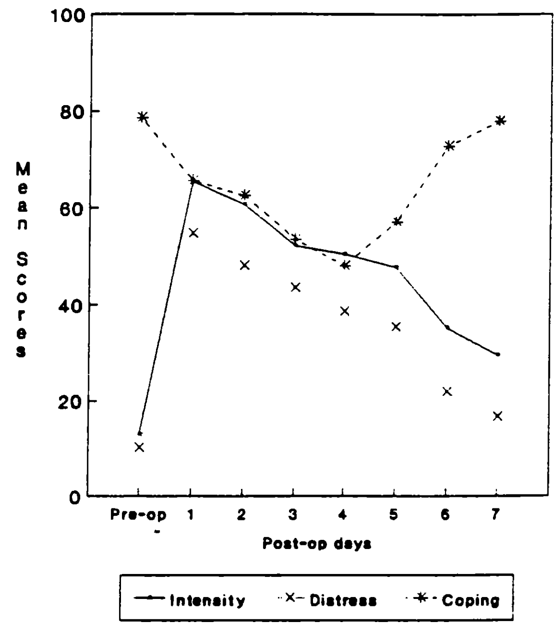
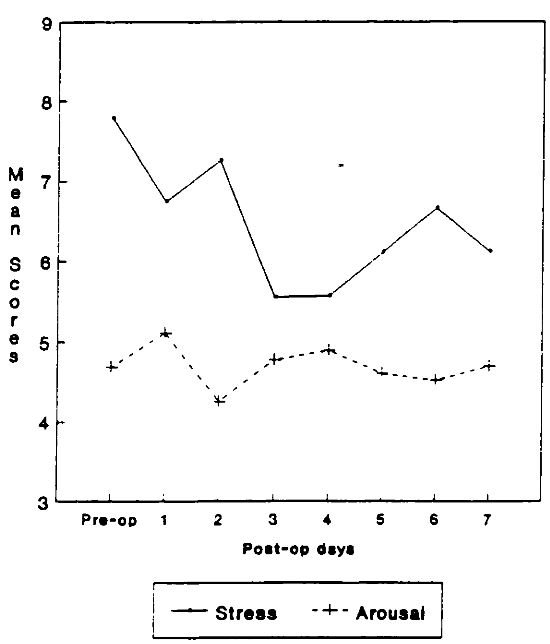


FIG. 4.2 (c) Major Surgery
Mean Scores for Stress and Arousal Pre-operatively and Post-operatively



mean scores of major surgery. These daily changes were confirmed to be significant by analysis of variance (overall minimum P value of F ratios < 0.001), Table 4.7).

Table 4.7

F-ratios from analyses of variance to compare changes over time of Recovery Inventory, symptoms, state anxiety, stress, arousal, pain (intensity, distress, coping). Degrees of freedom 7, 189.

Outcome measures	F	P
Recovery Inventory	49.94	$p < 0.001$
Physical symptoms	37.31	$p < 0.001$
State anxiety	15.45	$p < 0.001$
Pain intensity	54.70	$p < 0.001$
Pain distress	47.34	$p < 0.001$
Pain coping	20.46	$p < 0.001$
Stress	3.27	$p > 0.10$
Arousal	2.24	$p > 0.10$

Symptoms (MSPQ), pain intensity and pain distress were lowest pre-operatively, while somatic state and pain coping were also greatest pre-operatively. State anxiety reached its peak by the first post-operative day and then gradually declined. Stress and arousal showed insignificant variation.

4.10.2 Relationships among subjective outcome measures

In major surgery, correlations are fewer than those in minor surgery. The indices of subjective physical state tended to intercorrelate throughout (Table 4.8). Lower levels of state anxiety were strongly related to lower levels of stress by the seventh post-operative day. Arousal, as in minor surgery, remained unrelated to most of the other measures.

4.10.3 Relationships of Process measures with Outcome measures

4.10.3.1 Type A

Type A was related to poor somatic state (RI) only on the first post-operative day. Fewer symptoms, less pain intensity and pain distress were also associated with Type A personality pre-operatively and on the first and third day post-operative days (Table 4.9).

The strongest influence with Type A was with lower levels of state anxiety pre- and post-operatively and lower stress levels throughout the post-operative period. Type A was unrelated to arousal.

4.10.3.2 Trait Anxiety

The associations which appeared with trait anxiety were in contrast to those of minor surgery in that they emerged mainly during the latter part of the post-operative week (Table 4.9). State anxiety was correlated

Table 4.8

INTERCORRELATIONS (p <0.05) OF OUTCOME MEASURES BEFORE AND AFTER MAJOR SURGERY

PRE-OP	RI	MSPQ	PINT	PDIS	PCOP	STATE	STRES
MSPQ	-.33						
Pain-int	-.64*	.45*					
Pain-dist	-.74*	.37	.77*				
Pain-cop	.33	-	-.48*	-.54*			
State-anx	-	-	-	-	-.33		
Stress	-	-	-	-	-	.59*	-
POST-OP DAY 1							
MSPQ	-.49*						
Pain-int	-.51*	.71*					
Pain-dist	-.52*	.71*	.86*				
Pain-cop	-	-	-.31	-.42*			
State-anx	-	-	-	-	-.57*		
Stress	-	-.54*	-	-	-.50*	-	-
POST-OP DAY 3							
MSPQ	-.46*						
Pain-int	-	.63*					
Pain-dist	-	.60*	.80*				
Pain-cop	-	-.46*	-.77*	-.70*			
State-anx	-	-.41	-	-	-		
Stress	-	-.39	-	-	-	.67*	
Arousal	-	-	-	-	-	-	.45*
POST-OP DAY 5							
MSPQ	-						
Pain-int	-.45*	-					
Pain-dis	-.51*	-	.86*				
Pain-cop	.42*	-	-.85*	-.87*			
State	-.49*	-	-	-	-		
Stress	-.42*	-	-	-	-	-	-
POST-OP DAY 7							
MSPQ	-.53*						
Pain-int	-.37	-					
Pain-dis	-.36	-	.64*				
Pain-cop	-	-.32	-.54*	-			
State-anx	-	-	-	-	.36		
Stress	-	-	-	-	-	.78*	
Arousal	.43*	-	-	-	-	-	-

RI= Recovery Inventory, State= State Anxiety
MSPQ= Modified Somatic Perception Questionnaire
PINT= Pain-intensity, PDIS= Pain-distress, PCOP= Pain-coping, STRES= Stress, AROS= Arousal
* = p <0.01, - = not significant

Table 4.9

CORRELATIONS (p <0.05) of PERSONALITY WITH OUTCOME MEASURES BEFORE AND AFTER MAJOR SURGERY

Type A Personality

		Post-op. days			
	Pre-op	1	3	5	7
Post-op state					
RI	-	-.46*	-	-	-
MSPQ	-.43*	-.49*	-.39	-	-
Pain-intensity	-.36	-.37	-.40	-	-.35
Pain-distress	-.32	-.42*	-	-	-
Pain-coping	.33	-	-	-	.32
State anxiety	-.40	-.45*	-.50*	-.57*	-.58*
Stress		-.53*	-.51*	-.38	-.34

Trait Anxiety

	Pre-op	1	3	5	7
MSPQ	-	-	-	.44*	.37
State anxiety	.62*	-	-	.44*	.48*

Powerful Others locus of control

	Pre-op	1	3	5	7
MSPQ	-.50*	-.50*	-.49*	-	-
Pain-intensity	-	.32	-	.38	-
Pain-distress	-	.43*	-	-	-.33
State anxiety	-	-	-.52*	-.56*	-.44*
Stress	-.50*	-.70*	-.60*	-.35	-
Arousal	-	.34	-	-	.31

RI = Recovery Inventory
MSPQ = Modified Somatic Perception Questionnaire
* = p < 0.01, - = not significant

with trait anxiety pre-operatively and on the fifth and seventh post-operative days. Trait anxiety was also related to more physical symptoms on the fifth and seventh days after surgery. There were no associations with either stress or arousal. Trait anxiety was however, related to increased maximum heart rate during surgery ($r = 0.40$, $p < 0.05$).

4.10.3.3 Powerful Others locus of control

This was associated with fewer symptoms pre-operatively and with more symptoms during the earlier part of the post-operative week. Relationships with increased pain intensity, pain distress and higher levels of arousal only emerged on the first post-operative day. Additional correlations with reduced levels of state anxiety and stress appeared during the post-operative period (Table 4.9).

4.10.3.4 Internal locus of control

Few associations appeared with internal locus of control and are therefore not included in the table. The relationship between internal locus of control and lower levels of stress ($r = -0.34$, $p < 0.05$) appeared pre-operatively but on the third post-operative day the relationship was with increased stress levels ($r = 0.34$, $p < 0.05$). Other relationships were with increased pain distress ($r = 0.39$, $p < 0.05$), more symptoms ($r = 0.31$, $p < 0.05$) and poor somatic state ($r = -0.37$, $p < 0.05$) which appeared on the seventh post-operative day.

4.10.3.5 Chance locus of control

Correlations with a chance locus of control were also minimum and are not represented in the table. There were no correlations pre-operatively. Post-operatively a chance orientation was associated with less symptoms (r = -0.51, p < 0.01) on the seventh post-operative day, increased pain intensity (r = 0.39, p < 0.05) and less pain coping (r = -0.36, p < 0.05) on the third post-operative day. Chance orientation was also associated with increased maximum intra-operative heart rate (r = 0.31, p < 0.05).

4.10.3.6 State anxiety

State anxiety had the most extensive post-operative correlates with somatic state (RI), pain intensity, pain distress and pain coping. Although there were few associations pre-operatively or soon after surgery, significant relationships emerged from the third day onwards. This shows that state anxiety was related to poorer recovery. Stress and arousal however, showed few correlations. Table 4.10 represents the relationships found.

4.10.4 Relationships of subjective outcome with objective measures

Increased maximum intra-operative heart rate was correlated with more pain intensity (r = 0.41, p < 0.01), pain distress (r = 0.43, p < 0.01) and limited pain

Table 4.10
CORRELATIONS (p <0.05) BETWEEN PRE-OPERATIVE STATE and OUTCOME MEASURES IN MAJOR SURGERY

		Post-op. days			
	Pre-op	1	3	5	7
State Anxiety					
Post-op state					
RI	-	-	-.39	-.34	-.44*
MSPQ	-	.54*	.51*	-	-
Pain-intensity	-	-	-	.34	.39
Pain-distress	-	-	.46*	.43*	.59*
Pain-coping	-.33	-	-.31	-.35	-.44*
State anxiety	-	.60*	.36	.45*	.53*
Stress	.59*	-	-	-	-
Stress					
RI	-	-	-	-	-
MSPQ	-	.63*	.75*	-	-
Pain-intensity	-	-	-	-	.34
Pain-distress	-	-	-	-	.34
Pain-coping	-	-	-	-	-
State anxiety	-	.68*	.35	.31	-
Stress	-	.40	-	-	-
Arousal					
MSPQ	-	-.36	-.35	-	-
Stress	.40	-	.32	-	-
Arousal	-	-	.40	.40	.62*

RI = Recovery Inventory
MSPQ = Modified Somatic Perception Questionnaire
* = $p < 0.01$
- = not significant

coping ($r = -0.43$, $p < 0.01$) during the pre-operative period. Less coping with pain was also associated with increased maximum systolic ($r = -0.49$, $p < 0.01$), and diastolic ($r = -0.37$, $p < 0.05$) blood pressure during surgery.

4.10.5 Relationships among coping measures

The Kaloupek coping scale revealed extensive interrelationships (Table 4.11). The most significant was rational cognition with active coping, active behaviour, problem focusing and emotion focusing. Additionally, behavioural action correlated with rational cognition, less denial, active behaviour, and problem focusing. However in the Billings and Moos scales problem focusing was mainly related to active coping and active behaviour whereas emotion focusing was associated with active coping and avoidance.

4.10.6 Relationships of personality with coping measures

Correlations between coping scales and personality scales are as few as in minor surgery. Trait anxiety failed to show relationships with any coping measures. Out of the Kaloupek coping scales, Type A was correlated with less behavioural action ($r = -0.37$, $p < 0.05$), and increased denial ($r = 0.32$, $p < 0.05$) and from the Billings and Moos scales, limited active behaviour ($r = -0.36$, $p < 0.05$) and greater emotion focusing ($r = 0.34$, $p < 0.05$). An orientation towards powerful others was associated with limited active behaviour ($r = -0.36$, $p < 0.05$) and

Table 4.11

CORRELATIONS (p <0.05) AMONG COPING MEASURES IN MAJOR SURGERY * = (p < 0.01)

	Wory	Sprs	Bact	Rtcg	Dnal	Atis	Atcp	Actb	Avod	Prbf	Emtf
Cwory	-										
Sprs	-	-									
Bact	-	-	-								
Rtcg	-	-	.43*	-							
Dnal	-	-	-.32	-	-						
Atis	-	-	-	.42*	.31	-					
Atcp	-	.37	-	.65*	-	-	-				
Actb	-	-	.71*	.54*	-	-	-	-			
Avod	.31	.41*	-	-	.49*	.45*	-	-	-		
Prbf	-	-	.73*	.52*	-	-	.62*	.80*	-	-	
Emtf	.36	.46*	-	.32	.54*	-	.55*	-	.63*	-	-

The Kaloupek et al., (1984) Coping Scale. Items include: WORY = Worrying, SPRS = Supression, BACT = Behavioural action, RTCG = Rational cognition, DNAL = Denial, Additional scale - ATIS=Staff dependence

The Billings and Moos (1981) Coping Scale. Items include: ATCP = Active coping, ACTB = Active behaviour, AVOD=Avoid PROBF = Problem focusing, EMOTF = Emotion focusing was nearly significantly correlated with behavioural action.

4.10.7 Relationships of subjective outcome measures with coping measures

Out of the Kaloupek scales, suppression was unrelated to any subjective outcome measures. In addition worrying, rational cognition and denial showed few correlations with pre- and post-operative state. Of the Billings and Moos scales active coping and avoidance also showed limited relationships with pre- and post-operative status.

The post-operative correlations of coping that emerged were more significant on the first and third days after surgery (Table 4.12). Particularly, behavioural action was associated with better somatic state (RI), fewer symptoms, less pain intensity and less pain distress but with higher levels of state anxiety and stress on the first and third post-operative days. Active behaviour was similarly related to less symptoms on the first and third post-operative days, higher levels of state anxiety pre-operatively, on the first, third and seventh post-operative days and increased levels of stress on the first, third and fifth post-operative days.

Furthermore, problem focusing had many correlates. It was related before surgery to more symptoms, higher levels of state anxiety and increased pain distress. By the first

Table 4.12

CORRELATIONS (p <0.05) OF COPING MEASURES WITH PRE- AND POST-OPERATIVE STATE IN MAJOR SURGERY (* =p <0.01)

Denial

		Post-op. days			
	Pre-op	1	3	5	7
Pre.op state					
MSPQ	-	-	-	.37	-
State anxiety	-	-.41*	-.43*	-	-.34
Pain-intensity	.36	-	-	.31	.31
Pain-distress	-	-	-	-	.36
Pain-coping	-	-	-	-	-.31
Arousal	-.36	-	-	-	-.35

Avoidance

	Pre-op	1	3	5	7
RI	.45*	.37	-	-	.49*
State anxiety	-	-	-.36	-.35	-.37
Pain-distress	-.43*	-	-	-	-
Stress	-	-	-	-.36	-
Arousal	-.31	-	-	-	-

Worrying

	Pre-op	1	3	5	7
MSPQ	.41*	-	-	-	-
State anxiety	-	.43*	-	-	-
Pain-intensity	-	-	.35	-	-
Pain-distress	-	.32	-	-	-
Pain-coping	-	-.35	-	-	-
Stress	-	-	-	-	-.39

Active Behaviour

	Pre-op	1	3	5	7
RI	-	.36	-	-	-
MSPQ	-.40	-.46*	-.41*	-	-
State anxiety	.39	.36	.57*	-	.34
Pain-intensity	-	-	-	-	-.39
Pain-distress	.38	-	-	-	-
Pain-coping	-	-.49*	-	-	-
Stress	-	.54*	.48*	.38	-

Problem Focusing

	Pre-op	1	3	5	7
RI	-	.39	-	-	-
MSPQ	-.39	-.51*	-.45*	-	-
State anxiety	.59*	-	.62*	.40	.38
Pain-intensity	-	-	-.32	-	-.35
Pain-distress	.44*	-	-	-	-
Stress	-	.50*	.39	.34	-

		Emotion Focusing			
RI	.37	-	-	-	-
State Anxiety	-	-	-.32	-	-.31
Stress	-	-	-.32	-	-
		Behaviour Action			
RI	-	.33	-	-	-
MSPQ	-.35	-.60*	-.55*	-	-
State anxiety	-	.33	.59*	-	.32
Pain-intensity	-	-.38	-.54*	-	-.49*
Pain-distress	-	-.47*	-.32	-	-
Pain-coping	-	-	.33	-	-
Stress	-	.44*	.43*	-	-
Arousal	-	-	.33	-	-
		Rational Cognition			
MSPQ	-	-.36	-	-	-
State Anxiety	.37	-	.34	.32	-
Pain-intensity	-	-	-	-	-.35
Stress	-	.46*	-	-	-
		Active Coping			
State anxiety	.37	-	-	-	-

RI = Recovery Inventory - = not significant
MSPQ = Modified Somatic Perception Questionnaire
- = not significant

post-operative day relationships were limited to less symptoms, better somatic state (RI) and higher stress levels. On the third day following surgery, problem focusing was associated with fewer symptoms, less pain intensity, but higher levels of stress and state anxiety. On the fifth post-operative day, it maintained relationships with higher stress and anxiety levels. These associations continued up to the seventh post-operative day when problem focusing was related to less pain intensity and increased state anxiety.

4.10.8 Relationships between coping and objective measures

Correlations between coping scales and objective measures were as few as those in minor surgery. Suppression was related to lower maximum intra-operative systolic (r = -0.48, $p < 0.01$) and diastolic (r = -0.45, $p < 0.01$) blood pressure. Worrying was also correlated with increased maximum heart rate during surgery (r = 0.39, $p < 0.05$).

4.11 Discussion

The main aims of these first two studies were to determine whether; 1) state anxiety would be associated with poorer recovery and 2) whether arousal would be correlated with measures of active coping and better recovery. Results confirmed that state anxiety was indeed associated with a poorer while arousal was related to a better recovery in minor surgery and to a lesser extend in major surgery.

The pattern of intercorrelations revealed that pre-operative state anxiety in both studies was associated with poorer somatic state and greater pain during the post-operative week. This result is similar to some previous reports (Scott et al., 1983) but not to those of others (Wolfer and Davis, 1970; Johnston and Carpenter, 1980; Wallace, 1986a). The results suggest that there is a significant relationship between pre-operative state anxiety and poorer recovery. These divergent results are hardly surprising since when anxiety is measured post-operatively, it bears little relation to other post-operative measures. At times, the relationship between pre- and post-operative anxiety is not found (e.g. Ho et al., 1988) or when it is found, it is small. In Wallace's (1986b) results, the linear relationship between pre- and post-operative anxiety did not extend to post-operative anxiety measured after discharge.

In contrast, the interrelationships with arousal showed that at least in minor surgery, arousal was related to better somatic state and lower stress levels by the end of the post-operative week. Arousal was also correlated with measures of active coping, namely worry and behaviour action. We can, therefore, reasonably conclude that state anxiety is associated with poorer recovery while arousal is correlated with a better one. That pre-operative arousal predicted better outcome is consistent with other findings (Ray and Fitzgibbon, 1981; Ho et al., 1988).

The trait anxiety measure in both studies successfully predicted increased state anxiety. The intercorrelations are similar to those found with state anxiety. Some studies have shown similar results (Feinmann et al., 1987; George et al., 1980; Mathews and Ridgeway, 1981; Martinez-Urrutia, 1975). Other studies (Auerbach, 1973; Bruegel, 1971; Johnson et al., 1971; Wolfer and Davis, 1970; Hayward, 1975) however, failed to report any correlations of state anxiety with trait anxiety.

In the more Type A patients, pain and anxiety were less, symptoms fewer, somatic state better, stress levels lower and arousal greater in both major and minor surgery. It has been suggested that Type A personality is often associated with underreporting of physical symptoms in a variety of situations (Carver et al., 1976). An explanation which has been proposed for this is that there could be a tendency for Type A people to focus on external rather than internal changes, especially when internal changes are perceived to be relatively of less importance (Stern et al., 1981).

In relation to locus of control, an orientation towards the importance of powerful others was related to poorer somatic state (RI), greater stress, and lower levels of arousal in minor surgery. In major surgery the associations were with more symptoms (MSPQ), lower stress and anxiety levels and greater arousal post-operatively. In both types of surgery, powerful others locus of control was related to more pain intensity and pain distress. Levesque and Charlesbois (1977) have reported a similar result. In both minor and major surgery internal locus of control was related to less stress pre-operatively, increased pain, more symptoms and poorer somatic state in the later part of the week.

It has been suggested that the effects of surgery may be modulated by the psychological coping strategies used by patients. Therefore, patients who show high levels of pre-operative anxiety and who tend to have greater post-operative anxiety may use different coping strategies (Wallace, 1986a; Vogele and Steptoe, 1986). Patients in the minor surgery group who had higher scores of denial reported less pain, lower levels of anxiety and fewer symptoms, while patients in the major surgery group who reported less pain, fewer symptoms and better somatic state had tended to employ active behaviour and problem focusing. The major surgery groups' tendency to have higher scores of active behaviour may seem appropriate given the degree of involvement in their treatment that is often expected of them post-operatively. On the other hand, the use of denial by minor surgery patients seems to indicate that denial is an effective coping strategy in less severe surgical cases.

Type A personality was associated with increased blood pressure during minor surgery. This confirmed the finding of some previous investigations (Kahn et al., 1980; Krantz et al., 1982) but not of others (Kornfeld et al., 1985). In both groups, more Type A patients coped by using emotion focusing. Evidently they chose to cope with the trauma of surgery by managing the emotional consequences of the stressor (surgery).

Again, it should be emphasized that comparisons between the two studies must be treated with caution, given the differences in physical condition (i.e. type of anaesthetics, analgesics and muscle relaxants given during surgery itself). However, similarities in physiological and psychological responses were apparent.

4.12 Conclusion

In these initial studies, evidence was sought as to whether a patient's pre-operative state is associated with recovery after either minor or major surgery. When level of pre-operative state anxiety was correlated with outcome measures, some associations were found. High levels of pre-operative state anxiety were related to worse recovery. The dimension of arousal which emerged was related to active cognitive coping. Arousal was also associated with better subjective state post-operatively.

These results therefore, suggest that it may be possible to improve the care of post-operative patients by pre-operatively adjusting state anxiety and other factors that may delay a smoother recovery. The next study will investigate whether anxiety can be influenced by psychological intervention.

CHAPTER FIVE

PSYCHOLOGICAL PREPARATION FOR SURGERY: RELAXATION TRAINING VS CONTROL (GENERAL PROCEDURAL INFORMATION).

5.1 Introduction

In chapter 4 we saw evidence of transient increases in state anxiety around the time of surgery. Such evidence has led to attempts at providing information and reassurance in the hope of reducing any adverse consequences. The methods employed to prepare patients for surgery and the results of these efforts are reviewed in chapter 2.

These studies indicate that the outcome from surgical procedures is influenced by psychological as well as physical factors. Possible psychological factors include relatively permanent features of individuals such as personality traits, and mood changes which can be observed following psychological preparation. Whatever the mechanism, an association between personality variables, coping style and recovery from surgery suggests that even temporary modifications of psychological state might facilitate or delay recovery. Further experimental evidence that psychological and physical factors are modulated by psychological intervention, in some form of preparation for surgery, would allow less equivocal conclusions. It is this evidence that is the main concern of experiment 2 in this chapter. The present experiment examined the effect of relaxation training on subjective responses to surgery. The control procedure was to provide background procedural information; this was in the light of evidence that such information has little or no effect on recovery when compared with no treatment controls (Auerbach, 1989).

The intent of relaxation training is to replace the anxious response of the patient with a response that is physiologically and behaviourally incompatible with anxiety (Kendall and Norton-Ford, 1982). Benson (1975) describes the relaxation response as an innate physiological response which is directly opposed to anxiety or stress response. The stress and relaxation responses cannot therefore, be exhibited simultaneously. Hanley and Chinn (1989) proposed that this counter-response is a protective mechanism against the effects of "overstress" by allowing the individual to prevent the harmful bodily effects of sustained stress reactions. The relaxation response is characterized by a decrease in heart rate, lowered metabolism, decreased respiration rate, decreased muscle tension and is accompanied by a sense of peacefulness and calm. Meichenbaum (1985) concluded that it is this reciprocal inhibitory relationship between the anxiety and relaxation response which makes the relaxation response an important therapeutic component in the treatment of anxiety and stress.

An important direction for such research to take is to investigate the most efficient (both in terms of service delivery and post-operative outcome) mode of educating patients in active relaxation techniques. Some studies have shown that patients forget between 50% and 72% of the information communicated by medical personnel in clinical interviews (Svarstad, 1974, 1976). Consequently, the provision of a tape and recorder giving instructions in these techniques may be more effective, as patients can listen to the tape as often as necessary before the operation, as well as after.

This study therefore, aimed to investigate the comparative efficacy of a relaxation tape versus a general procedural information one on patients undergoing major surgery. Should the former prove equally or more beneficial to patients, this would prove a more cost-effective means of delivering this service than requiring a nurse or psychologist to spend approximately one hour with each patient prior to surgery.

5.2 Method

5.3 Preliminary Study 1

5.3.1 Aim

It was essential to carry out a preliminary study in order to investigate how able patients, who would be fairly poorly following major operations, could cope with listening to a taped message.

5.3.2 Subjects

Ten patients who were admitted for elective abdominal surgery were approached on the afternoon of admission. Two had language difficulties and were therefore not included in the preliminary study. Eight patients were in the final sample, 3 males and 5 females, with a mean age of 43, ranging from 22-71yr. Their main underlying illnesses were ulcerative colitis and Crohn's disease and main types of surgery carried out were hemicolectomies and resections. Appendix 5.1. gives details of operations.

Surgery was carried out between 08.30hr and 15.30hr. A premedication of papaveretum and hyoscine or pethidine and atropine was given intramuscularly one hour before surgery. Anaesthesia was induced with thiopentone and suxamethonium to facilitate intubation. Maintenance was achieved with controlled ventilation of oxygen and nitrous oxide supplemented by enflurane, isoflurane, halothane or fentanyl. Muscle relaxation was maintained by atracurium as necessary and patients received broad spectrum antibiotics of metronidazole 500ml and gentamycin 80mg intravenously during surgery.

For the first 24-72 hours after surgery patients received a continuous intravenous papaveretum or pethidine programmable infusion pump to provide analgesia. Antiemetics, metochlopramide or prochlorperazine were given whenever necessary and subsequently oral analgesia were given if requested.

5.3.3 Procedure

Patients were approached on the afternoon of the day of admission. Five patients were recruited on Monday afternoon and their operations were booked for Tuesday. The other three patients were recruited on Friday afternoon for the Monday operations. They were asked if they would like to to participate in a study which assessed "How patients can be helped during their recovery from surgery by listening to a tape." Patients gave their informed consent on this occasion.

5.3.4 Tape Recordings

A tape of the relaxation procedure, a portable recorder and lightweight headphones were provided for each patient. The patients were asked to listen to the tape at least once more on the eve of the operation and at least once while waiting to go to theatre on the day of surgery. After surgery patients could listen to the tape as often as they required. The cassette tape, recorder and headphones were removed on the seventh day after surgery. In this preliminary study no control procedure was required.

5.3.5 Questionnaire

Patients were given a questionnaire which evaluated the tape on the last day of the preliminary study. They were asked to rate "how helpful it had been" (made things worse, not helpful, helpful, very helpful; scored 1-4); "how often they had listened" (not at all, once a day, twice daily, more than twice daily; scored 1-4); "whether they would recommend it to a friend in hospital" and "whether s/he would want to use it in future" (no, undecided, yes; scored 1-3).

5.4 Results

Patients evaluated the tape positively. 7/8 found listening to the tape very helpful or helpful. 6/8 of the subjects said they listened to the tape at least twice daily and the remaining 2/8 said they listened once a day. Another 6/8 said they were definitely likely to recommend the tape to a friend in hospital. Finally, 7/8 of the patients responded that they would definitely use the tape in future if they had another operation.

5.5 Preliminary Study 2

5.5.1 Aim

The second preliminary study was carried out in order to determine whether patients undergoing surgery would be able to complete the questionnaires for at least one week post-operatively as well as manage to listen to the relaxation tape, as often as they desired.

5.5.2 Subjects

Ten patients admitted for major abdominal surgery were approached on the afternoon of their admission. All agreed to take part in the pilot study. Four were male and six were female aged between 25-63, mean age 40. Appendix 5.4 shows their characteristics. The main types of operations carried out were colectomies and laying open of fistulae. The drugs given for premedication, anaesthesia, antibiotics, antiemetics and analgesia are the same as those used in pilot study one.

5.5.3 Questionnaires

The pre-operative set included three personality scales: the trait version of the State-Trait Anxiety Inventory (Spielberger et al., 1970), a brief index of the Type A personality (Bortner, 1969) and the Multidimensional Health Locus of control (Wallston et al., 1978). Also given on this occasion as well as in each subsequent set, were the state anxiety version of the STAI, the Recovery Inventory (Wolfer and Davis, 1970) and the two 10-cm line visual analogue scale; pain intensity and pain distress. These questionnaires are similar to those completed in chapter 4.

Patients were also given a questionnaire which evaluated the tape on the last day of the preliminary study. This questionnaire has already been described in preliminary study 1.

5.5.4 Procedure

Patients were approached on the afternoon of admission between 15.00hr and 16.00hr. Five were recruited on

Monday for Tuesday operations and the remaining five on Friday for Monday operations. They were asked to participate in a study which was investigating "How patients can be helped during their recovery from surgery by listening to a tape". Patients gave their informed and written consent on this occasion.

On the afternoon of admission patients completed the personality measures followed by the first of eight identical sets of questionnaires. The remaining sets were left with the patients and each had to complete the questionnaires as close as possible to midday. Patients were seen daily around 12 noon for the first 7 post-operative days to answer any questions and help with completing questionnaires.

5.6 Results

Patients evaluated the tape as positively as in pilot study one. 8/10 of the patients found listening to the tape either very helpful or helpful. Another 8/10 listened to the tape either twice a day or at least once a day. 7/10 responded that they were likely to recommend the tape to a friend in hospital, 2/10 were undecided. 7/10 responded that they would definitely use the tape in future if they had another operation and 1/10 was undecided.

Finally, 9 out of 10 patients managed to complete their set of questionnaires without any assistance from the researcher. The one who did not, found it difficult to complete the immediate post-operative set as she was too ill.

5.7 Conclusion

It was concluded that patients undergoing major surgery were capable of completing questionnaires during the post-operative week. They were also able to listen to a tape before and after surgery. With this evidence, the next stage was to go on to the second study.

5.8 Experiment 2

5.8.1 Hypothesis

The main hypothesis was that:
patients in the group receiving relaxation training would have a better recovery from surgery (as measured by significantly better body state (RI), less pain intensity and pain distress and lower state anxiety levels) than patients in the control group.

5.8.2 Subjects

One hundred patients admitted for major abdominal/perineal surgery were randomly allocated into two groups (relaxation and control). They were matched for sex, age and type of operation (Table 5.1). Six were excluded because of language difficulties, another six declined to participate in the study, four were judged by the nursing staff to be too distressed, two died during surgery and the remaining two withdrew after surgery as they felt they could not cope with the completion of questionnaires. Eighty patients constituted the final subject sample (relaxation group n= 40, control group n= 40). They were aged between 16-79 yr, mean age 37 and there were 39 male and 41 female.

Details of the patients' illnesses and operations are presented fully in appendices (5.5) and (5.6). The main types of operations carried out were colectomies, rectoplexies and resections and the main underlying illnesses were ulcerative colitis, Crohn's disease and cancer of the rectum\colon. Surgery was carried out between 08.30hr and 15.30hr. The drugs given for premedication, anaesthesia, antibiotics, antiemetics and analgesia are similar to those mentioned for major surgery in study 1 (b) chapter 4.

5.9 Measures

5.9.1 Outcome Measures

The measures administered in this study are described in chapter three and are similar to those already used in preliminary study two. Anxiety was assessed by the state-anxiety version of the State-Trait Anxiety Inventory (Spielberger et al., 1970: STAI). The Recovery Inventory (Wolfer and Davis, 1970) was used to measure subjective physical state. Pain intensity and pain distress were measured on a 10-cm line visual analogue scale. These questionnaires were completed pre-operatively and on each occasion post-operatively.

5.9.2 Process Measures

The Multidimensional Health Locus of Control (Wallston and Wallston, 1978), the Trait-anxiety scale of the STAI (Spielberger et al., 1970) and the Type A personality scale (Bortner, 1969) were completed pre-operatively. The coping scale administered on the 7th post-operative day was based on the coping scale by Billings and Moos (1981). A questionnaire evaluating the tapes was also completed on this last occasion. This questionnaire has already been described in preliminary study one.

5.9.3 Tape Recordings

The relaxation group listened to the same tape as that described in preliminary study two, while the control group listened to the information tape (Transcript of the relaxation tape can be found in appendix 5.3 and the control tape in appendix 5.8). Both tapes lasted fifteen minutes. The voice was that of the researcher.

5.10 Procedure

Most of the procedure adopted in this study has been described in preliminary study two. The 80 patients who participated in the study were assigned alternately to two different groups, Relaxation and Control. The methods of recruitment to the study and the number and manner of administration of questionnaires was identical for both groups. The procedure was only modified where necessary to ensure sufficient matching on the basis of age, sex, diagnosis, type of surgery and number of previous operations.

Maximum intra-operative blood pressure and heart rate were retrieved from the theatre notes and were monitored automatically by a datascope (see chapter 4). The pre-treatment baseline estimate of systolic and diastolic blood pressure and heart rate was obtained after the patient had completed the first batch of questionnaires. Post-treatment blood pressure levels and heart rate were taken from the groups five minutes after listening to the tapes.

5.11 Statistical Analysis

Statistical analyses were computed by the Genstat Statistical programmes (Lawes Agricultural Trust, 1980). Groups were compared on measures made on the pre-operative day, the coping questionnaires, the evaluations of the tapes and post-operative analgesia intake by one-way analyses of variance.

Other post-operative questionnaire measurements were examined by two way analyses of variance; the "time" factor distinguished measurements made on post-operative days. The maximum blood pressure and heart rate reached during surgery were analyzed by separate one way analysis of variance. Where necessary, significant interaction terms were analyzed by post hoc t-test using error terms estimated from the relevant analysis of variance.

Product moment correlations assessed the relationship between personality questionnaires and coping subscales, and between the pre- and post-operative state. Tests of significance were made at 1% and 5% levels.

5.12 Results

At baseline, the groups were comparable with respect to age, diagnosis, type of surgery and number of previous operations (Table 5.1).

5.12.1 Evaluation of Tapes

Patients in the relaxation group listened to the tape "more often" (means: 84 vs 25 minutes; $F\ (1,78) = 4.33$, $p < 0.05$) and were more likely to use the tape "in future" ($F\ (1,78) = 3.57$, $p < 0.05$) than patients in the control group. There were however, no significant differences between the groups in rating the tape as "more helpful" or "recommending" the tape to a friend ($p > 0.10$).

5.12.2 Immediate effects of the tape

It is apparent from Figs. 5.1(a), 5.1(b) and 5.1(c) that blood pressure and heart rate decreased after first listening to the tapes; this was confirmed by the main

Table 5.1

Matching of Groups

Preliminary diagnoses, type of surgery and mean scores on medical, surgical and personality measures in each group. Differences between means are non-significant (p >0.10).

	Relaxation	Control
Diagnosis		
Crohn's disease	11	14
Ulcerative colitis	9	11
Cancer of rectum or colon	6	4
Rectal prolapse	5	3
Constipation or incontinence	4	2
Polyposis	2	3
Other	3	3
Type of surgery		
Colectomy and Anastomosis	15	11
Anterior posterior resection	7	8
Proctocolectomy and protectomy	6	7
Rectoplexy	5	4
Hemicolectomy	4	4
Colostomy and ileostomy	3	6
Age	39.8	38.5
Duration of illness (months)	46	63
Previous operations (number)	1.63	2.1
Start-time of operation (hr, min)	10.69	10.45
Duration of surgery (hr, min)	2.88	2.86
Type A	59	61.2
Trait-anxiety	39.6	39.8

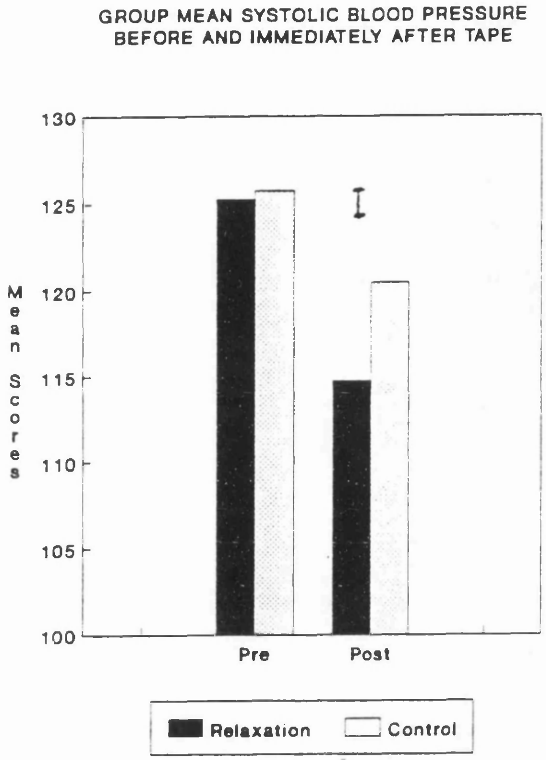


FIG. 5.1(a) Effects of tape

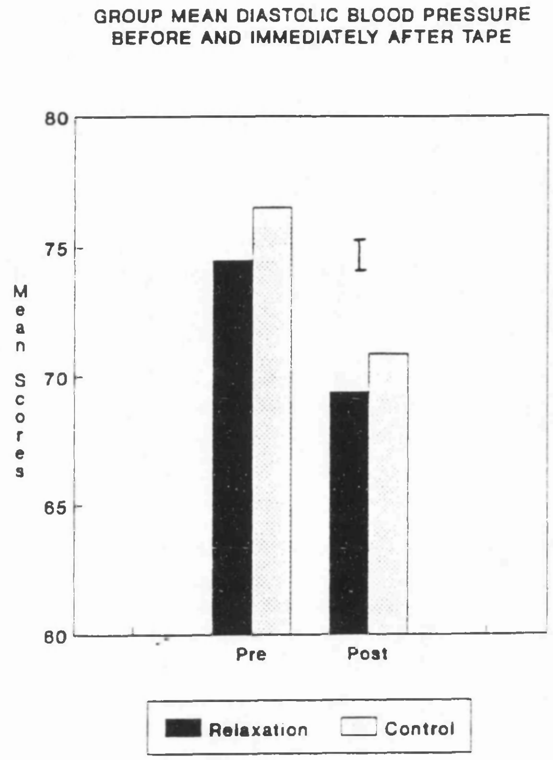


FIG. 5.1(b) Effects of tape

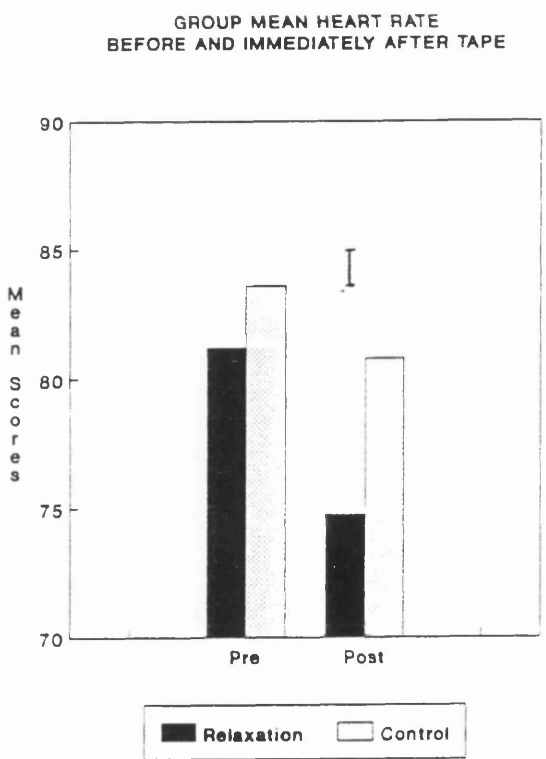


FIG. 5.1(c) Effects of tape

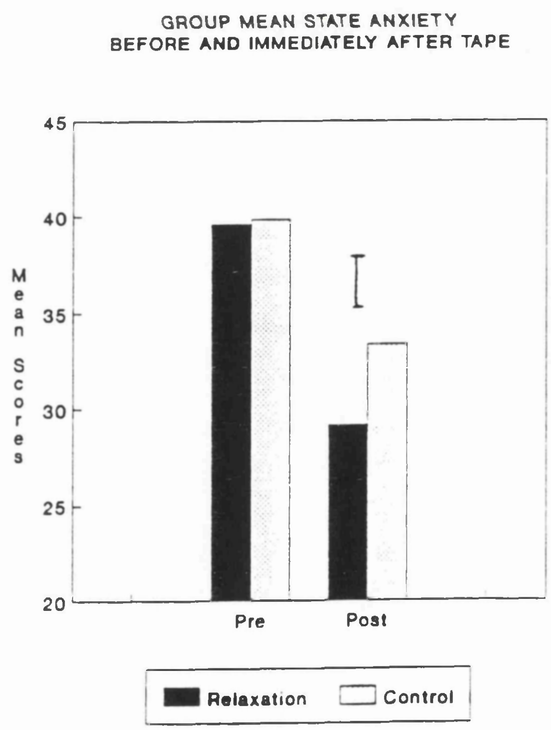


FIG. 5.1(d) Effects of tape
Bars show SEDs from relevant ANOVAs
for comparison between groups

effect of time in each case (Table 5.2). For systolic blood pressure and heart rate, the greater decrease in the relaxation group was confirmed by the interaction of Group x time (Table 5.2). The blood pressure and heart rate did not differ between the groups at the first measurement; after listening to the tape, rates were lower in the relaxation group for systolic blood pressure (t = 4.02; p < 0.01) and heart rate (t = 4.71; p < 0.01). Diastolic blood pressure did not differ between the groups after listening to the tapes.

Table 5.2

F-ratios from analyses of variance of state anxiety, heart rate and blood pressure before and immediately after first listening to the tapes. Degrees of freedom 1, 78, * p < 0.05; ** p < 0.001.

			Blood pressure	
	Anxiety	Heart rate	Systolic	Diastolic
Time	73.40**	455.88**	194.71**	72.58**
Group x Time	4.09*	71.57**	21.63**	0.16
Group	1.05	10.42*	6.13*	2.97

State anxiety was also lower after patients first listened to the tapes (Fig. 5.1(d), Table 5.2). The decrease was more in the relaxation group (t = 1.77, p < 0.05) and this is confirmed by the interaction of group x time but the main effect of group did not approach significance.

GROUP MEAN STATE ANXIETY SCORES
COMPARISON ON EACH OCCASION

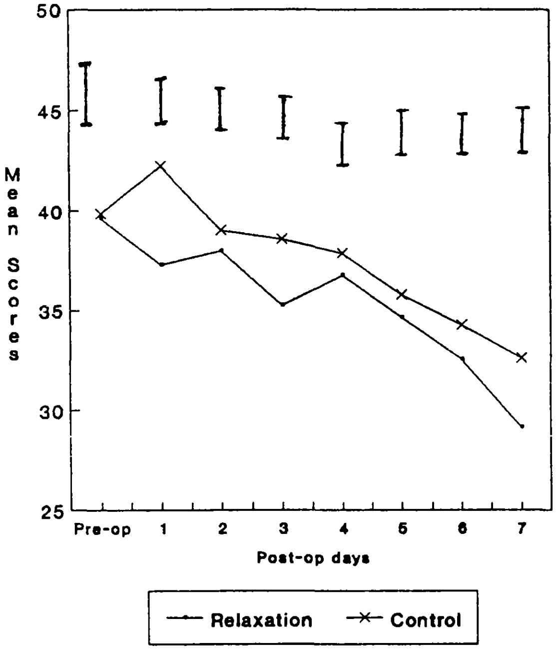


FIG. 5.2(a) Effects of tapes

GROUP MEAN RECOVERY INVENTORY SCORES
COMPARISON ON EACH OCCASION

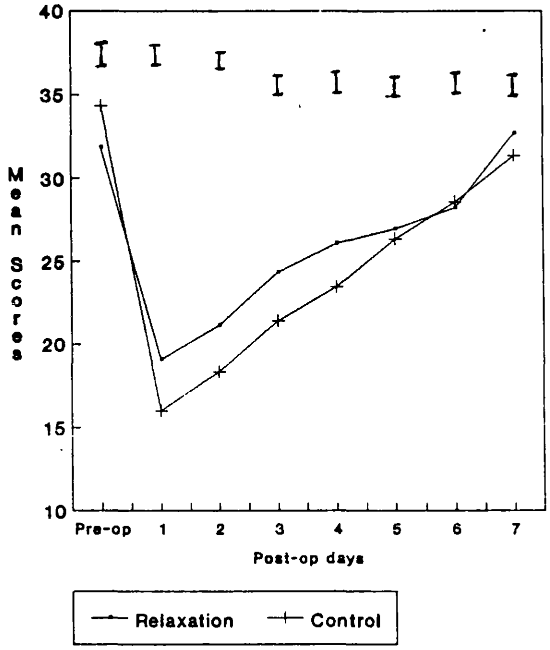


FIG. 5.2(b) Effects of tapes

GROUP MEAN PAIN INTENSITY SCORES
COMPARISON ON EACH OCCASION

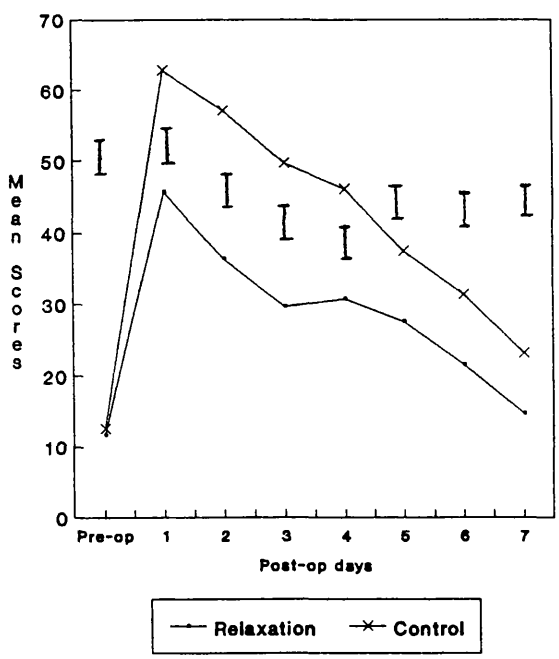


FIG. 5.2(c) Effects of tapes

GROUP MEAN PAIN DISTRESS SCORES
COMPARISON ON EACH OCCASION

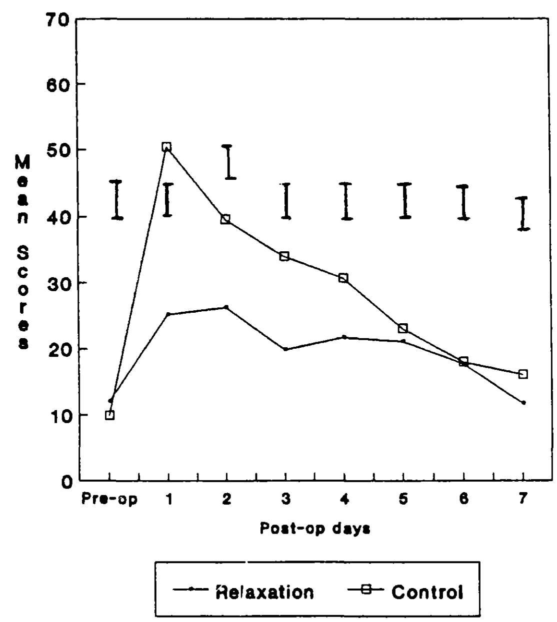


FIG. 5.2(d) Effects of tapes
Bars show SEDs from relevant ANOVAS
for comparison between groups

5.12.3 Intra-operative cardiovascular changes

There were no significant differences between the groups in blood pressure and heart rate during peak surgery (*p*s > 0.10): systolic blood pressure (means= relaxation, 128.2; control, 128.9), diastolic blood pressure (means= relaxation, 79.43; control, 78.63) and heart rate (means= relaxation, 88.9; control, 88.4).

5.12.4 Post-operative outcome

To evaluate the effect of tapes, a 2 (Groups x 7days) way analysis of variance (ANOVA) with repeated measures was conducted on post-operative state anxiety, somatic state (RI), pain intensity and pain distress.

5.12.4.1 State Anxiety

State anxiety scores fell post-operatively (Day; Table 5.3; Fig. 5.2(a), but the interaction of Group x day did not reach significance ($p > 0.10$). There was also no significant main effect of group.

5.12.4.2 Recovery Inventory

Mean Recovery Inventory scores improved from the first post-operative day onwards (Day; Table 5.3; Fig. 5.2(b)). This was confirmed by the main effect of day (Table 5.3). The greater improvement in scores in the relaxation group was confirmed by the interaction of Group x day but there were no differences between groups.

Table 5.3

F-ratios from analyses of variance of Recovery Inventory, state anxiety, pain intensity and pain distress. Degrees of freedom 7, 78; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

	Anxiety	Rec Inventory	Pain Intensity	Distress
Day	88.45***	129.45***	59.95***	24.14***
Group x Day	0.91	4.10***	3.39***	5.85***
Group	2.43	3.02	18.73***	7.28**

5.12.4.3 Pain intensity

A significant main effect of group (Table 5.3) emerged with the relaxation group showing lower mean pain intensity ratings (Fig. 5.2(c)) compared to those of the control group. Significant effects of day were also found (Day; F (7,546) = 59.95, $p < 0.001$). This effect is shown vividly in Fig. 5.2(c) which illustrates the pattern of lower levels of pain intensity over the post-operative week. These were confirmed by the interaction of Group x Day, Table 5.3). Subsequent post-hoc t-test indicated that relaxed patients demonstrated significantly decreased pain intensity ratings at each of the first six post-operative days (ts = day1, 3.79; day2, 4.59; day3, 4.42; day4, 3.41, ps < 0.01: ts = day5, 2.20; day6, 2.18, ps < 0.05) relative to those of the control counterparts.

5.12.4.4 Pain distress

There was a significant main effect of group with the relaxed group showing lower mean pain distress ratings (Fig. 5.2(d) than the controls. Significant effects of day were also found (Day; F (7,546) = 24.14, $p < 0.001$) This effect is illustrated clearly in Fig. 5.2(d) which shows lower levels of pain distress during the post-operative period. These were confirmed by Group x day interaction (Table 5.3). Post-hoc t-tests indicated that relaxed patients showed significantly decreased pain distress ratings on the first three (ts = day1, 5.42; day2, 2.86; day3, 3.03; ps < 0.01) post-operative days.

5.12.4.5 Effects of tape on coping

Suppression, rational cognition, active coping, emotion focusing and avoidance were not influenced by information or relaxation training. Of the Kaloupek scales, patients who had relaxation training worried more ($F(1,75) = 9.43$, $p < 0.003$), used behavioural action more ($F(1,75) = 6.06$, $p < 0.01$) and denial less ($F(1,75) = 4.19$, $p < 0.05$) than the control group. Of the Billings and Moos scales, relaxed patients used more active behaviour ($F(1,75) = 5.21$, $p < 0.01$) and problem focusing ($F(1,75) = 3.73$, $p < 0.05$) than the control group.

Patients were discharged from hospital sooner ($F(1,78) = 6.84$, $p < 0.01$) when they had listened to relaxation training tape (11.3 vs 13.8 days).

5.12.5 Correlations

5.12.5.1 Outcome measures pre- and post-operatively

Correlational analysis indicates that state anxiety, somatic state, pain intensity and pain distress tended to intercorrelate modestly throughout the pre- and post-operative period. Table 5.4 shows the relationships on every occasion.

5.12.5.2 Outcome measures with personality measures

Type A personality and Trait anxiety failed to show associations with any of the outcome measures except with state anxiety. Higher levels of state anxiety were correlated with Type A on the fourth post-operative day (r = 0.23, $p < 0.05$) and with Trait anxiety pre-operatively (r = 0.31, $p < 0.01$).

Belief in the importance of powerful others locus of control was related to poorer somatic state on the first (r = -.33, $p < 0.01$) and second (r = -.27, $p < 0.05$) days after surgery and to more pain intensity on the second (r = 0.33, $p < 0.01$) and fourth (r = 0.25, $p < 0.05$) post-operative days. Associations with less pain distress appeared in the later part of the week on the sixth (r = -.27, $p < 0.05$) and with lower levels of state anxiety on the seventh (r = -.26, $p < 0.05$) post-operative days.

Relationships with internal locus of control were mainly limited to poorer somatic state (RI). Correlations

Table 5.4

INTERCORRELATIONS (p <0.05) OF OUTCOME MEASURES PRE-AND POST-OPERATIVELY: * = p <0.01

PRE-OP	Recovery	Intensity	Distress	Anxiety
Pain intensity	-.43*			
Pain distress	-.42*	.90*		
State anxiety	-.45*	.25	.28*	-
POST-OP DAY 1				
Pain intensity	-.43*			
Pain distress	-.48*	.85*		
State anxiety	-.51*	.59*	.68*	-
POST-OP DAY 2				
Pain intensity	-.45*			
Pain distress	-.50*	.82*		
State anxiety	-.52	.38*	.55*	-
POST-OP DAY 3				
Pain intensity	-.65*			
Pain distress	-.23	.53*		
State anxiety	-.61*	.41*	.68*	-
POST-OP DAY 4				
Pain intensity	-.51*			
Pain distress	-.46*	.81*		
State anxiety	-.60*	.35*	.43*	-
POST-OP DAY 5				
Pain intensity	-.41*			
Pain distress	-.51*	.72*		
State anxiety	-.63*	.26	.56	-
POST-OP DAY 6				
Pain intensity	-.30*			
Pain distress	-.46*	.72*		
State anxiety	-.70*	.31*	.51*	-
POST-OP DAY 7				
Pain intensity	-.45*			
Pain distress	-.40*	.88*		
State anxiety	-.74*	.49*	.54	-

appeared after surgery on day 1 ($r = 0.38$, $p < 0.01$), day 2 ($r = 0.42$, $p < 0.01$), day 3 ($r = 0.28$, $p < 0.05$), day 4 ($r = 0.34$, $p < 0.01$) and day 5 ($r = 0.45$, $p < 0.01$). The only other relationship emerged midweek on the fourth post-operative day with less pain intensity ($r = -.26$, $p < 0.05$).

Correlations with chance locus of control were confined to the earlier part of the week. Associations appeared with poorer somatic state (RI) pre-operatively ($r = -.25$, $p < 0.05$), with less pain intensity on the second post-operative day ($r = -.24$, $p < 0.05$) and with less pain distress on the first day after surgery ($r = -.22$, $p < 0.05$).

5.12.5.3 Coping measures with personality measures

The Multidimensional Health locus of control did not show any associations with the coping measures. Type A had marginal correlations with more suppression ($r = 0.22$, $p < 0.05$), and less rational cognition ($r = -.24$, $p < 0.05$) of the Kaloupek et al., (1984) coping scales. Trait anxiety was related to less suppression ($r - 0.22$, $p < 0.05$). Its modest correlations were however, with increased avoidance ($r = 0.40$, $p < 0.01$) and more emotion focusing ($r = 0.37$, $p < 0.01$) of the Billings and Moos (1981) scales.

5.12.5.4 Coping measures with pre- and post-operative state

Relationships between coping measures and pre- and post-operative state were minimum and marginal. Active coping from the Billings and Moos scales was correlated with less pain intensity on the second (r = -.24, p < 0.05) and third (r = -.25, p < 0.05) days following surgery. Similarly, active coping was related to less pain distress post-operatively on the second (r = -.29, p < 0.01) and third (r = -.23, p < 0.05) days.

Denial was correlated with lower levels of state anxiety pre-operatively (r = -.24, p < 0.05), on the third (r = -.27, p < 0.05) and fifth (r = -.28, p < 0.01) post-operative days. Suppression was however, related marginally to higher levels of state anxiety pre-operatively (r = 0.22, p < 0.05) but to lower levels on the first post-operative day (r = -.23, p < 0.05). Suppression was also associated with poorer somatic state on the third day after surgery (r = -.22, p < 0.05). The only correlation to emerge with rational cognition was on the sixth post-operative day with less pain distress (r = -.22, p < 0.05).

5.12.5.5 Personality measures with blood pressure and heart rate during peak surgery

Type A personality was associated with lower systolic blood pressure ($r = -.29$, $p < 0.01$) while internal locus of control was related to decreased heart rate ($r = -.26$, $p < 0.05$) during peak surgery.

5.13 Discussion

The main conclusion to be drawn from results of the present study is that patients who received relaxation training had better recovery after major surgery. They reported better somatic state (RI), lower levels of pain intensity, pain distress and had a shorter post-operative hospital stay.

Although the variables studied did not reveal between group differences on every occasion, the changes were in the predicted direction. Importantly, not all of the significant differences were self report measures (e.g. number of post-operative days to discharge and systolic blood pressure and heart rate immediately after first listening to the tapes). Such findings dispute the suggestion that psychological interventions produce subjective changes only and have little or no effect on post-operative status (e.g. Ridgeway and Mathews, 1982).

Whilst beneficial effects were noted for the relaxation group, patients with a stronger belief in the importance of powerful others reported poorer somatic state (RI) and more pain intensity earlier in the post-operative week. They however, reported less pain distress and lower levels of state anxiety later during the same week.

Patients who used active coping reported less pain intensity and less pain distress during the early period of the post-operative week, while patients who resorted to rational cognition reported less pain distress later in the post-operative week. The ones who used denial reported lower levels of state anxiety before surgery and during the middle of the post-operative week. On the other hand, suppression was associated with poorer somatic state mid-week.

Patients who are of a more Type A personality employed more suppression and less rational cognition as a way of coping. They also had lower systolic blood pressure during peak surgery while those with an internal locus of control had reduced heart rate during peak surgery. Type A patients used suppression more, while trait anxiety patients used suppression less and emotion focusing more as a way of coping.

Presumably, active coping and rational cognition helped patients to cope with their pain intensity and pain distress during recovery from surgery, while denial provided them with a typical way of managing state anxiety.

This study clearly showed that teaching relaxation training to surgical patients improves their rate of recovery. The question however, arises as to what mechanism underlies the between group differences observed in indices of recovery and in particular number of days to discharge and reduced systolic blood pressure and heart rate immediately after relaxation training.

An important, if more distant objective, is the investigation of mechanisms that could underlie any link between psychological variables and physical recovery. Assuming that effects may extend beyond demand effects on self-report measures, a number of possibilities exist. It has been proposed that psychological preparation is effective because it (1) causes patients to rehearse mentally how they will cope with pain and discomfort after surgery (Meichenbaum et al., 1975), (2) provides a desensitizing experience that extinguishes conditioned fear responses (Shipley et al., 1978; Baum et al., 1987) and (3) helps the patient to be in a predictable environment (Johnson, 1975). Additionally, any instructions given may lead patients to behave differently in ways that serve to accelerate or impede physical recovery. These mechanisms could all be relevant to the results of this study and may clearly operate to a greater or lesser extent in different types of patients or surgical procedures. Considerable scepticism about any such associations is however, warranted, and results would have to be replicated before we can begin to accept that such a brief training might have such considerable effects.

Mathews and Ridgeway (1981) also suggested three ways in which psychological factors could influence indices of recovery from surgery. The relaxation exercises taught could be (1) influencing self report measures through suggestion (e.g. self control over tension) or demand effects; (2) they could produce changes in behaviours that promote recovery (e.g. deep breathing) or (3) might act specifically on the patient's physiological or immunological system. For the latter, state anxiety and other negative emotions may directly affect physical functions implicated in post-operative recovery such as autonomic arousal. With the second option, patients' anxiety levels may be influencing behavioural variables e.g. whether or not the patient avoids breathing exercises, which could in turn slow down recovery rate. As stated earlier the first alternative cannot be cited as a sufficient explanation in itself because measures other than self report ones appeared to be beneficially affected by the relaxation training. The possibility that this mechanism underlies between group differences in self report of pain intensity, pain distress levels and other measures of subjective state cannot be ruled out.

It is still impossible to definitively conclude which of the three postulated mechanisms underlies the between group differences in speed of recovery. It may well be the case that each has a role to play and will be reflected in different dependent measures. Thus for instance, the relaxation exercises taught may encourage patients to actively promote their own recovery by engaging in behaviours, such as deep breathing and muscle exercises to legs (which may prevent deep vein thrombosis), that facilitate it, and this will be reflected in measures of such behaviour, whilst reduction in state anxiety may facilitate recovery via its effects on autonomic arousal, which will be reflected in other subjective state data.

5.14 Conclusion

Information messages have often been used with diverse surgical groups and have thus been of a general nature, including details which apply to any surgery. As more such information is increasingly given to patients in hospital, such general details may offer little real preparation for the specific procedures or reactions the patient may experience. The main drawback of this study is that the methods (relaxation vs information) have not been also compared with an attention control condition to clarify the role of contact with hospital professionals.

In the next study, evidence will be sought for the effects of pre-operative relaxation training on anxiety and endocrine responses to surgery and the possible mechanisms involved.

CHAPTER SIX

THE EFFECTS OF PRE-OPERATIVE RELAXATION TRAINING ON ENDOCRINE RESPONSES TO SURGERY

6.1 Introduction

The results of studies 1(a) and 1(b) in chapter 4 showed that patients who have high levels of state anxiety pre-operatively, have a poorer post-operative recovery. Findings from study 2 in the following chapter revealed that a group of patients who were taught how to relax, were as a result less anxious, reported less pain and were discharged earlier than the control group who received procedural general information. Other studies have reported similar findings (Egbert et al., 1964; Langer et al., 1975; Ley, 1977; Auerbach and Killman, 1977; Cohen, 1979; Reading, 1979; Wilson, 1981; Ridgeway and Mathews, 1982; Anderson, 1987).

Improvement after surgery has often been measured by reduction in symptom reports or analgesia requests, patient's report of pain and shortening of post-operative hospital stay. Only a few studies have included autonomic, endocrine or immunological parameters, although these measures may provide valuable information regarding the mechanisms mediating psychological effects (Langer et al., 1975; Boore, 1978; Wilson et al., 1981; Salmon et al., 1986, 1988).

For the past few years, psychophysiological or endocrinological responses to surgery have been regarded as more valid indicators of a stress response (Wilmore et al., 1976; Kehlet, 1982). There is however, no general agreement on the effects of increased endocrine response. Some have suggested that endocrine responses are detrimental to the patient following surgery especially if they are prolonged and that their reduction may be beneficial in aiding recovery from surgery (see literature reviewed in chapter 2). The potential contribution of psychological intervention in order to moderate these endocrine responses to surgery could be therefore, of importance.

In a number of studies it has been argued that increased circulating cortisol levels might contribute to post-operative complications and impair the immune function post-operatively (see review in chapter 1, section 1.4.2), while catecholamines (adrenaline and noradrenaline) have been implicated in the syndrome of "post-operative fatigue" (Rose and King, 1978).

Others have consistently demonstrated that ability to cope with stressful experiences is related to higher levels of adrenaline (Frankenhaueser et al., 1980; Johansson and Frankenhaueser, 1973; Ursin, Baade and Levine, 1978; Ellertsen, Johnsen and Ursin, 1978). One study reported that adrenaline levels are associated with active coping styles (Obrist, 1975). Another study of patients who had surgery for rectal cancer found that increased catecholamine levels post-operatively were associated with the development of less post-operative complications (Genzdilov et al., 1977). Wilson's (1981) study of patients undergoing elective cholecystectomy and abdominal hysterectomy also demonstrated that patients with increased urinary adrenaline levels post-operatively had reduced pain and analgesia. Recently, Salmon et al., (1986) reported that post-operative cortisol excretion was greater, while pre-operative anxiety was lower in ear surgery patients who had received reassurance from nursing staff pre-operatively than uncounselled patients.

Although we now understand the endocrine responses to stress and injury, the important question as to whether the acute response is functional or pathological still remains to be answered. A major issue is therefore, whether therapeutic efforts should be made to inhibit these aspects of the response. We have already seen in chapter 1 (section 1.1.4.2) that anaesthetic techniques can be used to moderate such responses during surgery. It would therefore, be important to know whether a psychological technique, which is non-invasive, could have an effect on endocrine responses to surgery.

The aim of this study was to examine the effect of relaxation training on both subjective and endocrine responses to surgery. Specifically, patients' reports of pain intensity, pain distress, state anxiety, somatic state (RI), length of post-operative hospital stay and of analgesia requirements were chosen to represent indication of recovery from surgery. In addition, cognitive coping style and personality measures were selected as mediators possibly affected by relaxation training. Heart rate and blood pressure were measured since they are reported to be sensitive to psychological preparation for surgery (Schmidt and Woolridge, 1973; Shipley et al., 1978). Adrenaline, noradrenaline and cortisol levels were selected as endocrinological indicators of recovery.

The control group were given similar general background information about the day to day running of the ward and procedural information as the control group in chapter 5. Two studies, one of patients undergoing minor and the other major abdominal\perineal surgery were carried out. Both minor and major surgery were studied in order to provide a more adequate test of the effectiveness of relaxation training as a stress reduction technique for surgical patients.

Because only a small fraction (usually less than 5%) of secreted catecholamines are excreted in urine, urinary assays are not as appropriate for measuring absolute levels as are blood measures (Dienstbier, 1989). All the studies in this thesis therefore, measured adrenaline, noradrenaline and cortisol levels in blood before, during and after surgery.

6.2 Method

6.3 Experiment 3(a) (Minor Surgery)

6.3.1 Subjects

54 patients were randomly allocated into two groups (Relaxation and Control) The groups were matched for sex, age and type of operations (Table 6.1) after they were admitted for elective minor abdominal or abdominal-perineal surgery. They all had to be free from taking steroids in the previous six months. Four were excluded because of difficulties in comprehension, six were judged by the nurses to be too distressed and four declined to take part. The remaining forty patients (Relaxation group n= 21, Control group n= 19) were aged between 20-74 years, mean age 45 years and there were 22 male and 18 female.

Their main underlying illnesses were Crohn's disease and ulcerative colitis. Additional disorders were constipation, haemorrhoids, bleeding per rectum, rectal prolapse and feacal incontinence. The general types of operations carried out were laying open of fistulae/sinuses, closure of colostomies, haemorrhoidectomies, sphincter repairs and drainage of abcesses. Details of illnesses and operations are given fully in appendices (6.3) and (6.4). Table 6.1 displays the group mean baseline data of medical, surgical and personality measures.

Surgery was carried out mainly in the afternoon (usually until 17.30 hours). The drugs administered for premedication, anaesthesia, antibiotics, antiemetics and analgesia are similar to those already mentioned in study 1(a) chapter 4. Details of aneasthesia are presented fully in appendices 6.5 and 6.6.

6.3.2 Procedure

Patients were approached between 15.00hrs and 16.00hrs on the afternoon of the day of admission which was either one day before surgery for the Tuesday and Friday operations or three days before for the Monday operations. They were asked if they would like to participate in a study which assessed "How patients can be helped during their recovery from surgery by listening to a tape which many patients had found useful in the past". Patients gave their informed and written consent on this occasion.

At this first meeting with the investigator patients completed personality questionnaires, followed by the first of three identical sets of questionnaires. The remaining sets were left with the patients for completion on the first two post-operative days. Each patient had to complete the questionnaires as close as possible to midday. Patients were seen once before the operation and at noon on the first and second post-operative days to monitor compliance and give assistance with completing the questionnaires. The tape recorder and tape were removed on the final visit.

6.3.3 Measures

The pre-operative measures included three personality questionnaires: the Multidimensional Health locus of control (Wallston et al., 1978), the trait version of the State-Trait Anxiety Inventory (Spielberger et al., 1970) and a brief index of Type A personality (Bortner, 1969). Also given on this occasion as well as on subsequent occasions, were the State-anxiety version of the STAI, the Recovery Inventory (Wolfer and Davis, 1970) which provided a broad index of subjective somatic state, and two 10-cm line visual analogue scales (Pain-intensity, Pain-distress). An additional state anxiety inventory was completed pre-operatively after the patients first listened to the tape.

Included on the final occasion was a coping scale based on that devised by Billings and Moos (1981). Details of all the above mentioned questionnaires are given in chapter three. Also included on the second post-operative day were questions about the patients' evaluation of the tape; these have already been described in chapter 5, study 2.

6.3.3.1 Tape Recordings

The relaxation and control tapes are similar to those used in chapter 5, study 2 (copies of the tapes are in appendices 5.3 and 5.8).

6.3.3.2 Monitoring of Tape recorder

The procedure for administering and monitoring the tapes is also identical to study 2.

6.3.3.3 Biochemical measures

The procedure for obtaining blood samples is described in chapter 3 (section 3.8.1).

6.3.3.4 Blood pressure and Heart rate

Blood pressure and heart rate have already been described in chapter 3 (section 3.9).

6.3.4 Statistical Analyses

Statistical analysis were computed using the Genstat 5 programme (Rothamstead Experimental Station 1987). Interrelationships between measures were assessed by Pearson product-moment correlation coefficients such as associations between personality questionnaires and coping subscales, between these and pre- and post-operative state and of personality, coping and pre-operative state with endocrine levels at each occasion of measurement.

Patient groups were compared on their evaluations of the tapes by one-way analyses of variance. Blood pressure and heart rate during peak surgery and total number of analgesic administrations were analyzed by separate one way of analyses of variance. Two-way analysis was employed when comparing state anxiety, blood pressure and pulse before and after first listening to the tapes. Subsequent differences were also examined by two-way analyses of variance: the repeated measures term "time" distinguished measurements made on the first two post-operative days in minor surgery and on the first seven post-operative days in major surgery (for questionnaires) and on each occasion from the evening of the pre-operative day onwards (for blood pressure and heart rate). Nurses' heart rate and blood pressure measurements were analyzed by repeated measures analysis of variance.

The endocrine measures were subject to log transformation (transform = log10 (x+1)) in order to normalize their distribution. Groups were compared on measures made on the pre-operative day. Subsequent differences in endocrine measures were examined by two way analyses of variance; the "time" factor distinguished measurements made at induction and recovery in minor surgery and at induction, perop, recovery, day 1, day 2 and day 3 in major surgery. Where appropriate, significant interaction terms were analyzed by post-hoc t-tests using error terms estimated from relevant analysis of variance. Tests of significance were made at the 0.01 and 0.05 levels.

6.4 Results

Groups were similar on the ratio of males/females, mean age, duration of presenting symptoms, number of previous operations and type of surgery (Table 6.1). Detailed characteristics of groups are in appendices 6.3 and 6.4.

6.4.1 Evaluation of the Tapes

Patients who were in the relaxation group listened to the tape more often than those in the control group (means: 75 vs 25 minutes; F (1,38) = 4.46, $p < 0.05$), rated it as more 'helpful' (mean ratings: 3.5 vs 3.0; $F(1,38)$ = 11.26, $p < 0.01$), were more likely to 'recommend it to a friend' (2.8 vs 2.4; $F(1,38)$ = 9.63, $p <$ 01) and were prepared to 'use it in future' (2.62 vs 1.95; $F(1,38)$ = 6.13, $p < 0.05$).

6.4.2 Immediate effects of the Tapes

Blood pressure and heart rate were reduced after first listening to the tapes (Figs. 6.1(a), 6.1(b) and 6.1(c)). The main effect of Time confirmed this in each case (Table 6.2). The profound reductions of the systolic blood pressure and heart rate of patients in the relaxation group were confirmed by the interaction of Group x time (Table 6.2). Systolic blood pressure did not differ between the groups at the first assessment; after

Table 6.1

Group Mean Baseline Data of Medical, Surgical and Personality Measures. Differences are non-significant ($p > 0.10$)

	Relaxation	Control
Sex : Male	11	11
Female	10	8
Mean age (yr)	42	47
Duration of presenting symptoms (months)	10.0	10.4
Number of previous operations	5.4	5.6
Time of starting surgery (hr)	12.50	14.00
Duration of operation (min)	35	36
Personality Measures		
Type A	57.7	59.7
Trait anxiety	39.3	43.5
Internal locus of control	24.29	23.63
Chance locus of control	19.19	22.79
Powerful others locus of control	20.2	23.0

Group Mean Systolic Blood Pressure
Before and Immediately After Tapes

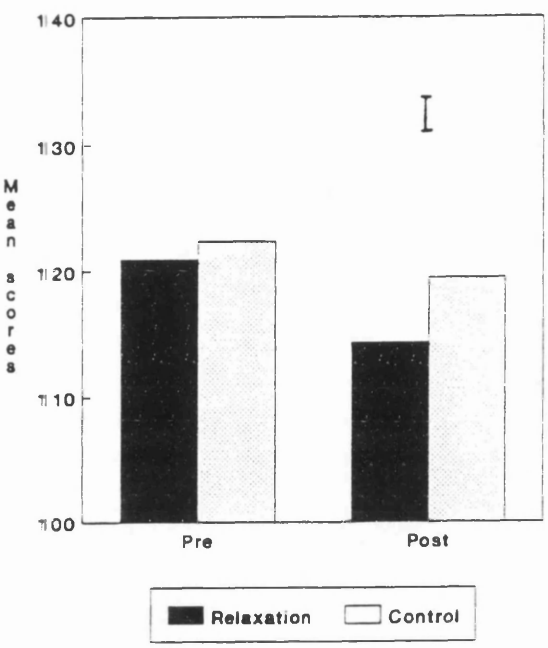


FIG. 6.1(a) Effects of tape

Group Mean Diastolic Blood Pressure
Before and Immediately After Tapes

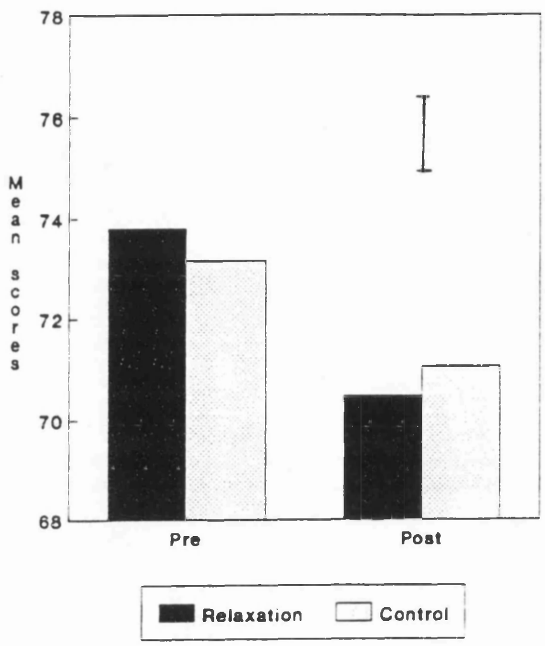


FIG. 6.1(b) Effects of tape

Group Mean Heart Rate Before and
Immediately After the Tapes

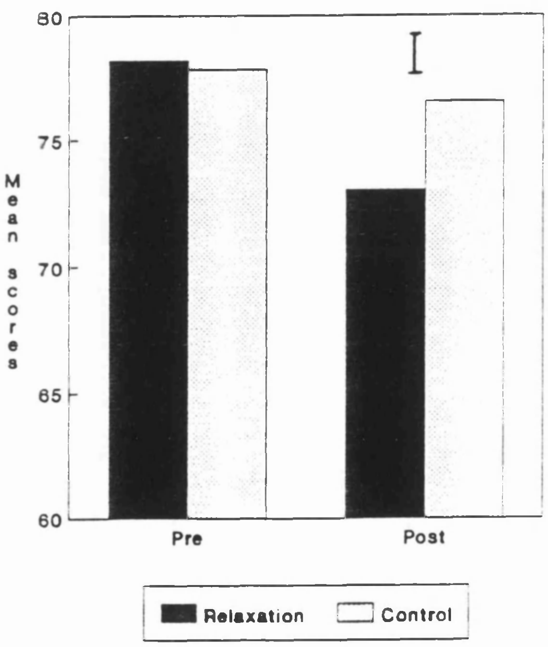


FIG. 6.1(c) Effects of tape

Group Mean State Anxiety Scores
Before and Immediately After the tapes

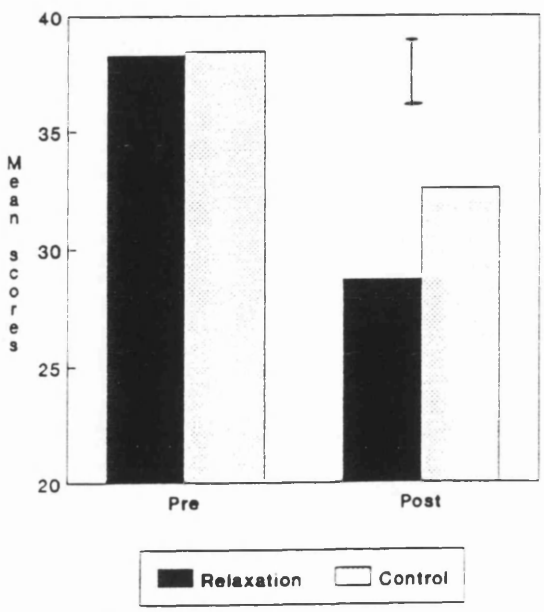


FIG. 6.1(d) Effects of tape
Bars show SEDs from relevant ANOVAs
for comparison between groups

listening to the tapes the differences bordered on significance (t = 1.96, $p < 0.05$ at t = 2.02). Patients in the relaxation group had greater heart rate before (means: Relaxation = 83.3 vs Control = 79.2; t = 2.70, $p < 0.05$); but the heart rate was lower in the relaxation group (means: Relaxation = 73.1 vs Control = 76.5; t = 2.25, $p < 0.05$) after listening to the tapes.

State anxiety was similarly lower after first listening to the tapes than before (Fig. 6.1(d), Table 6.2). The reduction was greatest in the relaxation group and this was confirmed by the interaction of Group x time, but the comparison of group means after listening to the tapes did not reach significance.

6.4.3 Subsequent Cardiovascular changes

Patients in the relaxation group had systolic blood pressure which was continuously and significantly lower from the pre-operative evening to the post-operative morning ($F(1,38) = 9.18$, $p < 0.01$); (Fig. 6.2). There were no significant differences in diastolic blood pressure (Fig. 6.3) and heart rate (Fig. 6.4) between the groups ($ps > 0.10$). However, the relaxed group showed significant reductions of maximum intra-operative systolic ($F(1,38) = 12.27$, $p < 0.001$) and diastolic blood pressure ($F(1,38) = 4.99$, $p < 0.05$). Maximum intra-operative heart rate also had reduced scores (means: Relaxation = 72.2 vs Control = 76) but there was no significant difference between the groups ($p > 10$).

Table 6.2

F-ratios from analyses of variance of state-anxiety, heart rate and blood pressure before and after first listening to the tapes. In no case did the main effect of Group approach significance. Degrees of freedom are 1, 38 *: p < 0.05; ** p < 0.001.

			Blood pressure	
	State-anxiety	Heart rate	Systolic	Diastolic
Time	98.91**	208.29**	127.89**	49.45**
Group x Time	5.45*	68.81**	19.09**	2.46

Table 6.3

Relevant F-ratios from analyses of variance of endocrine levels at induction and immediately post-operatively. Degrees of freedom are 1,38 for Adrenaline and Noradrenaline, and 1,37 for Cortisol. *: p < 0.05; ** p < 0.025.

	Adrenaline	Noradrenaline	Cortisol
Surgery			
Time	0.45	2.25	1.88
Group x Time	5.46**	0.06	5.13*

Table 6.4

F-ratios from analyses of variance of Recovery Inventory (somatic state), Pain intensity, Pain distress, and State-anxiety. Degrees of freedom 1, 38; *: p < 0.05; ** p < 0.01; *** p < 0.001.

			Pain	
	Anxiety	Rec. Inventory	Intensity	Distress
Day	6.03**	14.19***	12.32***	4.52*
Day x Tape	6.88**	0.01	0.01	0.19

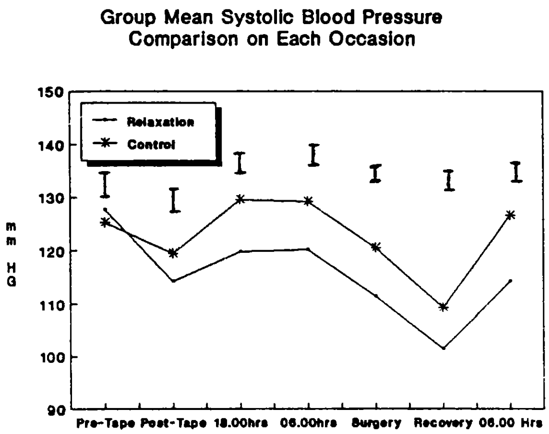


Fig. 6.2 Effects of tapes

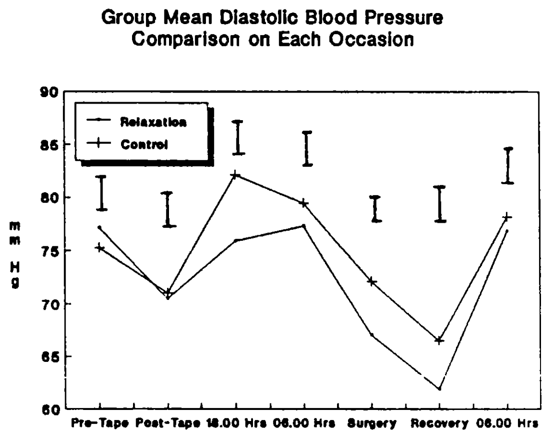


Fig. 6.3 Effects of tapes

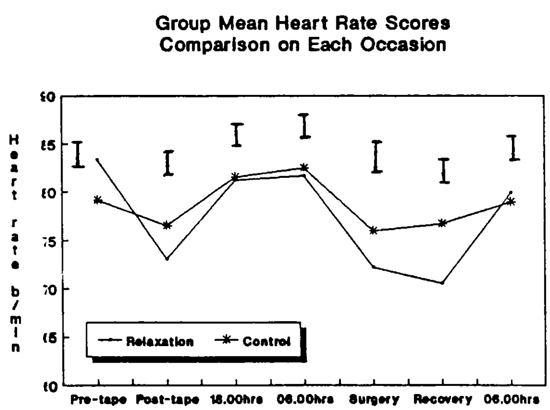


Fig. 6.4 Effects of tapes
Bars show SEDs from relevant ANOVAs
for comparisons between groups

6.4.4 Endocrine Responses

There were no significant differences between the groups in endocrine levels (Figs. 6.5, 6.6, & 6.7) for adrenaline and noradrenaline and for cortisol ($ps > 0.10$) pre-operatively. Differences emerged subsequently for the adrenaline and cortisol; the greater increase in the relaxation group was confirmed by the interaction of Group x time (Table 6.3). There were however, no overall group differences in noradrenaline levels ($ps > 0.10$). Adrenaline ($t = 2.10$, $p < 0.05$) and cortisol ($t = 2.55$, $p < 0.05$) in the relaxation group increased from induction to recovery while levels in the control group fell nonsignificantly between these periods (Figs. 6.5 and 6.7). In the recovery sample only cortisol was significantly elevated in the relaxation group by comparison with controls (t 2.20, $p < 0.05$). For noradrenaline there were no changes from induction to recovery (Fig. 6.6).

6.4.5 Post-operative Questionnaires and Analgesic intake

State anxiety scores fell after surgery. The interaction with group also reached significance (Table 6.4). Figure 6.8 shows that patients who received relaxation were less anxious than the controls on the first post operative day ($t = 2.33$, $p < 0.05$). However, the differences had disappeared by the second post-operative day. The Recovery Inventory (Fig. 6.9) showed no significant differences between groups ($ps > 0.10$; Table 6.4). Scores

ADRENALINE LEVELS PRE-OPERATIVELY,
AT INDUCTION AND RECOVERY

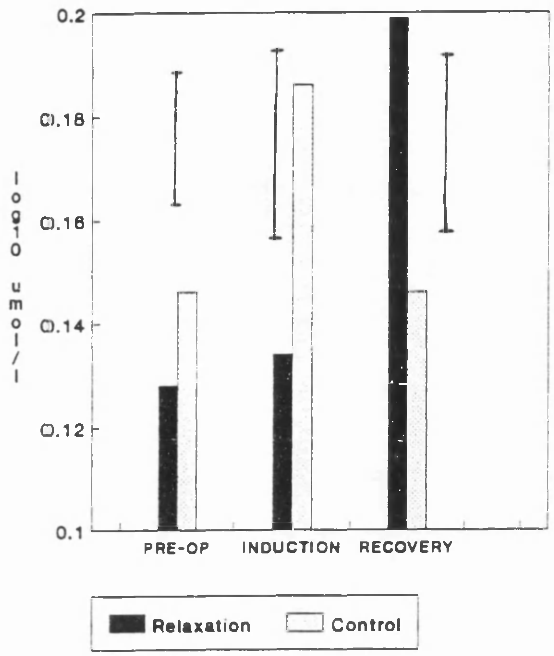


FIG. 6.5 Effects of tape

NORADRENALINE LEVELS PRE-OPERATIVELY,
AT INDUCTION AND RECOVERY

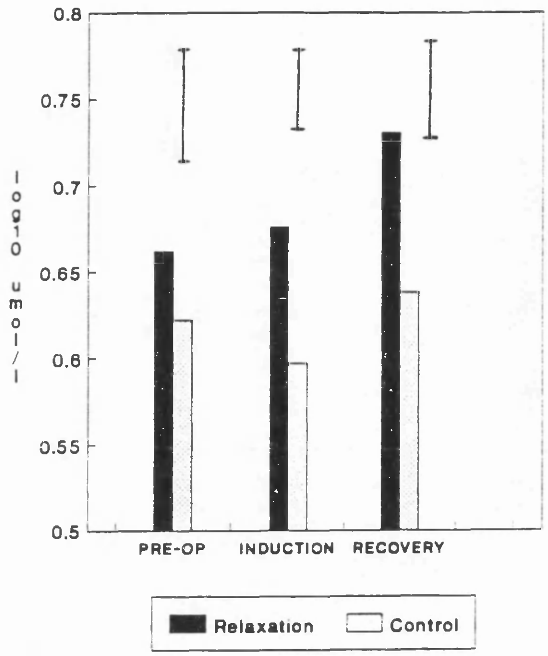


FIG. 6.6 Effects of tape

CORTISOL LEVELS PRE-OPERATIVELY,
AT INDUCTION AND RECOVERY

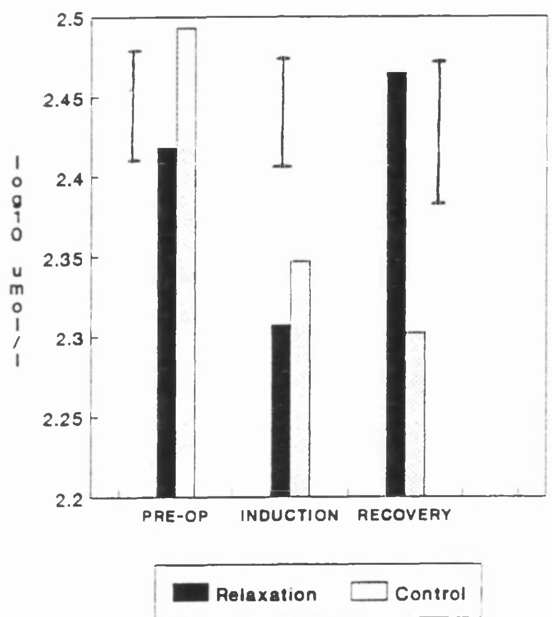


FIG. 6.7 Bars show SEDs for comparison between groups at baseline & for combined analysis @ induction & recovery

showed an improvement (means = 27.1 to 30.5) from the first to the second post-operative days. Pain intensity (Fig. 6.10) and pain distress (Fig. 6.11) show a similar time course in both groups. There were no differences between the groups ($ps < 0.10$) but there was a profound reduction in pain intensity and pain distress from the first to the second post-operative days. Pain intensity fell from 42.5 to 29.2, and pain distress from 30.7 to 21.9 (Table 6.4).

There were no significant differences between the groups in length of post-operative hospital stay ($p > 0.10$; means: Relaxed = 5.1 vs Control 4.7). No effects could be detected on any coping scale. Post-operative analgesia intake was much less in the relaxation group than in controls (1.1 vs 2.8 $F(1,38) = 5.04$, $p < 0.05$).

6.4.6 Correlations

6.4.6.1 Endocrine Levels with Personality Measures

The Multidimensional Health locus of control scale was not related to any plasma hormone levels ($ps > 0.10$). Trait anxiety showed negative correlations with adrenaline levels at recovery ($r = -0.33$, $p < 0.05$). Similarly, trait anxiety was negatively correlated with cortisol levels in recovery ($r = -0.36$, $p < 0.05$). The only association to emerge with Type A was adrenaline at induction ($r = 0.49$, $p < 0.01$).

STATE ANXIETY MEAN SCORES
PRE-OPERATIVELY AND ON SUCCESSIVE DAYS

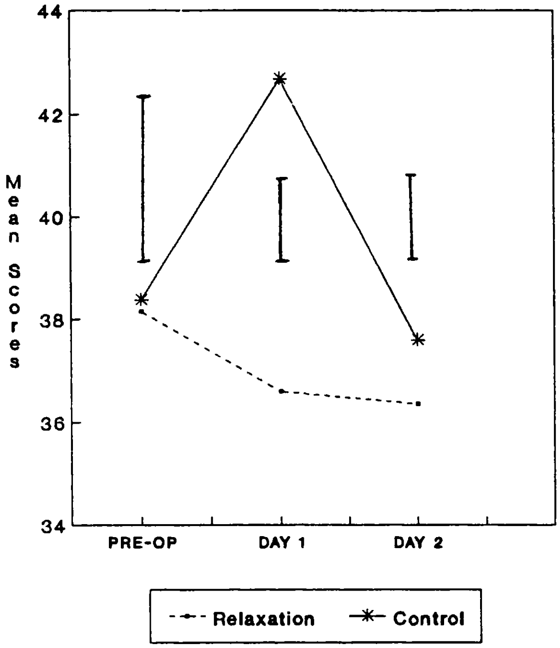


FIG. 6.8 Effects of tapes

RECOVERY INVENTORY MEAN SCORES
PRE-OPERATIVELY AND ON SUCCESSIVE DAYS

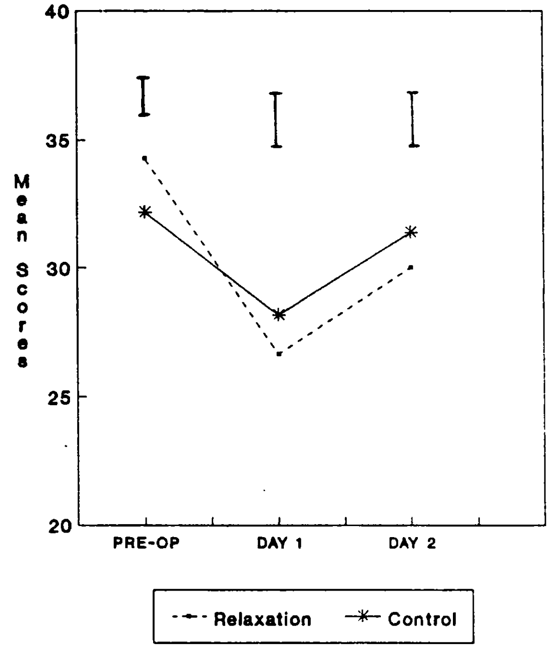


FIG. 6.9 Effects of tapes

PAIN INTENSITY MEAN SCORES
PRE-OPERATIVELY AND ON SUCCESSIVE DAYS

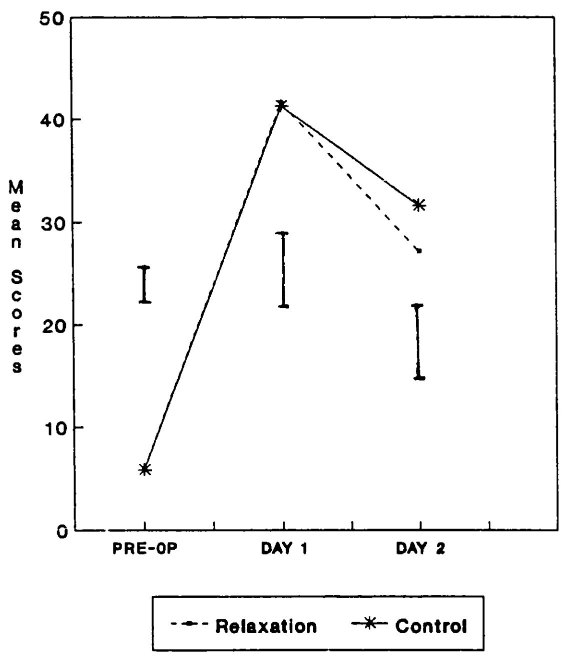


FIG. 6.10 Effects of tapes

PAIN DISTRESS MEAN SCORES
PRE-OPERATIVELY AND ON SUCCESSIVE DAYS

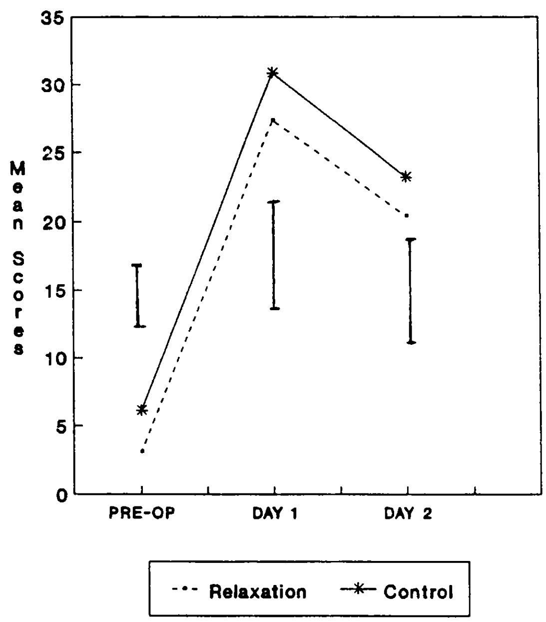


FIG. 6.11 Effects of tapes
Bars show SEDs from relevant ANOVAs
for comparison between groups

6.4.6.2 Endocrine Levels with Pre-operative State

There were no significant associations between the Recovery Inventory and any of the plasma hormones. Cortisol levels at induction and recovery correlated negatively with pre-operative state anxiety (r = -0.52, -0.41, respectively ps < 0.01). Adrenaline was positively related to pain intensity (r = 0.35, p < 0.05) and pain distress (r = 0.48, p < 0.01) pre-operatively. Noradrenaline levels at baseline and induction correlated positively with pre-operative pain intensity (r = 0.32, 0.31, respectively ps < 0.05). Noradrenaline levels at baseline were also associated with pre-operative pain distress (r = 0.31, p < 0.05).

6.4.6.3 Endocrine Levels with Coping Measures

Cortisol levels were correlated with suppression pre-operatively (r = 0.40, p < 0.01), with denial at induction (r = 0.35, p < 0.05) and with worry in recovery (r = -0.39, p < 0.05). Adrenaline and noradrenaline were not related to any coping scales.

6.4.6.4 Coping Measures with Personality Measures

The Multidimensional Health locus of control and Trait anxiety failed to show associations with any of the coping scales. The only relationship to emerge between coping scale and personality was a correlation of suppression with Type A personality (r = 0.32, p < 0.05).

6.4.6.5 Coping Measures with Pre- and Post-operative State

Associations between coping and questionnaire measures pre- and post-operatively were limited to only one coping scale. Suppression was modestly correlated with state anxiety pre-operatively ($r = 0.48$, $p < 0.01$), and pain intensity ($r = 0.38$, $p < 0.05$) and pain distress ($r = 0.54$, $p < 0.01$) on the second post-operative day.

6.5 Experiment 3(b) Major Surgery

6.5.1 Subjects

Fifty-nine patients about to undergo elective major abdominal/perineal surgery were approached and asked to participate in the study. They had to be free from taking steroids in the previous six months. Out of these ten refused to take part, four were on steroids, five dropped out immediately after surgery and two died during surgery. The final sample consisted of 38 subjects (19 male and 19 female). Their ages ranged from 20-75 (mean age 46).

All were judged fit by the anaesthetist to undergo the stress of surgery. Their main underlying illnesses included Crohn's disease, ulcerative colitis, Polyposis coli and cancer of the rectum or colon. The main types of operations carried out were colectomy, hemicolectomy, colostomy, anterior/posterior resection and ileostomy. Details of illnesses and operations are given in appendices (6.7) and (6.8). Table 6.5 shows similarities between the groups.

6.5.2 Procedure

Surgery started between 08.30hr and 15.30hr. Drugs prescribed for premedication, anaesthesia, antibiotics, antiemetics and analgesia are similar to those already mentioned for major surgery in study 1 (b) chapter 4. Details of anaesthesia given are presented fully in appendices (6.9) and (6.10).

6.5.3 Measures

The measures used are the same as the ones mentioned in minor surgery above.

6.5.3.1 Tape recordings

The tape recordings in this study are identical to the ones in minor surgery mentioned above.

6.5.3.2 Biochemical measures

Procedure for obtaining blood samples is described in chapter 3 (section 3.8.2).

Blood pressure, heart rate and additional observations were obtained in the same way as in the minor surgery study mentioned above. The rationale for the statistics carried out has also been presented in the minor study above.

Table 6.5

Group Mean Baseline Data of Medical, Surgical and Personality Measures. Differences are non-significant ($p > 0.05$).

	Relaxation	Control
Sex : Male	10	9
Female	9	10
Mean age (yr)	46	44
Duration of presenting symptoms (months)	4	6
Number of previous major surgery	2	2.16
Time of starting operation (hr)	11.24	10.49
Duration of operation (hr)	2.64	3.43
Personality Measures		
Type A	56.1	55.6
Trait anxiety	49.47	51.32
Internal locus of control	22.79	25.42
Chance locus of control	18.8	21.7
Powerful others locus of control	22.5	19.0

6.6 Results

The Relaxation and Control groups were matched on medical, surgical and personality factors. The data summarized in Table 6.5 shows a high degree of similarity in the relative proportions of the sexes in each group, their mean age, duration of presenting symptoms, number of previous operations, time at which operations began, duration of surgery and personality.

6.6.1 Evaluation of the tapes

The relaxation tape was played longer than the control tape (means: 2.45hr vs 35 minutes; $F(1,36) = 11.50$, $p < 0.002$) and was more likely to be 'used in the future' (means 2.47 vs 1.74; $F(1,36 = 7.60$, $p < 0.01$). There were no significant differences between the groups in finding the tapes 'more helpful' or in wanting to 'recommend to a friend'.

6.6.2 Immediate effects of the tapes

Blood pressure and heart rate decreased (Figs. 6.12(a), 6.12(b), and 6.12(c)) after first listening to the tapes. This was confirmed by the main effect of time in each case (Table 6.6). The greater fall of the diastolic blood pressure and heart rate in the relaxation group were confirmed by the interaction of Group x time. In no case did the effect of group approach significance. Diastolic blood pressure did not show any significant differences before listening to the tapes (means: Relaxation, 78 and

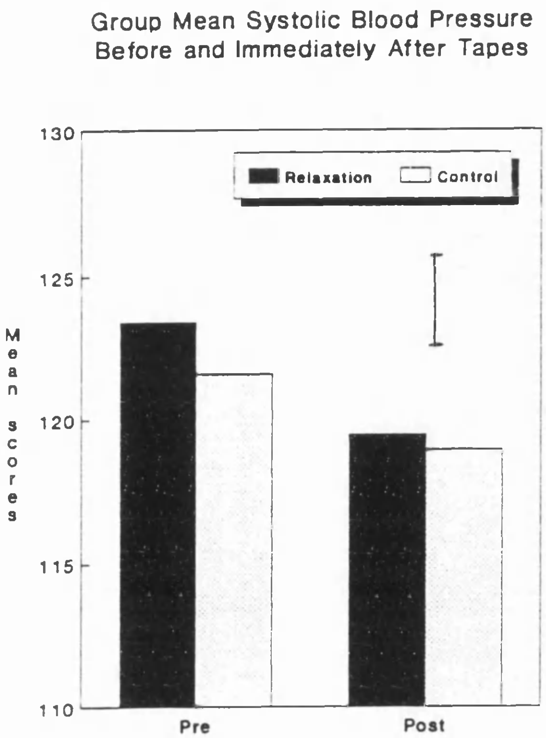


Fig. 6.12(a) Effects of tape

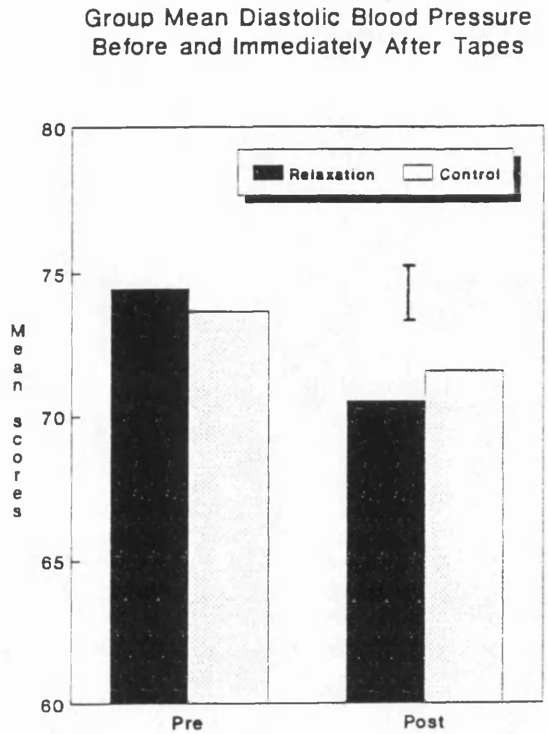


Fig. 6.12(b) Effects of tape

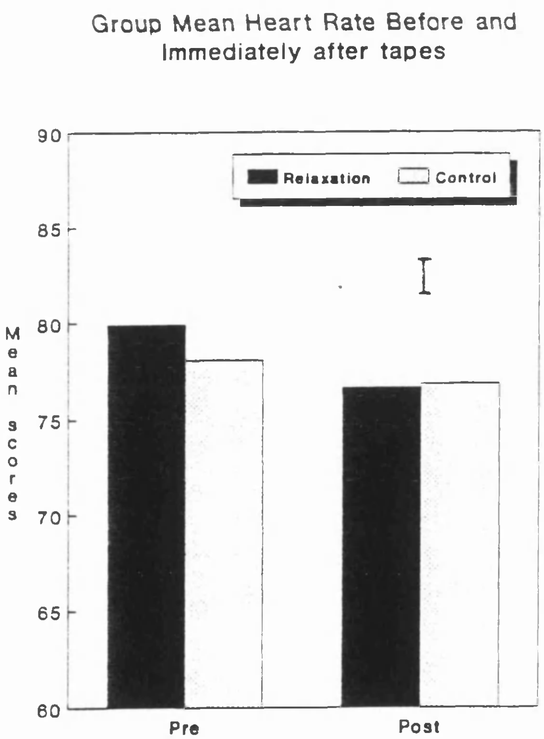


Fig. 6.12(c) Effects of tape

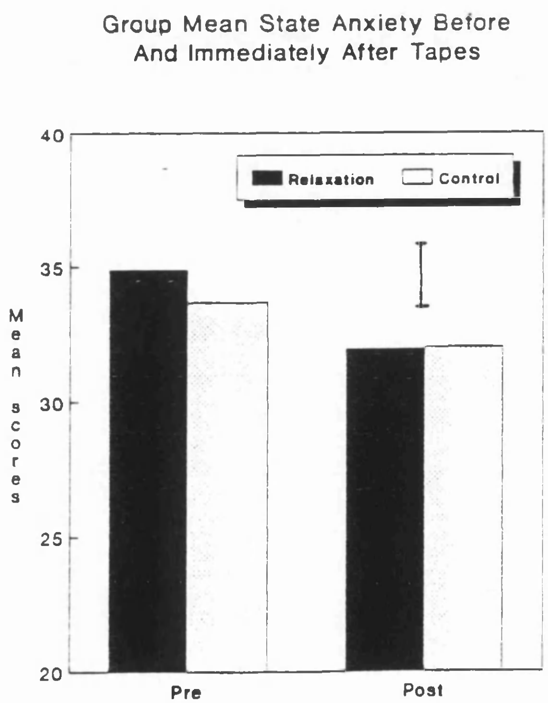


Fig. 6.12(d) Bars show SEDs from relevant ANOVAs for comparison between groups

Table 6.6

F-ratios from analyses of variance of state-anxiety, heart rate and blood pressure before and after first listening to the tapes. The main effect of group did not approach significance. Degrees of freedom are 1, 36; *: p < 0.05; **: p < 0.001.

	State-anxiety	Heart rate	Blood pressure Systolic	Blood pressure Diastolic
Time	14.78**	82.62**	59.84**	51.19**
Group x Time	6.06*	17.39**	2.39	4.74*

Table 6.7

Relevant F-ratios from analyses of variance of endocrine levels at induction, during surgery and post-operatively. The main effect of group did not approach significance. Degrees of freedom are 6,182 for adrenaline and cortisol levels and 6,205 for cortisol levels.
**: p < 0.025; ***: p < 0.001.

	Adrenaline	Noradrenaline	Cortisol
Surgery			
Time	31.77***	4.05***	2.49**
Group x Time	0.92	0.11	0.97

Table 6.8

F-ratios from analyses of variance of Recovery Inventory (body state), Pain intensity, Pain distress and State-anxiety. There are significant group differences with State-anxiety and Recovery Inventory. Degrees of freedom are 7,252; *: p < 0.04; **: p < 0.004; ***: p < 0.001.

	Anxiety	Rec. Inventory	Pain Intensity	Pain Distress
Group	4.53*	8.72**	0.18	1.23
Time	2.93**	52.23***	15.41***	8.78***
Group x Time	1.34	0.98	1.00	0.46

Control, 76), but after listening to the tapes there was a greater drop in the relaxation group (means: 70 vs 71). Similarly there were no differences in heart rate before the tapes (means: Relaxation, 83 and Control, 79), although patients in the relaxation group had a more significant fall (means: 76 vs 76) after listening to the tapes.

For systolic blood pressure, there were also no differences before the tapes. Scores were however, lower (relaxation: 119.47; control: 118.95) after listening to the tapes and this was confirmed by the main effect of time ($\underline{F}(1,36) = 59.84$, $\underline{p} < 0.001$)

State anxiety was reduced after patients had heard the tapes for the first time (Fig. 6.12(d), Table 6.6). The most decrease occurred with the relaxation group ($\underline{t} = 3.31$, $\underline{p} < 0.01$). This decrease was confirmed by the interaction of Group x time.

6.6.3 Subsequent Cardiovascular Changes

Systolic blood pressure and heart rate did not differ significantly between the groups ($\underline{p}$s > 0.10; Figs. 6.13 and 6.15). There was however, a main effect of time with diastolic blood pressure ($\underline{F}(5,180) = 4.06$, $\underline{p} < 0.002$) and heart rate ($\underline{F}(5,180) = 5.37$, $\underline{p} < 0.001$). Figure 6.14 shows that patients in the relaxation group had diastolic blood pressure which was lower on the morning of the

Group Mean Systolic Blood Pressure
Comparison on Each Occasion

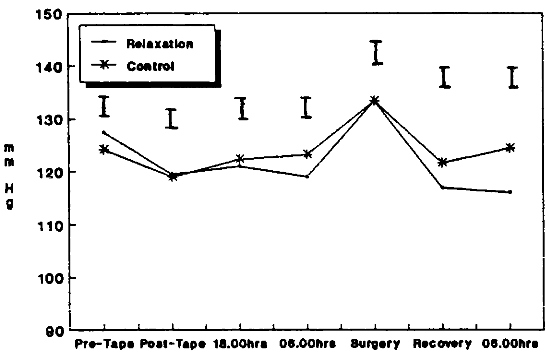


Fig. 6.13 Effects of tapes

Group Mean Diastolic Blood Pressure
Comparison on Each Occasion

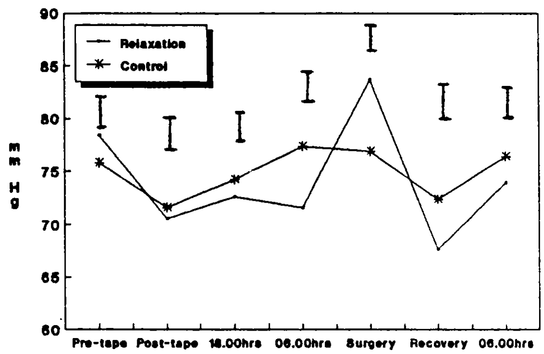


Fig. 6.14 Effects of tapes

Group Mean Heart Rate Scores
Comparison on Each Occasion

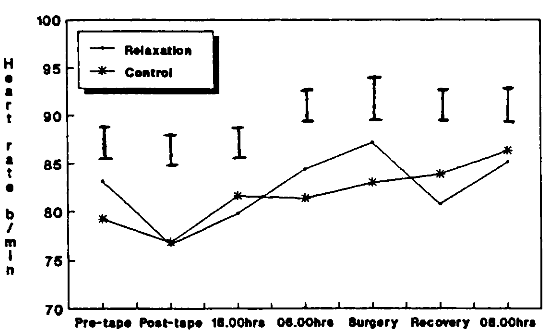


Fig. 6.15 Effects of tapes
Bars show SEDs from relevant ANOVAs
for comparison between groups

operation (06.00hr:$t = 2.81$, $p < 0.01$). There were no significant group differences in heart rate ($p > 10$). Both groups showed fluctuating heart rate throughout. The relaxation group heart rate was slower on the eve of the operation but by 06.00hrs on the day of the operation and during peak surgery the heart rate was much more increased although nonsignificantly. Diastolic blood pressure reached greater maxima during surgery in relaxed patients than in controls ($F(1,36) = 9.30$, $p < 0.004$). Although maximum heart rate during surgery was higher in the relaxed patients than the controls (relaxation: 87.2; controls: 83.0) this difference did not reach significance ($p > 0.10$).

6.6.4 Endocrine Responses

In no case did the main effect of group approach significance in the endocrine levels pre-operatively and post-operatively (figs. 6.16, 6.17, and 6.18); $ps > 0.10$, for adrenaline and noradrenaline and for cortisol). The rise and fall in adrenaline levels of both groups was confirmed by the main effect of time (Table 6.7). Adrenaline levels in relaxation and control groups showed a steep rise from induction to peak surgery ($ts = 2.9$: 3.05, $ps < 0.01$) and subsequently a significant increase from surgery to recovery room ($t = 2.66$, $p < 0.05$: $t = 4.96$, $p < 0.01$) followed by a gradual return almost to pre-operative levels by the first post-operative day ($ts = 4.62$; 6.79, $ps < 0.01$). Noradrenaline and cortisol levels in the relaxation group were higher although there

Group Mean Transformed Adrenaline Levels :Comparison on Each Occasion

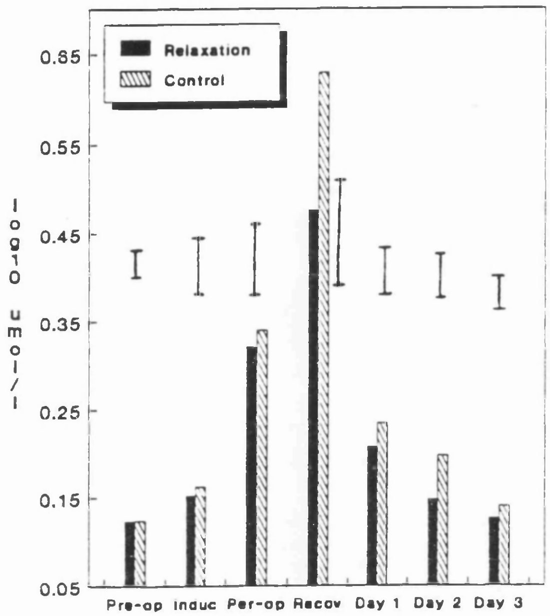


Fig. 6.16 Bars show SED

Group Mean Transformed Noradrenaline Levels: Comparison on Each Occasion

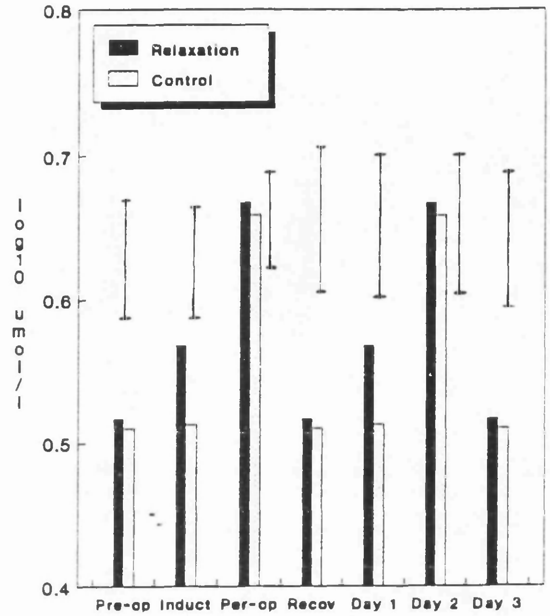


Fig. 6.17 Effects of tape

Group Mean Transformed Cortisol Levels: Comparison on Each Occasion

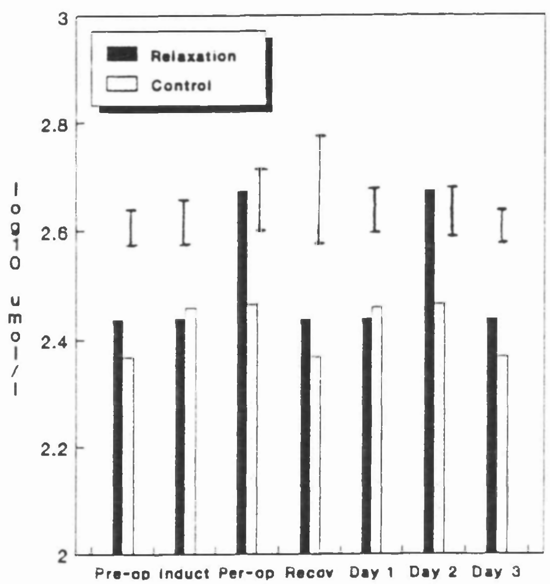


Fig. 6.18 Bars show SEDs for comparison between groups at baseline and for the combined analysis on other occasions

were no significant group differences. In both groups levels increased nonsignificantly during peak surgery and on the second post-operative day (Fig. 6.17 and 6.18). There was however, no significant interaction.

6.6.5 Post-operative Questionnaires and Analgesia Intake

State anxiety scores fell slightly during the post-operative week but the interaction with group did not reach significance (Table 6.8). There was a significant main effect of time. Figure 6.19 shows that patients in the relaxed group were less anxious than the controls on the first, second and fourth (ts = 2.88; 3.51; 2.64, ps < 0.01) post-operative days respectively.

Mean Recovery Inventory scores improved throughout the first post-operative week. There was also a significant main effect of group (Table 6.8). Figure 6.20 reveals that patients in the relaxed group reported better somatic state (RI) than the control group on days 2, 3, 4 and 6 (ts = 2.99: (2.29, $p < 0.05$): 3.99: 2.61, $p < 0.01$, respectively) after surgery.

There were no significant differences between the groups in both pain intensity and pain distress ratings (ps < 0.10). Both fell from the first to the second post-operative days. This was confirmed by the main effect of time (Table 6.8). Figures 6.21 and 6.22 reveal that pain intensity and pain distress fell significantly in the relaxed group from the first to the second post-operative

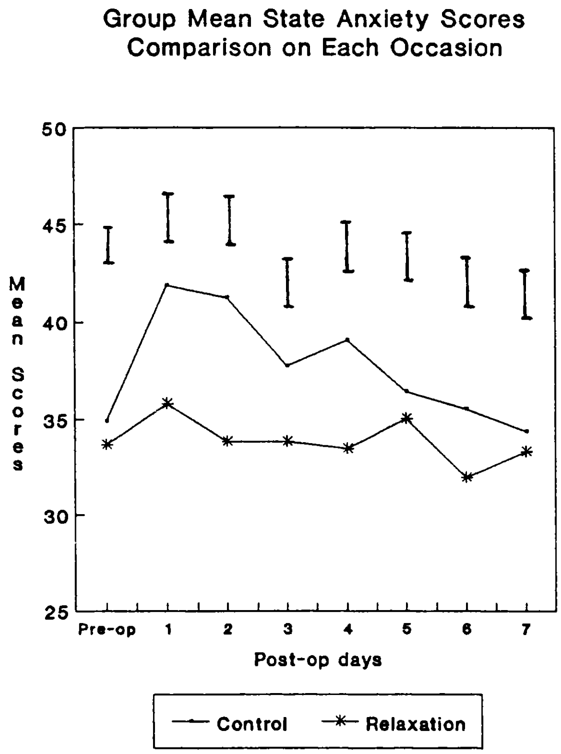


Fig. 6.19 Effects of tapes

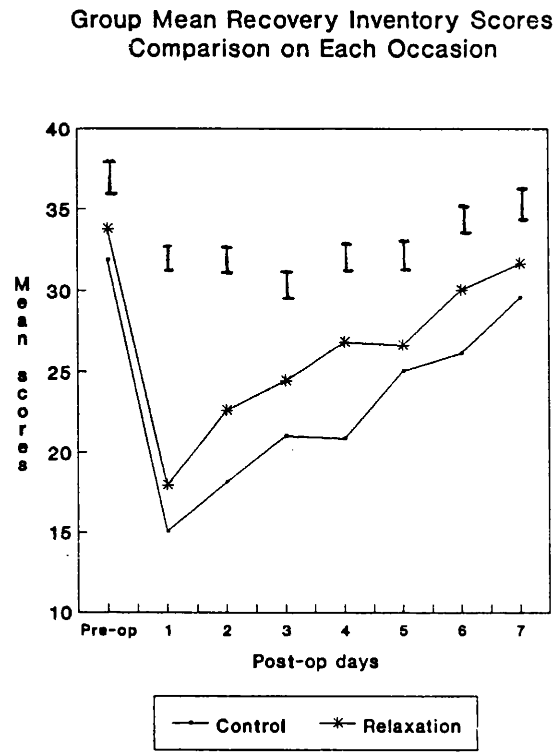


Fig. 6.20 Effects of tapes

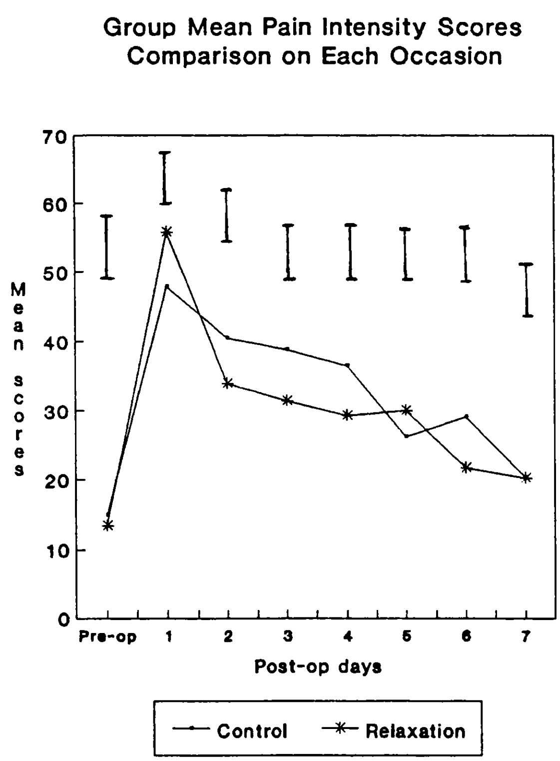


Fig. 6.21 Effects of tapes

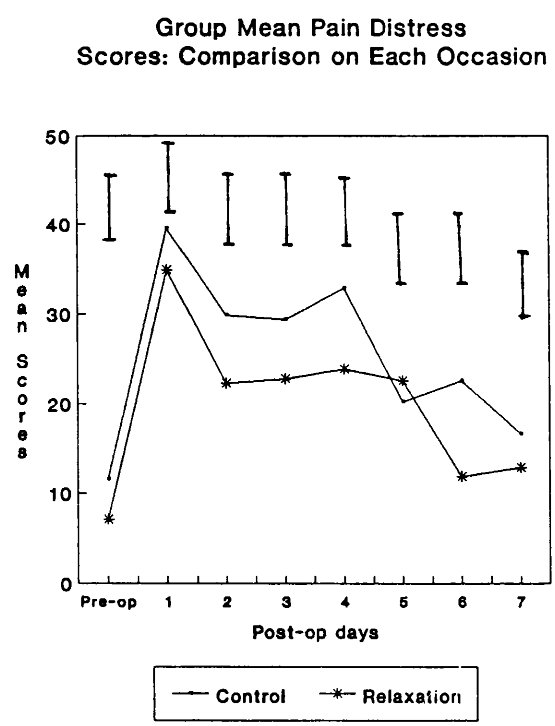


Fig. 6.22 Effects of tapes
Bars show SEDs from relevant ANOVAs
for comparison between groups

day (ts = 3.72: 2.13 ps < 0.01: 0.05 respectively) but that this difference had disappeared throughout the rest of the post-operative week.

Patients in the relaxation group were discharged 3 days earlier than those in the control group ($F(1,36) = 4.72$, $p < 0.05$; means: 14 vs 17 days). All patients were given continuous intravenous analgesia post-operatively. There were therefore no significant differences in the two groups in post-operative analgesia given. Group differences in analgesia intake however occurred during the immediate post-operative period in the recovery room when patients in the relaxation group regained consciousness sooner and requested more pain relief than those in the control group (means: .84 vs .42). Relaxed patients were also given more antiemetic drugs in the recovery room (means: .74 vs .42) full details are in appendices (6.11 and 6.12).

There were significant effects on some of the coping measures. Relaxed patients reported higher levels of denial ($F(1,36) = 3.81$, $p < 0.05$), avoidance ($F(1,36) = 7.45$, $p < 0.01$) and emotion focusing ($F(1,36) = 5.02$, $p < 0.03$).

6.6.6 Correlations

6.6.6.1 Endocrine Levels with Personality Measures

Type A personality and Trait anxiety were not associated with any plasma hormone levels (ps > 0.10). Of the

Multidimensional Health locus of control, chance locus of control also failed to show any relationships with endocrine levels. Internal locus of control was associated with a marginal increase in adrenaline levels on the second post-operative day (r = 0.33, p < 0.05); with lower noradrenaline levels (r = -0.46, p < 0.01) and increased cortisol levels (r = 0.34, p < 0.05) per-operatively. Powerful others locus of control was correlated with lower adrenaline levels at recovery (r = -0.33, p < 0.05). Its relationships on the third post-operative day were with lower adrenaline and noradrenaline levels (rs = -0.45, -0.42, ps < 0.05) and increased cortisol (r = 0.39, p < 0.05).

6.6.6.2 Endocrine levels with pre-operative state

There were no significant associations between noradrenaline levels and any of the questionnaire measures. The only correlations that emerged were between adrenaline levels and somatic state (RI) (r = 0.53, p < 0.01) pre-operatively and between cortisol levels and state anxiety (r = 0.48, p < 0.01) on the first post-operative day.

6.6.6.3 Endocrine measures with coping measures

Adrenaline levels were associated with few coping measures. Correlations were with worry (r = 0.32, p < 0.05) per-op and problem focusing (r = 0.36, p < 0.05) on the first post-operative day. Relationships with noradrenaline levels were confined to the pre-operative, induction and per-operative occasions. Noradrenaline was correlated with less suppression pre-operatively (r = -0.32, $p < 0.05$) and more denial at induction (r = 0.39, $p < 0.05$). The associations with noradrenaline per-operatively were with worry (r = 0.41, $p < 0.01$); rational cognition (r = -0.35, p 0.05) and avoidance (r = 0.34, $p < 0.05$).

Of the plasma hormones, cortisol showed the most associations with coping measures. Pre-operatively, cortisol was correlated with active behaviour (r = 0.34, $p < 0.05$) and problem focusing (r = 0.34, $p < 0.05$). The only correlation to emerge per-operatively was with avoidance (r = -0.33, $p < 0.05$). At recovery cortisol was associated with active behaviour (r = 0.35, $p < 0.05$); problem focusing (r = 0.42, $p < 0.01$); behaviour action (r = 0.34, $p < 0.05$) and active coping (r = 0.34, $p < 0.05$). The only correlation on the first post-operative day was with suppression (r = -0.52, $p < 0.01$).

6.6.6.4 Between Questionnaire Measures Pre- and Post-operatively

State anxiety was not related to pain intensity and pain distress pre-operatively. Post-operatively all the indices of subjective physical state tended to intercorrelate throughout the post-operative period. Table 6.9 shows the correlations on every occasion.

Table 6.9
Intercorrelations Between Outcome Measures Pre-operatively and on Post-operative Days.

	Recovery	Anxiety	Pain	
			Intensity	Distress
Pre-op				
Recovery Inventory	-			
State-anxiety	-.32	-		
Pain intensity	-.41	-	-	
Pain distress	-.33	-	.92	-
Post-op Day 1				
Recovery Inventory	-			
State-anxiety	-.45	-		
Pain intensity	-	.40	-	
Pain distress	-.51	.60	.84	-
Post-op Day 2				
Recovery Inventory	-			
State-anxiety	-.66	-		
Pain intensity	-.31	.37	-	
Pain distress	-.38	.43	.90	-
Post-op Day 3				
Recovery Inventory	-			
State-anxiety	-.46	-		
Pain intensity	-	.38	-	
Pain distress	-.36	.42	.79	-
Post-op Day 4				
Recovery Inventory	-			
State-anxiety	-.63	-		
Pain intensity	-.58	.53	-	
Pain distress	-.64	.68	.85	-
Post-op Day 5				
Recovery Inventory	-			
State-anxiety	-.49	-		
Pain intensity	-.35	.39	-	
Pain distress	-.43	.72	.70	-
Post-op Day 6				
Recovery Inventory	-			
State-anxiety	-.66	-		
Pain intensity	-.52	.55	-	
Pain distress	-.60	.72	.78	-
Post-op Day 7				
Recovery Inventory	-			
State-anxiety	-.33	-		
Pain intensity	-	.46	-	
Pain distress	-	.59	.80	-

- = not significant
< 0.32 = p < 0.05   < 0.41 = p < 0.001

Table 6.10

Correlations Between Coping Measures and Post-operative State

	Post-op Days						
	1	2	3	4	5	6	7
	Recovery Inventory						
Coping measures							
Behaviour action	-	.46	-	.45	.40	.51	.45
Rational cognition	-	.37	-	-	.39	.45	-
Active behaviour	-	-	-	.32	.36	.51	.32
Avoidance	-	-	-	-.33	-	-	-
Problem focus	-	.38	-	.34	.34	.48	-
	State-anxiety						
Behaviour action	-.38	-.52	-	-	-	-.40	-
Rational cognition	-	-	-	-	-	-.43	-
	Pain intensity						
Suppression	-	-	.45	-	-	-	-
Behaviour action	-	-	-	-.40	-.34	-.50	-
Rational cognition	-	-	-	-	-	-.36	-
Active behaviour	-	-	-	-	-	-.38	-
Problem focus	-	-	-	-	-	-.37	-
	Pain distress						
Behaviour action	-	-.33	-	-.35	-.31	-.46	-
Rational cognition	-	-	-	-	-	-.37	-

- = values did not reach significance
< 0.32 = p < 0.05   < 0.41 = p < 0.001

6.6.6.5 Coping Measures with Pre- and Post-operative State

Pre-operatively, only Recovery Inventory was marginally related to the worry component of the coping scale (r = -0.31, $p < 0.05$). Post-operatively, state anxiety and pain distress had the least associations with coping measures. Higher levels of state anxiety and increased pain distress were related to decreased behaviour action and reduced rational cognition. Table 6.10 shows the extent of the correlations. Pain intensity was similarly correlated negatively to some of the coping measures. Increased pain intensity was associated with more suppression, reduced behaviour action, decreased rational cognition, less behaviour action and limited problem focusing especially on the sixth post-operative day. Somatic state (RI) was associated with behaviour action and rational cognition of the Kaloupek et al., scales and active behaviour, avoidance and problem focusing of the Billings and Moos scales.

6.7 Discussion

The aim of the present study was to examine systematically the relationships between psychological preparation, coping style and endocrine responses to surgery. The main finding was that minor abdominal surgery patients in the relaxation group had reduced state anxiety while the control group had a significantly lower adrenaline and cortisol levels during surgery.

This result was however not found in patients who had major surgery. Although patients who listened to the relaxation tape showed increased noradrenaline and cortisol levels, the difference was not statistically significant.

Relaxation is expected to decrease sympathetic activity (Aiken and Hendrichs, 1971; Pearson, 1976; Egbert et al., 1964; Agras et al., 1980) and in both studies such effects were found when measures were assessed immediately before and after relaxation pre-operatively. Systolic (in minor surgery) and diastolic (in major surgery) blood pressure and heart rate (in both) were all reduced soon after initial relaxation training, showing the expected benefits of relaxation.

Examination of the relationship between relaxation and analgesia intake in major surgery reveal that patients in this group required more analgesia and antiemetic drugs in the recovery room than the control group. One possible explanation is that patients in the relaxation group recovered from anaesthesia sooner than the control group. Whether they then showed signs of distress or not, nurses gave them intramuscular analgesia and antiemetics more often than the control group. This result could not be found in patients who had minor surgery, possibly as they stay a shorter time in the recovery room.

Mean scores of state anxiety, pain intensity, pain distress and somatic state (RI) were lower in the relaxed patients of both minor and major surgery. The effect of relaxation training in minor surgery patients was possibly similar to that in major surgery, although patients who had minor surgery were up and about earlier as their operations were less severe and were as a result more active.

In both studies (major and minor surgery), where there are no significant differences between the relaxation and the control groups the results can be explained by the hypotheses that 1) relaxation simply did not have an effect and 2) information given to the control group benefits patients in some ways, depending on the patients personality and coping style (Mathews and Ridgeway, 1981; Sime, 1976; Cohen and Lazarus, 1973). In minor surgery for instance, there were no significant differences in coping style between the groups. In this case the procedural information, like the relaxation training may benefit the patient to the extent that it reduces uncertainty and provides accurate expectations about the future (Johnson, 1975). But recent evidence (Auerbach, 1989) has shown that information has no benefit.

Examination of relationships between personality and endocrine responses in minor surgery show that Trait anxiety and to a lesser extent pre-operative state anxiety predisposed patients to lower levels of adrenaline and cortisol before, during and after surgery. No relationships were found in major surgery between endocrine levels and trait anxiety. Therefore, current studies on personality traits as determinants of interindividual differences in neuroendocrine responses to surgical stress have not yet yielded conclusive results. However recently, Salmon et al., (1989) have provided evidence that low pre-operative anxiety is associated with greater endocrine response.

Holden-Lund (1988) also found that patients who had higher state anxiety had lower cortisol levels one day following surgery. This is completely opposed to the generally accepted view that anxiety increases the stress response to surgery. Instead, it suggests that anxiety may serve to limit the response. This finding however, helps to explain our results and other reports that surgical patients who had received psychological preparation designed to reduce anxiety had greater stress hormone levels post-operatively. In Wilson's (1981) study, post-operative urinary adrenaline levels were greater in patients who had undergone relaxation training than in untrained controls. In a later study by Salmon et al., (1986), a group of patients who received reassurance from nurses were less anxious pre-operatively but had greater urinary cortisol levels post-operatively.

Whether the effects are caused entirely by reduced production of adrenaline and cortisol in the anxious patients or whether decreased destruction is involved is not known. Whatever the mechanism, according to the theory that increased endocrine levels benefit recovery, anxiety may be seriously decreasing the endocrine responses and in turn delay recovery.

More Type A personality was associated with increased adrenaline levels in minor surgery but there were no relationships with endocrine levels in major surgery. Thus, it cannot be maintained that Type A personalities respond to surgery with greater sympatho-adrenal activation. Current evidence is contradictory (Kornfeld et al., 1985; Krantz et al., 1982).

The use of relaxation to reduce heart rate and blood pressure in hospital patients has been reported before (Aivazyan et al., 1988; Blanchard et al., 1988; McGrady et al., 1987). In both major and minor surgery studies, relaxation significantly decreased the systolic and diastolic blood pressure, heart rate and state anxiety which are under the influence of sympathetic activity. Goldstein et al., (1982) however, suggested that the cardiovascular responses to the stress of surgery are very complexly determined and may not be mediated by sympathetic influences. They reported intra-operative increases in heart rate, systolic blood pressure and cardiac output and that these persisted even when noradrenaline responses had been eliminated by diazepam sedation.

Some studies which have used adrenaline and cortisol as indicators of stress or anxiety (Anand and Ansley-Green, 1988; Chernow et al., 1987; Linn et al., 1988) have regarded their increase as detrimental. Frankenhaueser (1980) has however, consistently shown positive correspondence between performance of people exposed to different challenges in laboratory experiments and real life and catecholamine increase. She reported the existence of a "distress" factor and an "effort" factor. She found that with effort with distress, adrenaline and cortisol excretion rates increased. When there was effort without distress only catecholamines increased. Frankenhaueser and Lundberg (1982) theorized that distressing tasks may produce rises in cortisol independent of behavioural effort.

The major problem which emerges from these results is to find an intervention programme which eliminates distress and possibly moderate the endocrine stress response to surgery. From the literature review we have seen that cortisol responses to stress are known to be increased by passive attitude to the stress, as opposed to active effortful responses which seem to increase catecholamine release. Maybe the relaxation training provided did not make the patients feel they were really involved in their care. A programme which includes relaxation exercises and emphasizing the patients' ability to cope actively with the forthcoming stress of surgery might provide a better recovery.

Earlier, Janis (1958) made a similar recommendation. He proposed that the stressfulness of surgery could be reduced if patients were taught pre-operatively to engage in a process of actively thinking about and "working through" impending events, which he termed the work of worry (see Chapter 1, section 1.1.2). He hypothesized that a moderate amount of anxiety in patients was beneficial because these individuals developed a higher level of stress tolerance due to their realistic appraisal of the situation and their appropriate planning and preparation for it. Anxiety which is too high or too low would hinder this process. Using Janis model, preparation should emphasize the sources of distress and discomfort which occur in surgical patients and help patients to institute adaptive coping behaviour to deal with the threat the distress and discomfort present.

6.8 Conclusion

There is therefore, clearly some evidence to suggest that the psychological threat of surgery may influence pituitary/adrenocortical activity independently of the physical threats, but the mechanisms are still open to speculation. The differences between minor and major surgery are variable and may involve different response systems. In order to interpret differences between minor and major surgery, it is necessary to note potential confounding factors such as type of anesthesia and amount of blood loss that may account for the pattern of change. The endocrine responses to these factors have not been investigated in this thesis. Nevertheless, differences may have occured due to these factors.

In the next study an attempt will be made to determine whether patients who are made to feel that they are coping will have lower endocrine responses to minor surgery. Due to fewer major surgeries taking place in the hospital and because there were no endocrine effects in major surgery, only minor surgery patients are studied in the remaining experiments.

CHAPTER SEVEN

Experiment 4

PRE-OPERATIVE PREPARATION FOR SURGERY: A COMPARISON BETWEEN RELAXATION TRAINING WITH IMAGERY AND GENERAL PROCEDURAL INFORMATION (CONTROL) AND THEIR IMPACT ON ENDOCRINE RESPONSES TO SURGERY.

7.1 Introduction

The experiments described in chapter six produced some evidence that recovery is affected by relaxation training. The group of patients who had minor abdominal surgery and were given relaxation instructions pre-operatively had reduced state anxiety and had a significant increase in cortisol and adrenaline concentration during surgery. Noradrenaline was however, shown to be unaffected by relaxation instructions. In addition, systolic blood pressure pre-operatively and post-operatively and maximum per-operative systolic and diastolic blood pressure were reduced. For patients who had major surgery, relaxation reduced state anxiety, heart rate and diastolic blood pressure immediately after first listening to the tape; diastolic blood pressure on the morning of surgery and maximal per-operative heart rate were also reduced. In the relaxation group, noradrenaline and cortisol levels increased during surgery but this rise was not statistically significant. Examining the relationships among behavioural, psychophysiological and endocrine responses to surgical stress is therefore clearly very important in understanding the physiological impact of behavioural interventions.

Although studies (Langer et al., 1975; Kendall et al., 1979; Wilson, 1981: Auerbach, 1989) which have compared alternative anxiety reducing methods with standard information have found that alternative methods appear to be as or more effective than information alone, the mechanism responsible for any effects of psychological preparation still remains unclear. Mathews and Ridgeway (1982) concluded that the evidence from adequately controlled studies shows cognitive coping approaches to be superior and speculated that this is due to promoting the patient's "sense of control". The past years have also witnessed a convergence of theory and research on the influential role of perceived control in stress reactions (Averill, 1973; Lazarus, 1981; Miller, 1980; Bandura et al., 1985).

The effects of providing patients with information and heightening participation and choice have at times also been examined in terms of the concept of personal control. This heightened participation and choice often leads to increases in perceived control, since it may provide subjects with the belief that they can alter or affect outcomes. In some studies one of the aims of psychological preparation programs is to increase patients general feelings of self-reliance and control over their bodies, the psychological effects of self-care might therefore, be viewed in terms of the concept of personal control.

Information has also been conceptualized as a form of cognitive control, because it may increase the ability to prepare for aversive events and often results in the interpretation of events so that threat is lessened (Averill, 1973; Seligman, 1975). Johnson (1975) suggested that the effects of providing information in medical settings may also be viewed in this conceptual framework.

While some researchers have shown that increasing patient's control increases their well being (Raps et al., 1982; Partridge and Johnston, 1989) and decreases negative responses (Mills and Krantz, 1979), there is also evidence that the effects of increasing control are not always positive (Rodin, Rennert and Solomon, 1980). The reason for this difference could be that some patients once they are admitted into hospital either prefer or expect to be looked after by the doctors and nurses, others may not be well enough to play an active role anyway.

Personal control has also been associated with physiological responses which involve the role of the sympathetic adrenal medulla and the pituitary adrenal cortical axis in their response to stress. The sympathetic adrenal medullary response is associated with a perceived stimulus that produces a threat to control and results in a physiological response of increased catecholamines and unchanged cortisol levels while the pituitary adrenal cortical axis is related to stimuli that lead to loss of control and result in physiological increases in cortisol levels and unchanged catecholamines (Henry and Stephens, 1977).

In research in this area Henry (1982) linked loss of control to changes in cortisol secretion and Seligman (1975) and Sachar (1980) to helplessness. Frankenhaeuser and co-workers also reported the association between effort with distress and increased catecholamines and cortisol; and effort without distress with catecholamines only. Frankenhaeuser et al., (1978) speculated that a lack of control is almost invariably related to feelings of distress, whereas being in control may prevent a person from experiencing distress. Personal control could subsequently, reduce negative effects, and thereby changing the balance between sympathetic-adrenal and pituitary-adrenal activity. These results could be interpreted as due to the relative inactivity of patients undergoing surgery.

The studies mentioned above therefore, indicate that the phenomenon of particular interest is the impact of perceived control on stress reactions. The present study will examine the effects of relaxation with imagery on endocrine responses and recovery from surgery. Imagery and relaxation training have both been used as major components of systematic desensitization (Hamberger and Lohr, 1980). The role of imagery and other cognitive processes have been implicated in the maintenance and regulation of anxiety.

Imagery is assumed to be facilitated by relaxation and the resulting increased controllability of imagery could therefore aid in reduction of fear and anxiety through extinction of conditioned fear. Some studies (Bauer and Craighead, 1979; Lang, 1977) found that relaxation facilitated imagery by reducing distracting stimuli, aiding recall and clarifying the visual presentation of frightening experiences. Other studies (Rehm, Mattei, Potts and Slotnick, 1974) however, failed to illustrate such a relationship between relaxation and vividness of imagery.

In this study relaxation with imagery was designed to provide greater (belief in) personal control over recovery from surgery and this was assumed to be predictive of a better recovery. State anxiety, stress and arousal, patients reports of pain, length of hospital stay, adrenaline, noradrenaline and cortisol levels were selected as indicators of recovery from surgery.

Measures of Trait anxiety, Type A behaviour pattern, Krantz Health Opinion survey, Desire for Control of Medical Care, the Multidimensional Health Locus of Control and Coping style were selected as personality variables that may be influenced by the preparation procedures. The krantz Health Opinion Survey and the Desire for Control of Medical Care were used as an addition to the Multidimensional Health locus of control.

7.2 Method

7.2.1 Subjects

Sixty-seven subjects were approached following admission for minor abdominal surgery. Criteria for inclusion were that patients (1) be free from steroid medication for at least 6 months; (2) have no significant pre-existing cardio-pulmonary, neurological, metabolic or psychiatric disorders; (3) be lucid and remain lucid for the study period; (4) be between the ages of 17 and 80 years; and (7) have signed the consent form.

Subjects who were on a theatre list were approached and assigned to one of two groups: control group (n = 27) and relaxation with imagery (n = 28). Groups were matched and alternated weekly, patients were automatically allocated to the group in progress. The open wards of the hospital prohibited running of the two groups at a time, since transfer of information between patients would be inevitable through discussion and observation. The doctors and nurses were not told the group the patients had been assigned to. 18% of the patients who had been approached were dropped from the study because 5 were on steroids; 3 declined to take part; 3 had difficulties in comprehension and 1 was on an antidepressant drug.

The patients who participated in the study were 55 (31 male, 24 female). Ages ranged from 22-76 years (mean: 45). The groups were substantially equivalent with regard to demographic factors (Table 7.1). The main diagnoses were fistulae, faecal incontinence, Crohn's disease and haemorrhoids while main types of surgery were laying open of fistulae, anal sphincter repair and haemorrhoidectomy. Details of patients' characteristics are in appendices 7.1 and 7.2).

Surgery took place in the afternoon. Anaesthetic regimen was standardized for all patients. Pre-operative medication was papaveretum and scopolamine. Operative anaesthesia was thiopentone, nitrous oxide, oxygen and a muscle relaxant (enflurane, isoflurane or halothane). For the first 48 hours post-operatively patients were prescribed intramuscular papaveretum or pethidine to be given whenever requested. Antiemetics (either metochlopramide or prochloperazine) and subsequent oral analgesia were prescribed to be administered whenever required.

7.2.2 Procedure

On the afternoon of admission patients who were going for minor abdominal surgery the following day were approached between 15.00hrs and 16.00hrs. On this occasion patients who volunteered to take part in the study gave their written consent. As soon as consent was given the anaesthetist drew the first sample of blood.

Pre-operatively - After the anaesthetist had obtained the sample of blood patients completed the first set of questionnaires (see below). The researcher then took the pre-treatment systolic and diastolic blood pressure and heart rate before giving them a portable tape recorder, headphones and appropriate tape (described below). The patient lay on the bed with curtains drawn around them while they listened to the tape.

The researcher returned 20 minutes later and the patient completed the state form of the State-Trait Anxiety Inventory (see measures section). On this occasion the researcher took the post-treatment systolic and diastolic blood pressure and heart rate. The patient was asked to listen to the tape at least once more that day, at least once while waiting for surgery on the following day and as much after surgery as seemed helpful.

Post-operatively - The researcher visited the patients at noon on the first and second post-operative days to monitor completion of further questionnaires and to collect completed ones. The tape recorder, headphones and tape were removed on the final visit.

7.2.3.1 Tape recordings

The control group was given a control tape similar to the one already described in chapter 5 study 2 (see script in appendix 5.8).

The relaxation with imagery group listened to a tape based on progressive muscular relaxation training without the tensing instructions. This was followed by the imaginary "trip" through the pre-operative and post-operative period. Details about sensory impressions of feelings of hunger, thirst, mouth feeling dry, feeling uncomfortable, weak and pain from the wound are followed by reassurances of being in control, being able to cope and being able to overcome these feelings (see script in appendix 7.3).

These sensory impressions were included with the intention of allowing mental rehearsal in a state of deep calm. Suggestions for relaxing and dissociation from the discomfort were interspersed throughout the tape. Both tapes lasted 15 minutes, the voice was that of the researcher.

7.2.3.2 Monitoring of tape recorders

The tape recorders had a meter housed in the sealed case. The same recorders were used in other studies in the thesis and the monitoring system has already been described elsewhere (chapter 3, section 3.10.3).

7.2.4 Measures

The questionnaires administered pre-operatively included: the Multidimensional Health locus of control (Wallston et al., 1978), the Trait version of the State-Trait Anxiety Inventory (STAI, Spielberger et al., 1970), a brief index of Type A personality (Bortner, 1969), the Krantz Health Opinion Survey (Krantz et al., 1980) and the Desire for Control of Health Care scale (Smith et al., 1984).

Additional questionnaires given pre- and post-operatively were the state anxiety version of the STAI, the Recovery Inventory (Wolfer and Davis, 1970), three 10-cm line visual analogue scales measuring pain intensity, pain distress and pain coping and the Stress Arousal Checklist (Mackay et al., 1978).

A coping scale based on that devised by Billings and Moos (1981) was added to the final set of questionnaires. Details of the above mentioned questionnaires are given in Chapter three.

Questions about the patients' evaluation of the tapes were also included on the final occasion: 'how helpful it had been' (made things worse, not helpful, very helpful; scored 1-3); 'how often they listened to the tape' (more than once a day, once a day, not at all; scored 3-1); 'whether they would recommend it to a friend in hospital', and 'whether the patient would want to use it in future' (no, undecided, yes; scored 1-3).

The relaxation with imagery group were also given two additional questions on the final occasion: 'how vividly and realistically could you imagine the various situations described' (perfectly vivid, vividly and realistically, moderately clear and vivid, vaguely, hardly at all and not at all; scored 5-1) and 'how highly effectively do you think the technique will be applied by you' (extremely effective, very effective, effective to some extent, perhaps a little effective and not effective; scored 5-1). Details of the questionnaire is in appendix 7.4.

7.2.4.1 Biochemical measures

Samples were drawn from a peripheral vein, the first following the patient's consent, the second immediately before induction of anaesthesia and the final sample immediately after the patient had been removed to the recovery room. Details of obtaining blood samples, storage and assaying are already given in chapter 3, sections 3.8.1 and 3.8.3.

7.2.4.2 Blood pressure and heart rate

Blood pressure and heart rate were taken as additional measures for determining stress, anxiety and the effects of tapes. The first blood pressure and heart rate was taken by the researcher immediately before and after patients listened to the tape for the first time. Subsequent blood pressures and heart rates were extracted from the nurses' records on the pre-operative evening (18.00hrs); on the morning of the operation (06.00hrs); the intra-operative maximum blood pressure and heart rate; during the immediate recovery period and on the first post-operative morning (06.00hrs). Details of how the blood pressure and heart rate were taken are given in chapter three, section 3.9.

7.2.4.3 Additional observations

Duration of surgery measured from incision to the time of entering the recovery room was noted. Each administration of analgesia was recorded from medical notes and totalled over the two post-operative days. The amount of time for which the tape recorder had been operating was recorded (in units of 0.01hr) on an internal counter read when the equipment was collected. Length of hospital stay was also noted and assessed from the day of operation to the day of discharge.

7.3 Statistical analysis

Statistical analyses were computed using the Genstat5 programme (Rothamstead Experimental Station 1987)

(1) Transformations - Endocrine levels were log10-transformed (transform = log10 (x+1)) to normalize their distribution.

(2) One way analysis of variance - Comparisons were made on pre-operative measures, coping measures, evaluations

of the tapes, post-operative analgesic intake and length of hospital stay. The intra-operative maximum systolic and diastolic blood pressure and heart rate were also analyzed by separate one way analyses of variance.

(3) Two way analysis of variance - Baseline levels and the immediate effects of first listening to the tape for state anxiety, systolic and diastolic blood pressure and heart rate were examined by two way analysis. For endocrine levels, the 'time' factor distinguished measurements made at induction and recovery; for questionnaires, on the first two post-operative days and for blood pressure and heart rate, on each occasion from the evening of the pre-operative day onwards.

(4) Post hoc t-tests - Wherever necessary, significant interaction terms were analyzed by post hoc t-tests using error terms estimated from relevant analysis of variance.

(5) Product-moment correlations - This assessed the relationship (a) between personality and coping style; (b) between pre- and post-operative state and coping style; and (c) of personality , coping and pre-operative state with endocrine levels at each time of measurement. Intercorrelations were also calculated amongst the different questionnaire measures. Tests of significance were made at 0.01 and 0.05 levels.

7.4 RESULTS

7.4.1 Preliminary Analyses

Pre-operatively - Table 7.1 shows that on admission the two groups were matched in mean age, male/female ratio (relaxation with imagery n = 26, 15/11; control n = 25, 15/10), duration of illness, number of previous operations, personality and time at which operations began. Four patients who had participated in the study had to be excluded from the final analysis because they had outliers. Post-operatively - The groups did not differ in duration of surgery. Neither did they differ in duration of their post-operative stay.

7.4.2 Evaluation of tapes

Patients in the relaxation with imagery group played the tape longer (means = 48 vs 24 minutes; $F(1,50) = 4.06$, $p < 0.05$), rated the relaxation with imagery tape as more 'helpful' (means 1.8 vs 1; $F(1,50) = 53.37$, $p < 0.001$) and 'would use the tape in future' (means = 1.52 vs .92; $F(1,50) = 6.72$, $p < 0.01$) than the patients in the control group.

Further evaluation of the relaxation with imagery tape shows that 85% of the patients could mentally rehearse the various situations described and none claimed to be unable to. Of the 85%, 11% could imagine 'perfectly vividly', 33% vividly and realistically and 41%

Table 7.1

Matching of Groups

Diagnosis, type of surgery and mean scores on medical, surgical and personality measures in each group. Differences between means are non-significant ($p > 0.05$).

	Relaxation & Imagery	Control
	n	n
	26	25
Diagnoses		
Fistula/abcess/sinus	12	12
Feacal incontinence	5	5
Crohn's disease	3	3
Haemorrhoids	3	2
Ulcerative colitis	0	2
Fissure	2	0
Constipation	1	1
Other	0	2
Type of surgery		
Laying open fistula/abcess/sinus	12	11
Sphincter repair	6	5
Haemorrhoidectomy	3	2
Drainage of abcess	2	1
Closure of colostomy	1	2
Other	2	4
Age	46.70	43.80
Duration of symptoms (months)	8.44	8.48
Number of previous operations	2.20	2.56
Commencing time of surgery (hr.min)	14.21	13.38
Duration of surgery (hr)	0.58	0.65
Post-operative stay (days)	5.81	5.00
Type A	60.60	58.90
Trait anxiety	51.19	49.92

'moderately clear and vivid'. Only 15% could imagine situations 'vaguely, hardly at all'.

When evaluating the application of the rehearsal procedure described in the tape, 11% thought the tape was 'extremely effective', 42% 'very effective' and 42% 'effective to some extent'. Only 5% found it 'perhaps a little effective' while none found it 'not effective'.

7.4.3 Immediate effects of the tapes

After listening to the tapes for the first time there was a decrease in systolic and diastolic blood pressure (Figs. 7.1(a) and 7.1(b)) and heart rate (Fig. 7.1(c)). The main effect of time confirmed this in each case and the greater fall after the relaxation with imagery tape was confirmed by the interaction of Group x time (Table 7.2); In no case did the effect of group approach significance but for diastolic blood pressure the difference after first exposure to the tape shows that levels were lower in patients who had listened to the relaxation with imagery tape ($\underline{t}$ = 2.11, $\underline{p}$ < 0.05).

State anxiety also decreased after listening to the tapes for the first time (Figure 7.1(d)). This was confirmed by the main effect of time (Table 7.2). There were however, no significant differences between the groups before and after the tape.

GROUP MEAN SYSTOLIC BLOOD PRESSURE
BEFORE AND IMMEDIATELY AFTER THE TAPES

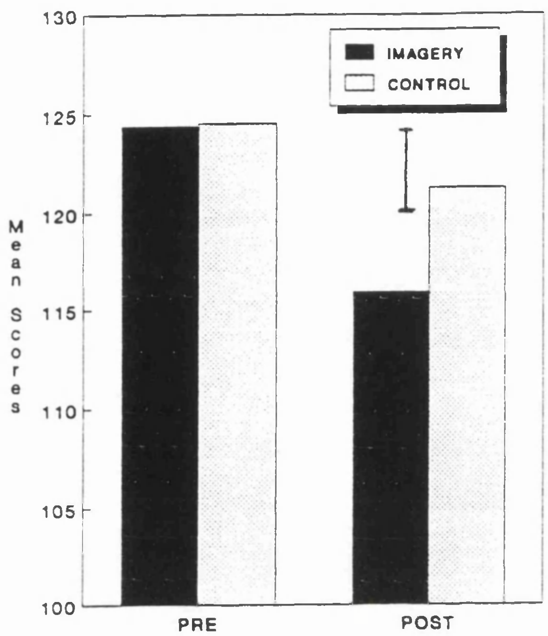


FIG. 7.1(a) Effects of tape

GROUP MEAN DIASTOLIC BLOOD PRESSURE
BEFORE AND IMMEDIATELY AFTER TAPES

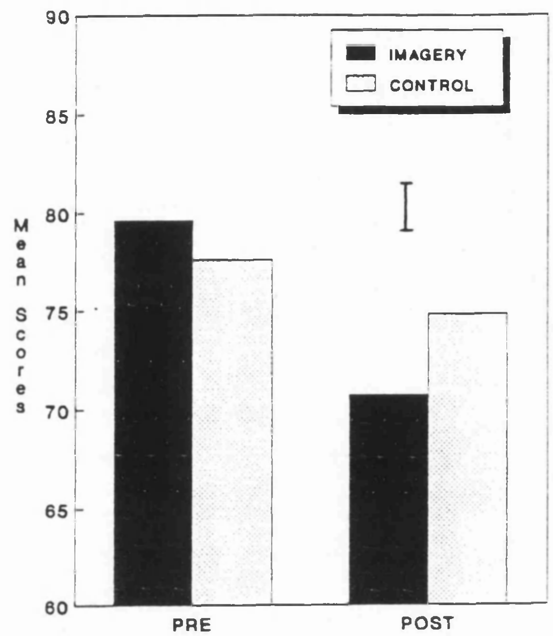


FIG. 7.1(b) Effects of tape

GROUP MEAN HEART RATE BEFORE AND
IMMEDIATELY AFTER TAPES

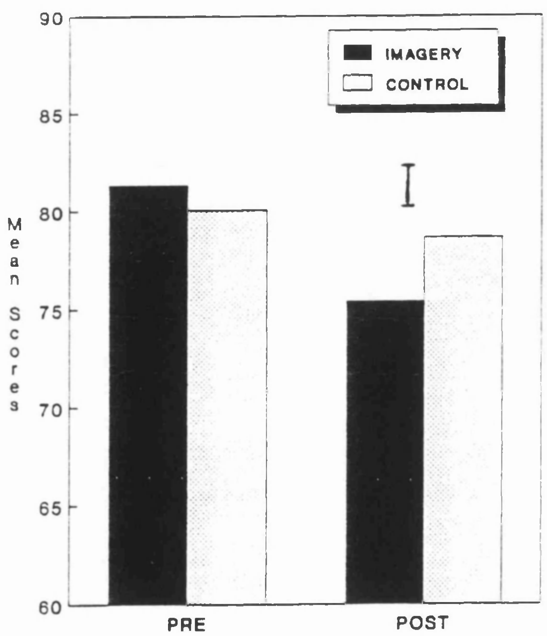


FIG. 7.1(c) Effects of tape

GROUP MEAN STATE ANXIETY BEFORE
AND IMMEDIATELY AFTER TAPES

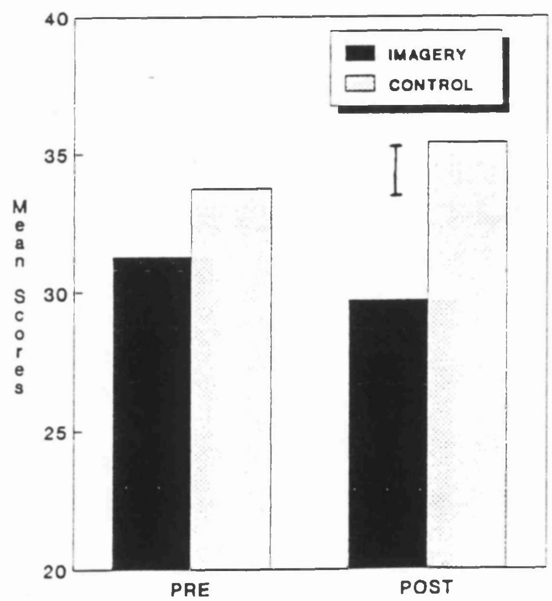


FIG. 7.1(d) Effects of tape
Bars show SEDs from relevant ANOVAs
for comparisons between groups

Table 7.2

F-ratios for analyses of variance state anxiety, heart rate and blood pressure before and after first listening to the tapes. Degrees of freedom are 1, 49; *: $p < 0.05$; **: $p < 0.001$.

	State-anxiety	Heart rate	Blood pressure Systolic	Blood pressure Diastolic
Time	12.75**	78.15**	63.42**	78.93**
Group x Time	0.24	28.42**	12.07**	20.55**

Table 7.3

Relevant F-ratios from analyses of variance of endocrine levels at induction and immediately post-operatively. Degrees of freedom are 1, 48 for Adrenaline and Noradrenaline, and 1, 46 for Cortisol. For adrenaline the main effect of group did not approach significance. *: $p < 0.025$; **: $p < 0.001$.

	Adrenaline	Noradrenaline	Cortisol
Group	0.68	15.50**	6.15*
Time	0.34	1.43	0.76
Group x Time	0.52	0.39	0.00

Table 7.4

F-ratios from analyses of variance of Recovery Inventory, state anxiety and arousal post-operatively. Degrees of freedom 1, 49; *: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$.

	State-anxiety	Recovery Inventory	Arousal
Day	12.40***	34.63***	11.86***
Day x Tape	0.86	2.48	0.14

	Intensity	Pain Distress	Coping
Tape	4.22*	8.17**	6.92**
Day	2.30	0.08	0.17
Day x Tape	2.98	1.22	2.50

7.4.4 Subsequent cardiovascular changes

Patients in the relaxation with imagery group showed consistently lower levels of blood pressure and heart rate than the controls (Figs. 7.2, 7.3, and 7.4). For systolic blood pressure ($F(5,240) = 17.19$, $p < 0.001$), diastolic blood pressure ($F(5,240) = 26.54$, $p < 0.001$) and heart rate (F $(5,242) = 16.40$, $p < 0.001$), this was confirmed by the main effect of time. The significant drop in diastolic blood pressure was confirmed by the interaction of Group x time ($F(5,240) = 2.92$, $p < 0.01$); diastolic blood pressure was lower in the relaxation with imagery group than in the controls on the morning before surgery, 06.00hrs ($t = 3.74$, $p < 0.01$) and on the morning after surgery, 06.00hrs ($t = 2.11$, $p < 0.05$). Similarly with heart rate, the significant fall was confirmed by the interaction of Group x time ($F(5,242) = 3.24$, $p < 0.01$). Heart rate was lower in the relaxation with imagery group than the control on the morning before surgery, 06.00hrs ($t = 4.19$, $p < 0.01$).

During surgery, heart rate reached lower maxima in the relaxation with imagery group than in the controls ($F(1,49) = 16.22$, $p < 0.001$). Although maximum per-operative systolic and diastolic blood pressure were lower in the relaxation with imagery group (systolic: 108 vs 115; diastolic: 65 vs 67) this difference was not statistically significant ($p > 0.10$).

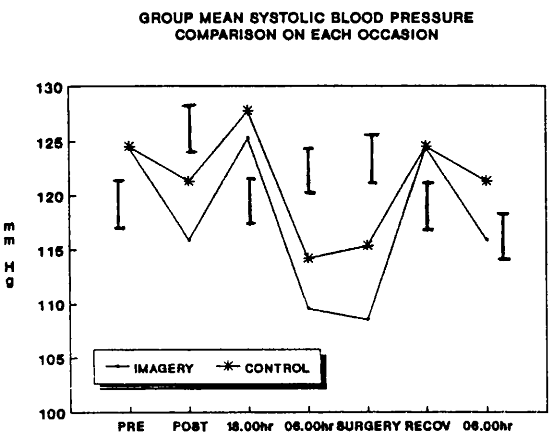


FIG. 7.2 Effects of tapes

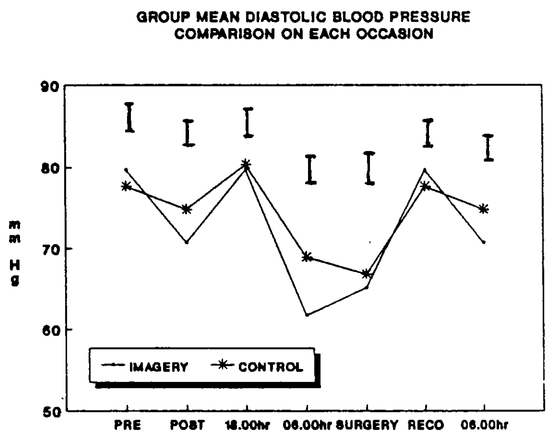


FIG. 7.3 Effects of tapes

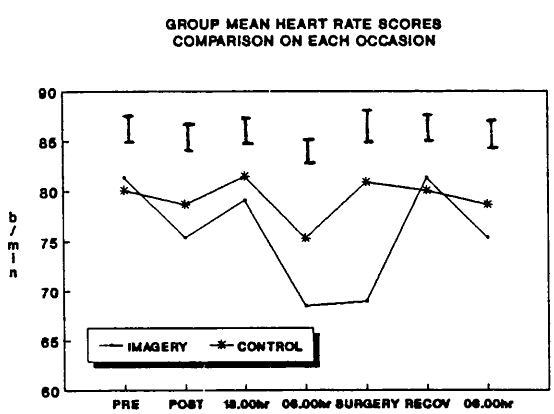


FIG. 7.4 Effects of tapes
Bars show SEDs from relevant ANOVAs
for comparisons between groups

7.4.5 Endocrine Responses

Cortisol levels were similar in both groups on the pre-operative day (Fig. 7.5) but differences emerged subsequently between the groups (Table 7.3). There were no effects in interaction with time of measurement but there was a main effect of group. At induction and at recovery the relaxation with imagery group had lower cortisol levels than the control group.

Before and after surgery there were no significant differences between the groups in adrenaline levels (Fig. 7.6). Levels were higher in the relaxation with imagery group than in the controls, but this increase is not statistically significant.

Pre-operatively, there were no significant differences between the groups in noradrenaline levels (Fig. 7.7). Differences however, appeared on subsequent occasions between the groups (Table 7.3). There was a main effect of group. Noradrenaline levels were greater in the relaxation with imagery group than in the controls at induction and recovery. No effects appeared in the interaction with time of measurement.

To examine more closely effects of the imagery tape, the group was further divided into two; patients who had good imagery (n = 12) and those who had poor imagery (n = 15). There were no significant differences among the groups

CORTISOL LEVELS PRE-OPERATIVELY,
AT INDUCTION AND RECOVERY

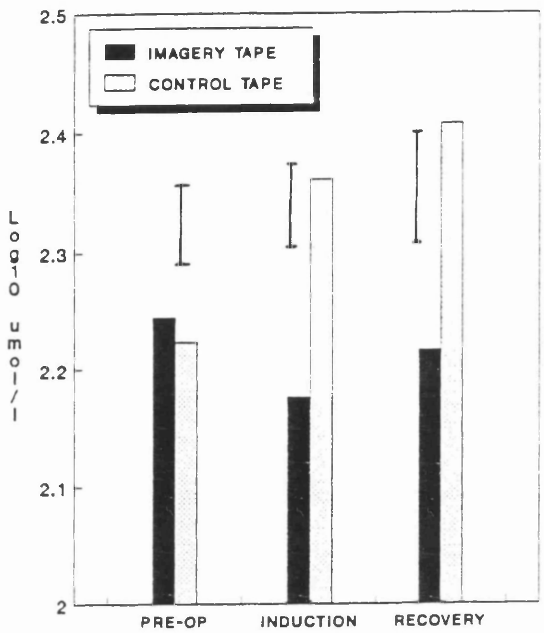


FIG. 7.5 Effects of tape

ADRENALINE LEVELS PRE-OPERATIVELY,
AT INDUCTION AND RECOVERY

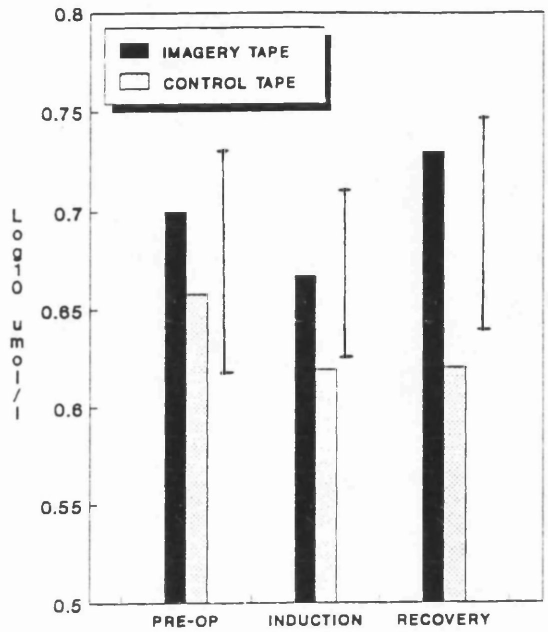


FIG. 7.6 Effects of tape

NORADRENALINE LEVELS PRE-OPERATIVELY,
AT INDUCTION AND RECOVERY

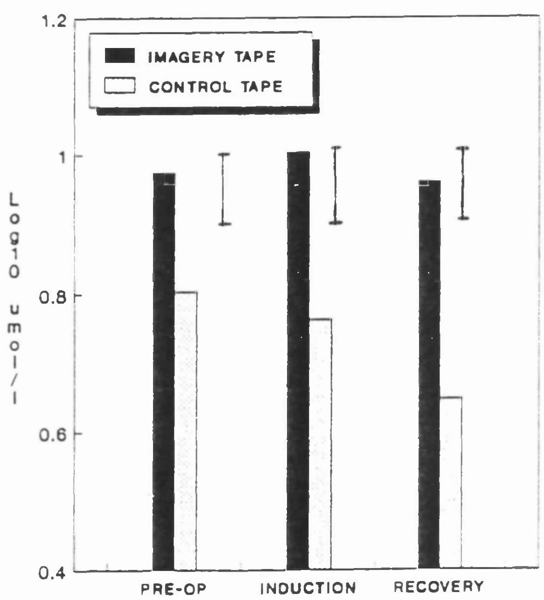


FIG. 7.7 Bars show SEDs for comparison between groups at baseline and for the combined analysis @ induction & recovery

pre-operatively (Figs. 7.8, 7.9, and 7.10), for cortisol, adrenaline and noradrenaline, *p*s > 0.10). Differences emerged subsequently between groups in noradrenaline levels ($F(2,48) = 8.83$, $p < 0.001$) and cortisol levels ($F(2,48) = 3.07$, $p < 0.05$). Figure 7.10 suggests that at induction noradrenaline levels were higher in the good imagery group than in the controls ($t = 2.9$, $p < 0.01$), while those of poor imagery were also higher than the controls ($t = 2.54$, $p < 0.05$).

At recovery, the good imagery group had higher noradrenaline levels than the poor imagery ($t = 2.97$, $p < 0.01$) and the control ($t = 5.14$, $p < 0.01$) groups; the poor imagery group also had higher noradrenaline levels ($t = 2.16$, $p < 0.05$) than the controls. The only group difference to emerge with cortisol was between good imagery and controls. Figure 7.8 illustrates that cortisol levels were lower in the good imagery group at recovery (t 2.22 = $p < 0.05$) than in the control group.

7.4.6 Post-operative questionnaires and analgesic intake

State anxiety scores declined from the first to the second post-operative day (Table 7.4) but the interaction with group did not reach significance. Figure 7.11 suggests that patients in the relaxation with imagery group were less anxious than the controls although there were no significant differences between the groups.

Effect of Imagery on Cortisol levels

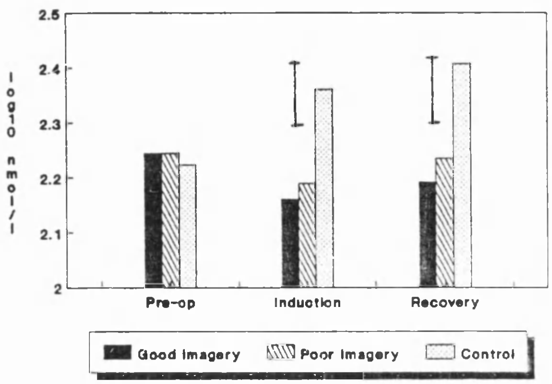


Fig. 7.8 Bars show SED

Effect of Imagery on Adrenaline levels

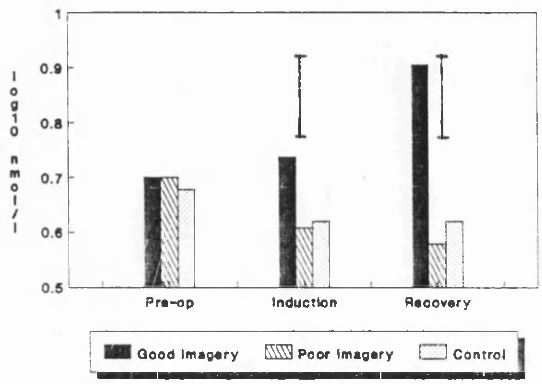


Fig. 7.9 Bars show SED

Effect of Imagery on Noradrenaline Levels

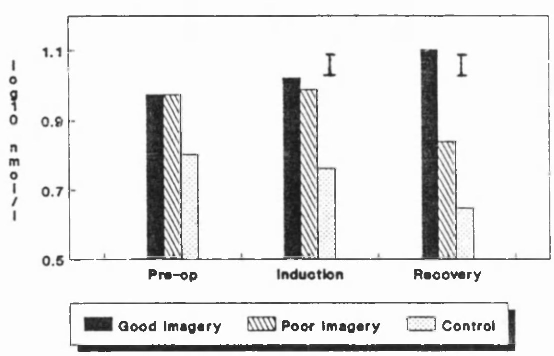


Fig. 7.10 Bars show SEDs from relevant ANOVAs for comparisons of groups

The Recovery Inventory mean scores showed an improvement from the first to the second post-operative day (Table 7.4). The interaction with group did not however approach significance. Figure 7.12 illustrates that the relaxation with imagery group appeared to have better scores on the first post-operative day than the controls. There were however, no differences between the groups.

Stress scores changed very little from the first to the second day post-operatively (Fig. 7.13), and the differences between the groups was not significant. Arousal in both groups increased from the first to the second post-operative day (Table 7.4). Figure 7.14 illustrates that the relaxation with imagery group appeared more aroused than the controls, although there were no significant group differences.

Pain intensity and pain distress decreased and pain coping improved after the first post-operative day (Table 7.4) but the interaction with group did not reach significance. The relaxation with imagery group had lower pain intensity and pain distress scores and better pain coping scores than the control group (Figures 7.15, 7.16, 7.17).

STATE ANXIETY MEAN SCORES
PRE-OPERATIVELY AND ON SUCCESSIVE DAYS

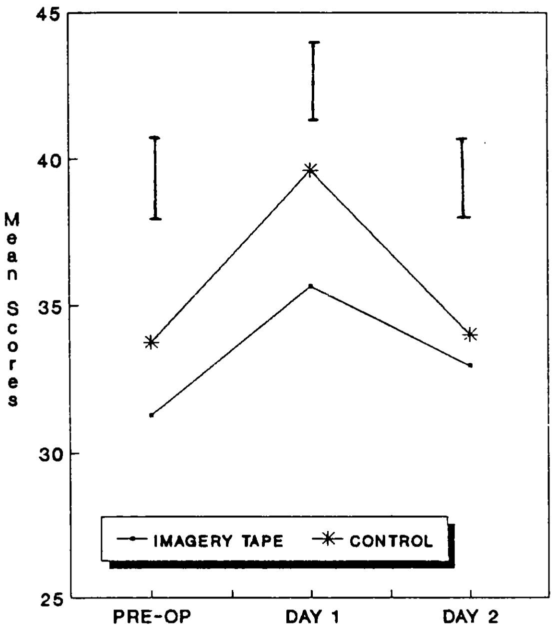


FIG. 7.11 Effects of tapes

RECOVERY INVENTORY MEAN SCORES
PRE-OPERATIVELY AND ON SUCCESSIVE DAYS

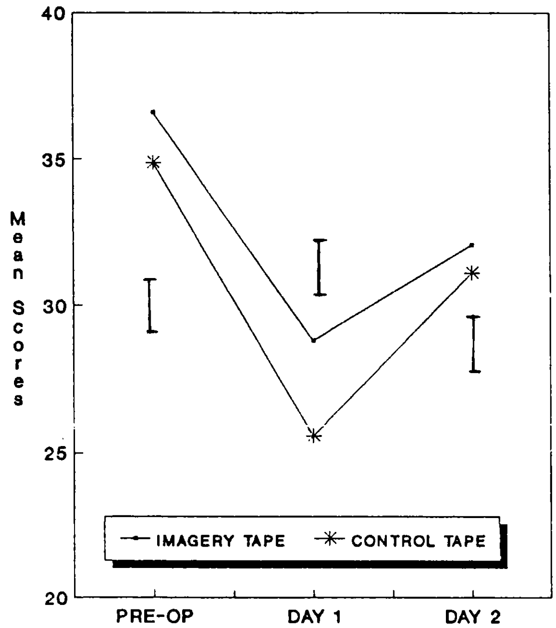


FIG. 7.12 Effects of tapes

STRESS MEAN SCORES PRE-OPERATIVELY
AND ON SUCCESSIVE DAYS

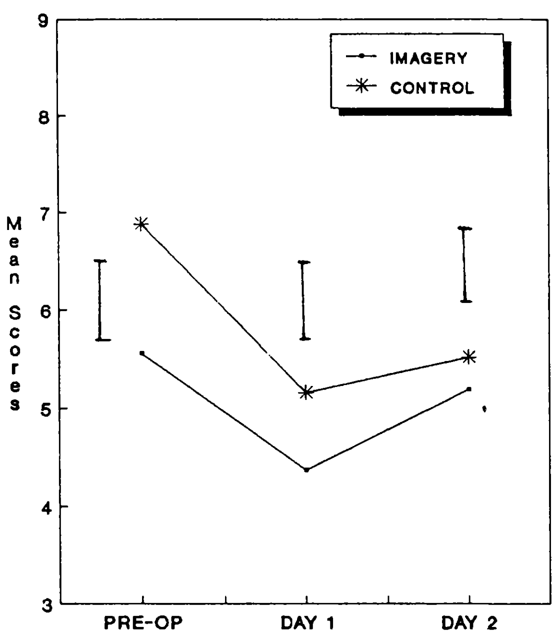


FIG. 7.13 Effects of tapes

AROUSAL MEAN SCORES PRE-OPERATIVELY
AND ON SUCCESSIVE DAYS

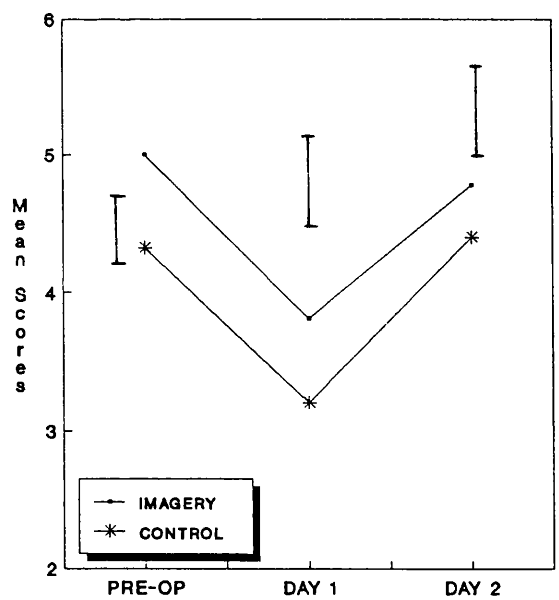


FIG. 7.14 Effects of tapes
Bars show SEDs from relevant ANOVAs
for comparisons between groups

PAIN INTENSITY MEAN SCORES
PRE-OPERATIVELY AND ON SUCCESSIVE DAYS

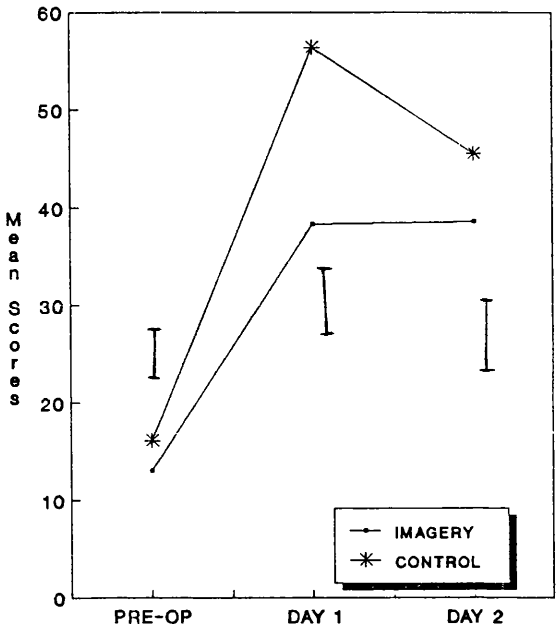


FIG. 7.15 Effects of tapes

PAIN DISTRESS MEAN SCORES
PRE-OPERATIVELY AND ON SUCCESSIVE DAYS

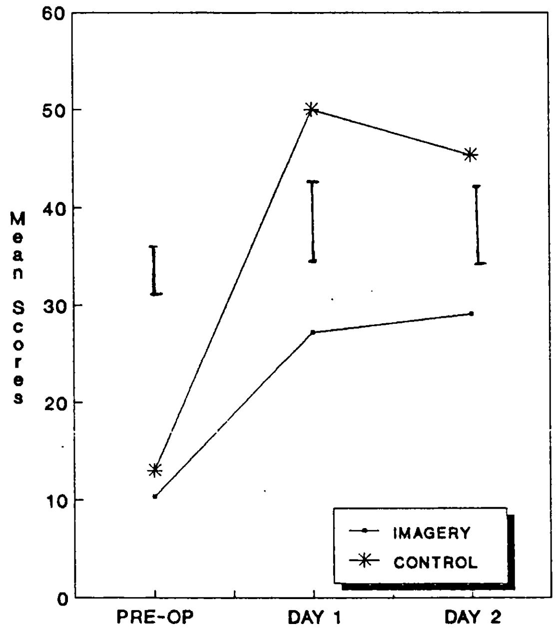


FIG. 7.16 Effects of tapes

PAIN COPING MEAN SCORES
PRE-OPERATIVELY AND ON SUCCESSIVE DAYS

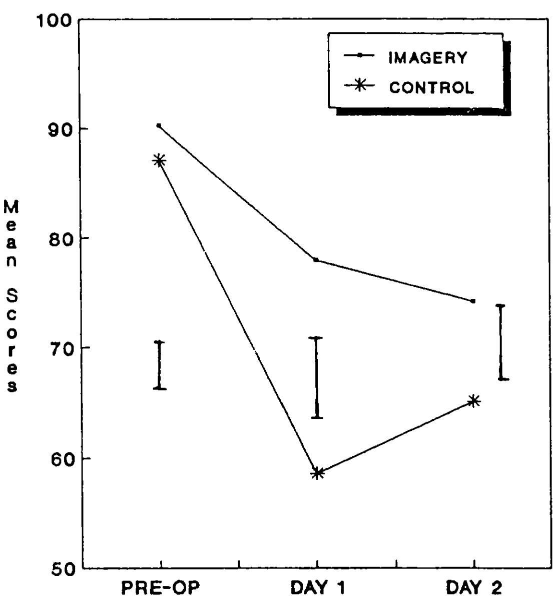


FIG. 7.17 Effects of tapes
Bars show SEDs from relevant ANOVAs
for comparisons between groups

Effects on any of the coping scales could not be detected (ps > 0.10). Oral analgesia intake post-operatively was less in the relaxation with imagery group than the controls (means= 1 vs 2.26; $F(1,46) = 4.83$, $p < 0.05$).

7.4.7 Correlations

7.4.7.1 Endocrine levels with personality measures

Type A personality was not related to any of the plasma hormone levels ($ps > 0.05$). Noradrenaline levels were correlated with desire for control of health care (DCON) pre-operatively ($r = 0.30$, $p < 0.05$), at induction ($r = 0.29$, $p < 0.05$) and at recovery ($r = 0.32$, $p < 0.05$).

Similar associations emerged with the Krantz Health Opinion Survey; noradrenaline levels were related to desire to be informed about medical decisions pre-operatively ($r = 0.38$, $p < 0.01$), at induction ($r = 0.32$, $p < 0.05$) and to desire for behaviour involvement in health care at induction ($r = 0.32$, $p < 0.05$). The only relationship between Trait anxiety and noradrenaline levels appeared at recovery ($r = 0.28$, $p < 0.05$).

Adrenaline levels were correlated pre-operatively with desire for control of health care ($r = 0.31$, $p < 0.05$) and desire to be informed about medical decisions ($r = 0.35$, $p < 0.01$); at induction with Trait anxiety ($r = 0.28$, $p < 0.05$) and chance locus of control ($r = -.36$, $p < 0.01$). The only association with cortisol levels appeared pre-operatively with internal locus of control ($r = -.41$, $p < 0.01$).

7.4.7.2 Endocrine levels with pre-operative state

None of the questionnaire measures showed any relationships with adrenaline levels. There were also no significant correlations of Recovery Inventory and pain distress with any of the plasma hormone levels. Only cortisol had moderate associations. Cortisol levels pre-operatively were related to pain intensity ($r = 0.33$, $p < 0.05$), pain coping ($r = -.37$, $p < 0.01$), state anxiety ($r = 0.29$, $p < 0.05$) and arousal ($r = 0.33$, $p < 0.05$). At induction cortisol levels were associated with stress ($r = 0.32$, $p < 0.05$). Correlations with noradrenaline levels were restricted to arousal, relationships emerged pre-operatively ($r = 0.36$, $p < 0.01$) and at induction ($r = 0.32$, $p < 0.05$).

7.4.7.3 Endocrine levels with coping measures

Table 7.5 shows that pre-operatively, adrenaline levels were correlated with worry, suppression, behaviour action, active behaviour and emotion focusing. At induction the associations with adrenaline levels were more modest and were with worry, suppression, active coping, problem focusing, emotion focusing and avoidance.

Noradrenaline levels were marginally related pre-operatively with suppression, behaviour action and active behaviour and at recovery with emotion focusing and

Table 7.5

Correlations between Coping Measures and Transformed Plasma Hormone Levels Pre- and Post-operatively

	Pre-op	Induction	Recovery
Adrenaline			
Worry	.28	-	.54*
Suppression	.35*	-	.39*
Behaviour action	.27	-	-
Active behaviour	.27	-	-
Active coping	-	-	.43*
Problem focusing	-	-	.34
Emotion focusing	.32	-	.46*
Avoidance	-	-	.31
Noradrenaline			
Suppression	.29	-	-
Behaviour action	.34	-	-
Active behaviour	.29	-	-
Emotion focusing	-	-	.35*
Avoidance	-	-	.29
Cortisol			
Worry	-	.36*	.32
Active behaviour	-	.32	-

\- = not significant
< 0.27 = $p < 0.05$
< 0.35 = $p < 0.01$

avoidance. The relationships with cortisol levels were limited to worry at induction and at recovery and to active behaviour at induction.

7.4.7.4 Coping measures with personality measures

Type A personality and trait anxiety were unrelated to any of the coping measures. Correlations with powerful others locus of control were marginal and emerged with active behaviour ($r = -.28$, $p < 0.05$), avoidance ($r = 0.29$, $p < 0.05$) and emotion focusing ($r = 0.33$, $p < 0.05$). Relationships with desire for control of health care were also minimum and appeared with suppression ($r = 0.29$, $p < 0.05$), active coping ($r = 0.34$, $p < 0.05$) and problem focusing ($r = 0.27$, $p < 0.05$). The desire to be informed about medical decisions was moderately related to worry ($r = 0.40$, $p < 0.01$), active coping ($r = 0.29$, $p < 0.05$), active behaviour ($r = 0.46$, $p < 0.01$) and problem focusing ($r = 0.46$, $p < 0.01$).

7.4.7.5 Coping measures with pre and post-operative state

Most of the coping measures failed to show any relationships with pre- and post-operative state. Correlations with denial appeared post-operatively; on the first day with pain intensity ($r = -.28$, $p < 0.05$) and pain distress ($r = -.32$, $p < 0.05$); on the second post-operative day with pain intensity ($r = -.29$, $p < 0.05$), pain distress ($r = -.39$, $p < 0.01$), pain coping ($r = 0.37$, $p < 0.01$) and state anxiety ($r = -.40$, $p < 0.01$).

Other associations that emerged were between avoidance and arousal pre-operatively (r = 0.27, p < 0.05) and on the first post-operative day (r = 0.28, p < 0.05; and between behaviour action and pain intensity pre-operatively (r = 0.28, p < 0.05).

7.4.7.6 Questionnaire measures pre- and post-operatively

Pain intensity, pain distress and pain coping tended to intercorrelate throughout as did somatic state (RI) and state anxiety. Stress was unrelated to somatic state pre-operatively but subsequently intercorrelations emerged. Although arousal was related to state anxiety throughout, it was largely unrelated to all the other measures. Table 7.6 shows the correlations on every occasion.

7.4.7.7 Among personality measures

Most of the personality measures were unrelated to each other. Powerful others locus of control was correlated with desire for control of health care (r = -.37, p < 0.01), desire to be informed of medical decisions (r = 0.33, p < 0.05) and desire to be behaviourally involved with health care (r = -.57, p < 0.01). Desire for control of health care was related to desire to be informed of medical decisions (r = 0.59, p < 0.01) and desire to be behaviourally involved in health care (r = 0.37, p < 0.01).

Table 7.6

Intercorrelations between questionnaire measures pre-operatively and on post-operative days

	Recov	Pain Intens	Distr	Cop	Anx	Stres	Arous
Pre-op							
Recovery	-						
Pain intensity	-.39*	-					
Pain distress	-.31	.86*	-				
Pain coping	.50*	-.64*	-.57*	-			
State anxiety	-.47*	-	-	-.28	-		
Stress	-	-	-	-	.61*	-	
Arousal	-	-	-	-	.42*	.32	-
Post-op Day 1							
Recovery	-						
Pain intensity	-.44*	-					
Pain distress	-.46*	.88*	-				
Pain coping	.58*	-.71*	-.65*	-			
State anxiety	-.51*	.48*	.52*	.53*	-		
Stress	.30	-	-	-	-	-	
Arousal	-	-	-	-	.35*	-	-
Post-op Day 2							
Recovery	-						
Pain intensity	-.30	-					
Pain distress	-.30	.86*	-				
Pain coping	.43*	-.59*	-.67*	-			
State anxiety	-.52*	.58*	.58*	-.61*	-		
Stress	.44*	-	-	-	-	-	
Arousal	-	-	-	-	.34	-	-

\- = not significant
< 0.27 = p < 0.05
< 0.35 = p < 0.01
Recov = Recovery Inventory; Intens, Distr, Cop = Pain Intensity, Distress, Coping; Anx = State anxiety; Stres = Stress; Arous = Arousal

7.4.7.8 Outcome measures with personality measures

Desire for control of health care (DCON), trait anxiety and internal locus of control were unrelated to any of the questionnaire measures before and after surgery. Marginal correlations appeared between chance locus of control and state anxiety on the second post-operative day (r = 0.33, p < 0.05); powerful others locus of control and stress on the first post-operative day (r = 0.34, p < 0.05) and desire to be informed of medical decisions and stress on the second post-operative day (r = -.28, p < 0.05). Associations with Type A personality were moderate and only emerged on the second post-operative day with Recovery Inventory (r = 0.27, p < 0.05), pain intensity (r = -.29, p < 0.05) and pain coping (r = 0.40, p < 0.01)

7.5 Discussion

The main purpose of this study was to investigate whether relaxation with imagery, could reduce both subjective and endocrine responses to surgery and give patients a better way of coping and whether this led to a better recovery after surgery than the control group.

The relaxation with imagery tape was listened to more often than the control tape and the group rated the relaxation with imagery tape as more helpful. Many patients requested personal copies at the end of the study and said they were likely to use the relaxation with imagery tape in future.

Patients who received relaxation with imagery displayed higher levels of noradrenaline and yet lower levels of cortisol than the control group. The noradrenaline changes are similar to changes obtained in autonomic reactivity as a function of strength of perceived self-control (Frankenhaeuser, 1983) but not to those of others (Bandura et al., 1985). Wilson's (1981) finding that patients trained in relaxation techniques had raised adrenaline levels and faster recovery patterns was interpreted as due to the increased sense of energy and activity. This greater activity may have been the critical component in achieving faster recovery. This speculation could therefore, be applied to our own results of higher noradrenaline levels.

Results of the present study lend further support to the view that perceived self-control operates as a cognitive mediator of stress reactions. Frankenhaeuser (1983) reported that during low-control tasks which induced distress, adrenaline and cortisol increased. During the high-control task which induced effort but no distress adrenaline increased whereas cortisol fell. In the present study, noradrenaline levels were higher while cortisol levels were lower in the relaxation with imagery patients than in the controls. Therefore, it is plausible to speculate that the effort required in the relaxation with imagery group was accompanied by noradrenaline increase, whereas the feelings of control in these patients was reflected in the decrease of cortisol. This increase versus decrease in hormonal levels depending upon whether controllability is high or low has been demonstrated in animal work (e.g. Mason, 1968; Levine, Weinberg and Brett, 1979).

Some researchers (Ursin et al., 1978) identified a "cortisol factor" and a "catecholamine factor" by factor analysis of data from a study of parachute trainees. Ursin et al., (1978) identified distress related cortisol responses which diminished with adaptation to the experience of multiple jumps and performance related factors involving catecholamine secretions which were consistent over many jumps. Cortisol rises were associated with defensiveness and poor performance, whereas catecholamine rises were associated with good performance. In a more general way, the results from this study also fit the animal model proposed by Henry and Stephens (1977) according to which the sympathetic-adrenal system is activated when the organism is challenged in its control of the environment, whereas the pituitary-adrenal system is associated with the conservation-withdrawal response.

Interestingly, relaxation with imagery also had an effect on cardiovascular reactivity. Blood pressure and heart rate declined more in the relaxation with imagery group than in the control group; diastolic blood pressure was lower immediately after first listening to the tapes, on the morning before surgery and on the first morning after surgery. Heart rate was also lower on the morning before surgery in the relaxation with imagery group. Studies which have examined the effect of control on cardiovascular reactions have found that lack of control was associated with greater increases in systolic blood pressure and heart rate (Obrist et al., 1978; Light and Obrist, 1980).

The effects of relaxation with imagery are not only manifest in terms of cardiovascular and endocrine responses. Patients who listened to the relaxation with imagery tape reported less pain intensity, less pain distress and better pain coping; and somatic state (RI) was better than those who listened to the control tape. Thompson (1981) has however, pointed out that while belief in behavioural control tends to increase tolerance of painful stimuli, its effects on self-reported distress and physiological responses when actually encountering aversive events are equivocal.

The findings on analgesia intake also calls for some interpretation. The group which had relaxation with imagery tape took significantly less pain medications than did the controls. Their reporting of less pain intensity, less pain distress and better pain coping with imagery procedure might have served to reduce their sensitivity to pain stimuli as they felt more prepared to cope with the pain.

Examination of the relationships between endocrine levels and personality measures revealed that adrenaline and noradrenaline levels (which have already been implicated in effort without distress) were associated with desire for control of health care (DCON) and desire to be informed about medical decisions. From a conceptual point of view therefore, the desire for control of health care (DCON) and desire to be informed about medical decisions bears some resemblance with effects of the relaxation with imagery tape, which possibly gave patients greater belief in perceived personal control. Internal locus of control was correlated with lower levels of cortisol. Other studies have shown that greater belief in perceived personal control, (internal locus of control) is related to more beneficial outcomes (Bulman and Wortman, 1977; Wallston and Wallston, 1978; Shadish, Hickman and Avrick, 1981; Wallston et al., 1987; Partridge and Johnston, 1989) although they did not study endocrine responses.

Higher levels of cortisol were also related to more pain intensity and pain distress, less pain coping, greater arousal, stress and anxiety levels, while the catecholamines were associated with active coping strategies of emotion focusing, behaviour action and suppression. More Type A was related to better somatic state, less pain intensity and better pain coping. This result is hardly surprising since Type A personalities believe that they are able to exercise control over potential threats (Glass, 1977, 1985).

Overall, the study suggests that behavioural interventions can offer a necessary and effective management technique for reducing surgical stress. A detailed comparison between the results in this study and those in chapter 6 is found in the concluding chapter (9)

7.6 Conclusion

In the current study an imagery relaxation technique was used as a mental rehearsal for dealing with feared and painful surgical procedures pre-operatively and post-operatively. Our findings have important clinical implications which rest on the argument that biochemical measures should be used together with other more valid indicators of surgical stress such as self-report measures or the behavioural measure of request for analgesia medication, or the physiological measures of heart rate and blood pressure. Therefore, results of these studies suggest that where a psychological method is geared to improve recovery from surgery it may subsequently raise the catecholamine responses while the cortisol levels either decline or remain unchanged. Further research along these lines is clearly warranted. There is little doubt that there is much yet to be discovered.

CHAPTER EIGHT

SUMMARY AND CONCLUSIONS

Studies of patients undergoing elective abdominal surgery were carried out in order to examine the psychological and physiological reactions associated with surgery. Measures used to assess recovery from surgical stress were presented in chapter 3. The possible relationships between state anxiety, emotional and physical recovery from both major and minor surgery was examined in chapter 4.

The effectiveness of a psychological procedure (relaxation training) in reducing the stress response to major surgery was examined in chapter 5. Chapter 6 looked at the effects of pre-operative psychological preparation (relaxation training) on endocrine responces to major and minor surgery. Following on from the theme that post-operative recovery of surgical patients can be facilitated by special psychological preparation pre- and post-operatively, endocrine mechanisms which may account for this were studied.

Following on from the results of the previous study, the study in chapter 7 tested the ability of a different psychological preparation (relaxation with imagery) to influence the endocrine responses to and recovery from minor surgery. This particular intervention was designed to make patients feel in control by rehearsing pre-operatively the distressing factors surrounding surgery.

Each chapter gives a detailed discussion of its findings. Therefore chapter 8 will only discuss the major findings.

8.1 Effects of psychological preparation for surgery

Two intervention methods were used, relaxation training and relaxation training with imagery. Procedural general information was given as a control for both interventions, as it has been shown that such information has little or no effect (Auerbach, 1989). The effect of intervention on several psychological parameters was investigated. In particular, the effect of psychological interventions on endocrine responses represent an advance that has not been adequately investigated.

8.1.1 Relaxation training

The most important finding was that in patients who had minor abdominal operations, adrenaline and cortisol levels increased significantly during surgery in patients who had listened to a relaxation tape pre-operatively, whereas they were unaffected or tended to decline in control patients who heard general information. Therefore, although the relaxation and control groups had similar cortisol levels at induction, levels were greater in the relaxation group than the controls immediately after surgery. For adrenaline the extent to which the effect of relaxation reflected a similar elevation in levels in recovery or a lowering of levels at induction was not clear because group comparisons did not reach significance on either occasion. Although the endocrine measures can be regarded as indices of surgical stress (Ellis and Humphrey, 1982; Salo, 1982b) these results suggest that pre-operative relaxation increased endocrine responses. Other differences which emerged between the relaxation and control groups were that relaxed patients were less anxious before and after surgery, their heart rate and blood pressure were lower throughout, and they received fewer oral analgesics post-operatively. These results are consistent with previous reports which have shown that pre-operative preparation can improve subjective state while increasing urinary adrenaline or cortisol levels on days following surgery (Wilson, 1981; Salmon et al., 1986). Because of the level of trauma involved in major surgery, the endocrine results which emerged with minor surgical patients were not found in patients who had major surgery.

The association of increased stress hormone circulation with decreased subjective stress is also in line with existing, correlational evidence. In patients undergoing major abdominal surgery, pre-operative distress (state-anxiety or pain ratings) correlated with lower circulating levels of adrenaline and cortisol post-operatively (Salmon et al., 1988). A similar, negative correlation has been found between trait-anxiety and the same endocrine measures (Salmon et al., 1989). A possible explanation for these findings is that pre-operative anxiety directly reduces adrenaline and cortisol responses. Alternatively, the findings might reflect the influence of another factor which is correlated with anxiety. Janis' (1958) concept of 'worry' which he proposed represented cognitive preparation for surgery and which reduced its stressfulness could be the factor. Anxiety has often been regarded as an index of this state. However, the 'worry' scale of the coping questionnaire provided no evidence of any effect of relaxation on coping although it correlated (positively) with pre-operative anxiety and (negatively) with cortisol levels in recovery.

Although very little evidence has so far supported Janis' theory, the use of physiological indices of the stress response has provided evidence consistent with his theory. Further studies are required in order to show the extent to which these results can be generalized to other forms of operations and pre-operative preparations.

8.1.2 Relaxation with imagery

Relaxation with imagery was examined in another comparative study of patients undergoing minor abdominal surgery. The study investigated whether promoting the patient's "sense of control" would result in a smoother recovery. Results were somewhat similar to the minor surgery study (chapter 6). Patients who listened to the relaxation with imagery tape had a better recovery than the control in that they reported less pain intensity, less pain distress and better pain coping. Somatic state (RI) was also improved and patients requested less analgesia. One of the main differences between this study and the previous study is that, the relaxation study found no effect on pain, while the relaxation with imagery study found no effect on state anxiety.

Blood pressure and heart rate declined in the relaxation with imagery group by comparison with the control group. Diastolic blood pressure was lower immediately after listening to the tapes for the first time, on the morning of surgery, and on the first morning after surgery, while heart rate was lower on the morning before surgery in the relaxation with imagery group than the control.

A major finding of this study is that patients who received relaxation with imagery displayed higher levels of plasma noradrenaline and lower levels of cortisol than the control group. In the review of the literature it is suggested that a rise in hormones is a normal response to surgery. But why a relaxation with imagery procedure should produce increased noradrenaline levels and lower cortisol levels bears some consideration. The findings are certainly not easy to explain, but the answer may lie in the "distress" factor and the "effort" factor reported by Frankenhaeuser et al., (1980). They suggested that when there is effort without distress, only catecholamines increased. In both minor surgery patients in chapter 6 (adrenaline) and chapter 7 (noradrenaline) the catecholamines were higher. This probably shows that patients with increased catecholamines are less distressed than patients with lower levels. These catecholamines are higher either due to the effort involved in achieving a smoother recovery or to the feeling of being in control.

A different theoretical framework leads to a similar explanation. Janis (1958) argued that the stressfulness of surgery could be reduced if patients pre-operatively were helped to engage in a process of actively thinking about and 'working through' impending events, which he termed the 'work of worry'. In relaxation with imagery patients were made to feel in control by rehearsing pre-operatively the distressing factors surrounding surgery. While this process reduced distress (pain intensity and pain distress) and had no effect on state anxiety, Janis had suggested that a similar process (working through) would be facilitated by moderate levels of anxiety, but hampered when anxiety was intense or very low.

Although Janis did not use endocrine changes as an index of the stressfulness of surgery, his theory does explain the findings which have been obtained with them: adrenaline and cortisol levels are increased when patients are relaxed, while noradrenaline is increased and cortisol levels reduced where patients are given relaxation with imagery. On this reasoning also, therefore, preparation should emphasize the source of distress and discomfort which occur and guide patients to think actively about them in a way which defuse the threat they present.

Clearly, in these studies where relaxation or relaxation with imagery has been systematically contrasted with general information, it has been proved to be more helpful in aiding recovery. Limitations to the designs however, open the experiments to two criticisms. First, because of the absence of a no-treatment control, the results could be attributed to the control procedure rather than relaxation. This is unlikely in view of evidence that the kind of general procedural information which the control tape gave does not have consistent effects on recovery from inpatient surgical procedures (Aiken and Henrichs, 1971). Second, because of the absence of a control with matched credibility to relaxation (patients evidently preferred the relaxation tape and used it more) and since patients' expectations of improvement are known to enhance the physiological benefits of relaxation training (Wadden, 1984) an expectancy-mediated effect on anxiety and blood pressure is a possible alternative to a specific effect of relaxation. Overall, conclusions can still be drawn with greater confidence that relaxation and relaxation with imagery are superior in reducing subjective pain, anxiety and need for analgesia following surgery.

8.2 Which method is more effective: Relaxation or Relaxation with imagery

Hathaway (1986) described the merit of combining different types of interventions into a single package in an attempt to strengthen the effect of preparation. Weinman and Johnston (1990) have reviewed preparation studies using different approaches in order to separate out their effects. They re-evaluated a number of preparation studies so that they could determine which forms of preparation tend to influence which aspects of recovery. This analysis of "inputs" and "outputs" as described by Johnston (1988) seems likely to add to our understanding of which symptoms might be modified by which methods. In future practice we can always choose to combine different methods of preparation in the most effective way so as to enhance post-operative recovery. Results of minor surgery in chapters 6 and 7 were therefore, compared in order to separate their effects. Table 8.1 presents percentage change from control values of the relaxation and relaxation with imagery. With subjective measures, relaxation with imagery was more

Table 8.1

Relaxation vs Relaxation with imagery and their effects on different outcome measures.

		% change from control values	
		Relaxation	Relaxation with imagery
Outcome measures			
Post-op			
State anxiety	day 1	-16.9%	-9.5%
	day 2	-3.0%	-4.2%
Pain intensity	day 1	-8.3%	-34.4%
	day 2	-14.0%	-17.6%
Pain distress	day 1	-14.7%	-50.2%
	day 2	-5.8%	-39.2%
Recovery	day 1	5.4%	-12.8%
Inventory	day 2	5.4%	-3.0%
Systolic Bp	Post-test	-4.3%	-4.4%
	18.00hr	-7.5%	-2.1%
	06.00hr	-6.9%	-4.1%
	surgery	-7.2%	-0.1%
	06.00hr	-9.8%	-4.4%
Diastolic Bp	Post-test	-1.5%	-5.4%
	18.00hr	-7.2%	-0.8%
	06.00hr	-2.4%	-10.5%
	surgery	-6.3%	2.6%
	06.00hr	-0.6%	-5.4%
Heart rate	Post-test	-6.0%	3.5%
	18.00hr	0.9%	-2.9%
	06.00hr	-0.3%	-9.0%
	surgery	-7.6%	1.6%
	06.00hr	1.6%	-4.1%
Adrenaline	Induction	27.7%	-7.8%
	Recovery	-36.3%	-17.7%
Noradrenaline	Induction	-12.6%	-33.6%
	Recovery	-14.6%	-47.6%
Cortisol	Induction	1.7%	8.6%
	Recovery	-7.1%	8.7%
Pain relief		-59.1%	-55.8%

successful in achieving a better recovery from surgery. Relaxation training was however, more effective in reducing cardiovascular measures. Of particular note is the profound effect of relaxation training on reducing systolic and diastolic blood pressure and heart rate during surgery. Its most consistent effect was in decreasing systolic blood pressure on all occasions it was measured and state axiety on the first post-operative day.

Relaxation with imagery had the effect of reducing cortisol and increasing noradrenaline levels while relaxation training alone increased both adrenaline and cortisol levels. Frankenhaeuser and Lundberg (1982) suggested that distressing tasks may produce rises in cortisol levels. Because relaxation with imagery actually reduced cortisol levels, this could be interpreted to mean that patients in this group were less or not distressed.

This kind of analysis suggests that subjective emotional states may be influenced more by a combination of relaxation and imagery. But, why the relaxation with imagery procedure might be more effective bears further consideration based on the patient involvement in the technique used. With imagery, effort is directed towards helping the patient appraise events before-hand, dispel unwarranted assumptions or enhance self-efficacy. The patient thus, rehearses beforehand the event in which s\he must play an active role, which provides the patient with a feeling of control.

This analysis also suggests that some interventions can be targeted on particular outcomes where they will be more effective. Table 8.1 for instance, shows that relaxation alone can be targeted to state anxiety, blood pressure and heart rate. Alleviation of some distressing factors would therefore, benefit from such specific targeting of intervention on outcome measures.

Results like these however, need to be replicated as there has been no similar research done before which examined the effects of psychological interventions on plasma endocrine responses to surgery. We have seen that endocrine responses to surgery are a complex issue. Defining whether higher or lower levels are good or bad adjustment will have to also depend on what is happening to other measures such as blood pressure, heart rate, state anxiety, reports of distress (pain intensity, pain distress), use of analgesia and length of hospital stay, as lower levels of these are associated with a smoother outcome. A question which needs to be addressed as a result of these findings is 'How far can one alter outcome?'

8.3 Implication of the Research

The results of this thesis suggest that psychological preparation can indeed aid emotional adjustment and recovery. The most effective type of intervention has been to provide patients with instruction in some form of cognitive strategy for managing physical or emotional distress associated with hospitalization and surgery. In a hospital setting the nurse is the most appropriate agent to provide patients with teaching about surgery, recovery, behavioural action, cognitive coping particularly pre-operatively and pain relief. Undoubtedly, the amount of time required will be a source of difficulty. But it has been shown (Lindeman, 1972) that group instruction can be as or more valuable than individual preparation and this may aid in the incorporation of such group meetings into the ward routine.

The endocrine studies in this thesis showed that psychological methods which reduce stress may increase endocrine levels (cortisol and adrenaline in chapter 6 and noradrenaline in chapter 7). It is hoped that these results may lead to a better understanding of the management of surgical stress.

In concluding this chapter, it is suggested that at a theoretical level, further investigations should be carried out to examine other intervention methods and their effects on endocrine responses to surgery. At a practical level, these results have implications for understanding the interaction between physiological, behavioural and cognitive responses under surgical stress. Fundamental to an understanding of stress and its application to surgical stress, is an appreciation of the various types of stressors encountered by hospitalized patients. The recognition of the interrelationships is important, but it is also necessary to be able to isolate specific factors which may cause stress and learn how to reduce these.

The results in this thesis are consistent with a model proposing that relaxation with imagery benefits patients by reducing their distress (pain, blood pressure, heart rate and cortisol levels) and increasing their feelings of being in control and their ability to actively and energetically cope with the stress of surgery (Frankenhaeuser and Lundberg, 1982).

Finally, the results also have implications for the development of intervention programmes. The emphasis in the research on pre-operative preparation for surgery has to be geared towards the application of therapy techniques to specific problem situations which are often confronted by surgical patients. Such psychological procedures have after all been shown to have no deleterious side effects (Wilson, 1981) and can produce effective outcomes.

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APPENDICES

4.1 Outline for questionnaires

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Effects of control tape on cortisol levels

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7.3 Transcript of the relaxation with imager tape

7.4 Assessment questionnaire for relaxation with imagery group

8. Publications originating from this thesis

Appendix 4.1

Survey of Responses to Surgery

Each week, one or two patients are being asked to help us with this survey. This involves filling in a number of questionnaires about your feelings before and after the operation.

The results of this study will help us to give better advice to future patients about what to expect when they come into hospital.

We hope that you will feel able to take part. Whether you do or do not , however, will not affect your care.

ALL INFORMATION WILL, OF COURSE, BE STRICTLY CONFIDENTIAL.

DIRECTIONS: This is a questionnaire to find out how people view important health-related issues. Each item is a brief statement with which you may agree or disagree. Beside each one is a scale which ranges from strongly disagree (1) to strongly agree (6). For each item please circle the number that represents the extent to which you disagree or agree with it. The more strongly you agree with a statement, then the higher will be the number you circle. The more strongly you disagree with a statement, then the lower will be the number you circle. Please make sure that you answer every item and that you circle only one number per item. This is a measure of your personal beliefs; there are no right or wrong answers.

Please answer carefully, but do not spend too much time on any one item. As much as you can, try to respond to each item independently. When making your choice, do not be influenced by your previous choices. It is important that you tell us what you actually think and not what you feel you "should believe", or what you think we want you to believe!

	Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
1. If I get ill, I have the power to make myself well again.......................	1	2	3	4	5	6
2. Often I feel that no matter what I do, if I am going to get ill, I will get ill.............	1	2	3	4	5	6
3. If I see an excellent doctor regularly, I am less likely to have health problems.............	1	2	3	4	5	6
4. It seems that my health is greatly influenced by accidental happenings..................	1	2	3	4	5	6
5. I can only maintain my health by consulting health professionals......................	1	2	3	4	5	6
6. I am directly responsible for my health..............	1	2	3	4	5	6
7. Other people play a big part in whether I stay healthy or become ill.................	1	2	3	4	5	6
8. Whatever goes wrong with my health is my own fault.............................	1	2	3	4	5	6
9. When I am ill, I just have to let nature run its course...........................	1	2	3	4	5	6
10. Health professionals keep me healthy.................	1	2	3	4	5	6
11. When I stay healthy, I'm just plain lucky............	1	2	3	4	5	6
12. My physical well-being depends on how well I take care of myself......................	1	2	3	4	5	6
13. When I feel ill, I know it is because I have not been taking care of myself properly..........	1	2	3	4	5	6
14. The type of care I receive from other people is what is reponsible for how well I recover from an illness..	1	2	3	4	5	6
15. Even when I take care of myself, it's easy to get ill.	1	2	3	4	5	6
16. When I become ill, it's a matter of fate.............	1	2	3	4	5	6
17. I can pretty much stay healthy by taking good care of myself..........................	1	2	3	4	5	6
18. Following doctor's orders to the letter is the best way for me to stay healthy................	1	2	3	4	5	6

DIRECTIONS: This is a questionnaire designed to determine the way in which different people view certain important health-related issues. Each item is a brief statement with which you may agree or disagree. Beside each statement is a scale which ranges from strongly disagree (1) to strongly agree (6). For each item we would like you to circle the number that represents the extent to which you disagree or agree with the statement. The more strongly you agree with a statement, then the higher will be the number you circle. The more strongly you disagree with a statement, then the lower will be the number you circle. Please make sure that you answer every item and that you circle only one number per item. This is a measure of your personal beliefs; obviously, there are no right or wrong answers.

Please answer these items carefully, but do not spend too much time on any one item. As much as you can, try to respond to each item independently. When making your choice, do not be influenced by your previous choices. It is important that you respond according to your actual beliefs and not according to how you feel you should believe or how you think we want you to believe.

	Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
1. If I get sick, it is my own behaviour which determines how soon I get well again	1	2	3	4	5	6
2. No matter what I do, if I am going to be sick, I will get sick	1	2	3	4	5	6
3. Having a regular contact with my physician is the best way for me to avoid illness	1	2	3	4	5	6
4. Most things that affect my health happen to me by accident	1	2	3	4	5	6
5. Whenever I don't feel well, I should consult a medically trained professional	1	2	3	4	5	6
6. I am in control of my health	1	2	3	4	5	6
7. My family has a lot to do with my becoming sick or staying healthy	1	2	3	4	5	6
8. When I get sick I am to blame	1	2	3	4	5	6
9. Luck plays a big part in determining how soon I will recover from an illness	1	2	3	4	5	6
10. Health professionals control my health	1	2	3	4	5	6
11. My good health is largely a matter of good fortune	1	2	3	4	5	6
12. The main thing which affects my health is what I myself do	1	2	3	4	5	6
13. If I take care of myself, I can avoid illness	1	2	3	4	5	6
14. When I recover from an illness, it's usually because other people (for example, doctors, nurses, family, friends) have been taking good care of me	1	2	3	4	5	6
15. No matter what I do, I'm likely to get sick	1	2	3	4	5	6
16. If it's meant to be, I will stay healthy	1	2	3	4	5	6
17. If I take the right actions, I can stay healthy	1	2	3	4	5	6
18. Regarding my health, I can only do what my doctor tells me to do	1	2	3	4	5	6

THE KRANTZ HEALTH OPINION SURVEY

Here are some statements about medical care. For each one please show whether you agree or disagree by placing a tick in the box under Agree or Disagree..

		Agree	Disagree
1.	I usually don't ask the doctor or nurse many questions about what they're doing during a medical examination.	☐	☐
2.	I'd rather have doctors and nurses make the decisions about what's best than for them to give me a whole of lot of choices.	☐	☐
3.	Instead of waiting for them to tell me, I usually ask the doctor or nurse immediately after an exam about my health.	☐	☐
4.	I usually ask the doctor or nurse lots of questions about the procedures during a medical examination.	☐	☐
5.	It is better to trust the doctor or nurse in charge of a medical procedure than to question what they are doing.	☐	☐
6.	I usually wait for the doctor or nurse to tell me the results of a medical examination rather than asking them immediately.	☐	☐
7.	I'd rather be given many choices about what's best for my health than to have the doctor make decisions for me.	☐	☐
8.	Except for serious illness, it's generally better to take care of your own health than to seek professional help.	☐	☐
9.	It is better to rely on the judgements of doctors (who are the experts) than to rely on "common sense" in taking care of your own body.	☐	☐
10.	Clinics and hospitals are good placed to go for help since it's best for medical experts to take responsibility for health care.	☐	☐
11.	Learning how to cure some of your own illness without contacting a physician is a good idea.	☐	☐
12.	It's almost always better to seek professional help than to try to treat yourself.	☐	☐
13.	Learning how to cure some of your illness without contacting a physician may create more harm than good.	☐	☐
14.	Recovery is usually quicker under the care of a doctor or nurse than when patients take care of themselves.	☐	☐
15.	If it costs the same, I'd rather have a doctor or nurse give me treatments than to do the same treatments myself.	☐	☐
16.	It is better to rely less on physicians and more on your own common sense when it comes to caring for your own body.	☐	☐

Appendix 4.5

DCON

Indicate the extent to which you agree or disagree with the following statements. Think of these in trems of what you want as a patient in (a specific health care situation).

	Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
1. I want to have a say in what will be done to me.	1	2	3	4	5	6
2. I want the doctors and nurses to decide what is best for me.	1	2	3	4	5	6
3. I want to know in advance which procedures will be used	1	2	3	4	5	6
4. I want to influence the kind of care I get.	1	2	3	4	5	6
5. I do not want to know in advance what the procedures will feel like.	1	2	3	4	5	6
6. I want to know what the procedures will do to me.	1	2	3	4	5	6
7. I want to have a say in what procedures I will get.	1	2	3	4	5	6

Below are 14 pairs of adjectives or phrases separated by a 7 point rating scale. Each pair represents two kinds of contrasting behaviour and each of us belongs somewhere along the line between these two extremes. For example, most of us are neither the most competitive nor the least competitive person we know. Please indicate on the scale below where you think you belong between these two extremes.

1. Never late for appointments	:__:__:__:__:__:__:__:	Casual about appointments
2. Not competitive	:__:__:__:__:__:__:__:	Very competitive
3. Anticipates what others are going to say (nods, interrupts, finishes for them)	:__:__:__:__:__:__:__:	Good listener, hears others out
4. Always rushed	:__:__:__:__:__:__:__:	Never feels rushed even under pressure
5. Can wait patiently	:__:__:__:__:__:__:__:	Impatient when waiting
6. Goes 'all out'	:__:__:__:__:__:__:__:	Casual
7. Takes things one at a time	:__:__:__:__:__:__:__:	Tries to do many things at once, thinks about what one is going to do next
8. Emphatic in speech (may pound desk)	:__:__:__:__:__:__:__:	Slow deliberate talker
9. Wants good job recognised by others	:__:__:__:__:__:__:__:	Only cares about satisfying oneself no matter what others may think
10. Fast (eating, walking etc)	:__:__:__:__:__:__:__:	Slow doing things
11. Easy going	:__:__:__:__:__:__:__:	Hard driving
12. 'Sits' on feelings	:__:__:__:__:__:__:__:	Expresses feelings
13. Many interests	:__:__:__:__:__:__:__:	Few interests outside work
14. Satisfied with job	:__:__:__:__:__:__:__:	Ambitious

DIRECTIONS: A number of statements which people use to describe themselves are given below. Read each statement and then circle a number to the right of the statement to show how you feel right now, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
1. I feel calm....................................	1	2	3	4
2. I feel secure..................................	1	2	3	4
3. I am tense.....................................	1	2	3	4
4. I am regretful.................................	1	2	3	4
5. I feel at ease.................................	1	2	3	4
6. I feel upset...................................	1	2	3	4
7. I am presently worrying over possible misfortunes	1	2	3	4
8. I feel rested..................................	1	2	3	4
9. I feel anxious.................................	1	2	3	4
10. I feel comfortable............................	1	2	3	4
11. I feel self-confident.........................	1	2	3	4
12. I feel nervous................................	1	2	3	4
13. I am jittery..................................	1	2	3	4
14. I feel 'high strung'..........................	1	2	3	4
15. I am relaxed..................................	1	2	3	4
16. I feel content................................	1	2	3	4
17. I am worried..................................	1	2	3	4
18. I feel over-excited and 'rattled'.............	1	2	3	4
19. I feel joyful.................................	1	2	3	4
20. I feel pleasant...............................	1	2	3	4

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you generally feel. There are no right and wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
1. I feel pleasant....................................	1	2	3	4
2. I tire quickly.....................................	1	2	3	4
3. I feel like crying.................................	1	2	3	4
4. I wish I could be happy as others seem to be.....	1	2	3	4
5. I am losing out on things because I can't make up my mind soon enough..............	1	2	3	4
6. I feel rested......................................	1	2	3	4
7. I am "calm, cool, and collected".................	1	2	3	4
8. I feel that dificulties are piling up so that I cannot overcome them	1	2	3	4
9. I worry too much over something that really doesn't matter	1	2	3	4
10. I am happy..	1	2	3	4
11. I am inclined to take things hard................	1	2	3	4
12. I lack self-confidence...........................	1	2	3	4
13. I feel secure.....................................	1	2	3	4
14. I try to avoid facing a crisis or difficulty.....	1	2	3	4
15. I feel sad..	1	2	3	4
16. I am content......................................	1	2	3	4
17. Some unimportant thought runs through my mind and bothers me..................	1	2	3	4
18. I take disappointments so keenly that I can't put them out of my mind	1	2	3	4
19. I am a steady person..............................	1	2	3	4
20. I get in a state of tension or turmoil as I think over my recent concerns and interests......	1	2	3	4

TO BE FILLED IN DAILY BEFORE LUNCH

For each item, please tick (✓) the column which best describes how this has felt since bedtime last night.

	Very Poor	Poor	Fair	Good	Very Good	Excellent
Sleep						
Appetite						
Strength and energy						
Stomach condition						
Bowel condition						
Ability to do things for myself						
Ability to get out of bed and move around by myself						
Interest in what's going on around me						

Appendix 4.10

TO BE FILLED IN DAILY BEFORE LUNCH

For each item, please tick (✓) the column which best describes how this has felt since bedtime last night.

	Not at all	A little/ slightly	A great deal/ quite a bit	Extreme/ could not have been worse
Pounding in Head				
Mouth Becoming Dry				
Flatulence (Wind)				
Heart Beating Louder				
Sweating in a Particular Part of the Body				
Blurring of Vision				
Breathing Becomes Faster				
Sweating All Over				
Heart Rate Increasing				
Stomach Churning				
Difficulty in Breathing				
Muscles Twitching or Jumping				
Feeling Hot All Over				
Feeling Faint				
Butterflies in Stomach				
Muscles in Neck Aching				
Tense Feeling in Jaw Muscles				
Blushing				
Dizziness				
Tense Feeling Across Forehead				
Hands Shaking				
Heart Missing Beats				
Pulse in Neck				
Everything Appearing Unreal				
Bladder Sensations				
Legs Feel Weak				
Nausea				
Pain or Ache in Stomach				
Difficulty in Swallowing				
Feeling Hot in a Particular Part of the Body				
Breathing Becomes Shallow				
Bowel Sensations				

Appendix 4.11

Here are some questions about the pain which you may have felt. Please answer each one.

1. The line represents a scale of increasing intensity of pain.

   Place a cross on the line at the point which best shows how intense your pain is at this moment.

   None At All ____ The Most Intense I Can Imagine

2. The line represents a scale of increasing distress caused by the pain.

   Place a cross on the line at the point which best shows how much distress the pain is causing you.

   None At All ____ The Most Distress I Can Imagine

3. The line represents a scale of increasing success in coping with the pain.

   Place a cross on the line at the point which best shows how well you are coping with the pain.

   None At All ____ Coped Completely

4. The line represents the strength of a pain killer.

   Place a cross at the point to show the strength of the pain killer you need.

   None At All ____ The Strongest possible

At All

Appendix 4.12

Here are some questions about the pain which the patient may be feeling. How much pain do you think the patient is feeling? Please answer each one. Your personal opinion is what we want.

1. The line represents a scale of increasing intensity of pain.

   Place a cross on the line at the point which best shows how intense the patient's pain is at this moment.

   None At All ________________________________ The Most Intense I Can Imagine

2. The line represents a scale of increasing distress caused by the pain.

   Place a cross on the line at the point which best shows how much distress the pain is causing the patient.

   None At All ________________________________ The Most Distress I Can Imagine

3. The line represents a scale of increasing success in coping with the pain.

   Place a cross on the line at the point which best shows how well the patient is coping with the pain.

   None At All ________________________________ Coped Completely

4. The line represents the strength of a pain killer.

   Place a cross on the line at the point to show the strength of the pain killer needed.

   None At All ________________________________ The Strongest Possible

Put a circle around the most appropriate answer

Indicate, for each item, how you feel at the moment.

vv v ? no - definitely feel

vv v ? no - feel slightly

vv v ? no - uncertain

vv v ? no - definitely do not feel

tense	vv	v	?	no	apprehensive	vv	v	?	no
alert	vv	v	?	no	idle	vv	v	?	no
cheerful	vv	v	?	no	active	vv	v	?	no
dejected	vv	v	?	no	relaxed	vv	v	?	no
comfortable	vv	v	?	no	energetic	vv	v	?	no
drowsy	vv	v	?	no	stimulated	vv	v	?	no
calm	vv	v	?	no	fearful	vv	v	?	no
activated	vv	v	?	no	contented	vv	v	?	no
nervous	vv	v	?	no	sleepy	vv	v	?	no
restful	vv	v	?	no	worried	vv	v	?	no
sluggish	vv	v	?	no	up-tight	vv	v	?	no
passive	vv	v	?	no	pleasant	vv	v	?	no
jittery	vv	v	?	no	aroused	vv	v	?	no
bothered	vv	v	?	no	somnolent	vv	v	?	no
tired	vv	v	?	no	uneasy	vv	v	?	no
lively	vv	v	?	no	distressed	vv	v	?	no
vigorous	vv	v	?	no	peaceful	vv	v	?	no

Here are some statements which people have made about how they reacted to being in hospital and having an operation. For each one, please circle either "True" or "False" to show whether it applied to you over the past week.

1. I tried to see the positive side .... True False

2. I tried to step back from the situation and be more objective .... True False

3. I prayed for guidance and strength .... True False

4. I took things one step at a time .... True False

5. I did everything I was told by the doctors and nurses True False

6. I considered several different ways of handling the situation .... True False

7. I worried over what might happen .... True False

8. I drew on past experiences .... True False

9. I tried to find out more about the situation .... True False

10. I talked with a nurse or doctor about it .... True False

11. I did something positive .... True False

12. I watched other people going through the same things. True False

13. I left everything to the doctors and nurses. as they are the ones who know best .... True False

14. I talked with a friend(s) about it .... True False

15. I tried to relax myself .... True False

16. I tried not to bother the nurses and doctors .... True False

17. I prepared for the worst .... True False

18. I felt angry about the way I was treated .... True False

19. I tried to reduce tension by not thinking about the situation .... True False

20. I tried to work out in my own mind what was happening True False

21. I tried to reduce tension by imagining I was somewhere else .... True False

22. I kept my feelings to myself .... True False

23. I felt there was nothing I could do to make things better for me .... True False

24. I kept busy with other things to keep my mind off the situation .... True False

25. I didn't worry about it; figured everything would probably work out fine .... True False

Appendix 4.15

CHARACTERISTICS OF MINOR SURGERY PATIENTS

Pt.	Age	Sex	Type of surgery	Illness	Previous ops	Length of op.
n	y					n
01	47	M	Closure colostomy	Ulcerative colitis	3	15min
02	40	F	Closure colostomy	Ulcerative colitis	2	20min
03	22	F	Div. Puborectalis	Constipation	3	30min
04	32	F	Closure colostomy	Ulcerative colitis	3	17min
05	26	F	Haemorrhoidectomy	Constipation	0	15min
06	54	M	Lay open fistula	Ulcerative colitis	3	40min
07	41	F	Closure ileostomy	Crohn's disease	3	15min
08	67	F	Drainage of abcess	Ulcerative colitis	3	25min
09	41	M	Lay open fistula	Crohn's disease	3	50min
10	29	M	Lay open sinus	Ulcerative colitis	3	30min
11	45	M	Anal sphincter repair	Rectal prolapse	2	60min
12	22	F	Closure ileostomy	Ulcerative colitis	1	60min
13	39	M	Excision anal tags	Ulcerative colitis	1	30min
14	53	F	Repeat anal repair	Feacal incontinence	1	60min
15	48	M	Lay open fistula	Ulcerative colitis	3	50min
16	37	M	Lay open fistula	Crohn's disease	3	30min
17	29	M	Sphincterotomy	Rectal bleeding	0	15min
18	31	M	Sphincterotomy	Feacal incontinence	3	20min
19	47	M	Lay open fistula	Cronn's disease	2	15min
20	39	M	Lay open fistula	Crohn's disease	3	50min
21	45	M	Sphinterotomy	Rectal bleeding	1	25min
22	28	F	Sphincter repair	Feacal incontinence	0	30min
23	43	M	Lay open fistula	Ulcerative colitis	1	40min
24	41	M	Lay open sepsis	Ulcerative colitis	3	30min
25	18	F	Sphincter repair	Ulcerative colitis	1	25min
26	17	M	EUA & Sigmoidoscopy	Crohn's disease	2	30min
27	51	M	Lay open of sepsis	Cancer of rectum	3	15min
28	22	F	Closure ileostomy	Crohn's disease	0	30min
29	54	M	Anal sphincter repair	Crohn's disease	1	45min
30	44	F	Closure ileostomy	Cancer of rectum	2	60min
31	40	M	Sphincterotomy	Fissure	2	35min
32	50	M	Lay open fistula	Ulcerative colitis	2	45min
33	55	M	Closure colostomy	Diverticulitis	1	10min
34	65	M	Haemorrhoidectomy	Haemorrhoids	3	50min
35	33	F	Lay open fistula	Cronn's disease	0	60min
36	40	M	Haemorrhoidectomy	Haemorrhoids	2	45min
37	43	F	Haemorrhoidectomy	Haemorrhoids	2	35min
38	44	M	Lay open fistula	Cancer of rectum	2	19min
39	41	F	Closure ileostomy	Ulcerative colitis	2	20min
40	24	F	Lay open fistula	Crohn's disease	0	20min

Appendix 4.16

CHARACTERISTICS OF MAJOR SURGERY PATIENTS

Pt.	age	sex	Type of surgery	Illness	previous ops.	Length of op.
n	y				n	
01	38	M	Rectoplexy	Rectal prolapse	0	2hr 02mn
02	64	F	Rectoplexy	Rectal prolapse	2	2hr 52mn
03	23	F	Colectomy	Crohn's disease	0	2hr 25mn
04	62	F	Rectoplexy	Reclal prolapse	3	1hr 50mn
05	33	F	Colostomy	Feacal incontinence	0	2hr 35mn
06	41	F	Ileostomy	Crohn's disease	3	2hr 50mn
07	18	F	Polypectomy	Jaeger Syndrome	0	3hr 40mn
08	65	M	Colostomy	Rectal prolapse	3	1hr 45mn
09	20	F	Anastomosis	Rectal Bleeding	0	1hr 55mn
10	21	M	Proctocolectomy	Ulc. colitis	1	1hr 50mn
11	57	F	Colostomy	Ulc. colitis	1	4hr 55mn
12	39	F	Ant. repair	Ulc. colitis	3	1hr 20mn
13	78	F	Rectoplexy	Cancer of rectum	0	3hr 05mn
14	20	M	Ant. repair	Feacal incontinence	3	1hr 25mn
15	57	F	Ileostomy	Crohn's disease	3	3hr 20mn
16	25	M	Ileostomy	Ulcerative colitis	3	2hr 50mn
17	47	F	Colectomy	Crohn's disease	1	2hr 25mn
18	40	F	Pouch removal	Ulcerative colitis	3	3hr 50mn
19	29	F	Pouch removal	Ulcerative colitis	3	3hr 52mn
20	28	F	Ant. repair	Ulcerative colitis	2	2hr 00mn
21	24	F	Ileostomy	Crohn's disease	1	1hr 45mn
22	44	F	Proctocolectomy	Crohn's disease	3	3hr 00mn
23	29	M	Anastomosis	Cancer of rectum	1	1hr 30mn
24	28	F	Colectomy	Constipation	1	2hr 25mn
25	52	M	Proctocolectomy	Cancer of rectum	1	3hr 50mn
26	85	F	Colectomy	Cancer of rectum	2	2hr 25mn
27	22	F	Colectomy	Crohn's disease	1	2hr 40mn
28	40	M	Colostomy	Ulcerative colitis	2	2hr 28mn
29	66	M	Proctocolectomy	Rectal bleeding	1	4hr 25mn
30	71	F	Rectoplexy	Rectal prolapse	1	2hr 50mn
31	48	M	Anastomosis	Cancer of rectum	1	3hr 35mn
32	45	F	Colostomy	Feacal incontinence	2	1hr 45mn
33	67	F	Anastomosis	Cancer of rectum	1	2hr 30mn
34	52	F	Colectomy	Cancer of rectum	2	2hr 30mn
35	70	F	Resection	Feacal incontinence	3	2hr 10mn
36	57	F	Rectoplexy	Rectal prolapse	2	2hr 00mn
37	19	F	Colectomy	Crohn's disease	0	2hr 30mn
38	42	M	Colectomy	Ulcerative colitis	3	3hr 05mn
39	53	F	Laporotomy & Refashion	Crohn's disease	3	3hr 00mn
40	32	M	Proctocolectomy & Ileostomy	Crohn's disease	3	2hr 05mn

Appendix 4.17

DEFFERENCES BETWEEN MAJOR AND MINOR SURGERY

Major surgery ----usually abdominal-perineum operations which involve cutting through the peritoneal cavity, including the abdominal muscles and some internal structure.

Minor surgery ---- when the operation does not involve cutting past the peritoneal cavity. The cut is usually superficial and often involve the pelvic region. Surgery takes less than 60 minutes. (Bupa 1986)

1) Proctocolectomy----surgical excision of the rectum and colon. The procedure is performed through a midline incision. The rectum may be excised from the abdomen by division at the level of the anal verge or by circumferential incision from the perineum.

2) Colostomy----a surgically established fistula between the colon and the surface of the abdomen. An abdominal artificial anus is constructed inorder to establish drainage of the bowel. A loop of colon is brought out through an abdominal incision.

3) Colectomy----excision of part or the whole of the colon. The affected colon is removed and anastomosis of the ileum to the pelvic colon is usually performed.

4) Ileostomy---- a surgically made fistula between the ileum and the anterior abdominal wall; usually a permanent form of artificial anus when the whole of the large bowel has to be removed, e.g. in severe ulcerative colitis. Similar to a colostomy but performed on the lower ileum. The ileum is divided and the proximal end brought out through a seperate stab incision; the distal end is either closed with sutures or exteriorised seperately.

5) Rectoplexy---- when there is prolapse of the rectum associated with haemorrhoids, an opening is made behind the anus and plugging is introduced to cause adhesions to form between the rectum and sacrum, so that the condition cannot recur.

6) Anastomosis---- a procedure of reconstructing the intestinal tract. End to end, end to side or side to side anastomosis are the methods employed. The openings are joined together to form the anastomosis.

7) Removal of Kock's pouch---- in 1969 Kock described a new type of ileostomy made entirely of terminal ileum and consisting of a pouch that would hold intestinal contents and an ileal conduit that led from the pouch to a cutaneous stoma. This was modified in 1973 to include an intestinal valve between the pouch and stoma.

8) Anterior venous fistula----a fistula is an abnormal communication between two body surfaces or cavities, e.g. gastrocolic---fistula between the stomach and colon; colostomy--- between the colon and the abdominal surface. An incision is made between the surfaces which the track connects.

9) Polypectomy----removal of an adenoma which has become a polypus. Usually excision of the polypus involves a small area of normal rectal mucous membrane surrounding it's base.

10) Anterior posterior anal repair---- the performance of a surgical division of the tight unyielding distal internal sphincter.

Appendix 5.1

Characteristics of sample in preliminary Study 1

Operation	Type of surgery	Sex	Age
1. Hemicolectomy	major	female	28yr
2. Resection	major	male	59yr
3. Resection	major	male	58yr
4. Proctectomy	major	female	32yr
5. Hemicolectomy	major	female	22yr
6. Hemicolectomy	major	female	30yr
7. Hemicolectomy	major	female	71yr
8. Resection	major	male	47yr

Appendix 5.2

HOW TO HELP YOURSELF RECOVER FROM THE OPERATION

There is now a great deal of evidence that what patients do and how they feel can affect how quickly they recover from an operation. Anxiety and tension can waste the body's energy; this slows down the natural healing processes.

So, by reducing tension, you can help your body heal. One of the best ways of doing this is by special exercises - called "relaxation training". You have been given a tape of some relaxation exercises which other patients, having similar operations to you, have found helpful.

It will help you if you can listen to the tape at least twice each day. It is important to realise that this is a way in which you are able to help your own recovery. Therefore, how much the tape will be depends on you. The more often you can listen, or practice the exercises without the tape, the more you will help your body to recover quickly.

It is especially useful to reduce tension in the days and hours before the operation, so you should practice the exercises as much as possible during this time.

Appendix 5.3

Relaxation Tape

Get into a comfortable position in bed and all you have to do now is listen to the tape------. To begin with, you can either focus your eyes onto a spot opposite, or you may close your eyes if you wish. If you do not succeed in relaxing some part of your body, do not worry, just carry on, and with practice it will become easier. Relaxing will help your body to recover from the operation.

Now think about your hands------, and all the feelings you can notice in your hands ------ think about the position of your hands, and the pressure of the palms of your hands against the bed ------ now think of the temperature of the skin of your hands------,such as the warmth or coolness of the skin of your hands ------think also of any other feelings in your hands , such as slight tingling feelings in your fingers and hands ------ you may notice all these feelings in your fingers and hands - and you may notice also any slight tightness or tension in the muscles around your wrists----- and over the knuckles------ as you notice the tension, let your hands go heavy and loose------ let them feel limp and soft------ let them sink heavily by your sides.

Now think about your arms-----, the position of your arms------ shoulders resting on the pillow------ and your forearms on the bed ------ think about tension or tightness in the muscles of your arms------, around your shoulders and neck------ as you become aware of the tension-----, it begins to go. Your arms feel heavy and relaxed------ and your shoulders sink heavily by your sides.----- Try and concentrate on the heaviness of your arms.

As you relax, breath slowly, quietly and very calmly (x2). Now think about your feet and legs------ just as you did with your hands and arms------ first your feet, concentrate on all the feelings you can notice-----, such as warmth----- or coolness------, even tingling feelings ------ and now your legs-----, think of the position of your legs----- and the pressure of the back of your legs against the bed------ notice any tension----- and tightness in the muscles of your legs. As you notice the tension-------, let your legs and feet feel heavy and limp------. Let them sink heavily into the bed------. Keep breathing slowly quietly and calmly (x2).

Now think of the muscles of your stomach and chest------ notice any tension in your stomach and chest------. As you notice the tension, let it go-------- so you feel yourself sinking deeper and deeper------- Breathing slowly, quietly and calmly (x2).

Now think of the muscles in your face, around your forehead and eyes------ notice any slight frowning tension ------ as you notice the tension-------,let the tension go-----. Let your forehead feel smooth and loose------ and all the while breath slowly and calmly (x2).

Think of your mouth and jaw ------Notice any slight clenching tension of the mouth and jaw----- as you notice the tension let it go------. Let your mouth feel loose and your jaw feel heavy.

Think about your breathing------, concentrate on breathing slowly, quietly and calmly (x2)------.Think about the air itself------, notice it on your upper lip as you breath in-----, and again as you breath out------. Feel the sensation of the draft of air as you expell it------. Do this slowly----. Feel the air on the upper lip as you draw it in------, and again as it leaves your body ------. Repeat the exercise breathing in and out several times------.As you carry on breathing slowly and calmly, let your body feel more and more relaxed.

Relaxing completely and totally, enjoy deeper and deeper relaxation. Let your legs feel heavy and soft------let your tummy feel heavy and soft ------let your arms feel heavy and soft ------let your hands feel heavy and soft-----. Notice the feelings of softness------, heaviness------ and warmth------ especially in your fingertips------- and toes.Feel the muscles in your body go soft------ and feel the tension go away.

Learning more and more about self control over tension, will help you to exercise greater awareness of your body. Each time you practise it will become easier and as you learn to relax you will be helping your body to recover from the operation. You may not ofcourse feel aware of all the ways your body is improving. Do not worry if you feel you haven't succeeded, it will get better with practice and trying to relax and practicing these exercises will help you gain control over your body. Keep breathing slowly, quietly and calmly (x2).

You may stay as you are while the tape continues to play silently for a minute or two------ enjoy these feelings of relaxation until you want to stop.

Appendix 5.4

Characteristics of sample in preliminary study 2

Operation	Type of surgery	Sex	Age
1. Colectomy	major	female	42yr
2. Colostomy	major	male	63yr
3. Colectomy	major	male	29yr
4. Colectomy	major	female	25yr
5. Hemicolectomy	major	female	63yr
6. Hemicolectomy	major	female	33yr
7. Hemicolectomy	major	male	39yr
8. Resection	major	female	40yr
9. Protectomy	major	male	34yr
10. Resection	major	female	33yr

Appendix 5.5

CHARACTERISTICS OF RELAXATION GROUP

Pt.	age	sex	Type of surgery	Illness	previous ops.	length of op.
n	y				n	hr
01	38	F	Anastomosis	Cancer rectum	1	2.50
02	48	M	Resection	Crohn's disease	2	2.25
03	20	M	Resection	Crohn's disease	2	2.83
04	38	F	Rectoplexy	Rectal prolapse	1	1.75
05	39	F	Proctocolectomy	Ulcerative colitis	1	3.00
06	26	F	Proctocolectomy	Crohn's disease	1	3.25
07	47	M	Colostomy	Cancer rectum	3	3.00
08	45	M	Proctocolectomy	Ulcerative colitis	3	3.16
09	62	M	Colectomy	Cancer rectum	2	3.25
10	33	M	Colostomy	Fistula	2	2.75
11	52	M	Colectomy	Crohn's disease	2	2.91
12	79	M	Resection	Cancer rectum	3	3.00
13	16	F	Colectomy	Ulcerative colitis	1	3.16
14	36	M	Proctocolectomy	Ulcerative colitis	2	3.00
15	56	F	Cholecystectomy	Crohn's disease	4	2.70
16	52	F	Colectomy	Ulcerative colitis	3	3.25
17	42	M	Laporotomy	Crohn's disease	3	2.00
18	66	M	Hemicolectomy	Cancer colon	1	3.50
19	54	M	Laporotomy	Cancer colon	4	3.00
20	32	F	Resection	Crohn's disease	2	3.67
21	48	M	Proctocolectomy	Ulcerative colitis	2	3.50
22	22	F	Anastomosis	Ulcerative colitis	1	3.16
23	20	M	Rectoplexy	Rectal prolapse	1	2.00
24	28	F	Rectoplexy	Rectal prolapse	1	1.91
25	29	F	Colectomy	Constipation	1	1.91
26	67	F	Hemicolectomy	Fissure	1	2.75
27	42	F	Colectomy	Constipation	2	2.91
28	25	M	Colectomy	Polyposis	2	2.50
29	29	F	Hemicolectomy	Crohn's disease	2	2.83
30	47	F	Hemicolectomy	Crohn's disease	2	3.66
31	32	F	Colectomy	Constipation	1	3.50
32	34	M	Colectomy	Ulcerative colitis	1	2.50
33	35	F	Resection	Crohn's disease	2	3.50
34	47	F	Proctocolectomy	Ulcerative colitis	2	3.00
35	29	F	Colectomy	Polyposis	4	4.50
36	33	M	Rectoplexy	Rectal prolapse	1	2.83
37	48	M	Colectomy	Fistula	2	3.33
38	34	F	Colectomy	Crohn's disease	1	1.91
39	26	F	Laporotomy	Feacal Incontinence	1	2.50
40	38	M	Resection	Prolapsed iliostomy	2	2.50

Appendix 5.6

CHARACTERISTICS OF CONTROL GROUP

Pt	age	sex	Type of surgery	Illness	previous ops.	length of op.
n	y				n	hr
01	18	M	Colectomy	Ulcerative colitis	1	3.50
02	25	F	Proctocolectomy	Ulcerative colitis	2	4.50
03	30	F	Resection	Crohn's disease	4	2.00
04	19	F	Colectomy	Constipation	1	3.83
05	29	M	Resection	Rectal stricture	2	2.41
06	43	M	Resection	Crohn's disease	3	4.00
07	21	M	Colectomy	Crohn's disease	1	3.66
08	33	F	Proctocolectomy	Ulcerative colitis	2	4.25
09	39	F	Hemicolectomy	Diverticulitis	1	2.50
10	40	F	Ileostomy	Crohn's disease	1	1.75
11	56	F	Colostomy	Feacal Incontinence	2	2.16
12	43	F	Proctocolectomy	Ulcerative colitis	1	3.50
13	19	M	Rectoplexy	Crohn's disease	2	2.00
14	74	F	Rectoplexy	Rectal prolapse	2	2.50
15	37	F	Colectomy	Polyposis	2	3.00
16	69	M	Rectoplexy	Cancer rectum	1	3.50
17	55	M	Proctocolectomy	Ulcerative colitis	2	4.00
18	19	M	Colostomy	Pelvic accident	3	3.25
19	41	M	Resection	Crohn's disease	1	2.50
20	22	F	Hemicolectomy	Crohn's disease	2	2.00
21	21	M	Ileostomy	Ulcerative colitis	2	4.50
22	54	M	Resection	Crohn's disease	7	2.25
23	18	M	Colostomy	Cancer colon	2	1.50
24	43	F	Colectomy	Polyposis	3	2.00
25	18	F	Colectomy	Polyposis	2	2.25
26	22	F	Hemicolectomy	Crohn's disease	1	2.50
27	40	F	Proctectomy	Ulcerative colitis	2	2.25
28	60	M	Hemicolectomy	Cancer rectum	3	1.50
29	25	F	Resection	Crohn's disease	1	3.00
30	58	M	Proctocolectomy	Ulcerative colitis	1	2.00
31	30	M	Resection	Crohn's disease	1	3.75
32	79	F	Rectoplexy	Rectal prolapse	2	2.00
33	27	M	Resection	Ulcerative colitis	2	2.00
34	34	F	Protectomy	Ulcerative colitis	3	1.83
35	48	F	Colectomy	Diverticulitis	3	2.50
36	41	M	Colectomy	Crohn's disease	3	1.58
37	56	M	Colectomy	Cancer rectum	3	4.50
38	49	M	Colectomy	Ulcerative colitis	2	2.25
39	31	M	Colectomy	Crohn's disease	2	2.25
40	37	F	Colostomy	Crohn's disease	3	4.00

Appendix 5.7

Handout for Control Group

While you are in hospital the nurses and doctors will take care of you. This tape describes the various people who will be looking after you. It also tells you about some of the things they will ask you to do that will aid your recovery. It is important that you follow their advice as they have considerable experience in helping people with problems like yours. You will find it helpful to listen to the tape as often as you can.

Thank You For Your Co-operation.

Appendix 5.8

CONTROL TAPE

Being a 'patient' means putting yourself in other people's hands. So that you feel quite ready to entrust yourself to this hospital, we feel that it is important for you to understand the reasons for the things we ask you to do.

We have therefore given you this tape to answer some of the many questions that may arise while you are in hospital. It also tells you how you can best help the nurses and doctors to help you. It is important for your recovery that you feel as confident in this hospital as possible throughout your stay. Many patients find that it helps to listen to the tape a few times before - and after - their operation.

St. Marks hospital forms one section of the Hackney and City District Health Authority. It was founded in 1835 and so has over 150 years of experience in caring for patients with problems like your own. There are up to 90 patients in hospital at any time. As well as this there are over 1,000 out-patient appointments every year.

There are many different sorts of hospital staff, each with their own special training and responsibilities. In overall charge of the nurses in the hospital is a Senior Nurse. This post used to be known as 'Matron'. Then there are Nursing Officers responsible for groups of wards. You won't often see these people as their work goes on behind the scenes, but they help you by keeping the ward running smoothly. The ward sister is in charge of your ward and of the nurses looking after you. If you have questions about the ward or your treatment, she will be able to answer them for you or will know who can help. The nurses will look after you and make you as comfortable as possible. On some wards, care assistants and receptionists help the nurses with particular tasks. They have built up a great deal of practical experience so that they can help the nurses to look after you. Please do all the nurses and their assistants ask of you: this will help your recovery.

Your medical care is in the hands of a team of doctors.They are headed by a Consultant Physician or Surgeon. He is an expert in his field, with years of experience, and has overall responsibility for your care. From day to day you will be looked after by Registrars and other assistants. The consultant will make decisions when his expertize is needed. If you need to ask anything about your treatment, the doctors will explain what they are doing and why.

The anaesthetist who looks after you in the operating theatre visits you beforehand to decide on the medication you should have before being taken to the theatre. It is important to take this because it will relax your mind and body before the operation.

You may meet other trained staff, including physiotherapists and radiographers, for instance. They have very special skills and experience, so it is important that you follow any of the instructions or advice they may give you. If necessary, a dietician might also come and advise you on what you should eat.

There are also many people who support the work of the doctors, although they will rarely be seen on the ward. Pharmacists and laboratory workers, for example, are vital parts of the complex system which is geared up to look after you.

The ward routine might feel a little strange at first. You will be woken up at around 06.30 in the morning and given a cup of tea. Breakfast will be served at 07.30 , lunch at midday, a light tea at 15.00hrs and supper at 18.00hrs. We realize that this may not be your normal routine, but you will soon settle into it.

The doctors and nurses will do all they can to get you well. It is important that you do the things they ask you to.For instance, on the day of your operation the nurses ask you to have a bath and then to change into a special gown and cap, and to remove any jewellery or make-up or false teeth. This helps to keep the operating theatre free of germs and of anything which might be dangerous or get in the way of the doctor's work. A wedding ring can be kept on, but the nurses will cover it with some tape. Your other valuables will be locked away or taken home by your relatives whilst you are unable to take care of them. If your operation is in the morning you will have nothing to eat or drink from midnight and if it is in the afternoon you will be given a light early breakfast and nothing afterwards. This helps to keep your stomach empty so that you cannot be sick while you are unconcious or in the recovery room. You will be asked to pass urine before being given pre-medication.This is because you have to remain in bed until you go to theatre. When that time comes one of the nurses from your ward will go with you to look after you until you have been anasthetized. A ward nurse will also collect you back to the ward after the operation. It is important that you cooperate with these procedures because this will help the nurses to help you.

After your operation the nurses will give you any drugs which the doctors have prescribed for you. There will be painkillers to help ease the pain from the operation. Sleeping tablets are available to help you get a good night sleep. Other pills can help to stop you from feeling sick.

The nurses will measure your temperature, pulse and blood-pressure at set times throughout your stay to check on your progress. This will not inconvenience you very much. Simply do as they ask and it should only take a few minutes. After your operation, the nurses will help you to get up and get out of bed when they decide you are ready. Following their instructions carefully will help your recovery from the operation.

You may be puzzled or concerned over some of the things which happen to you. You may not realize why certain things are being done, even though they may be important parts of your care, so do ask. And if you have any questions or problems at all, just ask the nurses and doctors. They are here to look after you and will do everything possible to care for you and to help your recovery.

Appendix 5.9

Assessment Questionnaire for Tapes

1. Did you find listening to the tape helpful?
   a) very helpful
   b) not helpful
   c) made things worse

2. How often did you listen to the tape?
   a) more than once a day
   b) once a day
   c) not at all

3. How likely would you be to recommend the tape to a friend in hospital?
   a) definitely
   b) undecided
   c) not at all

4. Would you use the tape in future if you had another operation?
   a) yes
   b) undecided
   c) no

SURVEY OF RESPONSES TO SURGERY

Each week, one or two patients are being asked to help us with this survey. This involves filling in a number of questionnaires about your feelings before and after the operation. We also need small samples of blood. These would be taken alongside routine samples so as to cause you minimum discomfort.

The results of this study will help us to give better advice to future patients about what to expect when they come into hospital.

We hope that you will feel able to take part. Whether you do or do not, however, will not affect your care.

All information will, of course, be strictly confidential.

- o O o -

PATIENT'S CONSENT FORM

Consultant................................Investigator......................

Purpose of study and brief description of procedure to be carried out	We are interested in finding out how patients react to having an operation, and how future patients can be helped to recover as quickly as possible. In this study we will collect 5 ml (about a teaspoonful) of blood from you on a number of occasions before, during, and after the operation: the total will be 40 ml (about 8 teaspoonfuls). You will also fill in some questionnaires asking about mood and pain. Before the operation, a researcher may visit you to talk about reactions to surgery.

I UNDERSTAND WHAT THIS STUDY INVOLVES AND I AGREE TO TAKE PART IN IT ON THE UNDERSTANDING THAT REFUSAL TO BE INCLUDED WILL NOT AFFECT MY TREATMENT IN ANY WAY AND THAT I MAY WITHDRAW AT ANY TIME.

Signature of Patient........................... Date....................

I HAVE BEEN PRESENT WHILE THE PROCEDURE HAS BEEN EXPLAINED TO THE PATIENT AND I HAVE WITNESSED HIS/HER CONSENT TO TAKE PART.

Signature of Witness........................... Date....................
(The witness should be a person not connected with the study)

Full name and address of patient: ....

(BLOCK CAPITALS PLEASE) ....

....

....

Appendix 6.3

CHARACTERISTICS OF MINOR SURGERY RELAXATION GROUP

Pt.	Age	Sex	Type of surgery	Illness	Previous ops.	Length of op.
n	y				n	min
01	39	F	Sphincter repair	Fissure & Ulcerative colitis	3	30
02	47	F	Sphincter repair	Incontinence	2	60
03	43	F	Lay open fistula	Fistula & Crohn's disease	3	45
04	44	M	Haemorrhoidectomy	Haemorrhoids	2	30
05	70	F	Haemorrhoidectomy	Haemorrhoids	1	55
06	44	F	Sphincter repair	Incontinence	1	30
07	42	F	Pouch Construction	Ileac reservoir & Ulcerative colitis	1	42
08	20	F	Lay open fistula	Fistula & Crohn's disease	3	30
09	57	M	Lay open fistula	Fistula & Crohn's disease	2	30
10	25	M	Lay open fistula	Anal stenosis & Crohn's disease	1	40
11	58	M	Haemorrhoidectomy	Haemorrhoids	1	40
12	23	M	Lay open fistula	Fistula & Crohn's disease	3	30
13	39	M	Closure colostomy	Fistula & Crohn's disease	3	45
14	57	M	Closure colostomy	Cancer rectum	2	60
15	57	F	Haemorrhoidectomy	Haemorrhoids	2	30
16	36	M	Sphincter repair	Fissure & Ulcerative colitis	1	45
17	31	F	Lay open fistula	Fistula & Crohn's disease	1	45
18	34	M	Sphincter repair	Fissure & Ulcerative colitis	3	50
19	41	M	Lay open abcess	Abcess Crohn's disease	2	15
20	35	F	Sphincter repair	Incontinence	1	45
21	41	M	Lay open fistula	Fistula & Crohn's disease	3	30

Appendix 6.4

CHARACTERISTICS OF MINOR SURGERY CONTROL GROUP

Pt.	Age	Sex	Type of surgery	Illness	Previous ops.	Length of op.
n	y				n	min
01	46	M	Excision of tags	Bleeding pr.	1	30
02	69	M	Closure colostomy	Rectal stricture	3	30
03	49	M	Lay open fistula	Abcess & Crohn's disease	3	45
04	66	F	Lay open abcess	Abcess & Crohn's disease	3	30
05	74	M	Haemorrhoidectomy	Haemorrhoids	3	50
06	35	M	Haemorrhoidectomy	Haemorrhoids	3	30
07	26	M	Lay open fistula	Ulcerative colitis	2	30
08	73	F	Excision of tags	Cancer duodenum	1	30
09	54	M	Sphincter repair	Fissure & Ulcerative colitis	1	30
10	55	F	Polyps excision	Polyps & Ulcerative colitis	1	30
11	42	M	Excision of tags	Ulcerative colitis	1	30
12	57	M	Haemorrhoidectomy	Haemorrhoids	1	45
13	60	F	Sphincter repair	Fissure & Ulcerative colitis	1	30
14	40	F	Drainage abcess	Abcess & Ulcerative colitis	3	30
15	32	F	Lay open fistula	Fistula & Crohn's disease	2	30
16	42	M	Lay open fistula	Fistula & Crohn's disease	1	50
17	38	M	Lay open fistula	Fistula & Crohn's disease	1	45
18	36	M	Lay open fistula	Fistula Ulcerative colitis	1	30
19	43	F	Sphincter repair	Incontinence	1	60

Appendix 6.5
Minor Surgery, Relaxation Group: Anaesthesia given

	Pre-operative			Intra-operative	
Pt.	Premedication	Induction		Maintanance	
01	Omnop & scop	Thiopent	--------	NO2/O2	& Fentanyl
02	Omnop & scop	Thiopent	& Suxameth	NO2/O2	& Halothane
03	Omnop & scop	Thiopent	--------	NO2/O2	----------
04	Omnop & scop	Thiopent	& Suxameth	NO2/O2	----------
05	Omnop & scop	Thiopent	& Suxameth	NO2/O2	----------
06	Omnop & scop	Thiopent	& Suxameth	NO2/O2	& Enflurane
07	Omnop & scop	Thiopent	--------	NO2/O2	----------
08	Omnop & scop	Thiopent	& Suxameth	NO2/O2	----------
09	Omnop & scop	Thiopent	& Suxameth	NO2/O2	& Enflurane
10	Omnop & scop	Thiopent	& Suxameth	NO2/O2	& Enflurane
11	Omnop & scop	Thiopent	--------	NO2/O2	& Fentanyl
12	Omnop & scop	Thiopent	--------	NO2/O2	& Enflurane
13	Omnop & scop	Thiopent	--------	NO2/O2	---------
14	Omnop & scop	Thiopent	& Suxameth	NO2/O2	& Enflurane
15	Omnop & scop	Thiopent	& Suxameth	NO2/O2	& Enflurane
16	Omnop & scop	Thiopent	& Suxameth	NO2/O2	& Enflurane
17	Omnop & scop	Thiopent	& Suxameth	NO2/O2	& Isoflurane
18	Omnop & scop	Thiopent	--------	NO2/O2	----------
19	Omnop & scop	Thiopent	--------	NO2/O2	----------
20	Omnop & scop	Thiopent	& Suxameth	NO2/O2	& Halothane
21	Omnop & scop	Thiopent	--------	NO2/O2	& Isoflurane

Omnop & scop = Omnopon and Scopolamine
Suxameth = Suxamethonium
Thiopent = Thiopentone

Appendix 6.6

Minor Surgery, Control Group: Anaesthesia Given

Pt.	Pre-operative Premedication	Induction		Intra-operative Maintanance	
01	Omnop & scop	Thiopent	--------	NO2/O2 & Fentanyl	
02	Omnop & scop	Thiopent &	Suxameth	NO2/O2 &	Isoflurane
03	Omnop & scop	Thiopent &	Suxameth	NO2/O2	----------
04	Omnop & scop	Thiopent &	Suxameth	NO2/O2 &	Enflurane
05	Pethid & Atr	Thiopent &	Suxameth	NO2/O2 &	Enflurane
06	Omnop & scop	Thiopent	--------	NO2/O2	---------
07	Omnop & scop	Thiopent &	Suxameth	NO2/O2 &	Enflurane
08	Omnop & scop	Thiopent	--------	NO2/O2	----------
09	Omnop & scop	Thiopent	--------	NO2/O2	----------
10	Omnop & scop	Thiopent &	Suxameth	NO2/O2 &	Halothane
11	Omnop & scop	Thiopent &	Suxameth	NO2/O2	----------
12	Omnop & scop	Thiopent &	Suxameth	NO2/O2 &	Halothane
13	Omnop & scop	Thiopent	--------	NO2/O2 &	Halothane
14	Omnop & scop	Thiopent	--------	NO2/O2 &	Isoflurane
15	Omnop & scop	Thiopent	--------	NO2/O2 &	Isoflurane
16	Omnop & scop	Thiopent	--------	NO2/O2 &	Isoflurane
17	Omnop & scop	Thiopent	--------	NO2/O2	----------
18	Omnop & scop	Thiopent &	Suxameth	NO2/O2 &	Halothane
19	Omnop & scop	Thiopent &	Suxameth	NO2/O2 &	Isoflurane

Omnop & scop = Omnopon and Scopolamine
Pethid & atr = Pethidine and Atropine
Suxameth = Suxamethonium
Thiopent = Thiopentone

Appendix 6.7

CHARACTERISTICS OF MAJOR SURGERY RELAXATION GROUP

Pt.	Age	Sex	Type of surgery	Illness	Previous ops.	Length of op.
n	y				n	hr
01	33	F	Ileo rectum Anastomosis (IRA)	Renal Failure & Ulcerative colitis	3	4.0
02	35	M	Proctocolectomy	Imperforated anus & Ulcerative colitis	3	3.8
03	61	M	Colectomy & IRA	Cancer rectum	2	1.8
04	53	F	Hemicolectomy	Diverticular disease & UC.	1	2.0
05	72	M	Cystoscopy & Laporotomy	Cancer rectum	3	1.9
06	20	M	Hemicolectomy	Crohn's disease	2	3.8
07	43	M	Laporotomy & Resection	Cancer rectum	2	4.0
08	22	M	Hemicolectomy	Crohn's disease	1	3.0
09	53	F	Colectomy & IRA	Polyposis coli	2	3.0
10	55	M	Ant. Resection	Cancer rectum	1	2.3
11	47	F	Protectomy	Polyposis coli	2	3.0
12	66	F	Ant. Resection & Rectoplexy	Crohn's disease & incontinence	2	1.8
13	20	F	Rectoplexy	Rectal prolapse	1	1.8
14	58	M	Resection & anastomosis	Cancer rectum	1	3.0
15	36	M	Revision of Pouch	Ulcerative Colitis	3	3.5
16	55	M	Hartmann's & appendicectomy	Diverticular disease & UC	1	3.0
17	60	F	Laporotomy & Hartmann's	Diverticular disease & UC	1	2.6
18	40	F	Ant. Resection	Ulcerative Colitis	1	2.0
19	52	F	Repair hernia & adhesions	Hernia Adhesions & Ulcerative colitis	2	2.0

UC = Ulcerative colitis   Ant. = Anterior

Appendix 6.8

CHARACTERISTICS OF MAJOR SURGERY CONTROL GROUP

Pt.	Age	Sex	Type of surgery	Illness	Previous ops.	Length of op.
n	y				n	hr
01	75	M	Anterior Resection	Cancer rectum	1	3.5
02	34	F	Colectomy & Anastomosis	Constipation & Crohn's disease	2	2.1
03	41	M	Abdominal-perineal excision	Cancer rectum	2	3.5
04	38	M	Laporotomy & ant. resection	Ulcerative colitis	3	3.5
05	32	F	Protectomy & ileostomy	Crohn's disease	2	3.0
06	35	M	Anterior Resection	Constipation & Ulcerative colitis	3	2.0
07	64	M	Colectomy & anastomosis	Polyposis Coli	2	3.0
08	58	F	Anterior Resection	Cancer rectum	1	3.0
09	47	F	Rectoplexy	Rectal prolapse	2	2.5
10	25	F	Anterior Resection	Crohn's disease	2	2.5
11	62	M	Anterior Resection	Cancer colon	1	2.0
12	53	M	Laporotomy & Adhesion division	Ulcerative colitis	3	2.5
13	50	F	Laporotomy & Adhesion division	Polyposis coli	3	4.0
14	28	F	Protectomy & Anastomosis	Ulcerative colitis	1	3.0
15	35	F	Protectomy	Ivalon Sponge & Ulcerative colitis	2	3.5
16	40	M	Ileo rectal anastomosis	Cancer colon	2	3.5
17	47	F	Ant. Resection	Crohn's disease	2	2.0
18	27	F	Laporotomy & adhesion division	Cancer colon	2	2.3
19	57	M	Hemicolectomy	Cancer rectum	1	2.5

Appendix 6.9

Major Surgery, Relaxation Group: Anaesthesia Given

	Pre-operative		Intra-operative
Pt.	Premedication	Induction	Maintanance
01	Omnop & scop	Thiopent & Fentanyl	Atracur & Fentanyl
02	Omnop & scop	Etomidate & Suxameth	Atracur & Diamorph
03	Omnop & scop	Etomidate & Suxameth	Atracur & Alfentan
04	Pethid & Atr	Etomidate & Suxameth	Atracur & Alfentan
05	Omnop & scop	Etomidate & Suxameth	Atracur & Alfentan
06	Omnop & scop	Etomidate & Suxameth	Atracur & Diamorph
07	Omnop & scop	Etomidate & Suxameth	Atracur & Diamorph
08	Omnop & scop	Etomidate & Suxameth	Atracur & Diamorph
09	Omnop & scop	Etomidate & Suxameth	Atracur & Diamorph
10	Omnop & scop	Etomidate & Suxameth	Atracur & Diamorph
11	Omnop & scop	Etomidate & Suxameth	Atracur & Diamorph
12	Omnop & scop	Thiopent & Fentanyl	Atracur & Fentanyl
13	Omnop & scop	Thiopent & Omnopon	- -
14	Omnop & scop	Thiopent & Atracur	- -
15	Omnop & scop	Thiopent & Pethid	- -
16	Omnop & scop	Etomidate & Suxameth	Atracur & Alfentan
17	Omnop & scop	Etomidate & Suxameth	Atracur & Alfentan
18	Omnop & scop	Etomidate & Suxameth	Atracur & Alfentan
19	Omnop & scop	Thiopent & Fentanyl	Atracur & Fentanyl

Omnop & scop = Omnopon and Scopolamine
Pethid & atr = Pethidine and Atropine
Suxameth = Suxamethonium, Thiopent = Thiopentone
Alfentan = Alfentanil, Atracur = Atracurium
Diamorph = Diamorphine, - = no medication given
NO2/O2 & Halothane or Enflurane or Isoflurane were administered in all cases to maintain anaesthesia.

Appendix 6.10
Major Surgery, Control Group: Anaesthesia Given

	Pre-operative		Intra-operative
Pt.	Premedication	Induction	Maintanance
01	Pethid & atr	Etomidate & Suxameth	Atracur & Alfentan
02	Omnop & scop	Thiopent & Suxameth	Atracur -
03	Omnop & scop	Thiopent & Suxameth	- -
04	Omnop & scop	Thiopent & Pethid	- -
05	Omnop & scop	Etomidate & Suxameth	Atracur & Alfentan
06	Omnop & scop	Thiopent & Atracur	Atracur & Fentanyl
07	Omnop & scop	Etomidate & Suxameth	Atracur & Alfentan
08	Omnop & scop	Etomidate & Suxameth	Atracur & Alfentan
09	Omnop & scop	Thiopent & Atracur	Atracur & Pethid
10	Omnop & scop	Etomidate & Suxameth	Atracur & Alfentan
11	Omnop & scop	Etomidate & suxameth	Atracur & Alfentan
12	Omnop & scop	Etomidate & Suxameth	Atracur & Alfentan
13	Omnop & scop	Etomidate & Suxameth	Atracur & Alfentan
14	Omnop & scop	Thiopent & Atracur	Atracur & Fentanyl
15	Pethid & atr	Thiopent & Atracur	Atracur -
16	Pethid & atr	Thiopent & Atracur	Atracur -
17	Omnop & scop	Etomidate & Suxameth	Atracur & Alfentan
18	Omnop & scop	Etomidate & Suxameth	Atracur & Alfentan
19	Omnop & scop	Thiopent & Suxameth	Atracur & Alfentan

Omnop & scop = Omnopon and Scopolamine
Pethid & atr = Pethidine and Atropine
Suxameth = Suxamethonium, Thiopent = Thiopentone
Alfentan = Alfentanil, Atracur = Atracurium
- = no medication given
NO2/O2 & Halothane or Enflurane or Isoflurane were administered in all cases to maintain anaesthesia.

Appendix 6.11

Analgesia and antiemetics given in recovery room to major surgery patients immediately post-op: Relaxation group

Pt	Analgesia	Route	Dose	Antiemetic	Route	Dose
01	Papaveretum	IM	15mg	Metoclopramide	IM	10mg
02	Papaveretum	IM	15mg	-		
03	Papaveretum	IM	20mg	Prochlorperazine	IM	12.5mg
04	Pethidine	IM	75mg	Prochlorperazine	IM	12.5mg
05	Papaveretum	IM	20mg	Prochlorperazine	IM	12.5mg
06	Papaveretum	IM	15mg	Prochlorperazine	IM	12.5mg
07	Papaveretum	IM	15mg	Prochlorperazine	IM	12.5mg
08	Papaveretum	IM	15mg	Prochlorperazine	IM	12.5mg
09	Papaveretum	IM	15mg	Prochlorperazine	IM	12.5mg
10	Papaveretum	IM	15mg	Prochlorperazine	IM	12.5mg
11	Papaveretum	IM	10mg	Prochlorperazine	IM	12.5mg
12	-			-		
13	Papaveretum	IM	15mg	Perphenazine	IM	2.5mg
14	-			-		
15	-			-		
16	Papaveretum	IM	15mg	-		
17	Papaveretum	IM	10mg	Metoclopramide	IM	10mg
18	Pethidine	IM	50mg	Metoclopramide	IM	10mg
19	Papaveretum	IM	15mg	Metoclopramide	IM	10mg

- = medication not given   IM = Intramuscular

Appendix 6.12

Analgesia and antiemetics given in recovery room to major surgery patients immediately post-op: Control Group

Pt.	Analgesia	Route	Dose	Antiemetic	Route	Dose
01	Pethidine	IM	100mg	Perphenazine	IM	5mg
02	-			-		
03	-			-		
04	Papaveretum	IM	15mg	Proclorperazine	IM	12.5mg
05	Papaveretum	IM	15mg	Metoclopramide	IM	10mg
06	Papaveretum	IM	15mg	Perphenazine	IM	2.5mg
07	-			Metoclopramide	IM	10mg
08	Papaveretum	IM	10mg	-		
09	-			-		
10	-			Perphenazine	IM	5mg
11	-			-		
12	-			-		
13	-			Metoclopramide	IM	10mg
14	-			-		
15	-			-		
16	-			-		
17	Papaveretum	IM	15mg	Metoclopramide	IM	10mg
18	-			-		
19	-			-		

- = medication not given IM = Intramuscular

Abdomen and Alimentary – Surgical Procedure

Oesophagus

	Class
Injury, repair	MAJOR
Oesophagectomy	CMO: C
Oesophago-gastrectomy	CMO: B
Highly selective vagotomy	MAJOR
Oesophagoscopy	MINOR
Heller's procedure	MAJOR
Nissen fundoplication	MAJOR

Stomach

Gastroscopy	MINOR
Gastrostomy	MAJOR
Gastrectomy: partial	MAJOR
total	MAJOR
Antrectomy	MAJOR
Perforated gastric ulcer	MAJOR
Pylorectomy	MAJOR
Pyloroplasty (including vagotomy)	MAJOR
Ramstedt's procedure	MAJOR
Gastro-enterostomy	MAJOR

Duodenum

Duodenoscopy	MINOR
Diverticulum, excision	MAJOR
Duodenectomy	MAJOR
Perforated duodenal ulcer	MAJOR

Jejunum and Ileum

Enterotomy	MAJOR
Meckel's diverticulum, excision	MAJOR
Resection and anastomosis	MAJOR
•Fistula, repair	MAJOR
Obstruction (including intussusception)	MAJOR
Jejunal biopsy	INTER

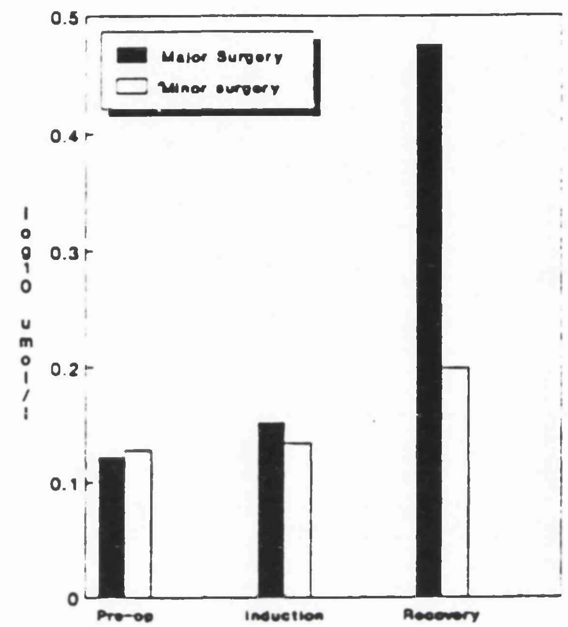
Colon

Appendicectomy	MAJOR
Caecostomy	MAJOR
Colostomy	MAJOR
Colostomy, closure	INTER
•Fistula, repair	MAJOR
Diverticulitis, other operative treatment	MAJOR
Obstruction	MAJOR
Colectomy: partial	MAJOR
total	MAJOR
Procto-colectomy	CMO:C
Sigmoidoscopy, diagnostic (carried out in isolation)	MINOR
Sigmoidoscopy for removal of polyp(i)	MINOR
Colonoscopy [including removal of polyp(i)]	INTER
•Bowel resection	CMO: D

Rectum

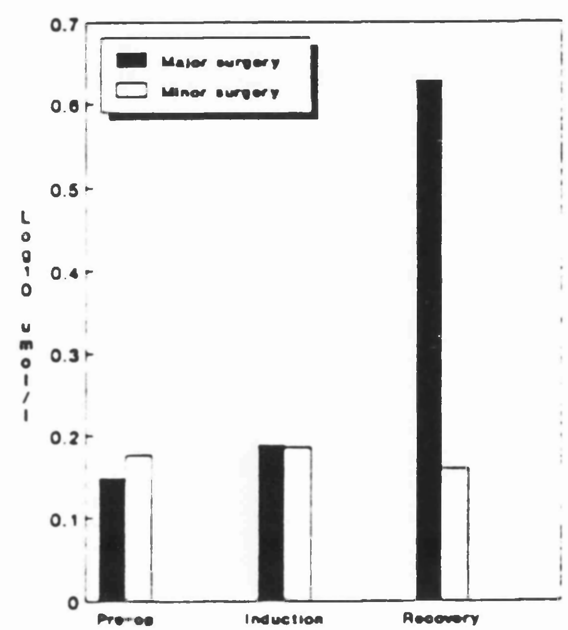
Resection, anterior	CMO: C
Abdomino-perineal (combined synchronous) excision	CMO: C
Prolapse, total repair	MAJOR
Prolapse, partial repair	INTER
Fistula, repair	INTER
Stricture, dilatation	INTER
Polyp(i), removal	MINOR

Adrenaline Levels: A Comparison Between
Major and Minor Surgery



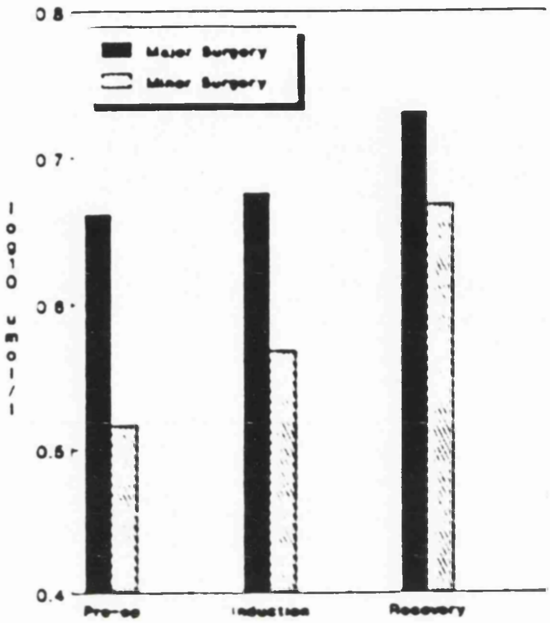
Appendix 6.14 Relaxation tape

Adrenaline Levels: A Comparison Between
Major and Minor Surgery



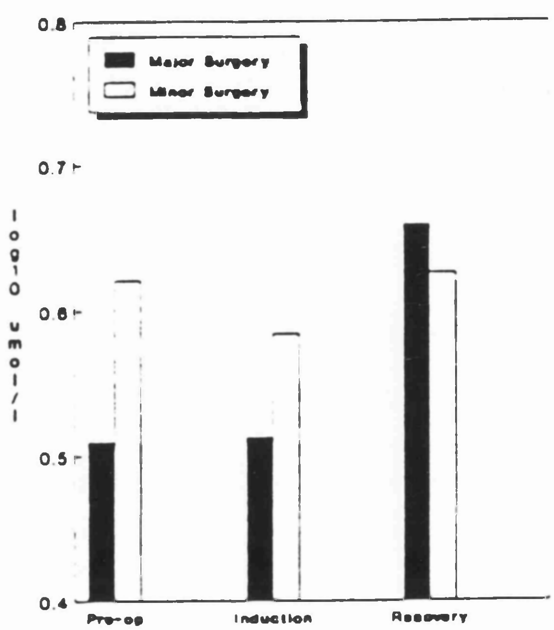
Appendix 6.15 Control tape

Noradrenaline Levels: A Comparison
Between Major and Minor Surgery



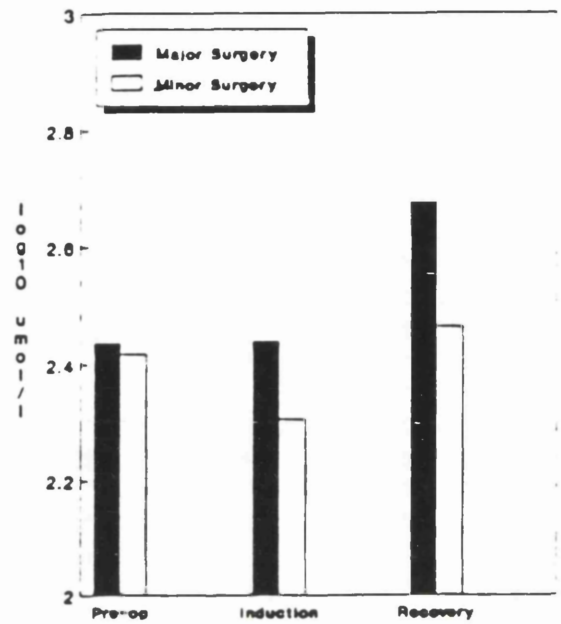
Appendix 6.16 Relaxation tape

Noradrenaline Levels: A comparison
Between Major and Minor Surgery



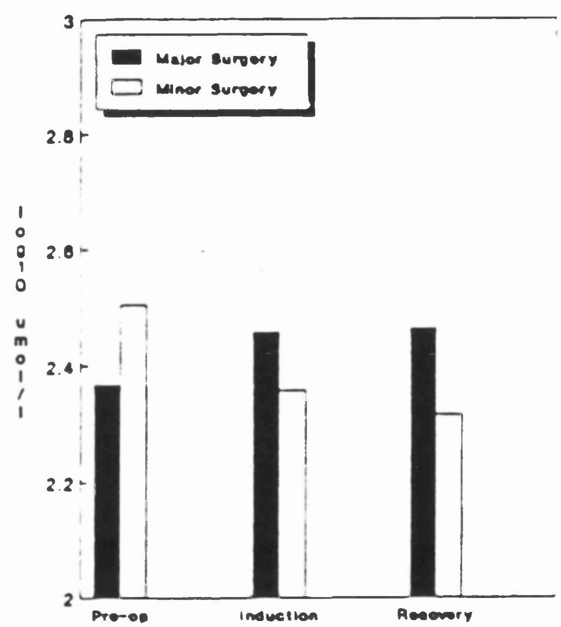
Appendix 6.17 Control tape

Cortisol Levels: A Comparison Between
Major and Minor Surgery



Appendix 6.18 Relaxation tape

Cortisol Levels: A Comparison Between
Major and Minor Surgery



Appendix 6.19 Control tape

Appendix 7.1

CHARACTERISTICS OF THE RELAXATION WITH IMAGERY GROUP

Pt.	age	sex	Type of surgery	Illness	previous ops.	length of op.
n	y				n	hr
01	45	F	Laying open abcess	Abcess	4	0.50
02	64	M	Sphincterotomy	Fissure in ano	3	0.33
03	68	F	Hernia repair	Hernia	1	1.00
04	50	F	Laying open fistula	Crohn's disease	*	*
05	67	M	Laying open fistula	Fistula (crohn's)	1	1.00
06	70	F	Sphincterotomy	Fissire in ano	3	0.50
07	33	F	Laying open fistula	Fistula (crohn's)	1	0.33
08	39	F	Sphincterotomy	Incontinence	0	0.66
09	42	M	Laying open fistula	Fistula in ano	4	0.50
10	56	F	Haemorrhoidectomy	Haemorrhoids	3	0.25
11	40	M	Laying open fistula	Fistula in ano	4	0.50
12	35	F	Closing ileostomy	Crohn's disease	5	0.50
13	30	F	Sphincterotomy	Crohn's disease	2	1.25
14	55	M	Haemorrhoidectomy	Haemorrhoids	2	0.58
15	22	F	Sphincterotomy	Incontinence	5	0.75
16	59	M	Colostomy	Constipation	1	0.41
17	36	M	Sphincterotomy	Crohn's disease	0	0.91
18	48	M	Laying open sinus	Pilonidal sinus	0	0.50
19	30	M	Laying open fistula	Fistula in ano	5	0.41
20	59	M	Laying open sinus	Pilonidal sinus	2	0.16
21	43	M	Laying open fistula	Fistula in ano	*	0.16
22	46	M	Laying open fistula	Fistula in ano	4	0.50
23	27	M	Drainage of abcess	Perianal abcess	1	0.50
24	42	M	Laying open fistula	Anal fistula	2	0.58
25	58	M	Haemorrhoidectomy	Haemorrhoids	1	0.91
26	66	F	Sphincterotomy	Incontinence	0	0.33

Appendix 7.2

CHARACTERISTICS OF THE CONTROL GROUP

Pt.	age	sex	Type of surgery	Illness	previous ops.	length of op.
n	y				n	hr
01	29	M	Closing ileostomy	Ulcerative colitis	3	0.66
02	44	M	Hernia repair	Hernia	7	0.50
03	35	M	Haemorrhoidectomy	Haemorrhoids	2	0.41
04	37	F	Colostomy	Crohn's disease	4	1.16
05	75	F	Colostomy	Obstruction	1	0.66
06	45	M	Laying open sinus	Crohn's disease	5	1.00
07	70	M	Laying open fistula	Fistula in ano	2	0.75
08	54	M	Closing ileostomy	Ulcerative colitis	4	*
09	55	M	Laying open fistula	Fistula in ano	0	0.50
10	47	M	Laying open fistula	Fistula in ano	1	0.33
11	74	F	Perianal repair	Incontinence	3	1.08
12	27	F	Sphincterotomy	Incontinence	2	0.50
13	56	M	Laying open fistula	Fistula in ano	2	0.50
14	43	F	Haemorrhoidectomy	Haemorrhoids	3	1.00
15	53	F	Hernia repair	Hernia	3	0.66
16	24	M	Laying open fistula	Fistula in ano	5	1.00
17	20	M	Laying open fistula	Fistula in ano	2	0.33
18	21	M	Laying open abcess	Abcess	0	0.35
19	50	F	Sphincterotomy	Incontinence	2	0.83
20	30	M	Laying open fistula	Fistula in ano	0	0.25
21	25	F	Excision of sinus	Pilonidal sinus	2	0.25
22	48	F	Laying open fistula	Fistula in ano	2	0.83
23	35	M	Sphincterotomy	Anal pain	2	0.33
24	46	F	Laying open fistula	Crohn's disease	3	0.66
25	29	M	Sphincterotomy	Incontinence	4	0.83

Appendix 7.3

IMAGERY TAPE

Learning to relax helps you to learn to take control of the way you feel. Research has shown that, by taking control of their illness , patients can prepare themselves better for surgery and can help themselves to recover more quickly from it.

Get into as comfortable a position in bed as possible. First of all---, close your eyes as this will help you to relax--- and mentally rehearse the different experiences--- and sensations--- which you might come across before and after the operation.

Please relax as much as possible during these mental exercises---. Imagine each of the experiences described as vividly as possible.

To begin with think about your hands and arms----, all the feelings you can notice in your hands and arms---- such as the warmth, coolness or slight tingling feelings----as you become aware of the tension----it begins to go. Let your arms and hands feel heavy and relaxed----. Let them sink heavily by your sides.

As you relax, breath slowly, quietly and calmly (X2).---- Now think about your feet and legs---- just as you did with your hands and arms---- As you notice the tension---

Let your legs and feet feel heavy and limp ----. Let them sink heavily into the bed----. Keep breathing slowly, quietly and calmly (X2).

Now think of the muscles of your stomach and chest---- notice any tension in your stomach and chest----. As you notice the tension, let it go---- so you feel yourself sinking deeper and deeper----. Breathing slowly, quietly and calmly (X2).

While remaining as deeply relaxed as possible please try to imagine each of the situations and experiences that I describe as vividly and as realistically as possible. Now breathe deeply---, slowly--- and relax----. Breathe in -----and breathe out.

Imagine it is the day of your operation, you have had nothing to eat or drink, you feel hungry and thirsty, and you know that you cannot eat or drink. Your mind is occupied by the thought that you are in control of your hunger and thirst, that you can easily manage without food or drink for the day. You feel positive about what you are going through knowing that it is necessary and that you can easily cope. Breathe deeply---, slowly---, and relax.(X2)

Now imagine that it is just before your operation and you have just had your premedication and you are waiting to go to theatre. Your mouth is feeling dry, very dry and you are now very hungry. You wish you could only drink or eat but you tell yourself it will be only a few more hours. You see yourself later after the operation tucking into a good meal and you know you can easily cope with hunger and thirst for a few more hours. Breathe slowly--- quietly--- and calmly.

Now imagine that you have had your operation, you are back on the ward and you are feeling uncomfortable. You know that you can ask the nurses to relieve the discomfort whether it is due to pain or feeling sick. You are occupying your mind by the thought that the operation is over and you are in control of the discomfort which usually follow surgery. That you can easily manage for the rest of the day. Time passes quickly. You feel positive about what you are going through, knowing that it is necessary and you can easily cope. Continue breathing slowly---, quietly---, and calmly.

Now it is the day after your operation and you are ready to get out of bed with a little help and even start to eat light food . There may be even more discomfort due to feeling weak, and pain from the wound. But you know you can overcome these feelings. After a few steps on your own you realise its not as difficult as you had imagined. You eat with a big appetite and know that soon you will be ready to go home where you will finish recovering from your operation. Continue breathing slowly---, quietly--and calmly.

By imagening yourself coping well,facing various problems with a positive outlook , and seeing yourself achieving a speedy and successful recovery,you will in fact experience a much better result in reality. Of course you will really experience pain, discomfort and other sensations, but by imagining these things and by seeing yourself coping well, you will be much better prepared, much more able to cope and recover more rapidly and easily than you would otherwise.

Your mind is a powerful thing, and its ability to prepare your body for what you will be going through is much greater than is commonly realised. If you have had a similar operation before, much of what is described will be familiar. However it is not only the experiences themselves that are important, it is your mental attitude towards them, your ability to accept that what is happenning is bound to occur, but that you are coping very positively. Always see yourself actively coping with the situation you experience regardless of how unpleasant it might normally be or might have been on a previous occasion.

Continue to feel yourself coping positively with all these experiences as the tape runs to the end. Such as feeilng hungry and thirsty before the operation ---------
Mouth feeling dry after the premedication ---------------
Feeling sick and uncomfortable soon after the operation -

Feeling pain the day after the operation when you try to get out of bed --------- Always see yourself coping well with the situation you experience regardless of how npleasant it might be. Now carry on breathing slowly, quietly and calmly------. Breathing slowly, quietly and calmly.

Appendix 7.4

Assessment Questionnaire for Relaxation with Imagery Tape

1. Did you find listening to the tape helpful?
   a) very helpful
   b) not helpful
   c) made things worse

2. How often did you listen to the tape?
   a) more than once a day
   b) once a day
   c) not at all

3. How likely would you be to recommend the tape to a friend in hospital?
   a) definitely
   b) undecided
   c) not at all

4. Would you use the tape in future if you had another operation?
   a) yes
   b) undecided
   c) no

5. In using the mental rehearsal procedure suggested on the tape, in general how vividly and realistically could you imagine the various situations described?
   a) perfectly vivid, as clear as the real thing
   b) vividly and realistically
   c) moderately clear and vivid
   d) vaguely, hardly at all
   e) not at all

6. In applying the rehearsal procedure desribed on the tape, how highly effective do you think the technique will be applied by you?
   a) extremely effective
   b) very effective
   c) effective to some extent
   d) perhaps a little effective
   e) not effective

PUBLICATIONS ORIGINATIONG FROM THIS THESIS:

1. Salmon, P., Pearce, S., Smith, C.C.T., Heys, A., Manyande, A., Peters, N. and Rashid, J. (1988). The Relationship of Pre-operative Distress to Endocrine & Subjective Responses to Surgery: Support for Janis' Theory. J. of Behavioural Medicine, 11, (6), 599-613.

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3. Manyande, A. and Salmon, P. (1991-1992). Recovery from abdominal surgery: a preliminary attempt to separate anxiety and coping. British Journal of Clinical Psychology (in press).

4. Manyande, A., Priyakumar, P. Smith, C.C.T., Chayen, S., Higgins, D., and Salmon, P. (1991-1992). Anxiety and Endocrine Responses to Surgery: Paradoxical Effects of Pre-operative Relaxation Training. Psychosomatic Medicine, (in press).

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8. Salmon, P. and Kaufman, L. (1990). Pre-operative anxiety and endocrine response to surgery. The Lancet, 1340.