A PSYCHOLOGICAL INVESTIGATION

INTO

THE EXPERIENCE OF SURGERY.

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ABSTRACT

The stress response, a complex multi-factorial survival mechanism is elicited by surgery. The factors of the stress response include psychological variables, anxiety, mood, coping and sense of control and physiological variables, activation of the adrenocortical system to increase peripheral levels of cortisol and catecholamines, cardiovascular and metabolic changes. The relationships between these factors are generally unknown. Nor is it clear that the stress response remains the same over the period of the hospitalisation, surgery and recovery. The general aim of the studies reported here was to investigate any relationships between the factors of the stress response to surgery within the context of the patients lives. The Response to Surgery Questionnaire was developed to assess subjective responses to surgery identifying four subjective coping response styles, 'optimistic / vigilant', 'pessimistic / negative', 'anger' and 'faith in others'. This questionnaire was used with other established measures to assess the psychological factors of the stress response and the recovery from surgery. Interactions between the catecholamines and some of the psychological variables emerged.

Overall the findings indicate a complex interactive response to pain and stress. Subjective anticipation of the event influences the subsequent experience and recall. Anticipation, experience and recall are elaborated by anxiety. Subjective perception of the event emerged as important to recovery and was related to factors beyond the immediate scope of the hospitalisation and surgery. Recovery was influenced by environmental, ward versus home, sociological factors and subtle failures in communication between patients and professional staff. Interactions between physiological and psychological variables emerged. There were clear associations between catecholamines, treatment failure and postoperative fatigue. The evidence indicated future research and the importance of including subjective perspective and sociological factors is emphasised.
Acknowledgements

This research would not have been possible without the cooperation and help of the medical and nursing staff of St. Bartholomew's and Hackney Hospitals. Especially Mr. T. Bucknell, Mr. S. Edmondson, Mr. J Gilmore, Mr. D. Glyn Evens, Mr. C. Hudson, Mr. G. Rees, Mr. W. Shand, Mr. J Shepherd, Mr. M. Straunton, Mr. T. Wadsworth and Prof. C. Wood who kindly allowed their patients to participate in the studies. Dr R. Ellis and Dr. A. Molloy who collected blood samples and Dr. C Hinds who was medical advisor for the cardiac study. Dr L Perry, Dr. D. Perrett and staff of the Dunn Laboratory for analysis of the blood samples. The nursing staff of Vicary ward and Intensive Care Unit of St. Bartholomew's Hospital.

For inspiration, guidance and advice I am most grateful to Dr. Shirley Pearce, Dr. Peter Salmon and Dr. Charles Vincent.

The cardiac study was supported by a grant from The British Heart Foundation.
Chapter one; The Nature of Stress

The nature of the stress response as a survival mechanism is examined. The physiological and psychological variables of the stress response are identified. The effects of the stress response to surgery on the recovering patient are explored.

Chapter two; Psychological Intervention to Ameliorate Surgical Stress.

Current preparation techniques to reduce the stress of surgery are explored. The apparent failure of these techniques, in many instances is discussed and some suggestions as to the cause of the failure are postulated. The paradoxical role of anxiety, a patient's spontaneous coping responses and problems in communication between patient and staff are suggested as contributing to the equivocal effects of preparation for surgery.

Chapter three; Postoperative Pain.

Postoperative pain is discussed as part of surgical stress and as a stressor in its own right. The similarity between pain and the stress response is examined, the shared physiological and psychological variables are set out. The physiological and psychological differences between pain and stress response are explored. It is postulated that pain
and the stress response are separate but interactive.

Table of hypotheses and a brief description of the research is set out.

Chapter four; The Development of the 'Response to Surgery' Questionnaire

Pilot Study: Interviews with surgical patients to elicit responses to hospitalisation and surgery.

The development of the 'Coping Scales'. The patient interviews clearly identified postoperative pain as a dominant factor in a patient's assessment. However, while clearly part of the overall concern pain seemed to emerge as a separate but related factor to the other stresses of surgery; e.g. loss of privacy on the ward, concerns about recovery. Since adequate response to pain scales existed a 'patient friendly,' 'response to surgery' questionnaire was devised and analysed producing four 'coping scales' assessing individual response styles.

Chapter five; Coping Responses to Surgical Stress.

The patients' responses to pain and surgical stress are examined at focal points during admission for three surgical groups. Changes in response as a function of time indicate an active role for the patient and suggest that the stress response to surgery is a dynamic while response to postoperative pain is static. Interactions between the various factors of surgical stress are explored.
Chapter six; Anticipation and Recall of Postoperative Pain.

The patients' responses, explored in the two previous chapters, suggested that they had preconceptions about the admission and surgery that primed and/or influenced their responses. The first episode of postoperative pain was chosen as a focal event to examine the effects of anticipation on experience and response. Subsequently the effects of anticipation and other factors on recall of this episode of pain were assessed.

Chapter seven; State Dependent Memory Effects in Postoperative Pain.

The first episode of postoperative pain was recorded and recalled in later recovery. Current pain state at recall was recorded and found to influence memory.

Chapter eight; Developing a Psychological Preparation for Major Surgery.

Current preparation for surgery and early recovery following cardiac surgery was assessed. The treatment regime, a psychological intervention to enhance subjective perception of control was developed to compliment the current preparation.

Chapter nine; 'Perception of Control' as a Preparation for Major Surgery:

The Psychological and Physiological Outcomes.

'Perception of control' compared with a 'social support' and a 'no-
treatment control group, in subjects experiencing cardiac surgery. Treatment was assessed against psychological and physiological stress factors.

Chapter ten; Final Remarks. 217

An overview of the principle findings of the studies. Anxiety, Coping and Pain are reviewed in relation to other stress factors. The multi-factorial nature of a subject's response to hospitalisation and surgery is discussed. The subjects’ preconceptions, beliefs and the social factors influencing stress are discussed. The findings are examined in the light of current literature, the relevance of the results for aspects of psychology and application as treatment for surgical stress are examined.

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THE NATURE OF STRESS

In the late twentieth century increased medical knowledge and skills combined with sophisticated technology makes surgery the treatment option of choice to resolve a substantial number of conditions. The majority of the population of western states will encounter surgery at some time during their lives which for many represents "...the most stressful event that most individuals can or will experience" (Newman, 1984). Familiarity, however, has not lessened the stress of surgery with anxiety, depression, fear, hope and confusion being common emotions of the surgical patient. This psychological distress while uncomfortable for the patient was thought to be dissipated by reassurance by medical and nursing staff in the caring environment of the ward. However the overt psychological distress is associated with the physiological stress response which has consequences for recovery from surgery (Hall, 1994).

To successfully address surgical stress it is important to understand the nature of stress, the response to stress and how the effects of stress on the surgical patient can best be managed to maximise their recovery.

Stress

Stress is easily recognised but difficult to define precisely. Dictionary definitions include 'pressure, tension or compulsion', 'when much energy is needed' (Oxford English Dictionary) and 'mental or physical tension' (Collins). These definitions imply that stress is unpleasant and consumes resources but do not fully explain what is usually meant by stress in human terms. There is however an implication of a link between stress and suffering. This association has been noted before, 'The situations producing stress are those that produce suffering' (Paton, 1984; Man and Mouse, p. 93). Curious then that many people freely partake in activities that are regarded as stressful e.g. parachuting, rock climbing. This suggests that there are degrees of stress and since different people
partake in different stressful activities, there is an implication of interaction between the activity and the person. Folkman and Lazarus have defined stress as '(the) relationship between person and environment that is appraised by the person as relevant to their well-being where their resources are taxed or exceeded' (If it changes it must be a process: Study of emotion and coping. page 152; 1985). This definition allows for stress as suffering when resources are exceeded but a degree of pleasure when resources are taxed but adequate. Taken together these definitions suggest that stress is a mental or physical pressure/strain relevant to the person that may be pleasurable/exciting or so distressing as to cause suffering. The magnitude of the resources required to counteract the stress seems to determine pleasure or suffering. For the discussion of the nature of stress a simpler description of stress will suffice.

Thus I shall define stress as an experience or an event which severely challenges the organism's resources. Stress may be internal, a disease process or injury; external, a natural calamity e.g. earthquake; entirely cognitive, university examinations; entirely material, an encounter with a ferocious animal or any combination of the above. Stress may be a minor challenge which subsequently thrills, a ride in a theme park; a more serious challenge which enhances self worth, examinations; a threat, involvement in a minor road traffic accident or a threat of such magnitude that it completely overwhelms our resources resulting in panic, complete psychological breakdown or even death. Stress is usually regarded as detrimental to the organism but examination of the list above will indicate some beneficial effect of stress. When stress is a challenge and the organism finds the resources to meet the challenge self worth is enhanced. Stress also evokes a physiological response, one aspect of which, the increase of circulating epinephrine (adrenaline) humans have learnt to savour. These beneficial effects of stress lead some individuals to willingly engage in apparently life threatening activities e.g. sky diving. The beneficial effects of stress are only apparent where the individual is in control of the situation. The circumstances may change and the challenge increase to threatening proportions and if the individual becomes aware that their own resources are not
competent to meet the challenge then the stress response may overwhelm them resulting in panic e.g. if the sky diver's parachute fails to open. Stress is principally detrimental to the organism, using up psychological and physiological resources. Where stress is prolonged or repeated, as in work related stress, the physiological changes may result in permanent damage e.g. cardiac disease (Rahe and Lind; 1971).

It is the nature of stress that one man's challenge is another man's threat. An important component of psychological stress is the individual's assessment of the event and their own resources. An experience is stressful if the person perceives a discrepancy between the environment and their ability to respond to it (Sarafino, 1990). The magnitude of the threat may be the magnitude of this perceived discrepancy. The magnitude of the discrepancy between environment and personal resources is the result of several factors. The personal responses will be influenced by personality, prior experience and preconceptions about the experience. For example a confident experienced British driver accustomed to driving on the left will be stressed when obliged to drive on the right, as in Rome. It can be supposed that an inexperienced nervous British driver will be rather more stressed when driving in Rome for the first time. The nervous new driver who believes all Italian drivers behave as if the streets are race tracks will be too frightened to drive in Rome. The environmental challenge is also multi factorial involving the initial magnitude of the threat and factors relating to the avoidance or amelioration of the threat. The challenge of driving in an unfamiliar city may be minimal in good light, perfect weather conditions and at a quiet period. The challenge becomes threatening in poor visibility on icy roads during the rush hour. Stress is the interaction of the person and environment involving many factors. Its magnitude and subsequent impact on the individual is associated with the person's assessment of the environmental conditions and their own resources.

There are occasions when an event is of overpowering magnitude and of instant impact that there is no time for appraisal e.g. sudden and severe trauma. With no time for
appraisal the shock induced is severe. The physiological stress response is evoked as a reflex and psychologically the individual is disorientated, confused and unable to muster cognitive functions (Trumbull and Appleby, 1986). If the event is severe enough the stress response may be sufficient to overwhelm the individual and threaten their life unless others intervene, e.g. anaphylactic shock.

There are occasions when the nature of the threat is beyond our power to alter it but its effect is not imminent. To minimise the stress on the individual it may be prudent to ignore it. Life is finite, death is largely unknown to us and the unknown is stressful but the majority of individuals do not think about death except when forced to by bereavement or illness. Deliberately not dwelling on events we can not alter is a form of coping with stress and controlling its impact on us.

The effect of stress on an individual is the product of the nature and magnitude of the threat and the personal response to it. We examine the stress response next.

The Stress Response

The stress response is a primitive complex survival technique involving physiological and psychological variables. It is the flight or fight response of the hunter gatherer alerting man to danger and by subtle physiological changes preparing the body for sudden and rapid flight or attack (Selye, 1976). The emergence of the stress response is not clear but for humans to have survived successfully it must have been present in our very early ancestors. Logically the psychological response evokes the physiological response prior to injury, it being safer to run away from the predator than to fight it. Where injury is sudden and unseen the physiological response is instantly evoked as a reflex but the sense of vulnerability will evoke psychological variables e.g. anxiety. The physiological response may be a reflex, it is certainly instantly evoked when the integrity of the organism is breached. The psychological response is an adaptive behaviour, it is
the response to the environment to maximise survival. As the human environment has changed the psychological response has adapted to meet the new challenges. The psychological aspect of the stress response has adapted so that the physiological response is evoked by different events for modern humans. Clearly we still experience stress when encountering a ferocious dog as did our ancestors but the stress response to time pressures and deadlines is peculiarly modern. The psychological adaption may also moderate the physiological stress response in modern man. A severe flesh wound would be very stressful for our ancestors by restricting their activities, possibly including food acquisition and the risk of infection would be a serious concern. The same injury today would be less stressful in advanced cultures where access to medical care and antibiotics reduces the risks. This knowledge would probably reduce anxiety and moderate the physiological response.

For biological systems, pace of adaption lags behind cultural change and the stress response is no exception. Clearly the psychological stress response has adapted to the changing environment but the physiological response remains essentially the same. Where actual injury occurs the physiological response is to increase adrenocortical hormone production, alter heart rate and adjust metabolism to facilitate flight. The surgical incision evokes the same physiological response and bodily changes as any wound. This response may be moderated by psychological variables e.g. the individuals cognitive appraisal of the event. However prior knowledge of surgery may increase rather than decrease anxiety and enhance the physiological response.

The bodily changes resulting from the stress response affect the surgery, anaesthetic and recovery of the patient. The surgical stress response may endanger the patient's life if the metabolic changes are not addressed (Hall, 1994).

To understand how an adaptive survival mechanism may itself become a danger to man we must explore the known variables of the stress response.
The Principal Variables of the Psychological Stress Response

The primitive, adaptive flight or fight physiological changes must in part be triggered by psychological variables. Logically it is better to avoid danger and conflict which may result in injury. Awareness of a threat simultaneously induces the physiological changes by activation of the sympathetic nervous system and evokes other psychological variables (Selye, 1976). Awareness of danger initially evokes emotion, usually fear which fixes the attention on the situation and forces the individual to assess the situation. During the initial assessment of the threat the individual will be examining the magnitude of the threat and their own resources. If the threat is of great magnitude the individual may simply run in terror and panic. Danger perceived as less threatening will allow the initial fear to abate to anxiety. This will maintain attention on the problem but the reduced emotion will facilitate cognitive function allowing the individual to rally their resources to combat the threat. The next stage in the psychological response is to 'behave' by taking action to avoid the danger or to confront and overcome the threat. During this stage further assessment will occur. For example primitive man fleeing a predator may glance back to assess the distance between them and finding it diminished may alter his tactics and climb a tree. The assessment may also evoke or alter the emotional state. Anxiety may be increased or anger induced if the threat is increasing or anxiety may be reduced if the individual's behaviour is succeeding. If the individual has sustained an injury or considers themselves open to further stress their sense of vulnerability will maintain or enhance their psychological stress response. Emotional levels will remain high and there will be continuous monitoring of the environment. The individual will be more susceptible to clues indicating danger and respond to minor changes which may have been ignored previously. For example a patient who has had a malignant mole removed will be alarmed and suspicious of every freckle or age spot although these may have been ignored in the past.
The Principal Variables of the Physiological Stress Response

When the integrity of the organism is breached a complex physiological response is triggered. The stress response occurs in two phases. Immediately on injury a hypodynamic state occurs when the metabolic rate and physiological processes are severely reduced. This stage is usually of short duration. The second phase is hyperdynamic, the metabolic rate and cardiac output being raised. The circulating levels of catabolic hormones increases, notably cortisol, epinephrine (adrenaline), norepinephrine (noradrenaline) and glucagon. The circulating levels of anabolic hormones, notably insulin and testosterone are reduced. Peripheral circulation is reduced to maintain supply to the vital organs, blood glucose levels are increased and respiration is increased (Kehlet, 1984). These responses are an adaptive mechanism to maximise survival (Selye, 1976). The changes energise the body for flight or fight and improve tissue healing. The magnitude of the changes and the duration of the second phase of the stress response is directly related to the type of injury and the amount of tissue damage. Clean surface flesh wounds produce minimal changes which quickly revert to homeostasis while penetrating injury to the thorax or abdomen results in massive and prolonged change (Kehlet, 1984). With normal healing the physiological changes revert to normal levels.

The physiological response may recur or the duration of the second phase be increased by repeated injury or stress during the recovery period. If during the healing stage a second injury occurs or the individual overexerts himself resulting in pain and fatigue, the physiological changes will be enhanced and prolonged. Repeated stress may result in permanent damage making the individual more vulnerable or even disabled.

The importance of the global stress response on surgery is discussed below.
Matching the Psychological and Physiological Stages of the Stress Response

Above we have discussed the psychological and physiological factors of the stress response. Kehlet (1984) divided the physiological response into two stages, hypodynamic and hyperdynamic, grouping the variables chronologically and by the bodily changes the hormonal changes induced.

Selye's (1985) General Adaption Syndrome similarly groups the variables of the psychological stress response. The general adaption syndrome describes three stages, alarm, resistance and exhaustion. During the alarm stage the individual is highly aroused and their emotion levels are high. During the resistance stage the individual is adapting to the stress. Psychologically they are coping and re-assessing the events but they remain anxious and vulnerable. During the exhaustion stage the individual is fatigued of depressed mood and possibly feels helpless.

When the physiological and psychological variables are grouped in this way it is possible to map the pattern of responses one onto the other. The first two stages of the general adaption syndrome, alarm and resistance, are very similar to the phases described by Kehlet above. The first, alarm is consistent with Kehlet's hypodynamic phase. The highly aroused and emotional individual is initially physiologically inactive e.g. frozen to the spot. During this short first stage the pituitary gland secretes ACTH (adrenocorticotropic hormone) and stimulates the adrenal glands. The second stage, resistance is consistent with Kehlet's hyperdynamic phase. ACTH releases the catabolic hormones to induce the bodily changes necessary for flight. Psychologically the individual begins to react and cope with the situation. Physiologically the initial heightened response will reduce, the levels of circulating hormones will fall but will instantly rise again if the individual remains threatened. The third stage, exhaustion describes the chronic stress condition where prolonged or repeated exposure reduces energy levels causing increased catabolic response further weakening the individual.
The mapping of the psychological and physiological stages indicates where interactions may occur, although there is no strong evidence to suggest that one set of responses elicit the other and no conclusions can be drawn about interactions.

**Factors Modifying the Stress Response**

The psychological response to stress will be related to the magnitude of the event and influenced by other psycho-social variables. Personality, personal experience and social relationships will all influence the response. People who exhibit Type 'A' behaviour respond faster and more robustly to stress tending to perceive all challenge as a threat (Carver, Diamond and Humphries, 1985; Glass, 1977). People who feel a greater sense of control in their lives are more self reliant will tend to perceive stress as a challenge and their psychological response will be modified (Kobasa, 1979).

Clearly self reliance will be influenced by the individual's experience and in some part by their intelligence. If stressful events have been successfully met and overcome then the individual will be inclined to perceive stress as a challenge and have acquired some skills that enable them to respond. If previous experience has been successful then new stresses will evoke a lower level of emotion. The converse is of course true, unsuccessful prior experience tending to increase anxiety levels as any one who failed their first driving test will confirm.

The psychological stress response will also be influenced by interpersonal relationships. Individuals with a strong supportive social network will utilise it to moderate their anxiety, increase their coping response by sharing other's experience and enhance their assessment of their actions with feedback from others (Cobb, 1976; Schaffer, Coyne and Lazarus, 1981).

The psychological stress response is multivariate and idiosyncratic but the principle
variables are awareness, emotion, assessment, behaviour and re-assessment. These variables are modified by others including personality, experience and social network.

Logically the psychological response elicits or modifies the physiological response. The physiological response may also elicit or modify psychological variables. A patient recovering from surgery may become more anxious if their heart rate increases and they are breathless without exertion. Asymptomatic changes in the variables of the physiological response do not influence the psychological variables.

The stress response is a complex interactive process involving psychological and physiological variables. Chronic stress can result in physiological changes which subsequently exhaust and weaken the individual. If the individual is already weak, due to disease process or major surgery then prolonged stress will complicate or impede their recovery. The stress response to surgery is examined next.

**Surgical Stress**

**The Consequences of the Physiological Stress Response to Surgery**

The physiological response to surgery is associated with postoperative complications including myocardial infarction, pulmonary infection, thromboembolism and fatigue (Kehlet, 1991). Endocrine changes that lead to vasoconstriction result in elevated blood pressure which is harmful in the postoperative period, they may also cause catabolism delaying healing and causing general body wasting (Ellis and Humphery, 1982). Recent medical research implicates high levels of circulating cortisol with immuno-suppression (Salo, 1982 and Hole, 1984). This could leave the patient susceptible to postoperative infections. The endocrine and metabolic response to surgery is not completely understood but continuing medical research is slowly unravelling its effects. Besides the
impact of the actual surgery other associated factors may be contributing to the physiological stress response, or complicating its course. One such factor may be the patient's preoperative general health, a good example being the metabolic disturbance that may occur in severe diabetes.

The consequences of the changes resulting from the stress response to surgery are serious enough to concern the medical profession who attempt to combat the deleterious effects on the patient. Anaesthetic techniques are constantly being developed, revised and adjusted to combat the effects of the physiological stress response to surgery (Kehlet, 1984 and 1989 and Hall, 1985). Pre and post-operative care attempt to minimise the effects of the stress response; e.g. dehydration time of a patient preoperatively has been considerably reduced in recent years (Millar, Wishart and Nimmo, 1983). However, inevitably some patients, or their conditions, are not suitable for a particular anaesthetic technique and therefore the stress response is not totally regulated. Some factors, e.g. pre-operative haemorrhage following injury, or a chronic debilitating condition may have already set the physiological changes in motion and it may not always be possible to improve matters preoperatively, further complicating the post-operative period. The patient's physiological stress response may also be triggered pre-operatively by psychological factors (Bradley, 1982).

The Consequences of the Psychological Stress Response to Surgery

The awareness of impending hospitalisation and surgery is certainly threatening and induces emotional changes. It is clear from both animal (Sawrey and Weiss, 1956) and human studies (Cobb and Rose, 1973) that prolonged psychological stress induces psychosomatic disease through the mechanism of the autonomic nervous system, whose action directly activates catecholamines and other hormones associated with the physiological stress response (Garoutte, 1981). Since purely psychological stress can induce physiological responses and emotion, particularly anxiety, is associated with the
primitive flight or fight response, some part of the stress response to surgery may be psychologically induced. There is some evidence to support this view from studies involving the surgical patient. Endocrine responses in particular have been found to be elevated as the patients regain consciousness immediately post-operatively (Plumpton and Besser, 1969, and Salmon et. al., 1988). This suggests that awareness of their vulnerable state is inducing a stress response. Urinary metabolites of catecholamines and cortisol have been found to be elevated on the day of admission (Tolson et. al., 1965) indicating a stress reaction occurring prior to surgery but during the time a patient is anticipating it. It would be logical to suggest that since the stress response to surgery may in part be induced by psychological means, psychological treatments may ameliorate it.

**Psychological Responses to Surgery**

An individual's first psychological response on becoming aware of a stressful event is emotion, often fear or anger. Unless the threat is of such magnitude that it overwhelms the individual the initial strong emotion will abate sufficiently to allow the individual to assess the threat and ways of coping with it. The process of 'thinking through' is the means of abating the raw emotion (fear) into anxiety. This process has been termed 'the work of worry' (Janis, 1958). Anxiety at moderate levels maintains our focus of attention on the threat and we continue to monitor our progress, changing our behaviour as appropriate. The role of emotion is to heighten awareness and to focus attention on the stress.

The majority of individual's first response to being told they require surgery is emotional. If they have suffered strong or prolonged pain they may feel relief that they are to receive treatment but that relief will be tinged with anxiety. Unless surgery occurs instantly following trauma most patients will have some time to anticipate the surgery. They will 'think through' the consequences of surgery on their lives. Moderate levels of anxiety will keep the patient focussed on the impending surgery, they will 'worry' about all aspects of
admission to hospital, the effects on their family and the recovery period. 'The work of worry' (Janis, 1958) will hopefully mean that the patient addresses their concerns, seeking out information, arranging time off work etc. Moderate levels of anxiety allow the patient to prepare for the surgery and will reduce its impact. Implicit in the theory 'the work of worry' is the notion that an absence of anxiety and very high levels of anxiety do not facilitate the thinking through process. Certainly elevated levels of emotion make rational thought difficult (Trumbull and Appleby, 1986) and may lead to panic. Low levels of emotion may not be sufficient to focus attention on the surgery and patients may not prepare for its impact on their lives.

Janis' theory implies that moderate levels of emotion, anxiety in response to stress are not necessarily negative. Evidence from some clinical studies support this theory. Patients exhibiting moderate pre-operative anxiety generally had less anxiety and depression post-operatively than those with high or very low levels of pre-operative anxiety (Janis, 1958, Auerbach, 1973, Johnson, Levental and Dabbs, 1971). However, the relationship between pre and post-operative anxiety was found to be more complex. Some later studies found the linear relationship broke down post discharge, (Wallace, 1986) or was absent (Ho et. al., 1988) and that pre-operative anxiety levels did not predict overall improved recovery or reduced physiological stress responses (Wallace, 1986, Johnson, Levental and Dabbs, 1981, Wolfer and Davis, 1970). Others report associations between pre-operative anxiety and physiological stress response (Manyande et. al., 1992) and pain (Salmon et. al., 1988). Comparison of the studies is complicated by the variety of measures used in assessing the variables. It is clear that the magnitude of pre-operative anxiety is important to post-operative recovery, its effects are however complex.

Emotional responses to stress may also be useful as coping responses. In a study of examination stresses Folkman and Lazarus (1985) demonstrate how emotionally focussed responses were employed when no action by their subjects could change the event. For example subjects after the examination but prior to the results were anxious
but then distracted themselves with other activities. Emotional responses occurred again on receiving the results.

Emotion may be beneficial at some level but not at all levels. If we are not anxious when anticipating a stressful event then the impact of the event may overwhelm our resources. Extreme emotional response may result in panic. In either event the outcome following on the stress may be severely compromised.

Coping Responses

When faced with a threat individuals are not passive they respond, awareness, emotion assessment, behaviour (action), reassessment. The subjective behavioural response to the threat is an attempt to exert some control over the event. This subjective response may be 'conceptualised as a transactional process between person and environment' (Suls, David and Harvey, 1996). In short they are coping responses.

Coping responses are often construed as dichotomous. One group of responses including, information seeking and addressing the possible outcomes, confronting the problems, being construed as 'vigilant' or 'monitoring'. The opposing group including shutting out the stress, actively not thinking about the stress being 'avoidant' or 'blunting'. Both response styles can alter the emotional response to the threat. Vigilant responders may by addressing problems related to the stressor have strategies for overcoming every eventuality and thus reduce the impact of the stress by exerting control over it. Equally constant rehearsal of the problems without finding a solution may increase the impact of the stress. Avoidant coping responses may reduce the emotional impact by not worrying about problems they cannot deal with or enhance the stress by being unprepared. In clinical studies most evidence suggests that the 'avoidant' style leads to a more satisfactory outcome, Mathews and Ridgeway (1981) for example. However there are indications that 'vigilant' coping is advantageous. Andrew (1970) Manyander and Salmon
(1992) demonstrated that subjects who were clearly 'vigilant' or 'avoidant' had better outcomes than those subjects who had no discernable coping response.

For other stressors coping responses have been equally difficult to assess. Pain is a common source of stress and coping responses to it have been examined. Negative or catastrophising responses are associated with increased and prolonged pain. These responses tend to be 'worrying' about the pain and its cause and restrictive life diminishing behaviours like resting in bed for long periods. The positive responses, distraction from the pain by other activity e.g. reading and behaviours like taking analgesics are not clearly associated with improved pain relief. Practically if the psychological stress response sequence holds true, awareness, emotion, assessment behaviour, reassessment then the subjective response will alter possibly encompassing 'avoidant' and 'vigilant' and 'positive' and 'negative' responses. The studies of examination stress (Folkman and Lazarus, 1985) clearly demonstrated that as the event unfolds the subjective response changes as appropriate to enhance the outcome or minimise the impact of the stress.

**Subjective Sense of Control**

In coping with a stress the individual is trying to exert control over the event. If they are moderately successful they will reduce the negative effects of the event on themselves. If an individual does not perceive any control over a stressful event the chronic or repeated physiological response may lead to permanent damage. Certainly 'loss of control' over stressful events has long been known to contribute to psychosomatic disease in laboratory (Weiss, 1970 and Horkarsan et. al., 1971) and non-medical studies (Cobb and Rose, 1973). Similar results are emerging in the medical field. Shadish et. al. (1981) and Wallston et. al. (1987) report increased emotional distress and poorer overall recovery in patients who feel they have little control over their health and recovery. This "loss of control" particularly during recovery interferes with the normal coping responses and
may even add to the stress response to surgery (Salmon, 1992). Further evidence is emerging to suggest that a 'normal' individual deprived of this sense of personal control, e.g. in trauma, will make considerable efforts to restore it (Taylor and Anmer, 1996). Conversely perception of control in aversive situations has resulted in stress reduction, in the laboratory (Geer, Davidson and Gatchel, 1970). Clinically, favourable results of intervention are reported when perception of control is encouraged in rehabilitation group (Johnston et. al. 1992). There is some evidence of alterations in the physiological stress response during treatment of severely phobic subjects. Changed patterns of plasma catecholamines are reported for phobic subjects who initially perceived no personal control in their treatment when they subsequently discerned personal involvement (Bandura et. al., 1987). The observed effect of coping with the stresses of surgery may therefore be attributed to the enhancement of the patient's sense of active control over the situation.

Summary

Above we have considered the impact of the survival stress response in our sophisticated world. It is clear that the response is still relevant and has adapted somewhat to the changing cultural environment. There are some stressful events where the response has a certain nuisances value e.g. surgery. Individuals facing a stressful event still exhibit the primitive physiological and psychological response. We have considered how the physiological response may be primed and maintained by the psychological variables. We have also examined how we may attenuate the physiological response psychologically. Emotion, coping and control are much reported in the literature and emerge as the most important variables. However preparations for surgery to reduce the stress of surgery based on emotion, coping or control alone have proven equivocal (Salmon, 1992). In the next chapter we examine some of the preparation techniques and why they might fail.
In the previous chapter stress and the stress response were examined in detail. The principal variables of the stress response were discussed. The association between the variables of the physiological and psychological stress response were explored. The physiological changes evoked by the stress response are an adaptive mechanism to facilitate flight or fight. These changes may complicate surgery itself e.g. the increased perfusion of blood to the limbs to supply the muscles of flight may result in excessive blood loss during hip replacement surgery. The physiological stress response once evoked will usually subside when the danger is past unless it is maintained by some other variable. When actual injury occurs the organism feels vulnerable, remains highly aroused and responds readily to any potential danger. This maintenance of the stress response is particularly pertinent to surgery. The post-operative patient is vulnerable as a result of surgery and immediately post-operatively as a result of anaesthesia. There may be other factors which maintain the stress response in post-operative patients. Factors relating to the recovery period which in themselves are stressful e.g. the results of a biopsy taken at surgery, a period of assisted breathing, post-operative pain etc. Factors not directly related to recovery e.g. chronic physiological states, diabetes, multiple-sclerosis or age related factors, immature organs in the very young or fragile systems in the very old may respond in exaggerated ways to surgery or anaesthesia. The medical profession spends a great deal of effort counteracting those physiological changes which may be complicating recovery, distressing or harmful for the patient.

As discussed in chapter one the stress response involves both physiological and psychological variables which are closely associated if not interactive. Attempts have been made to utilise the psychological variables of the stress response to alleviate the physiological response to surgery. Nursing, medical and psychological disciplines have attempted to reduce the stress of surgery by various techniques, most often directed at altering the affective response both pre and post-operatively.
The Experience of the Surgical Patient

Submitting oneself to surgery is in one sense a very curious action to take and in survival of the organism terms quite contrary. We know that the surgeon has diagnosed our disease and with great care and skill will repair or remove the damage and we will subsequently be cured or at least more comfortable. The body's reaction to surgery is however exactly the same as if an assailant had stabbed us with a knife. The stress response is evoked.

Before exploring the interventions designed to ameliorate the psychological stress response to surgery it is useful to consider the experience from the surgical patient's perspective. There are numerous factors involved in the experience of surgery and the experience unique for every individual. However some experiences are common to most surgical patients and we can imagine a typical scenario. For our 'typical' patient the experience begins with the first realisation that surgery is a treatment option. This may be their first instance of pain, or their general practitioners advice. It will not be the moment they are admitted to hospital unless they have suffered an acute trauma. This first knowledge of surgery is 'awareness' of the psychological response to stress we described in chapter one. 'You need an operation' hearing these words will evoke fear possibly, anxiety at least, this is the psychological 'emotional' response.

Assessment and Anticipation

For the majority of patients a considerable time will elapse between becoming aware of the need for surgery and admission to the hospital. This leaves a substantial amount of time to anticipate the experience and to enhance or moderate their initial emotion. Leventhal's 'Processing model of personal episodic memory' (Leventhal and Everade, 1979) demonstrates how any personal experience is informed by prior knowledge, attitudes or beliefs and enhanced by mood and emotion. This model predicts that an
individual waiting for surgery will gather all they know or believe during this period and enter hospital with a particular set of preconceptions. It follows that the patient's behaviour during this anticipation stage is important because it has consequences for the subsequent psychological responses to surgery and may effect outcome or complicate recovery. Behaviour in this context refers to any action taken to avoid, attenuate or avert the stressful event. The action may be cognitive, thinking about the surgery and its implications or deliberately not thinking about it but concentrating on other things as a distraction or overt behaviour like deep rhythmic breathing to overcome acute pain.

One of the first thing a patient does in this anticipation stage is to assess the threat. Assessment of the threat will involve many issues but the driving force will be what does the surgery mean to the patient. The patient may be described as 'thinking through' the situation. This process will involve many issues including the magnitude of the surgery, social/family factors, economic concerns and other variables. The magnitude of surgery may directly influence anxiety both pre and post-operatively. While any surgery is stressful, the response to surgery which is in itself life threatening or a palliative procedure for a chronic or terminal disease, will be more complex (Feifel, Strack and Negy, 1987). Social factors involving family relationships, economic factors relating to long term post-operative care and simply coming to terms with one's own death will be worries for the seriously ill patient. Some of these issues may serve to increase the anxiety level pre-operatively others may prompt behaviours which subsequently reduce anxiety. For example a mother sorting out child care for the duration of the hospital stay will resolve one problem and perhaps resolve the anxiety related to it. Focusing on 'solvable' problems may also serve as a distraction from 'unsolvable' problems that would otherwise tend to exacerbate the psychological stress.

Often at this point patients will seek information about their surgery. This information will come from a variety of sources. Official publications such as information leaflets issued by medical personal, G.P.s or hospital clinics. Unofficial publications, articles in
magazines, television documentaries etc. Other sources include specific patient groups e.g. the hospital's coronary surgery patients group, a report from a relative who has had a similar operation or even a chance remark from a fellow passenger on a train. The information will not always be reliable but for an anxious patient it may be difficult to sort the good from the bad. A second problem with information is communication difficulties between patient and source of information. The problems of communication are dealt with in the section on intervention below.

In the survival stress response sequence our 'typical' patient has become aware of the threat and activated the physiological response to best prepare the body for flight. The psychological response has aroused some emotion probably anxiety which has focussed attention on their plight and they have thought through the implications of the surgery. During the anticipation period the psychological variables, principally emotion, have been evoked and may be maintaining or even enhancing the physiological responses. Other variables, persistent pain or disability may also be exacerbating the stress response at this time.

In assessing the threat, implications of surgery, the patient thinks through the situation and as our example of the mother above demonstrates this leads almost seamlessly to another variable in the psychological sequence, behaviour or 'coping responses'.

*Spontaneous Coping Responses to Stress*

When faced with a stressful situation the majority of people will attempt to minimise its impact. Essentially they will try and cope with the problem. Adults will usually have a repertoire of behaviours based on their experience and knowledge of the world from which they select those they believe useful in their current situation. Each individual threat will evoke a unique set of responses from each individual. There will be some commonality, some stresses evoke the same response from most people e.g. most people
will stop when they reach the kerb on a busy road. Equally an individual's responses to a wide range of stresses may be similar e.g. some people deal with stress with anger or aggression whether it arises from overwork, confrontation or ill health. The same stress may evoke quite different responses from different individuals. Exhaustion can be experienced as pain, an athlete in competition may experience a period of exhaustion but will attempt to run through the 'pain barrier' in order to win. Lesser mortals walking up a steep hill will normally stop and rest when this exhaustion/pain level has been reached. Whatever the response the individual is attempting to cope. These behaviours are spontaneous coping responses

Coping responses to surgical stress have generally been conceptualised as two basic styles. Patients who either try to ignore, or deny the imminent threat and thus not think about it, are classified as avoiders. While those who investigate, 'think it through', the possible outcomes of the situation are classified as vigilant. Both coping styles have been reported as being effective in reducing the emotional impact of stress. Avoidant coping has led to reduced post-operative anxiety and shorter hospital admission (Mathews and Ridgeway, 1981) and fewer post-operative complications (Cohen and Lazarus, 1973). Vigilant coping has been associated with poorer long term recovery and higher levels of post-operative pain (George et. al., 1980). Avoidant coping has also been associated with higher plasma levels of cortisol (Ho et. al., 1988). Both vigilant and avoidant coping have been reported as effective in reducing post-operative psychological distress (Andrew, 1970) and physiological response (Manayande et. al., 1992), while no effect has been found for subjects for whom no coping style can be discerned. This suggests that some active controlling of the situation by the subject to address the threat or to ignore it underlies coping. This notion has additional support from studies where 'locus of control' has been assessed in relation to either spontaneous or taught coping responses to surgery (Auerbach, 1989 and Picket and Clum, 1982). The evidence reported suggests that the use of coping strategies enhanced a sense of subjective control over the situation. This notion of control is consistent with the Folkman (1985) concept
of coping as a dynamic process. Although over time subjective coping may seem inconsistent, vigilant 'thinking through' at one stage but avoidant 'deliberately not thinking about it' at a different stage the overall impression is of active monitoring and adapting to the changing threat or subjective control.

**Spontaneous Coping Response to Pain**

In our discussion of spontaneous coping responses to surgery it is also important to consider post-operative pain, although pain and its relationship with stress will be discussed in the following chapter. The literature on coping responses to pain is quite separate to that of more general stress, although related when the stress involves pain as in surgery.

Coping responses to pain have tended to be regarded as static rather than as a dynamic, possibly because each episode of pain is perceived as complete unto itself, and dealt with in isolation. Different strategies may be utilised for pain arising from different causes e.g. a simple headache may be resolved with a propriety analgesic while pain arising from trauma may require medical assistance. There is some evidence that the responses to different pains may have a consistency for the individual (Tan, 1982). In the example above the responses to both the simple and traumatic pain are specific to the event but both are positive, help seeking action. Pain that persists for months beyond healing or for which there is no discernable physiological cause, chronic pain must change over time, however there is no evidence to date that suggests that utilising different strategies at different stages of the experience occurs.

There is evidence to suggest that some coping responses are associated with higher levels of pain. Individuals who dwell constantly on their pain and its causes, who interpret every twinge as portending some incurable disease or whose lives are seriously disrupted by their pain e.g. would not leave home in case the pain occurred, are described as
'catastrophising' or utilising 'negative' responses. These responses are associated with reports of high levels of pain which is persistent both in chronic (Rosensteil and Keefe, 1983 and Pearce, 1986) and acute pain (Chaves and Brown, 1985 and Pick, Pearce and Legg, 1990). Conversely taking positive action, requesting an analgesic, distracting oneself with a pleasant activity and trying not to be unduly disabled by the pain is associated with lower levels of pain but less securely. Comparing the 'negative' and 'positive' responses it is clear that in the first style the pain takes over the individual, controlling their lives by restricting their activities. In the second style the individual is attempting to control the pain and avoid it altering their lives. This suggests that subjective control is as important for pain as in responding to more generalised stress. It is clear that subjects who actively do try and control their pain are less likely to have their lives disrupted by it.

*Coping Responses in the Post-operative Period*

Whether the patient utilises avoidant or vigilant coping, to the stress of surgery or to pain it is clear that patients actively assess their progress and respond to their perception of it. The clues to their progress will be many and diverse. Their own feelings, do they feel better today than yesterday, did they have less pain. The medical staff's reassurance and possible discussion of a discharge date. Other patients' reactions to them e.g. are they included in the general society of the ward or tactfully ignored. Less obvious sources of clues to their progress will be overheard and possibly misunderstood conversations between nursing staff or staff and relatives. The moving of their bed from one part of the ward to another, changes in their treatment regime, an unexpected or unexplained blood test and many others. Having assessed any change in their situation patients alter their response to meet that change. This may be emotional e.g. becoming more anxious or behavioural e.g. refusing a routine analgesic if their pain is abating. The consequences of their new strategy will then be monitored. Most adults are accustomed to monitoring their environment and the effects of their reactions to it and there is no reason to assume
that individuals will abandon this active participation when entering hospital, although the hospital environment generally discourages it.

The patient's experience of surgery is at best confusing. They find themselves in unfamiliar situations where they are expected to behave in abnormal ways, giving up control over their lives, sharing rooms with strangers who may witness their more intimate activities and somehow overcoming their natural desire to flee danger and subject themselves to the surgery. Their experience at worst is terrifying. Yet as we have seen above most patients rally a great variety of personal resources to help them through the situation. They really want to get better and having sought professional help they will endeavour to fulfill their role and be a 'good patient' since they see this as maximising their survival. This will include following the behaviours suggested to minimise their stress. It is this professional intervention that we examine in the next section.

**Intervention to Minimise the Stress Response to Surgery**

The pre-operative preparation for patients is designed principally to reduce the stress of surgery. Practically this usually means reducing anxiety. The most prevalent opinion has been that anxiety should be reduced to the minimum.

A variety of techniques exist to prepare patients for surgery. The earliest attempt to reduce anxiety was simple reassurance provided by medical and nursing personal. The ward environment was also a means of calming the patient. The manner of the reassurance and the ambience of the ward has altered over time. In the early twentieth century a clean, antiseptic, regimented ward run by efficient nurses, demonstrated good order and discipline. Patients were told little so that they would not be alarmed and encouraged to trust the staff who would cure them. In more recent times the regimentation of hospitals and nursing staff has softened. Patients are no longer confined to their beds but often free to leave the ward to visit the shop or gardens. The wards are
often divided to give individual patients greater privacy and attention is paid to the
decoration of the ward to make it as relaxing as possible. The patient is consulted about
their condition and encouraged to inquire about their treatment. Many formal techniques
of preparation for surgery are now routine practice and we examine some of these next.

Information

To reduce patient anxiety various preparations have been utilised. Most, however are
based on providing information by leaflet or discussion with the nursing staff to
familiarise patients with the ward environment, the procedures, the immediate aftermath
of the operation, the sensations and pain they might expect. Often patients are
encouraged to discuss their worries with the professional staff and some hospitals
provide video coverage of inaccessible units like intensive care.

Procedural information e.g. 'first we will give you a sedative then the doctor will pass the
tube' etc. was found to be ineffective (Suls and Wan, 1989). When information included
sensations the patient might experience e.g. 'the sedative will make you feel drowsy, you
will feel the doctor pressing on your tummy and feel a bit sore' the results improved
(Johnson and Leventhal, 1974, Wilson Barrett, 1978). While the information and
attention is no doubt comforting to the patient and for some will reduce their anxiety
levels the effects of this preparation are disappointing. Information which included
procedure and sensation was effective in minor procedures e.g. endoscopy but no effect
was found when the technique was applied to major surgery (Langer, Janis and Wolfer,
1975).

The effectiveness of information was prone to influence from other variables Individual
differences in personality traits are important. Individuals who scored high on trait
anxiety and were prone to respond to all events with increasing levels of anxiety tended
to be more anxious after receiving information than before (Salmon, 1992).
A second difficulty with information is common to many other preoperative techniques, the problem of misunderstanding the information. Pre-operative information is often given on admission to the ward, although some patients receive leaflets at a pre-operative clinic. A difficulty with giving information leaflets is that there is no one immediately available to answer questions and it is impossible to know what benefit patients obtain from them. Rarely, if at all are patients assessed for anxiety at pre-operative clinics therefore the leaflets may actually increase anxiety for some patients (Salmon, 1982). When information is given on admission a whole new set of problems arise. The information has to compete with pre-operative visits by medical staff and the routine tests often carried out at this time. The average patient is anxious on admission, disorientated by the ward and possibly embarrassed at the close proximity of the other patients who are total strangers to them but who will observe them in a state of undress. This is probably not the environment most conducive to information processing. Where it has been possible to assess what a patient learns or retains of the information given no association has been found with recovery indices (Andrew, 1970).

The failure of 'information alone' techniques has led to the use of various psychological treatments to encourage patient participation in their preparation for and recovery from surgery.

*Cognitive Behavioural Techniques*

Cognitive behavioural techniques attempt to reduce stress by teaching an individual skills which they utilise in stressful situations. These skills may be entirely behavioural e.g. relaxation where an individual is taught to concentrate on specific muscles and tense and relax them. They may be entirely cognitive e.g. learning to imagine pleasant situations as a distraction. Frequently the skills involve both cognitive and behavioural aspects e.g. relaxation coupled with desensitisation to overcome phobias. A major difficulty with cognitive behavioural techniques as a preparation for surgery is the time it takes to
acquire the skill. Desensitisation typically takes six one and a half hour sessions spaced a few days apart (Gatchel, 1980). This is clearly not possible for most pre-operative preparation which usually occurs immediately pre-operatively or at best one day before.

Cognitive behavioural techniques frequently utilised in preparation for surgery include relaxation training and distraction. Typically a patient is given detailed information about a procedure, taught to relax the relevant muscle groups and/or taught to recite or sing a little rhyme. A common practice to overcome labour pain is for the woman to breath rhythmically and try to recite a familiar rhyme for the duration of the contraction. Sometimes the cognitive behavioural skill will be enhanced by soothing music which is a further distraction.

Some studies have utilised principal cognitive techniques as pre-operative preparation for surgery. The patients are taught pre-operatively to restrain negative thoughts e.g. 'the injection will hurt', to reinterpret them e.g. 'the pain is very short', to distract themselves 'I will think about my holiday plans' (Ridgeway and Mathews, 1982; Anderson, 1987). The results of these studies are mixed (Salmon, 1992).

Some studies have utilised principal behavioural techniques mostly relaxation. Patients are taught pre-operatively to achieve relaxation by concentrating on a specific group of muscles and first tensing them then allowing them to relax. The results of relaxation as a pre-operative preparation are also mixed. Patients report feeling better post-operatively and request less analgesia but plasma levels of epinephrine (Wilson, 1981) and cortisol (Manyande et. al., 1992) were raised over base levels. Relaxation taught pre-operatively seems to reduce the psychological stress response but enhance the physiological response.

These techniques have proven equivocal for several reasons. First there is the common problem of knowing exactly what the patients learn during the busy pre-operative period.
Secondly they may reduce pre-operative anxiety to levels below which patients prepare themselves for surgery. The impact of the surgery is thus greater and the physiological stress response is enhanced. Thirdly they are thought to fail because they are competing with the patients own spontaneous coping strategies, discussed above.

*Coping Skills*

The preparations for surgery that seem universally effective are those including coping skills training, with all patients benefiting in some measure (Mathews and Ridgeway, 1984). Coping skills help the patient to manage their surgical stress. There are a variety of skills involved but they divide into two broad categories, emotional and problem centred. The first task in any coping skills training is to present an accurate picture of the procedures and the level of discomfort expected. Where stress can not be avoided e.g. a painful diagnostic procedure, the patient may be encouraged to use emotional coping, seeking support from the staff e.g. hand squeezing and trying to distract themselves. When the stress is more tangible e.g. mobility difficulties, the patients are encouraged to use problem centred coping e.g. seeking advice on modifying their home to ease their mobility.

Coping skills training has been shown to enhance the patient's subjective well-being (Manyande et al., 1992) and reduce the post-operative endocrine response (Ho, Hashish, Salmon, Freeman and Harvey, 1988). Coping skills are techniques which help the patient to cope with particular situations occurring within the broad event. A typical coping skill is the rhythmic panting taught at antenatal classes to be employed by women during the contractions of labour.

Where coping skills training has been studied in relation to 'avoidant' and 'vigilant' stress response styles (Auerbach, 1989) and 'locus of control' (Picket and Clum, 1982) the evidence suggests that the preparation enhances the patient's sense of control and
involvement in their recovery. Certainly 'loss of control' over stressful events has long been known to contribute to psychosomatic disease in laboratory (Weiss, 1970 and Horkarsan et. al., 1971) and non-medical studies (Cobb and Rose, 1973). Similar results are emerging in the medical field. Shadish et. al. (1981) and Wallston et. al. (1987) report increased emotional distress and poorer overall recovery in patients who feel they have little control over their health and recovery. This 'loss of control' particularly during recovery interferes with the normal coping responses and may even add to the stress response to surgery (Salmon, 1992). Conversely perception of control in aversive situations has resulted in stress reduction in the laboratory (Geer, Davidson and Gatchel, 1970). Further evidence is emerging to suggest that a 'normal' individual deprived of this sense of personal control, e.g. in trauma, will make considerable efforts to restore it (Taylor and Anmer, 1996).

Interventions to Enhance Subjective Sense of Control

It is difficult to imagine that the patient has any control over an experience like surgery as they are often given a general anaesthetic for the operation. Even those patients who remain conscious throughout the procedure are rendered semi-paralysed by 'spinal' or 'local block' anaesthesia. During recovery patients' needs are attended to by nursing staff and post-operative pain is controlled by regular doses of analgesia. The patient may even be rendered immobile by the nature of the operation and the attendant equipment that aids recovery. Despite all this if a patient can communicate they may still have some control.

The most frequently used technique involving subjective control is 'patient controlled analgesia'. Prior to the operation some patients are offered a choice of methods of post-operative analgesia, nurse administration or carefully monitored self administration. There are two aspects of subjective control involved in the procedure. Firstly the patient may chose, although there may be subtle pressure from the medical staff to opt for what
they believe to be the best option for the patient. The second aspect of subjective control is that the patient will choose when the analgesia is administered.

Even in situations where there is no possibility of giving control to the patient, a sense of control may be induced and effective. Favourable results of intervention are reported when perception of control is encouraged in rehabilitation group (Johnston et. al., 1992). There is some evidence of alterations in the physiological stress response during treatment of severely phobic subjects. Changed patterns of plasma catecholamines are reported for phobic subjects who initially perceived no personal control in their treatment when they subsequently discerned personal involvement (Bandura et. al., 1985).

Limitations of Psychological Techniques for Ameliorating Surgical Stress

The interventions discussed above are the ones most often employed to reduce the stress response and maximise outcome. Sadly the results of the psychological interventions have been equivocal (Salmon, 1992). In the discussion of common interventions to ameliorate surgical stress we noted some failings. The failure of simple techniques often led to the introduction of more complex techniques e.g. where information alone failed the preparation was enhanced by the introduction of cognitive behavioural techniques. While the psychological interventions have been based on validated research the knowledge base of 'health psychology' is far from complete. Clearly the failure of psychological treatments to ameliorate surgical stress is, in a large part, due to the limits of this body of knowledge. Recently more attention has been paid to why a treatment failed rather than simply complicating the procedure. The research into the limitations of preparation for surgery has focussed on variables common to many techniques. Pre-operative anxiety, communication, subjective preconceptions, discrepancies between the intended treatment and the actual treatment and the interactions between the variables. Next we examine these subjects in greater detail and how they may effect pre-operative techniques.
The Role of Preoperative Anxiety

The majority of pre-operative techniques to reduce surgical stress have concentrated on reducing anxiety. This is based on the belief that anxious patients are more distressed and recover less well than non-anxious patients. It is not clear that this belief is well founded. In the previous chapter we examined the emotional response to stress. Janis (1952) put forward the idea that anxiety at moderate levels kept the attention focussed on the forthcoming event and encouraged a thinking through of potential problems, 'the work of worry'. The thinking through process might lead to action which resolves a problem and reduces the stress. In the Folkman and Lazarus (1985) study of examination stress the 'work of worry', pre-examination anxiety led students to adopt a problem centred activity, revision. For the surgical patient, most of whom will have a considerable time to anticipate the surgery, the pre-operative anxiety might encourage them to get some one to care for children or pets during their hospital stay or set their affairs in order prior to admission. Solving all these minor problems will reduce the impact of the stress. Some clinical studies have reported that a moderate level of pre-operative anxiety predicted lower levels of post-operative anxiety and depression (Janis, 1958, Auerbach, 1973, Johnson, Levental and Dabbs, 1971). Other studies have found associations between moderate levels of pre-operative anxiety and lower levels of post-operative pain (Salmon et.al., 1988) or reduced indices of the physiological stress response (Manyande et.al., 1992). Where preoperative preparation has significantly lowered pre-operative anxiety by relaxation the physiological stress response seems to have been greater post-operatively (Wilson, 1981; Manyander 1992). In the light of this evidence it is hard to sustain the premise that all anxiety is bad, moderate levels of anxiety apparently benefiting the patient. Logically it would seem useful for preparation for surgery to try and maintain anxiety at moderate levels. This suggests that patients can be recognised as high, moderate or low anxious individuals and the pre-operative intervention presented in an appropriate manner. This brings us to the second reason for failure of preparation for surgery techniques, communication.
Communication

Communication is fundamental to all psychological interventions to reduce surgical stress. A growing body of evidence highlights the areas where communication fails. The two principal failings are verbal, not necessarily only medical terminology and environmental. The failure in verbal communication is not just a misunderstanding of language, although that may occur, it is a failure on the part of the professional staff to understand the patients needs. This is not because the staff are indifferent to their patients. They are genuinely concerned and caring but they are unable to see the surgery from the patient's point of view as Johnston (1984) demonstrated. Further studies suggest that communication between professionals and patient is not perfect (Fitzpatrick et. al., 1984). We next review where communication breaks down beginning with straightforward misinterpretation of information.

Appropriate or Inappropriate Information

On admission to a ward patients are often given a tour of the facilities and some basic information. Even at this level it is possible for confusion to arise what is 'given' is not always what is 'received'. For example a pre-operative patient may be told where the ward bathrooms are, when visiting hours are and that the priest comes to the ward on Thursdays but is available at other times. Useful and harmless, even reassuring information. What the patient may understand is, 'I will have to get myself to the toilet even if I'm just out of theatre', 'My husband can't come during the visiting times because he's at work then' and 'they think I'm going to die'. Do adult articulate patients really think like this? The final comment was made to me when I visited a patient in hospital following a routine ward round by the chaplain.

Misinterpretation can occur on many levels. Firstly simple confusion of language. Assuming that technical jargon is avoided, since most hospital staff do attempt to explain
medical terms in 'lay' words, there is still considerable scope for misunderstanding. Simple, apparently unambiguous terms, e.g. bilious, may convey something quite different to the doctor and the patient. Less precise phrases found in many psychological questionnaires e.g. 'I feel nervous, jittery' are ripe for misinterpretation. This may result in a confusion about the patient's well being or disease state.

Secondly, the medical and nursing professions may fail to understand the patient's real worries and concerns, as ably demonstrated by Johnston (1984). In her study, the subject's fellow patients predicted their worries with greater accuracy than the clinical staff. Consequently the information the patients receive may not address their fundamental problems or resolve their worries but may actually increase their anxiety about the whole procedure. This too would account for some failings of psychological interventions to enhance recovery from surgery.

An example of communication failure both of language and failure in understanding what is 'received' is what was 'given' being complicated by a misunderstanding of the patient's view is the technique of patient controlled analgesia (Peerbhoy et al., 1998). The authors particularly note a discrepancy between what patients are 'given', in this case a notion of control and what they 'receive'. Patient controlled analgesia (PCA) is considered to be a particularly efficient means of keeping postoperative patients pain free. Physically the patient is able to administer analgesia when they need it at and not rely on either asking a nurse or the regular drug round. Psychologically the patients sense of control or active participation in the treatment is thought to limit the stress response. Peerbhoy and colleges listed several factors that interfered with the basic principals of the treatment resulting in some patients feeling bewildered and isolated rather than in control. One problem we have already discussed is the time allocated to instructing the patient and their ability to comprehend the details of the treatment and to make decisions about accepting it. The patient probably first encounters PCA when the anaesthetist makes a pre-operative visit, one of many visits and tests that compete for time on the day...
or morning prior to surgery. The patient has to absorb many technical details related to
the administration of the analgesia e.g. that they cannot overdose, that they press the
button to obtain pain relief, that they may feel sleepy or nauseous with some drugs. They
are asked if they would prefer this type of analgesia to nurse administered drugs, thus
enhancing the patient’s sense of control over their treatment. Even if the patient has fully
understood the technical information they are left little or no time to consider what they
may want. A common response is 'what do you think is best doctor?' The patient is
offered a choice but no time to make a decision so negating the choice. A second
problem relates to the competence of individual staff members with the procedure. An
inexperienced nurse can negate the sense of control by confessing that they are
unfamiliar with PCA or this particular administration set and therefore can not replenish
the reservoir of drugs. The patient is then forced to wait for a more experienced staff
member who may not be immediately available. A third major problem is the failure of
the staff to understand the patient’s view of their recovery. This notion of patient
perception is discussed again later. In the case of PCA the staff expect that the patient
will administer the analgesia to maintain a pain free or very low pain state. The patient
however may administer a larger dose immediately before some activity that could be
painful e.g. getting out of bed. They may also choose to bear more pain but be more alert
when they have visitors. The patient may have control of their analgesia but pain itself
can enhance or maintain the stress response during recovery. In terms of a stress
reduction technique PCA would seem to fail on all counts. Either the patient fails to feel
in control or they use the analgesia to improve their life style rather than to obliterate
pain.

The Influence of Environment on Communication

Communication between staff and patient may be misinterpreted not by language alone
but also by the ward environment. A considerable effort is made by busy staff to make
the patient feel safe, comfortable and reassured. When a patient is encouraged to have
some 'control' over their situation the 'don't worry we will take care of everything'
ambience of the ward can silently undermine the treatment. Equally, as Peerbhoy and
colleagues (1998) points out, a patient's perception of control over their analgesia may be
compromised by inexperienced staff. Further conflict may arise if patients have a
problem e.g. increasing pain and have been instructed to ask for analgesia but perceive
the nurses as 'too busy' and elect to bear the pain rather than 'be a nuisance'. This conflict
also arises from a failure to view the surgery and recovery from a patient's perspective.
These failures of communication can have consequences for the patient’s stress response,
increasing some psychological variables like anxiety or depression which may maintain
the physiological stress response.

*Subjective Influences on Communication*

Communication may be further complicated by a patient's response to the information
being given. Perceptual defence (Eriksen, 1954) describes the screening out of highly
emotive information before it impinges on the subject's consciousness. If the information
is unpalatable it may be screened out and not be 'received' by the patient at all. Perceptual
defence may explain why some patients who have been told that their surgery may be
more extensive than anticipated and who have signed a consent form which gives the
surgeon permission to proceed with a more major operation if necessary on waking up
deny any prior knowledge of the extended procedure.

The patient's perception of their operation will also influence communication leading to
substantial misunderstanding between professional and patient. For example the
magnitude of the surgery may be quite different for the staff and patient. The
professional grading of surgery relates to its intrusiveness, its location, its duration and
the degree of support required in recovery. Removal of the gall bladder is a major
procedure involving intrusion into the abdomen and removal of an organ leaving a
visible scar. A vaginal hysterectomy is less intrusive and leaves no scar although an
organ is removed. These procedures are similarly classified as major operations by the professionals. The patient however may view them differently. The loss of a gall bladder may have no discernable long term effect on the patient, except to cure their pain. The removal of a uterus is often associated with loss of femininity, a loss of potential children and may have lasting psychological effects on the patient and even on her family. The failings in communication between patients and staff may arise from simply not viewing the surgery in the context of a patient's life. This failure to perceive the surgery in context may account for Johnston's findings (1984) that fellow patients predicted patient worries more accurately than the staff.

Communication is a complex mix of language, non-verbal clues and the patient's own response to what is being communicated and failure can occur on all levels.

*Discrepancies Between the Intended and Actual Effects of the Intervention*

Above we explored the ways in which failures in communication may occur and treatments to ameliorate surgical stress flounder. Closely related to failures in communication are failures between what is taught and what the patient learns or understands. While most patients benefit in some measure from coping skills preparation, it is not clear that the benefit gained is enhanced coping skills (Salmon, 1992). Most patients are 'prepared' for surgery in the time between admission and the surgery itself, often somewhat less than twenty four hours and this time is often shared by essential pre-operative tests, it is also during this time that subjects are most anxious. These conditions must constitute an impediment to efficient learning at best and sensory overload at worst, which can limit information processing considerably (Broadbent, 1958). However, since recovery is improved by coping skills training the patients clearly gain some benefit from the preparation.

Understanding the nature of the beneficial effect of preparation for surgery is not
peculiar to 'coping skills' training. A fundamental problem with all preparation for surgery, from simple information to complex coping techniques, is that we cannot know what the patients take away from the interview, training etc. New information must compete with a patient's preconceptions about an event and may be modified or rejected according to these pre-existing beliefs (Williams and Keefe, 1991). Related to perceptual defence but applicable to all types of stress reduction techniques is the problem of a patient's pre-existing beliefs or attitudes. Quite simply if a patient does not believe a treatment will work its effectiveness will be compromised (Thompson, 1984).

Preconceptions about illness or treatment can influence a patient's response to treatment (Helman, 1978); e.g. a patient may believe that some drugs are addictive. If that drug is prescribed as an analgesic, the patient may be reluctant to take it and whether administered by a nurse on request or self-administered the patient will endeavour to avoid using the drug. When the treatment is psychological, as many stress reduction techniques are, a certain amount of trust in the treatment is required for compliance. If the patient is taught distraction techniques to reduce anxiety in the immediate pre-operative period and they do not believe it will work they are unlikely to achieve distraction. Equally a patient's preconceptions regarding the surgery and recovery may serve to increase their emotional responses to admission to hospital and the post-operative period. Similarly the recovery post-discharge may be affected by the patient's recall of the experience. Patients who exaggerate the pain and discomfort of recovery may be less inclined to assume a normal life style post-discharge because they are increasingly anxious about postoperative complications occurring outside the safety of the hospital ward.

It is clearly not practical to test patients' acquired skills in the clinical environment and not possible to recreate the magnitude of personal threat of surgery in a laboratory. However, some clues as to the 'benefit' gained from preparation for surgery are emerging. In learning how to cope in an aversive situation an individual is exacting some control over events. Control may be exercised by alleviating the distress. Women in labour gain
control over pain of by rhythmic breathing for the duration of the contraction. Control may also be achieved by ignoring a problem that cannot be altered by the individual. After an examination paper has been submitted the student has no more effect on its success or failure. To alleviate the distress of waiting for the result the student distracts himself with other activities. The effect of teaching coping skills prior to surgery may be attributed to the enhancement of the patient's sense of active control over the situation, rather than acquiring the skill per se.

Another benefit of preparation for surgery that some patients may utilise is the inevitable increased social support (Salmon, 1992). Social support has been demonstrated to act as a buffer to stress responses (Cohen, 1985) and improve health outcomes (Ganster and Victor, 1988). In the hospital environment patients are isolated from their normal social network both physically and to some extent psychologically. Also despite the best efforts of the medical and nursing staff patients often perceive them as 'too busy' to confide in and so do not substitute available resources for the absent social network. However, some support is gained from repeated visits by key staff who become familiar to the patient. Preoperative visits by the anaesthetist are thought to facilitate emotional support (Schelsenger et al., 1980). The benefit gained from stress reducing interventions may therefore be not a gained coping skill but increased social support from a member of staff. It is important, theoretically, economically and practically to understand exactly what aspect of a treatment benefits a patient.

*Failure to Consider Interactions*

Above are cited several variables that may contribute to the failure of treatments to reduce surgical stress: The paradoxical effects of pre-operative anxiety, failures in communication, failure to know precisely what the patient gains from the intervention, failure to consider patient preconceptions and responses and failure to regard the patient as an active participator. Research into the stress response to surgery has tended to
examine variables in isolation. Some studies have examined several psychological factors together (Pickett and Clum, 1982) but little attempt has been made to investigate the interactive effects of these variables and no unifying conceptualisation has been attempted except in one or two notable reviews (Mathews and Ridgeway, 1984 and Salmon, 1992). Neither has the relationship between the physiological stress response and the psychological variables been much examined, although some multi-discipline studies are now emerging (Vogele and Steptoe, 1986, Salmon and Kaufmen, 1990, Salmon et. al., 1988 and Manyande et. al., 1992). In studies of the effects of relaxation as a preparation for surgery it is clear that the physiological response to stress and the psychological stress response are quite separate factors but closely associated or interactive. Relaxation training is effective in reducing the psychological stress response (Rimm and Masters, 1979). Other studies found that the physiological response to surgical stress was enhanced following relaxation training (Wilson, 1981 and Manyande et.e.l., 1992) Neither the psychological nor the physiological variables of stressful events occur in isolation and changes in one variable may trigger concomitant changes in the others. Understanding the nature of the interaction between the psychological variables and the physiological mechanisms that underlie them may go some way to explaining the equivocal effects of current psychological interventions.

Conclusion

If preparation for surgery is to be successful in ameliorating the stress response to surgery it is important to understand the failings of current practice. Above we have discussed several factors that contribute to a failure to reduce stress.

Essential to all stress reduction techniques is accurate communication. There are several levels at which misunderstanding occurs, language, conflict between verbal and environmental clues and a failure to appreciate the patients view.
Closely related to failure in communication is the failure to know exactly what factor of the stress reduction treatment is benefiting the patient. Treatments that include coping skills training were most successful, as we discussed above. Later research into the practical application of stress reducing interventions, including coping skills, found that they were 'taught' to the patient pre-operatively when they had to compete with many other activities. Salmon (1992) suggested that part of the success of 'coping skills' training was not enhanced coping but rather social support provided, probably unknowingly, by the 'teacher'.

Another benefit of coping skills training, other than enhanced coping, was enhancing the patients perception of control over the event (Picket and Clum, 1982). Clearly it would be important to understand what benefits patients derive from the interventions that reduce surgical stress.

If psychological treatments are to be successfully employed in hospital and surgery, it is essential to evaluate the effect on the targeted variable e.g. anxiety, in the context of other possibly interacting variables. It is also essential to improve our understanding of the physiological mechanisms that underlie the psychological variables. Equally the psychological concept of stress must be re-examined to establish the effects of patients' active monitoring and adaption of both the situation and the treatments that allegedly ameliorate it. Redefining the stress response as a dynamic process which takes account of this active participation by the patient may indicate areas of current preparation that could be improved.

Surgery occurs, not in isolation but within the context of a patient's life, and has many consequences other than merely effecting a physical cure. These consequences may be of great importance to the patient but not be addressed by current psychological treatments. Only by understanding the interaction of the various dimensions of the stress response can we hope to improve on the psychological management of the surgical patient.
POST-OPERATIVE PAIN

In the previous two chapters we have examined the general stress response and its consequences as a response to surgery. We also touched on post-operative pain, an inevitable consequence of surgery and as such part of the stress of surgery. Pain is a complex phenomenon which may itself evoke the stress response. Its function is to protect the organism, alerting it to injury or disease and during healing reducing activity or strain on the weakened tissues. The literature on pain tends to be quite separate from that of stress and in the case of post-operative pain, patients tend to separate pain from other aspects of surgery (Johnstone, 1982).

While pain is associated with surgical stress and either may be sufficient to induce the other, they are not necessary to each other. Pain is associated with other causes e.g. extreme physical exertion. Patients also separate pain from other aspects of surgery. They expect post-operative pain following surgery and if it is well managed and moderates steadily during recovery it causes little distress. Pain is associated with psychological variables relating to stress e.g. anxiety and mood and may be exacerbated by it. Excessive or unrelenting pain may also exacerbate stress. It is important therefore to explore pain as part of the surgical stress response and separately.

The focus of this chapter is post-operative pain as separate from surgical stress although relevant interactions between the two are included. Pain and the known physiological and psychological variables associated with it are briefly described. The factors that influence postoperative pain are explored. Communicating pain presents difficulties and these are described and measurement of post-operative pain is discussed.

In the final section of the chapter the research is briefly described.
Pain

Pain is a response to noxious stimuli wherever and however they are caused. It focuses the individual's attention on potential danger and frequently evokes the stress response. The general stress response evoked by pain will be similar to that evoked by other stresses. Physiological changes occur to maximise survival, including release of pineal hormones and activation of the adreno-cortical systems, metabolic changes and increased cardiac output. The psychological stress response will follow a similar pattern as for other stresses. On becoming aware of the pain an emotional response occurs, probably anxiety or anger. This is swiftly followed by assessment, trying to establish the cause of the pain. Some action or behaviour follows to attenuate the pain, possibly taking some analgesic and reassessment; has the pain changed or gone.

Pain differs from other stressful events in two principal ways. First for severe pain of sudden onset a reflex response occurs to protect against further damage e.g. a hand put on a hot plate is removed almost before the individual is aware of the burn. The sensation of pain may even be delayed until the individual looks at the injury. This reflex action may even precede the physiological stress response or will occur simultaneously. The psychological stress response will be evoked when the individual is aware of the sensation. Secondly individuals can in some circumstances ignore pain to the point of temporarily being unaware of it e.g. athletes speak of crossing the pain barrier. In these circumstances pain will not effect a cessation of the behaviour inducing it even though this may cause serious damage. The need to win is sufficient motivation to overcome the psychological stress of the pain until the endorphin system is activated and the pain subsides. Pain may therefore exist without being stressful, it may also be ignored in some very stressful circumstances. Conversely the stress response is evoked by events that do not, usually, involve pain e.g. examination stress.
Physiological Systems Underlying the Experience of Pain

Although pain, indicating tissue damage evokes the physiological stress response it also induces other physiological changes. When noxious stimuli occur specific nerve pathways are activated, sending impulses to the central nervous system. These pathways pass through the dorsal horn of the spinal cord and ascend through the brain stem to structures in the forebrain, periaqueduct grey and medulla regions of the brain (Snyder and Childers, 1979). These pathways are principally endorphinergic, therefore the physiological mechanisms underlying pain are thought to be principally mediated by the endorphin system (Melzack and Wall, 1982). Although some of the ascending and descending pain pathways of the brain stem are norepinephrinergic and serotoninergic (Basbaum and Fields, 1984). The reflex response to severe and sudden pain e.g. burn, is probably mediated by the spinal cord as the pain impulses ascend to higher centres. Where substantial tissue damage has occurred the pain pathways of the spinal cord remain in a hypersensitive state which persists long after the initial injury. The individual's pain response will be heightened during this period (Carr, 1998). This mechanism may protect against further damage to an already weakened system.

The physiological systems of the stress response are set out in chapter one. The principal systems involve secretions from the pineal which activate the release of epinephrine (adrenaline) norepinephrine (noradrenaline) and cortisol. These hormones cause changes in the cardiovascular system and alter metabolic rate. The stress response may persist for some time after the threat, the individual remaining alert and monitoring their situation. No specific central mechanism, similar to the spinal cord hypersensitivity to pain, has been identified to facilitate the prolonged stress response.

The physiological systems of pain and stress response are clearly separate. These systems, however, do not operate in isolation. Endorphins may induce a sense of calm and relaxation thus relieving anxiety. Similarly norepinephrine has some analgesic effect.
on damaged peripheral nerves (Melzack and Wall, 1982). As discussed in chapter one, a principal variable of the physiological stress response is an increase in circulating norepinephrine. The relationship between pain and the physiological stress response may involve the common norepinephrinergic pathways in the brain stem.

*Psychological Responses to Pain*

Pain is primarily a protective mechanism alerting the organism to breaches of its integrity. Pain swiftly focuses the individual's attention on the injured area. Often there is a direct link between the severity of the pain and the severity of the injury. In some circumstances this relationship breaks down e.g. the pain caused by passing a kidney stone can be so severe as to cause physiological shock and collapse although the process is apparently minor affair (Melzack and Wall 1982). Conversely pain can persist when healing has occurred e.g. phantom limb pain. Pain often induces the stress response especially if it is severe or its cause cannot easily be ascertained or if it is not moderated following some suitable action by the individual e.g. altering the position of a limb which has become trapped. Pain induces anxiety and sometimes aggression.

Coping responses to pain have tended to be regarded as static rather than as a dynamic, possibly because each episode of pain is perceived as complete unto itself, and dealt with in isolation. As with responses to stress some 'coping' responses tended to exacerbate the pain both in chronic (Rosenstein and Keefe, 1983 and Pearce, 1986) and acute pain (Chaves and Brown, 1985 and Pick, Pearce and Legg, 1990). Other 'coping' responses seemed to be associated with lower levels of pain. There is some evidence that some 'coping' strategies that are adaptive to one type of pain may be maladaptive in other types of pain. Pain that rapidly increases to severe, e.g. radiant heat burning is not moderated by distraction (Melzack, et. al., 1963). In severe pain which represents extensive damage and possibly life threatening injury it may not be possible to distract oneself. In the interests of survival it would be important to escape further injury or minimise the
damage. This suggests that the stress response is overriding the subjective cognitive coping with pain. Pain response and stress response would appear to be quite separate on some occasions.

The Interactions of Pain and Stress

Stress as a Modifier of Pain

Severe pain of sudden onset is a threat to survival and will evoke the stress response. However there are circumstances where the stress response has been evoked prior to pain onset and other factors are alerting the individual to the threat. In these circumstances pain may be ignored or modified by the need to survive. Psychologically the individual is assessing the pain in the context of the entire event specifically in relation to maximising their survival. An example of this is reported by Beecher (1959). He noticed that soldiers and civilians who sustained similar injuries during the 1914/18 conflict reported very different levels of pain. The civilians had severe pain following traumatic amputation of a limb following bombardment, whereas soldiers on the front line suffering a similar injury had little or no pain although they complained of poorly administered injections. Beecher concluded that for the civilian the pain meant disablement and disaster, for the soldier it meant removal from the front line and salvation. Pain may equal threat but the need to survive or overcome the challenge can obstruct or modify the pain. Pain is an inevitable and anticipated consequence of surgery but individuals assess the pain in the context of maximising their survival. The surgery is necessary for their well being and they accept some pain. Psychologically the surgical patient and the front line soldier are responding in a similar way. The need to maximise survival is altering their perception of pain. Physiologically the stress response increases plasma levels of catecholamines and these have some analgesic effect (Melzack and Wall, 1982). This may be the mechanism whereby the survival stress response alters the pain effect.
Stress Variables that Exacerbate Pain

Pain, particularly of unknown cause, induces anxiety. Studies ranging from the nineteen fifties to the nineteen eighties demonstrate a linear relationship between anxiety and pain. As anxiety levels rise so the pain threshold and tolerance of the individual falls. In a review of emotion and pain literature Elton and colleagues (1983) conclude that reduction in uncertainty has a concomitant reduction in anxiety which raises pain thresholds and tolerance. However in some circumstances this linear relationship breaks down. Traumatic amputation of a limb and the challenge of athletic competition are both stressful raising anxiety levels but both the soldiers and the athletes pain thresholds and tolerance were raised. A similar paradox occurs with dental pain. A common occurrence is the disappearance of agonizing tooth ache the moment an individual is asked by the dentist to indicate the painful tooth. Conversely increased pain levels during routine dental examinations are reported by dental phobics (Bernstein, 1979).

The Influence of Anticipation on Pain

In the previous two chapters examining the stress response, subjective preconceptions about an event were an important factor influencing the experience and the stress response. Preconceptions about pain are also influential in the subsequent experience. In the case of post-operative pain, patients normally have considerable time to anticipate the pain.

Anticipation and Post-operative Pain

The anticipation of post-operative pain may be important in several ways. Where subject expectation in isolation has been examined, no direct effect on post-operative pain has been found (Wallace, 1985 and Kent, 1986). However changes in pre and post-operative
fear and anxiety have been noted in response to pre-operative 'thinking about' surgery and post-operative pain. Fear is thought to induce the 'fight or flight' response and may therefore mask or reduce pain (Bolles and Fanselow, 1980). However the effect of fear of pain itself is not clear. Heightened pre-surgical state anxiety has also been associated with higher levels of post-operative pain, (Mathews and Ridgeway, 1981, de Groot, Boeke, van der Berge, Duivenvoorde, Bonke and Passcheir, 1997). The mechanism of this association is not clear. Heightened pre-operative anxiety may result in raised post-operative anxiety levels and thus directly affect pain.

A more direct influence of anticipation on pain may be postulated within the theoretical framework of cognitive processing. Leventhal's 'Processing Model' of personal episodic memory (Leventhal and Everhart, 1979) demonstrates how pain is enhanced and elaborated by emotional state, information, behaviours and memory systems. Where the pain stimulus is of sudden onset the elaboration of the stimulus will occur at encoding pain onset. However in post-operative pain the majority of patients will have considerable time to anticipate the pain. Anticipation of pain by stimulating memory schemata relating to pain intensity and distress may prime the system. Even where the pre-operative preparation to operation time is short, as in 'day surgery' and the preparation comprehensive, well managed and meets each individual's needs there will be some time for elaboration of the stimulus.

**Anticipation and Recall**

The anticipation of an event for the majority of individuals will be influenced by past experience. Even patients for whom this is the first experience of surgery will expect post-operative pain and will use their memory of similar experiences e.g. minor cuts to inform their anticipation. This conception of pain will be elaborated by other information and beliefs. Patients may know that a flesh wound is moderately painful and assume that a deep incision will be more painful. They may also know that they will be given
analgesia which they assume will be of a strength compatible with the magnitude of the pain. Recall however, is not an exact science and memory is subject to external influence (Aberneathy 1940, and Bower, 1981).

There is some evidence that anticipation of pain influences memory, but the mechanism is not clear. Significant correlations between anticipated (expected) and recalled pain have been reported for dental patients (Kent 1985) and chronic pain (Linton and Merlin, 1982). In both studies over estimation of the pain resulted in overestimation at recall. In the case of the acute pain anxiety was shown to influence the anticipation and recall, highly anxious subjects tending to overestimate. Interestingly, Bernstein, et al (1979) cite memory of past painful experience as a cause of enhanced dental anxiety.

Clearly there is a strong relationship between anticipation of pain, the experience and the recall.

Factors Influencing Recall

The research into recall of pain has been little influenced by the theories and concepts of memory per se. Possibly because until recently the theoretical base of recall was founded principally on experimental recognition tasks. Research using recognition requires the features of each presentation to be identical. The physiological and psychological mechanisms of pain are still poorly understood and their complexity makes consistently reproducing the same pain experimentally questionable. Also assessment of recognition of clinical pain, where the instigating events of individual pain episodes are unknown, is clearly impossible. Therefore recognition task assessment of memory has been largely avoided in pain research. However, some concepts of recall are applicable to pain memory and current developments in personal episodic memory are relevant to recall of pain.
State dependent effects on recall were reported in the nineteen forties, however these early papers refer principally to situational conditions. Recall was reported as more accurate if it occurred in the same room with the same lighting, noise levels, ambience etc. (Abernathy, 1940). Bower (1981) extends the concept of 'state dependency' to include 'psychological state' particularly in personal episodic memory. His 'Semantic Network Theory of Emotion and Memory' not only identifies accuracy of recall with congruency of emotion (mood) at encoding and recall but also allows for interaction of the impact of the event and the emotional state at encoding. The subjective assessment of an event (its impact) can alter mood; not winning the lottery may make normally happy people sad. Equally mood intensity can alter the impact of an event; it may be supposed that not winning the lottery will make little impact on the happiness of a couple at their wedding. The concepts of emotional congruency and the interaction of event and mood intensity is relevant to pain memory research.

Pain does not occur in isolation, its onset causes alarm and usually behaviour changes, until its cause has been identified and the pain is reduced. It seems reasonable to assume that at encoding pain is accompanied by some anxiety. Clinical pain usually indicative of an underlying disease state may also be associated with depression. Patients reporting a pain episode, often after the pain is past, may not be in the same state of anxiety or depression. Bower's model (1981) predicts that the recalled pain will be inaccurate if there is incongruity of mood or anxiety.

The Measurement of Clinical Pain

The measurement of pain relies on communication either verbal or non-verbal. Onset of severe pain is usually accompanied by a cry of distress and a clutching of the area effected. Assessment of less severe clinical pain normally occurs after the incidence of pain has occurred and accuracy is reliant on recall and verbal communication.
Verbal Pain Scales

Clearly a simple measure of pain is the subject's description of the intensity and quality of the pain e.g. moderate, stinging. Individuals' free expression of their pain experience makes objective comparison of pain arising from similar causes difficult e.g. is stinging the same as pricking? Formalised pain scales limiting the choice of verbal description improve the measure.

The simplest verbal pain scale measures the sensation or intensity of the pain. Patients are given a list of words describing pain and asked to choose one category e.g. mild, moderate, severe. If the measure is repeated over time an accurate assessment of change in pain state is obtained.

More complex verbal pain scales measure other aspects of pain, quality e.g. burning, stabbing, duration, emotional aspects e.g. distress, mood. The McGill Pain Questionnaire is an example of this type of scale. The information obtained by these complex scales give a broader perspective of the patient's pain e.g. pulsing stabbing vicious unbearable may accurately describe a migraine headache. These scales are repeatable and a validated pain measure (Bond, 1984).

Assessment of post-operative pain often occurs during early recovery. The patients are often disorientated or even sleepy following the operation, their concentration and attention span are poor. The complex verbal pain scales may represent a challenge in such circumstances and inaccuracies may occur.

The simple verbal pain scales are frequently used as a measure of post-operative pain. There are some difficulties in assessing changes in pain state with all verbal scales. Semantic memory registers cognitive referents to input signals e.g. mood, meaning of
pain, not the property of the pain itself (Erskine et al. 1990). Patients would have no
difficulty in recalling the description given to the pain in the first instance e.g. moderate.
Pain as noted above does not occur in isolation and other factors e.g. affective state may
influence the patient's description of their pain on repeat measures. For example a patient
fearful of managing alone at home may recall the early description of pain as moderate
and the pain may be essentially unchanged but heightened anxiety may change that
description to severe.

**Visual Analogue Scales**

The visual analogue scale is a line of specific length, usually 100 millimetres with
opposing descriptors at either end e.g. no pain at all and the most severe pain I can
imagine. The line represents a raising intensity of pain. Subjects are asked to mark the
line with a cross at the point on the line that represents their pain. The distance of the
cross from the start of the line is given a numerical value e.g. 30mm. Repeated measures
are less likely to involve semantic memory and are less likely to subjective bias. They are
however subject to bias of another kind. Subjects may vary in their discrimination of
distance along the line. They may all represent moderate pain as being 50 millimetres but
discrimination between severe and extreme may vary within subjects over time or
between subjects. The visual analogue scale may be adapted to measure different aspects
of pain e.g. distress.

Measurement of clinical pain is difficult. The clinician must choose a scale which best
suits the clinical conditions. Where recall of pain is important simple verbal pain scales
would seem undesirable. Complex verbal pain scales require a cognitive ability lacking
in some clinical pain states e.g. post-operative pain. The visual analogue scale suffers
from other forms of subject bias. A recent comparative study found a universal
consistency in broad categories of the visual analogue scale. On a 100 millimetre scale
30 mm represented moderate pain for eighty five percent of the sample and 60mm severe
pain (Collins et. al. 1997). The authors conclude that they are confident that the scale is an accurate and validated measure of post-operative pain.

As we have seen above anticipation is important to pain experience and there is a growing body of literature on anticipation and memory of pain. There are also validated non-verbal pain measures e.g. visual analogue scale. Postoperative pain can be pinpointed to the first experience of pain when they wake from the anaesthetic. In fixing the time of the pain experience subjects will find it easier predict the pain and to recall it.

**Measurement Bias**

Both pain measures are subject to bias as noted above. There is a further source of bias common to all pain measures, anticipation of the pain. There is sufficient evidence, discussed above, to suggest that anticipation influences experience and in some instances recall. It is not clear how influential anticipation is on either experience or recall nor whether the influence is direct or indirect e.g. by raising anxiety levels. The effects of anticipation on pain measured during the experience may be assumed to be directly influencing the pain. The bias effects of anticipation occur when pain is recalled as is often the case with clinical pain. If anticipation influences recall then the pain measurement will reflect anticipation.

**An Outline of the Experiments**

In the previous two chapters we have examined the stress response, its consequences during surgery. Above we have examined post-operative pain and argued that it is separate to the general stress response. We have also examined common pre-operative preparation for surgery that attempts to utilise the psychological stress response to moderate or ablate the physiological stress response. Although these preparations are based on sound theory all failed to be consistently effective.
In reviewing the literature on general stress response, surgical stress and post-operative pain several factors emerged to account for some of the failings of pre-operative preparation for surgery to ameliorate stress. First the problems of communication. These were both straightforward misunderstandings of language and conflict between verbal communication and environmental clues. Second the failure of professionals to view the surgery in the context of the patients life and therefore failure to address their real worries. Third the tendency to assume that the patient is a passive receiver of treatment and so take no account of their changing response to the unfolding event. Fourth the gaps in the knowledge base of health psychology. These contribute to the failing in understanding the function of anxiety, the capacity of individuals to assess and process information under stressful conditions and which aspects of the preparation technique were effective. Finally a failure to understand the interactive nature of the stress response variables. It is important theoretically, practically and economically to address these failings.

An Outline of the Research

The overall purpose of these studies was to assess the surgical stress response as a dynamic exploring the target variables in relation to other important variables of the stress response. A second purpose was to eliminate the failings of communication between staff and patient that may have confounded previous studies of the surgical stress response and also to focus the investigations on the patients experience of surgery.

The Literature Search

The initial search through Medline and Psylit used the following principal key words separately and together. Additional keywords used with the principal keywords to narrow the search are in parentheses.
Key words: Anxiety (preoperative, postoperative), Cardiac Vascular Surgery, Coping Strategies (efficacy) Coronary Artery Bypass Grafts, Depression (postoperative), Endocrine and Metabolic Responses to Surgery, Endogenous Opiates, Fatigue (postoperative), Memory (recall, episodic), Pain (beliefs, measures, postoperative, recall), Psychoneuro Deficits (measures, postoperative) Stress (surgery).

Additional material was accessed from ongoing work in the psychology department, publications by Manyande, Pearce and Salmon. Subsequent Medline and Psylit searches accessed publications by author.

From the initial searches publications were chosen according to the following criteria:

Publications in English. Publications of original theories relevant to the studies e.g. Janis (1958), Levental et. al.(1979). Publications that added a new dimension to the work. Publications related to the measures used in the studies e.g. Woolfer et. Al (1970).

Ethical Approval

Each study reported below was submitted separately to the District Ethical Committee of The City and Hackney Health Authority. All the studies were reviewed and found to be ethically satisfactory prior to commencing the data collection.
Table of Hypotheses

1) Subjective coping response to surgical stress is a dynamic.
   
a) Subjective responses will change over the duration of the event.
   
   Early pre-operatively and late post-operatively subjects are expected to employ a ‘vigilant’ style of coping and focus on items that they can cope with. In the immediate peri-operative period subjects are expected to have a more emotional coping style.

b) Coping responses will reflect the subject's perception of the magnitude of the surgery.

2) Preconception effects on post-operative pain.

   a) Post-operative affective state and pain intensity and pain distress would be influenced by anticipation.

   b) Highly anxious subjects would tend to overestimate the anticipated pain and the recalled pain.

As a preliminary investigation of the interaction of stimulus enhancing mechanisms cited in the processing model the effects of the anticipation on the patient's subjective responses to pain would also be assessed

c) Anticipated pain would influence subjective coping responses to pain. Clear patterns of association between anticipation of pain and coping would be discernable.

3) The effects of mood, state anxiety and current pain state on the accuracy of recalled
pain.

a) It is predicted that where incongruence of mood, anxiety or pain state occurs between encoding and recall, inaccuracies will occur.

4) Assessment of the post-operative psychological and endocrine effects of a preparation for surgery that uses relaxation to enhance a perception of control in coronary surgery patients.

a) Those subjects who perceive a greater personal and active control over events during their admission, will respond to surgery with a diminished physiological (endocrine) response and improved subjective assessment of their recovery.

b) This modified stress response will not be attributable to social support.

c) Additionally the relationships between the post-operative physiological and the subjective psychological variables will be assessed.

Chapter Four addresses the problems of communication, verbal misunderstanding and the difficulty of knowing what patients worry about. In a short study surgical patients were interviewed at different stages of the event. The patient responses are critically reviewed, repeat items and purely attitudinal statements are eliminated. The remaining items, with the addition of a four point response scale form a questionnaire. This is presented to another set of surgical patients and the results are subjected to principal component analysis and subsequently yield four 'coping response' scales. These scales are patient generated and therefore couched in lay language and represent the patient's real concerns about surgery.

Chapter Five assesses the notion of the patient as active in their treatment. The 'response
to surgery questionnaire' developed in chapter four is used to assess any changes in 'coping' during the experience of surgery. The patients are also asked to complete other questionnaires to assess state and trait anxiety, post-operative pain, early and late recovery. Besides assessing changes in responses as a function of time, interactions between the principal variables are explored.

Chapters Six and Seven investigate the role of subjective preconceptions on post-operative pain. Pain is reliably measurable on non-verbal scales eliminating semantic memory effects. It is also easy for a patient to focus on one incidence of pain thus reducing confusion which may have compromised the reliability of the results. In Chapter Six the patients completed visual analogue scales measuring anticipation of the post-operative pain, experienced pain and early and late recall of pain. Measures of anxiety were taken at the same time. Subsequently the effects of anticipation on pain were assessed. The influence of anxiety on anticipation experienced and recalled pain was explored. The study reported in Chapter Seven assessed the influence of current pain state on recall. The experienced and recalled pain measures were assessed as in Chapter Six with a different set of subjects. Their pain state at recall was also measured.

Chapters Eight and Nine explore the problem of which feature of a pre-operative preparation technique benefits the patient. In a cardiac surgery group subjects were divided into three sets. One set received a preparation for surgery that enhanced their perception of control over the treatment and recovery. The second set received equal attention from the investigator which constituted social support but no formal pre-operative skills were taught and the third set simply completed the questionnaire on coping, anxiety, pain and recovery. All subjects gave blood samples for assay of plasma levels of epinephrine, norepinephrine and cortisol. The results of the three sets of subjects were compared to assess whether the cognitive behavioural technique, social support or no treatment were effective in reducing the stress response to surgery.
THE DEVELOPMENT OF THE RESPONSE TO SURGERY QUESTIONNAIRE

Introduction

In the preceding chapters we examined the stress response to surgery, its consequences for recovery and the psychological preparations that attempted to ameliorate it. We explored the reasons for the disappointing results of preparations for surgery currently in use. There were two fundamental problems underlying the majority of techniques. First a failure in communication between staff and patient. Second the inability to perceive the surgery in the context of the patients life which resulted in a failure to appreciate the real worries of the patient. Patients were often confused or misled by their interpretation of instructions or information and their real concerns were not addressed. The following study attempts to address these communications difficulties by developing a measure couched in 'patient terminology' and reflecting 'worries' generated by patients.

Reliable and validated questionnaires assessing 'worry' as a coping response to impending stressful events are available. 'Ways of Coping' (Folkman and Lazarus, 1980) and 'Coping Scale' (Kaloupek, 1984) are questionnaires designed for use in a variety of stressful situations from student examinations (Folkman and Lazarus, 1985) to blood donation (Kaloupek, White and Wong, 1984. Kaloupek, and Stoupakis, 1985). The construction of the questionnaires reflects this universality with items couched in very general terms, e.g. "I tried to relax myself" " I took some positive action" " I felt angry about the way I was treated" (Kaloupek, 1984), "I try to analyse the problem in order to understand it better", "try to forget the whole thing" (Folkman and Lazarus, 1985). Both questionnaires yield clear factors that reflect different styles of coping, i.e. avoidant, positive, problem focussed and emotional focussed. In the Folkman and Lazarus studies it was also possible to assess an individual's change in coping over the duration of the stressful event.
While it was clearly attractive to utilise an established questionnaire for the study of worry as a coping response to surgery, there were several reservations about the style and generality of the items of the questionnaires. Firstly, there were doubts that the items of the established questionnaires may not reflect the actual worries of the surgical patient. Johnston (1982) in a comparative study, found that the medical and nursing staff are poor at identifying the worries of the surgical patient. Although Kaloupek, et. al. had used the 'Coping Scale' for blood donors their subjects were all healthy and not threatened in any way by the procedure. All surgical patients are threatened in some degree by their disease and the surgery itself, and for some it is life threatening. Secondly, the items of the established questionnaires were developed for a North American population and some words and phrases used would be unfamiliar to a broad group of British subjects. Thirdly, the items of both questionnaires were very general reflecting the universality of the measures. It was thought that the pre-surgical patients would regard the items as so general as to be irrelevant to their current situation leading to a poor response to the questionnaire. Too many changes to the items of the existing measures would jeopardise their validity, therefore a new measure was developed, the 'Response to Surgery Questionnaire' (RSQ).

While reflecting the concepts of positive/vigilant coping, avoidant/negative coping and the possible changes over the duration of the stress situation in the existing measures the RSQ must be relevant to the peri-surgical group. In view of the difficulty of predicting the focus of worries, concerns and coping responses of the hospitalised surgical patient demonstrated by Johnston (1982) it was considered essential to ascertain these concerns etc. from the patients themselves in a short pilot study.

The Pilot Study

The pilot study took the form of a short interview in which the patients were asked to freely express their thoughts. To encourage the subjects and focus the discourse a short
explanation of the study was included on the ethical consent form as follows:-

"We are interested in finding out how patients cope with a hospital admission for surgery. The hopes, fears and worries that may attend on admission and how these thoughts may affect a patient's hospital stay. This information will be used to help us prepare future patients for operation. We are running a study here to find out how people cope with a proposed hospital stay and surgery. We are interested in any thoughts you have, however irrelevant or unimportant they may seem to you, about your forthcoming/current hospital stay and operation"

To further focus the interview and prompt the subjects as necessary a set of 11 short open questions were devised (see method). The questions reflected the coping styles, emotional, problem focussed, avoidant and vigilant reported by Lazarus et al. They were, however focussed on the admission and surgery to elicit the relevant responses, after Johnson.

Method

Measures

A structured interview included the following questions:

1) Will this be your first operation and hospital stay?
1a) Can you remember what your previous hospital stay was like?
2) How do you feel about coming into hospital for this operation?
3) Is there anything you are particularly worried about?
4) Is there anything that you are looking forward to?
5) Will you be concerned about anything at home/work while you are in hospital?
6) How do you think you will feel about going home after the operation?
7) Do you think you will make any special preparations in regard to your hospital stay?

8) Will you discuss your hospital stay and or operation with anyone? 
(minister, relatives, close friends etc.)

9) Have any of your friends or relatives had an operation recently?

10) Do you feel that the nurses and doctors tell you enough about your condition and what to expect while you are in hospital?

11) How do you think coming into hospital and having an operation rates compared to other events in your life?

SUBJECTS

Thirty five (10 male, 25 female) adult (over 18yrs.) patients from the outpatient clinic or admitted from the waiting lists, of the general surgical, orthopaedic and gynaecological departments of St. Bartholomew's Hospital, London took part in the study. All patients for 'intermediate' or 'major' surgery were asked to take part. Twenty four in-patients and eleven out-patients with an age range of 19 - 82 years (mean 45.5 yrs. median 53 yrs.) were interviewed, eighteen preoperatively and seventeen postoperatively. Out-patients were directed to the investigator by the senior nurse in charge of the clinic. In-patients were selected by the investigator from the operating list for the preceding and following days.

Patients were excluded according to the following criteria:

1) Patients who declined to take part.

2) Patients who did not speak English.

3) Patients who in the medical or senior nursing staffs' opinion would be seriously distressed by taking part.

4) Patients whose general medical condition made discussion difficult, e.g. Stroke
patients or those with advanced Parkinson's disease.

5) In-patients who were being nursed in isolation.

The outpatients for the pilot study were referred to the investigator by the senior nurse of the clinic and it is impossible to estimate how many declined to take part in the study. Twenty five in-patients were approached by the investigator. Only one patient declined to take part citing profound deafness.

PROCEDURE

The study was explained to the patients and their informed consent to take part was obtained. Demographic information (age, sex and occupation) was obtained. The summary of the study on the consent form (Appendix 1) included the sentence "We are interested in any thoughts you have, however irrelevant or unimportant they may seem to you, about your hospital stay and operation". Patients were reminded, if necessary, of this sentence to encourage them to freely express their thoughts with regard to their illness, operation and hospital admission. The interviewer guided the discourse, if necessary, with the eleven questions described above, to prompt discussion of worries, hopes and fears. The questions were not presented in any order but used as prompts within the flow of the discourse allowing the patients to express their own concerns rather than reflecting those of the interviewer. Where possible, patients were encouraged to discuss any action they would take to cope with their problems (e.g. discussing them with relatives). The patients' responses were noted down. Details of the patients' operation were obtained from the medical and nursing records.

The patients required very little prompting to express their thoughts on their admission and surgery other than being asked to do so. It was only necessary to use the prompt questions to guide two subjects and encourage one other.
After each session, in which between two and four patients had been interviewed separately, the responses were reviewed and each new response formed an item of the 'surgery response list' - 173 items in all (Appendix 2, p 255).

**Results**

The items of 'surgery response list' were assessed for frequency of responses. Most patients (88%) were concerned with pain and its control. Other items with a high frequency of response are listed in table 4:1.

**Table 4:1 Patient's Concerns with a High Frequency of Response**

<table>
<thead>
<tr>
<th>Item</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>preop.</td>
<td>postop.</td>
</tr>
<tr>
<td></td>
<td>In</td>
<td>Out</td>
</tr>
<tr>
<td>1) Concern with procedural information about the operation</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>2) Concerns with coping after discharge</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>3) Relief to get something done about the problem.</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>4) Fear of the anaesthetic and attendant sense of loss of control of one's body</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>5) Thoughts about death.</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>6) Reliance on social support from other patients</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>7) Concern to keep their worries from close relatives.</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

The 173 items of the surgery response list were reviewed and repeated items or
attitudinal statements, e.g. "It's important to have a positive attitude", were eliminated. The very high frequency of endorsement of pain statements may have obscured other important themes in the responses to surgery in the principal component analysis. These statements were eliminated from the list and responses to postoperative pain were considered separately.

The remaining 42 items reflected three principal response styles. First a desire for information about procedure or coping while recovering at home (Items 1 & 2; Table 4:1). Secondly an emotional response, relief or worry (Items 3, 4 & 5; Table 4:1) Thirdly responses reflecting social support from other patients or concern about close relatives (Items 6 & 7; Table 4:1). Two other minor themes emerged from the review of items: A concern with 'loss of control' over events and body function and a suggestion of anger.

The 42 items plus a 4 point ordinal scale form the Response to Surgery Questionnaire (RSQ) (Appendix 2, p 257).

When responses were compared across the groups, pre-operative in and outpatients and post-operative in and out patients, they were found to be broadly similar except for three items.

1) Concern with what the hospital would be like.
2) The same worries going round and round in the head.
3) Fear of drips or injections.

These items were responded to by the in-patient groups only.

Discussion of the Pilot Study

The pilot study was designed to elicit the thoughts, worries and concerns of surgical patients so that the RSQ would accurately reflect these thoughts. In this small sample
pain and its control was of overriding importance, overshadowing all other considerations even life threat. Since validated and reliable measures of acute post surgical pain (PRQ (acute) Pick, Pearce and Legg, 1990) were accessible it was decided to omit pain and its control from the RSQ. Clearly no generalisation to a wider population is possible from so small a sample, however the 42 items of the RSQ cover a wide variety of concerns, hopes and fears of surgical patients.

The Development of the Coping Scales

Method

SUBJECTS

Subjects were selected by the investigator from patients admitted to St. Bartholomew’s Hospital for elective general, orthopaedic and gynaecological surgery. All patients admitted for intermediate, major or major pus (RCS, classification, Appendix 7, p. 282) surgery over an eight month period were invited to take part. Except for the following:

1) Patients considered by the nursing and medical staff to be too distressed or confused by inclusion in the study.
2) Minors; patients under 16 yrs of age.
3) Patients whose first language was not English and who did not have sufficient command of English to fully understand the questionnaires.

It was important and an ethical consideration not to increase the stress of the clinical sample therefore patients were not pressed to take part in the study, nor were they obliged to give a reason for refusing. The majority of patients readily agreed to take part in the study. Four subjects declined. Where reasons for refusing were given they included:
1) Already taking part in a separate investigation.
2) Too frightened
3) An attendant relative advised the subject against taking part.
4) The subject had some disability, not related to the surgery, that they thought
   would make participation difficult e.g. Too deaf.

Since the sample included gynaecological surgery there was a gender imbalance 42 male,
84 female. The age range was 18 to 76 years with a mean of 53 years and standard
deviation of 13.3 years.

PROCEDURE

The 42 item RSQ was presented four times to the 126 surgical inpatients, (twice pre-
operatively and twice post-operatively).

Of 126 inpatients only 84 completed the second post-operative presentation of the
questionnaire. This sample was considered too small for accurate analysis of the 42
items. The three other presentations of the questionnaire were completed by 126
subjects, one day pre-operatively, 95 subjects pre-operatively on the day of operation and
100 subjects one day post-operatively. These three questionnaires were subsequently
analysed separately and compared.

STATISTICAL ANALYSIS

Principal component analysis was chosen to explore the relationship between the items
and to extract a small set of uncorrelated components from them that formed classes or
factors. Since the study was empirical and there was no theory as to the latent structure of
the factors principal component analysis was chosen rather than factor analysis
(Tabachnik and Fidell 1989, page 30).
Results

SAMPLE SIZE

Although the sample size failed to reach the ideal five cases per item Fidell and Tabachnick state that '100 to 200 (cases) is good enough for most purposes' (1984; page, 603) and our sample was considered adequate. Not all of the subjects completed all of the questionnaire on each occasion that it was presented. Occasionally one or two items would not be endorsed. Although it was possible to estimate the missing cases (items) theoretically it may have influenced the resulting factors and obscured any changes over time in the subjects' responses. Therefore a reduction of sample size was considered preferable to estimating missing cases. As a result the sample size changes from 126 one day pre-operatively to 95 pre-operatively on the day of operation and to 100 one day post-operatively.

PRINCIPLE COMPONENT ANALYSIS

On completion of the study the frequency of response, on the ordinal scale, to the individual items was assessed. No one item yielded the same response for more than 80% of the population, therefore all items were entered into the initial principal component analysis (Tabachnik and Fidell, 1987).

Each of the three in-patient samples was entered separately for principal component analysis. In the resulting solutions most of the variance was accounted for by 7 (47%v), 3 (35%v) and 6 (47%v) factors respectively (Table 4:2). The Scree Tests showed marked directional change at Eigen values of 1.62, 2.23 and 1.73 respectively Fig 4:1 (Tabachnik and Fidell, 1989).
Figure 4:1 The Scree Plot from the Initial Principal Component Analysis

PrincipaComponent Analysis
Scree Plot

Key:   ___ scree point 1 day pre-op.   scree point day of op pre-op.
       ___ scree point 1 day post-op.

To establish the best fit of variables to factors and account for the greatest percentage of variance it was important to re-analyse the data restricting the factors to those accounting for most of the variance (Table 4:2). The sample taken on the day prior to surgery was re-analysed restricting the factors to seven, the sample on the day of operation restricted to 3 factors and the sample one day post-operatively was restricted to 6 factors. These
solutions were compared.

Table 4:2. The Initial Principal Component Analysis; Percentage of Variance and Eigen Values

<table>
<thead>
<tr>
<th>Sample day</th>
<th>Sample size</th>
<th>Eigen value</th>
<th>% Variance</th>
<th>No. of Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 day pre-op.</td>
<td>126</td>
<td>1.62</td>
<td>47%</td>
<td>7</td>
</tr>
<tr>
<td>day of op pre-op.</td>
<td>95</td>
<td>2.23</td>
<td>35%</td>
<td>3</td>
</tr>
<tr>
<td>1 day post-op.</td>
<td>100</td>
<td>1.73</td>
<td>47%</td>
<td>6</td>
</tr>
</tbody>
</table>

COMPARISON OF THE RESTRICTED FACTOR SOLUTIONS

The rotated loading matrix of three solutions with restricted factors were compared. An item was said to load onto a factor if its loading coefficient was greater than 0.4 with that factor alone. Eleven items either failed to reach the criterion or loaded inconsistently in the three solutions. These items were eliminated from the analysis.

Eleven items consistently loaded onto factor 1 in all three solutions (items listed as scale 1, Table 4:3).

Twelve items were loaded onto factors 2 and 3 for the samples obtained 1 day pre-operatively and 1 day post-operatively. These twelve items were combined on one factor in the sample obtained on the day of operation (items listed as scale 2, Table 4:3).

Five items consistently loaded together on one factor in all solutions (factor 4 / 1 day preoperatively. Items listed as scale 3, Table 4:3).
Similarly three items were consistency loaded together on one factor in all solutions (factor 7/1 day pre-op. Items listed as scale 4, Table 4:3).

Thirty one of the forty two subjective response items were loading consistently on to independent factors in all three samples.

The thirty one items that were consistently loading together on independent factors were assessed for psychological content.

The eleven items (scale 1, Table 4:3) loading onto factor 1 in all the sample solutions reflected optimism, confidence in the medical and nursing staff, information seeking and a strong interaction with both fellow patients and visitors.

The eight items (scale 2, Table 4:3) of factor 2 (1 day pre-op. & 1 day post-op.) implied a negative and pessimistic view, poor social interaction with patients and staff and a tendency to concentrate on the possible worst outcomes of their surgery. The four items (scale 2, Table 4:3) of factor 3 (1 day pre-op. & 1 day post-op.) reflected concern with death, the anaesthetic and loss of control of bodily functions. These twelve items were combined on one factor in the sample taken on the day of operation and psychologically they seemed to fit well together reflecting pessimism and isolation, almost the antithesis of factor 1.

The five items (scale 3, Table 4:3) of factor 4 (1 day pre-op.) reflected a faith in others to achieve a good outcome, with apparently no sense of any personal control over the events.
The three items (scale 4, Table 4:3) of factor 7 (1 day pre-op.) reflected anger and irritation.

The four items (marginal factors, Table 4:4) of factor 5 (1 day pre-operatively) did not load onto one factor in any other solution and were considered statistically unstable. Only 1 item (marginal factors, Table 4:4) loaded onto factor 6 according to our criteria.

The analysis had reduced the ‘response to surgery items’ to a smaller number of uncorrelated factors. However eleven items failed to load consistently onto one factor in the restricted factor solutions and were considered to be unreliable and excluded.

Of the remaining factors the first two (scales 1 and 2, Table 4:3) were statistically sound, the items loading robustly and consistently together in all three solutions. The remaining factors contained fewer items and were statistically less robust. However the items of factors four and seven (scale 3 and 4; Table 4:3) consistently loaded together and their loading coefficient was high with that factor. Although these two factors might be regarded as marginal they were psychologically interesting.

The factors 1,2,3,4 and 7 (1 day pre-op.) contained items that appeared to be consistent psychologically. These factors were considered to form different scales, reflecting different coping responses to surgery.

RELIABILITY OF SCALES

It is generally accepted that those factors which account for most of the variance and the items within them that have the greatest loading coefficient with that factor and no other are stable and reliable. Those factors accounting for very little of the variance, usually
below the Scree point are unreliable. The accepted factors for the RSQ were all above the Scree point and therefore reliable. The validity of the factors/scales was a feature of the correlation between the items loading onto that factor this was assessed by Cronbach’s Apha.

The scales were analysed to assess internal reliability (Cronbach’s Alpha). Since the items of factors 2 and 3 had been loaded together on one factor on the day of surgery and both reflected negative/pessimistic views they were analysed separately and together for internal reliability. Table 4:3 lists the items of the scales with their loading coefficients, percentage of variance and Alpha scores.

Table 4:3. RSQ: The Coping Scales, Factor Loading Coefficients; Variance and Alpha Coefficients

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Factor</th>
<th>Loading coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SCALE 1 OPTIMISTIC/VIGILANT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It helps to see other patients recovering with confidence</td>
<td>1</td>
<td>0.67</td>
</tr>
<tr>
<td>The friendliness between other patients is reassuring</td>
<td>1</td>
<td>0.66</td>
</tr>
<tr>
<td>It is important to understand as much as possible about the operation and recovery</td>
<td>1</td>
<td>0.65</td>
</tr>
<tr>
<td>This illness makes you realise what is important in life</td>
<td>1</td>
<td>0.59</td>
</tr>
<tr>
<td>You can help yourself to get better</td>
<td>1</td>
<td>0.55</td>
</tr>
<tr>
<td>I look forward to taking a full part in my life again.</td>
<td>1</td>
<td>0.54</td>
</tr>
<tr>
<td>I must try to relax and get better</td>
<td>1</td>
<td>0.52</td>
</tr>
<tr>
<td>I try to be confident to encourage other patients who are having this operation</td>
<td>1</td>
<td>0.50</td>
</tr>
<tr>
<td>I tell myself you must have confidence in the medical staff and nurses.</td>
<td>1</td>
<td>0.50</td>
</tr>
<tr>
<td>It helps to talk about my experience with relatives and friends</td>
<td>1</td>
<td>0.49</td>
</tr>
<tr>
<td>It's reassuring to know the nurses and other patients are keeping an eye on you.</td>
<td>1</td>
<td>0.48</td>
</tr>
</tbody>
</table>

variance = 16.1%  alpha coef. = 0.82
<table>
<thead>
<tr>
<th>ITEM</th>
<th>FACTOR</th>
<th>LOADING COEFFICIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCALE 2 PESSIMISTIC/NEGATIVE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I hope I don't catch something from the other patients</td>
<td>2</td>
<td>0.73</td>
</tr>
<tr>
<td>The noise, sights and smell of hospitals is upsetting</td>
<td>2</td>
<td>0.68</td>
</tr>
<tr>
<td>I will remember this terrible experience all my life</td>
<td>2</td>
<td>0.58</td>
</tr>
<tr>
<td>It would be terrible if a complication set in and delayed my discharge</td>
<td>2</td>
<td>0.58</td>
</tr>
<tr>
<td>I would be happier with a room of my own away from other patients.</td>
<td>2</td>
<td>0.57</td>
</tr>
<tr>
<td>It's worrying not knowing what the hospital is like.</td>
<td>2</td>
<td>0.50</td>
</tr>
<tr>
<td>I'd rather not be left alone with my worries.</td>
<td>2</td>
<td>0.48</td>
</tr>
<tr>
<td>The injections are the worst part.</td>
<td>3</td>
<td>0.47</td>
</tr>
<tr>
<td>I think I might die</td>
<td>3</td>
<td>0.70</td>
</tr>
<tr>
<td>Worries about my illness/operation go round and round in my head</td>
<td>3</td>
<td>0.68</td>
</tr>
<tr>
<td>The anaesthetic is frightening.</td>
<td>3</td>
<td>0.62</td>
</tr>
<tr>
<td>I worry about not being in control of my own body.</td>
<td>3</td>
<td>0.44</td>
</tr>
<tr>
<td><strong>variance = 13.5% alpha coef. = 0.79</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCALE 3 FAITH IN OTHERS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I knew I needed this operation</td>
<td>4</td>
<td>0.67</td>
</tr>
<tr>
<td>I pray for help.</td>
<td>4</td>
<td>0.50</td>
</tr>
<tr>
<td>It's a relief to get something done about my problem at last.</td>
<td>4</td>
<td>0.46</td>
</tr>
<tr>
<td>I worry about getting lost in hospital.</td>
<td>4</td>
<td>0.45</td>
</tr>
<tr>
<td>I think about being unattractive after this operation</td>
<td>4</td>
<td>0.43</td>
</tr>
<tr>
<td><strong>variance = 4.6% alpha coef. = 0.40</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale 4 ANGER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It took too long to find out what was wrong with me.</td>
<td>7</td>
<td>0.67</td>
</tr>
<tr>
<td>I have been angry when little things go wrong. (e.g. lunch is cold.)</td>
<td>7</td>
<td>0.49</td>
</tr>
<tr>
<td>Things may be more serious than the doctors have said.</td>
<td>7</td>
<td>0.44</td>
</tr>
<tr>
<td><strong>variance = 3.9% Alpha coef. = 0.43</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The eleven optimistic items yielded an Alpha of 0.82.
The eight pessimistic items an Alpha of 0.79, the four internal pessimistic items an Alpha of 0.69, together these twelve items had an Alpha of 0.79.
The five items of 'faith in others' an Alpha of 0.40.
The three angry items an Alpha of 0.43.

The eleven optimistic items were statistically sound and psychologically sensible. The twelve pessimistic items assessed together were statistically sound and psychologically sensible. These scales clearly reflect two coping response styles to surgery. The variables with the greatest loading on the factor were used to define the scale.

The first three items of scale 1 had a loading coefficient greater than 0.6

- It helps to see other patients recovering with confidence. 1 0.67
- The friendliness between other patients is reassuring. 1 0.66
- It is important to understand as much as possible about the operation and recovery. 1 0.65

They reflect an optimistic, information seeking self helping response.

The first two items of Scale 2 had a loading coefficient greater than 0.6

- I hope I don't catch something from the other patients. 2 0.73
- The noise, sights and smell of hospitals are upsetting. 2 0.68

They reflect a pessimistic, rather withdrawn response in which the subject feels events are out of their control.

The first two items of Scale 3 had a loading coefficient greater than 0.5

- I knew I needed this operation. 3 0.67
- I pray for help. 3 0.50

These items seemed optimistic but reflected a sense of having no control over life events but rather having ‘Faith in Others’ to help or solve the problem.

The first two items of Scale 4 with a loading coefficient greater than 0.49 reflected simple anger.

- It took too long to find out what was wrong with me. 4 0.67
- I have been angry when little things go wrong. 4 0.49

(e.g. lunch is cold.)
The low alpha coefficients of scale 3 'faith in others' and scale 4 'anger' were considered to reflect the small number of items in the scales. The items had loaded together consistently in principle component solutions for all samples and they were interesting psychologically. These four scales seemed to represent 'the solution with the greatest scientific utility, consistency and meaning' Tabachnick and Fidell (1989, p.634). Since scales 3 and 4 represented responses not reported in other coping measures it was decided to include them in the response to surgery questionnaire and in further analysis. However given their low Alpha coefficients these scales must be interpreted with caution.

Factor five was statistically unreliable, the items loaded together in only one solution. The items were also difficult to interpret psychologically, although they seemed to reflect a concern with practical worries about home and work they also reflected concern with 'doing the right thing'. Factor six containing only one item which was negatively loaded. These two factors were on balance considered too difficult to interpret and statistically unsound and were excluded from further analysis and the final Response to Surgery Questionnaire. The items of factors five and six are listed as Marginal Factors in Table 4:4.

Table 4:4 The Marginal Factors; Items and Loading Coefficients

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor</th>
<th>Loading coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>It's hard to discipline yourself to take things easily when recovering</td>
<td>5</td>
<td>0.69</td>
</tr>
<tr>
<td>Are they coping without me at home/work</td>
<td>5</td>
<td>0.56</td>
</tr>
<tr>
<td>I have to remind myself to take one step at a time</td>
<td>5</td>
<td>0.51</td>
</tr>
<tr>
<td>I worry about doing something embarrassing</td>
<td>5</td>
<td>0.41</td>
</tr>
<tr>
<td>It helps to talk about my experience with relatives and friends</td>
<td>6</td>
<td>-0.39</td>
</tr>
</tbody>
</table>

The final response to surgery questionnaire consists of 31 items that statistically and
psychologically differentiate into 4 coping response styles, 1; optimistic/vigilant and self helping; 2; pessimistic/negative and no sense of control; 3; faith in others and external control and 4; anger.

DISCUSSION

The coping scales of RSQ do not easily compare with the emotional centred and problem centred scales of the Lazarus 'Ways of Coping'. 'Anger' and 'faith in others' are principally emotional responses, however the 'optimistic/vigilant' scale and the 'pessimistic/negative' scale contain items which are problem centred and items which are emotionally centred. There is not much evidence that the responses to surgery reflect the 'beneficial challenge' response reported by Folkman and Lazarus. Two items of the 'optimistic/vigilant' scale; 'you can help yourself to get better' and 'I look forward to taking a full part in my life again' are the nearest the subjects get to rising to a challenge.

The items of 'faith in others' are a curious collection, however they are consistently loading together. Emotional in nature they seem to reflect a certain desperation, 'I knew it would come to this' and a cry for help. Anger, scale four, is entirely emotional. Anger as a subjective response to stress is not much reported in the literature. Kaloupek's (1984) 'Coping Scale' has one angry item 'I felt angry about the way I was treated'. The three items of scale four are reflecting a generalised and strong emotion. It is not clear exactly whether the anger is directed at the inadequacies of the system, the disease/surgery itself or if it is used as some emotional release. Angry responses to seemingly small irritations may be a simple release mechanism for some overwhelming emotion, e.g. fear. 'Faith in others' and 'anger' scales are clearly less reliable than scales one and two. However 'faith in others' and 'anger' are not well reported in the 'coping' literature and so reflect a new and psychologically interesting aspect of subjective responses to stress. Clearly the threat of personal physical harm (surgery) does not evoke the same response as stressful events
of a less personal (e.g. exams) nature.

Comparing the scales with Johnston's findings many items reflect the principle concerns of her population. Recovery, coping after the operation and social support from others is reflected in items on each of the scales but from different perspectives. 'It is important to understand as much as possible about the operation and recovery.' from the optimistic/vigilant scale and 'It would be terrible if a complication set in and delayed my discharge' from the pessimistic/negative scale represent rather different view points on recovery.

The thirty one items of response to surgery questionnaire represent four distinctly different coping styles to threat. It is not clear whether an individual adopts one particular style in the form of a trait or whether different coping styles are adopted to deal with different or changing situations.

Given the literature on the failings of communication between patient and staff, reviewed in chapter two, it is not surprising that the patient generated items of the RSQ are not easily mapped onto existing coping schema. They represent the patients real concerns which may not be addressed by current pre-operative preparation to ameliorate surgical stress. The emergence of post-operative pain as a separate but related stress from a patient’s perspective is consistent with the concepts outlined in Chapter Three. Logically if a subject separates surgical stress and postoperative pain then they will cope with them separately.

It is not clear if the style of coping response to surgical stress and postoperative pain will be different. For example do patients respond in an optimistic way to both surgical stress and postoperative pain? Is the response to the stresses associated with surgery consistent or changing over the event? These questions are addressed in the next chapter.

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COPING RESPONSES TO SURGICAL STRESS

Introduction

In chapter four we developed a questionnaire (RSQ) to measure patients' spontaneous responses to surgery. The questionnaire based on patient generated items in lay language overcame any misunderstandings of language and meaning of the items. It also focussed on the patient's perception of their surgery and therefore represented their worries about the surgery. The items of the questionnaire divide into four styles of coping response. It was not clear whether the coping style was consistent for each individual or altered over time. If the style altered it may be that the nature of the stress is influencing the nature of the response, as discussed in Chapter Two. Any alteration of stress response over the event would also indicate an active participation by the patient. Surgical stress response would resemble the dynamic process of examination stress response described by Folkman and Lazarus (1985). This chapter examines changes in coping responses over time.

Subjective responses to a stressful event influence its impact and outcome, surgery is no exception (Mathews and Ridgeway, 1981). In a review of the research on coping and personality Suls and colleagues explored the history and various conceptualisations of the relationship. They describe the development of the current definition from the early theories of personality dominated by psychoanalysis when coping was thought to be entirely subjective, through the 'Trait' theories of personality where coping was thought to be almost entirely environment to the current concept. "In so far as these responses are an individual's attempt to control or manage the stress they may be 'conceptualised as a transactional process between person and environment" (Suls, David and Harvey, 1996). In short they are coping responses. Medical, nursing and psychological research of the past decade has identified several groups of coping responses that considered together have a certain psychological consistency and may constitute a style. Where 'treatments'
including coping responses to surgery have been employed to reduce peri-operative stress, no one style has emerged that is universally beneficial.

In the discussion of coping responses to surgical stress and pain (Chap. 2) several inconsistencies emerged. Both avoidant and vigilant coping styles to stress were associated with satisfactory outcomes (Andrew, 1970, Manyande and Salmon, 1992). There was a more consistent link between negative responses to pain and increased pain (Rosensteil and Keefe, 1983 and Pearce, 1986) but subjects utilised both negative and positive coping styles for each incidence of pain (Chaves and Brown, 1985 and Pick, Pearce and Legg, 1990).

Generally subjects who attempted to cope with their pain and stress reported better outcomes, psychological and physiological indices, than subjects who were passive. What is not clear from the literature review (Chap. 2) is whether response style is consistent for each individual or stress or if the style changes over time. Nor is it clear what factors determine the responses i.e. personality, past experience, magnitude of threat.

Coping responses to stress and pain are important because they affect outcome. It is tempting to assume that some coping responses are adaptive while others are maladaptive. However the research to date indicates that this is not the case. The subjective response to stress and pain is complex and sometimes paradoxical. To understand coping it is important to establish what an individual is doing in response to stress.

Subjects attempt to 'cope' with the effects of stress in differing ways thereby achieving a measure of 'control'. The evidence suggests that those who achieve an active consistent response report greater effect on stress/pain than those whose response is less well defined. The suggestion that 'active' coping, whatever the style, contributes to satisfactory
outcome is consistent with the psychoanalytical driven theory of 'the work of worry' (Janis, 1958). Where worrying is seen as an active 'thinking through' preparation for a stressful event. In later studies 'worry' has been conceptualised as a cognitive process which encapsulates both fear and hope and relates to emotion and mood (Breznitz, 1971 and Barkover et.al., 1983). Coping is an attempt by the subject to control events. The underlying theories suggest that coping is cognitive but possibly influenced by mood and emotion.

Folkman and Lazarus (1985) have expanded this concept describing worry as a dynamic coping response to stress which changes as the event progresses. They identified three coping styles, problem centred, emotional and avoidant coping which were elicited at different times, during student examinations. The choice of style seemed dependent, principally, on the interpretation of the stress (threat or challenge) by the subject. However, they also indicated that even when a stressor was appraised as being unchangeable and subjects utilised 'emotional' coping strategies there was a tendency to deal with associated events with 'problem centred' coping. In the clinical setting subjects faced with a life threatening illness may ignore or deny their condition, 'avoidant' coping, but write a will, 'problem centred' coping. This relationship between magnitude of threat and coping response has been demonstrated in medicine. Life threatening and non life threatening disease/surgery evokes different response styles, (Feifel, Strack and Nagy, 1987). The reported evidence suggest that in a variety of situations an overall style of coping in response to stress is discernable and that different subjects adopt different styles. However the majority of subjects utilise some responses from each 'coping style' in each incidence of stress. No clear association can be made, therefore, between stressor and response or subject and response.

A general picture is emerging of an interactive dynamic process between the stressor, as perceived by the subject 'what it means to me', and the coping response. This conceptualisation would suggest that the individual is constantly monitoring the stress,
its magnitude, assessing their ability to control, or effect the current situation and adapting their responses accordingly. It may, for example, be effective for a surgical patient on admission to hospital to be 'vigilant', information seeking and address the problems of surgery, control of pain, postoperative mobility, visiting hours, etc. However during the pre-operative waiting period on the day of operation after all the arrangements are made it might be more effective to adopt an 'avoidant', 'put it out of the mind' response. Coping seen as a dynamic in this way may account, in some part, for the apparent inconsistencies reported in the literature.

Clearly there are other factors influencing the choice of coping response and the outcomes in any stressful event. Personality, mood and anxiety are associated with outcome in terms of pain, recovery (Mathews and Ridgeway, 1981, and Salmon, 1992) and sense of well being (Johnstone, 1984). The association between anxiety, and coping has hardly ever been explored although it might be expected that highly anxious subjects would respond with more emotional style coping than with problem based coping. There is evidence that mood, depression, was improved in subjects who employed cognitive coping techniques as a response to the stress of surgery Mathews and Ridgeway, 1982). However, no clear evidence of an association between coping responses to surgery and personality (Scheier and Carver, 1987, Scheier et. al., 1989, Manyande and Salmon, 1992) has emerged.

Current evidence suggests that problem centred/vigilant responses will emerge early pre-operatively, on admission and including the day prior to surgery and late post-operatively, some forty eight hours post surgery, when the patient perceives that their responses are effective. While emotional/ avoidant responses will increase in the immediate peri-operative period when the patients feel they are less effective. The responses to the stress and pain of surgery will show individual variation relating to the perceived magnitude of the condition. Theoretically, palliative surgery with perceived disfigurement will elicit more emotional responses which are perhaps more persistent.
If patients are to be managed effectively and successful outcomes maximised it is important to understand the coping response. If the response to surgery is an interactive process, eliciting different responses as the threat changes then management to encourage effective coping must also change. The following study examines subjective coping responses to surgery as a process, within the context of other variables. No intervention was included in the study. Its purpose was to explore the patients coping responses to surgical stress and the associations with other variables. The time scale of the study spaned the surgery from the immediate pre-operative period through early to late post-operative period.

It is hypothesised that the responses will a) change over time (pre-operative, early post-operative (first forty eight hours), late post-operative) and b) reflect the magnitude of the perceived threat.

**Method**

**Subjects**

Patients admitted for elective major surgery from the orthopaedic, gynaecological and general surgical waiting lists at the City and Hackney district Hospitals over a period of seven months were asked to take part in the study. Three categories of patient were excluded:

1) Patients considered by the nursing and medical staff to be too distressed or confused by inclusion in the study.
2) Minors; patients under 16 yrs of age.
3) Patients whose first language was not English and who did not have sufficient command of English to fully understand the questionnaires.
It was important and an ethical consideration not to increase the stress of the clinical sample therefore patients were not pressed to take part in the study. Nor were they obliged to give a reason for refusing. The majority of patients readily agreed to take part in the study less than ten refusing. Where reasons for refusing were given they included:

1) Already taking part in a separate investigation.  
2) Too frightened.  
3) An attendant relative advised the subject against taking part.  
4) The subject had some disability, not related to the surgery, that they thought would make participation difficult e.g. Too deaf.  

128 patients agreed to take part, 40 male and 88 female, aged 17 - 76 years, with a mean age of 51 yrs. Table 5:1 lists the age and gender in each surgical group. 

| Table 5:1 Age, Gender and Surgical Group of Subjects. |

<table>
<thead>
<tr>
<th></th>
<th>Gynaecology</th>
<th>Orthopaedic</th>
<th>General Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean Age</strong></td>
<td>46 yrs (sd 12.82)</td>
<td>46.36 yrs (sd 16)</td>
<td>57.3 yrs (sd 13.6)</td>
</tr>
<tr>
<td><strong>Age Range</strong></td>
<td>21 to 75</td>
<td>17 to 70</td>
<td>20 to 76</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td>50 F</td>
<td>12 M 12 F (24)</td>
<td>28 M 26 F (53)</td>
</tr>
</tbody>
</table>

*sd. Standard deviation in years*

**MEASURES**

In choosing measures for a clinical sample several practical and ethical issues were considered. It was important that the subjects stress was not increased by participating and that they did not feel overburdened by the questionnaires. It was also important that the measures were easy to complete by the clinical sample especially those measures which were presented within twenty four hours post surgery.
Questionnaires

Response to Surgery Questionnaire (RSQ)

Spontaneous subjective responses to surgical stress were assessed by the Response to Surgery Questionnaire (RSQ) (Appendix 2). This thirty one item questionnaire identifies four distinct styles of coping, Optimistic/ Vigilant; Pessimistic/ Negative; Faith in Others and Anger. The questionnaire is fully described in chapter four above.

Pain Response Questionnaire (PRQ)

Subjective responses to postoperative pain were assessed by the Pain Response Questionnaire (PRQ, acute) (Pick, Pearce and Legg, 1990). A twenty three item questionnaire identifies three distinct classes of response to acute postoperative pain: Negative cognitions e.g. ‘worry about what might be causing the pain’, positive cognitions e.g. ‘tell yourself you can over come the pain’, and behaviours e.g. ‘lie down and rest’. The subjects are asked to indicate how often they use the items on a four point ordinal scale ranging from ‘not at all’ to ‘most of the time’.

State /Trait Anxiety Inventory

Anxiety was assessed by the State/ Trait Anxiety Inventory (STAI) Speilberger, 1970) A two part questionnaire consisting of twenty items each and a four part ordinal scale. The first section requires the subject to respond as to how they feel right now to items describing emotion e.g. ‘I feel anxious; I feel calm’. The scale for state anxiety ranges from ‘not at all’ to ‘very much so’. Assessment of trait anxiety requires the subject to respond as to how they generally feel to emotional items e.g. ‘I am inclined to take things hard; I am a steady person’ on a scale ranging from ‘almost never’ to ‘almost always’.
The Recovery Inventory

Recovery during admission was assessed by 'The Recovery Inventory' (Wolfer and Davies, 1970). This questionnaire assesses how patients have felt in the last twenty four hours. Patients are asked to respond to eight items relating to recovery e.g. sleep; stomach condition; interest in what's going on around me, on an six point scale ranging from poor to excellent.

The Recovery Diary

The simple and reliable 'recovery checklist' (Woolfer and Davis, 1970) above, could have measured recovery after discharge. Although the recovery checklist assesses how a subject feels it did not give any indication as to their return to a normal life style. It was necessary to devise a measure to assess return to normal life style. A diary which included date of discharge and the time, in days, of return to usual tasks was a simple comparative measure. Simply asking patients to select their own tasks would make comparison difficult. Selecting tasks for them would make no allowance for differences in age and life style. A simple diary check list was devised which included specified tasks derived from those of Williams et. al. (1976), household tasks and tasks suggested by the subjects that they were accustomed to perform as part of their routine.

The recovery diary check list (Appendix 3) consisted of eight questions about general recovery; e.g. 'on which day did you first get up at your usual time' derived from a scale developed by Williams et. al. (1976) and eight tasks nominated by the subject from their repertoire of routine tasks, at home or work, undertaken prior to surgery. Subjects noted the date that each task was first attempted and the date the task was successfully completed. The general recovery items were consistent for all subjects the second set of tasks compensated for the differences in age and disability between subjects. Prior to the operation the patients nominated tasks from their usual routine that they performed on a
once and twice daily and once and twice weekly. Tasks frequently nominated were items such as: 'making pots of tea', 'walking to the post office', 'visiting friends', 'going to the pub/club', 'entertain grand children', 'making beds'. Subjects were also asked the date of their discharge. Late recovery was assessed in days after discharge taken to complete the tasks, that is to return to their normal routines. Both sets of tasks had reliable internal consistency the specified tasks $r > 0.5$, $p < 0.01$; routine tasks $r > 0.04$, $p > 0.05$.

Other measures

Demographic details, social class based on current or previous occupation, and the outcome of the surgery, palliative or curative were obtained from hospital records. The surgery was classified according to Royal Collage of Surgeons guidelines (Appendix 7) into intermediate, major and major plus.

The degree of disfigurement following the surgery was noted. Subjects were classified as being 'overtly disfigured' if a limb or breast was amputated or if they were left with a sense of loss or alteration, e.g. hysterectomy or colectomy and stoma. All other procedures were classified as non-disfiguring.

Post operative pain was assessed by two 100mm visual analogue scales. One scale assessed the pain intensity and was anchored; 'none at all' and 'the most intense I can imagine'. The second scale assessed the affective aspect of pain, 'how much the pain distresses you' and was anchored; 'not at all' and 'the most distress I can imagine'.

PROCEDURE

The patients were recruited to the study on the day of their admission for surgery, normally one day before the operation. The study was explained to them and their informed written consent obtained (consent forms Appendix 1).
One Day Prior to Operation

One day before their operation the patients completed the RSQ by endorsing one of four responses for each item (not at all, sometimes, often, most of the time). Thus indicating their current thoughts about the surgery. They completed the Trait and State sections of the STAI.

The recovery diary for completion post discharge was explained to them and tasks were selected by the patients to form the second section of the diary. The tasks were selected from those that the subjects had routinely performed prior to admission and that they expected to be able to complete within 4 weeks after discharge.

Patients were then asked to complete the pain VAS and to indicate how bad they thought the post-operative pain would be.

The Day of Operation

Pre-operatively
On the day of operation, immediately prior to the administration of the sedative premedication the patients completed a second RSQ and a second pain VAS, indicating their anticipation of the post-operative pain.

Post-operatively
On return to the ward from recovery the patients completed a pain VAS as a measure of their post-operative pain.

One and Three Days Post-operatively

One day and three days postoperatively patients completed the RSQ, the PRQ(acute), the
recovery inventory, the state questionnaire of the STAI and a pain VAS, this time indicating how bad their first episode of postoperative pain had been.

**Day of Discharge**

On discharge the patients were given their recovery diaries and a stamped addressed envelope to be returned after one month.

**Post-operative Outpatients (approximately six weeks post-op.)**

Where possible the patients were contacted at their first outpatient visit post surgery and were asked to recall their post-operative pain and to complete the pain VAS. The diaries were collected or the patients were reminded to complete and return them.

**Figure 5:1 An Overview of the Procedure**

<table>
<thead>
<tr>
<th></th>
<th>Pre-op.</th>
<th>Post-op.</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 day</td>
<td>day of op</td>
<td>day of op</td>
<td>1 day</td>
<td>3 days</td>
<td>30 days</td>
</tr>
<tr>
<td>RSQ</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>STAI Trait</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAS ant. exp.</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>rec.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R. I.</td>
<td></td>
<td></td>
<td></td>
<td>Y</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>R. D.</td>
<td>set tasks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>PRQ</td>
<td></td>
<td></td>
<td></td>
<td>Y</td>
<td>Y</td>
<td></td>
</tr>
</tbody>
</table>

RSQ; Response to Surgery Questionnaire. STAI; State and Trait Anxiety Inventory. Vas; Visual Analogue Scale. ant; Anticipated Pain. exp; Experienced Pain. rec; Recalled Pain. R I; Recovery Inventory. R D; Recovery Diary. PRQ; Pain Response Questionnaire
STATISTICAL ANALYSIS

Effects of gender, magnitude of surgery (1. palliative, cure. 2. Overt disfigurement, non-disfigurement) and changes in the PRQ scores were assessed by 't' test. Affects of type of surgery (general, orthopaedic, gynaecological), classification of surgery (major plus, major, intermediate) and social class were assessed by one way analysis of variance. Subjects' scores on the RSQ and PRQ were calculated by summing the responses comprising each scale. (RSQ: optimistic/vigilant, pessimistic/negative, faith in others, anger. PRQ: positive, negative, behavioural.) Changes in the RSQ over the duration of the admission were assessed by repeated measure anova. Product moment correlation assessed the relationships between the coping responses and trait and state anxiety, post-operative pain and recovery.

Figure 5.2 Overview of Design

<table>
<thead>
<tr>
<th>'t' Test</th>
<th>One way ANOVA</th>
<th>MANOVA</th>
<th>CORRELATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>gender</td>
<td>type of surg.</td>
<td>within subs. RSQ by time</td>
<td>anxiety with coping pain and recovery</td>
</tr>
<tr>
<td></td>
<td>gen/orth/gynae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mag of surg</td>
<td>RCS class of surg.</td>
<td></td>
<td>coping with pain and recovery</td>
</tr>
<tr>
<td>pal/cure</td>
<td>interm./major.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>deform/nondeform</td>
<td>/major+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRQ +1 +3</td>
<td>social class</td>
<td></td>
<td>pain with recovery</td>
</tr>
</tbody>
</table>

The analysis of the effects of anticipation of pain and its subsequent recall are described in Chapter Six.
Results

Changes in response over time

There was some evidence to support the hypothesis that subjective responses to surgery change over the duration of the event and that this was not attributable to changes in state anxiety.

Table 5.2. The Coping Scales: Response to Surgery and Pain Response, Changes over the Admission

<table>
<thead>
<tr>
<th>Response Scales</th>
<th>Pre-op.</th>
<th></th>
<th>Post-op.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 day</td>
<td>day of op</td>
<td>1 day</td>
</tr>
<tr>
<td>RSQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optimistic/Vigilant</td>
<td>Mean (sd)</td>
<td>34 (6.7)</td>
<td>33.25 (7.27)</td>
<td>33.25 (6.73)</td>
</tr>
<tr>
<td>min11 max44</td>
<td>Range</td>
<td>14 - 44</td>
<td>16 - 44</td>
<td>14 - 44</td>
</tr>
<tr>
<td>Pessimistic/Negative</td>
<td>Mean (sd)</td>
<td>20.44 (6.32)</td>
<td>20.15 (5.78)</td>
<td>20.02 (5.97)</td>
</tr>
<tr>
<td>min12 max48</td>
<td>Range</td>
<td>12 - 40</td>
<td>12 - 40</td>
<td>12 - 41</td>
</tr>
<tr>
<td>Faith</td>
<td>Mean (sd)</td>
<td>8.03 (2.73)</td>
<td>8.22 (2.68)</td>
<td>7.8 (2.78)</td>
</tr>
<tr>
<td>min5 max20</td>
<td>Range</td>
<td>5 - 13</td>
<td>5 - 13</td>
<td>5 - 14</td>
</tr>
<tr>
<td>Anger</td>
<td>Mean (sd)</td>
<td>4.51 (1.72)</td>
<td>4.67 (1.57)</td>
<td>4.42 (1.61)</td>
</tr>
<tr>
<td>min3 max15</td>
<td>Range</td>
<td>3 - 9</td>
<td>3 - 9</td>
<td>3 - 10</td>
</tr>
<tr>
<td>PRQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>Mean (sd)</td>
<td></td>
<td>15.13 (3.8)</td>
<td>14.8 (3.99)</td>
</tr>
<tr>
<td>min0 max33</td>
<td>Range</td>
<td></td>
<td>10 - 24</td>
<td>10 - 24</td>
</tr>
<tr>
<td>Negative</td>
<td>Mean (sd)</td>
<td></td>
<td>13.37 (4.59)</td>
<td>13.44 (4.28)</td>
</tr>
<tr>
<td>min0 max33</td>
<td>Range</td>
<td></td>
<td>11 - 26</td>
<td>11 - 28</td>
</tr>
<tr>
<td>Behaviour</td>
<td>Mean (sd)</td>
<td></td>
<td>9.87 (2.76)</td>
<td>9.62 (2.44)</td>
</tr>
<tr>
<td>min0 max15</td>
<td>Range</td>
<td></td>
<td>5 - 16</td>
<td>5 - 15</td>
</tr>
</tbody>
</table>
Although no sustained pattern of change was observed in the choice of coping response to surgery or pain over the duration of the threat (admission), Table 5:2.

Table 5:3. Response Scales: 't' Tests Between Paired Sample and Repeated Measure ANOVA

<table>
<thead>
<tr>
<th>Response Scale</th>
<th>'t' values</th>
<th>F ratio (df)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 day pre-op.</td>
<td>Day of op.</td>
</tr>
<tr>
<td>RSQ Optimistic/</td>
<td>0.37</td>
<td>0.18</td>
</tr>
<tr>
<td>Vigilant</td>
<td>0.53</td>
<td>0.68</td>
</tr>
<tr>
<td>3 days post-op.</td>
<td>0.57</td>
<td>0.68</td>
</tr>
<tr>
<td>Pessimistic/</td>
<td>0.42</td>
<td>-0.98</td>
</tr>
<tr>
<td>Negative</td>
<td>0.39</td>
<td>0.59</td>
</tr>
<tr>
<td>3 days post-op.</td>
<td>2.23*</td>
<td>0.59</td>
</tr>
<tr>
<td>Faith in Others</td>
<td>-0.13</td>
<td>1.27</td>
</tr>
<tr>
<td>Day of op.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 day post-op.</td>
<td></td>
<td>1.27</td>
</tr>
<tr>
<td>3 days post-op.</td>
<td>1.54</td>
<td>2.05*</td>
</tr>
<tr>
<td>Anger</td>
<td>-0.51</td>
<td>1.44</td>
</tr>
<tr>
<td>Day of op.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 day post-op.</td>
<td></td>
<td>1.44</td>
</tr>
<tr>
<td>3 days post-op.</td>
<td>1.45</td>
<td>1.14</td>
</tr>
<tr>
<td>PRQ Positive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 days postop.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 days post-op.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behaviour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 days post-op.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p<0.05
The 't' tests between the paired samples revealed a slight change in response on two scales (Table 5:3). The mean value of the pessimistic/negative scale 3 days postoperatively was significantly lower than 1 day preoperatively (t=2.23; p<0.05) and the mean score on the 'faith in others' scale 3 days postoperatively was significantly lower than preoperatively on the day of operation, (t=2.05; p<0.05) Table 5:2. This suggests that subjects are utilising less pessimistic/negative cognitions about the surgery and are less reliant on 'others'. However, repeated measure analysis of variance for each scale over time did not yield any significant F ratios (Table 5:3). Therefore the observed change must be treated with caution.

There was no significant change in overall state anxiety pre-operatively to post-operatively, (preop mean = 40.33, postop mean = 37.53; t= 0.02). However, not all subjects were less anxious post-operatively than pre-operatively. Eighty (63%) subjects returned sufficient data to assess the direction of change of anxiety (preop anx - postop anx = direction of change). When the resulting scale was correlated with the RSQ scales, significant negative correlations emerged with the pre-operative pessimistic/negative response scale only, (Table 5:4.)

Table 5:4: Product Moment Correlations Between the Direction of Change of Anxiety and RSQ Scales

<table>
<thead>
<tr>
<th>RSQ Scales</th>
<th>Pre-operative</th>
<th>Post-operative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>O/V</td>
<td>P/N</td>
</tr>
<tr>
<td>Direction of Change of Anxiety</td>
<td>0</td>
<td>-0.37</td>
</tr>
</tbody>
</table>

** p < 0.01
RSQ scales: O/V, optimistic/vigilant; P/N, pessimistic/negative; FO Faith in Others; A, anger

Subjects who were more anxious pre-operatively than post-operatively had
correspondingly higher scores on the pre-operative RSQ, pessimistic/negative scale. Conventional theory suggests that coping responses are related to emotion later. This would suggest that the subjects who are pessimistic and negative pre-operatively are less anxious post-operatively. However the notion that there is some mutual interaction cannot be excluded by this correlation. It is possible that very anxious subjects pre-operatively are prone to utilise more pessimistic responses. No other significant correlation between the coping scales and anxiety emerged.

COPING RESPONSES AND POSTOPERATIVE OUTCOMES

Table 5:5. Product Moment Correlations: Coping Responses with Recovery, Pain and Postoperative Anxiety

<table>
<thead>
<tr>
<th>RSQ</th>
<th>Recovery 1 Day</th>
<th>Recovery 3 Days</th>
<th>Anxiety 1 Day</th>
<th>Anxiety 3 Days</th>
<th>Pain Intensity</th>
<th>Pain Distress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimistic</td>
<td>Preop 0.15</td>
<td>Postop 0.03</td>
<td>Preop -0.16</td>
<td>Postop -0.18</td>
<td>-0.12</td>
<td>-0.06</td>
</tr>
<tr>
<td>/vigilant</td>
<td></td>
<td></td>
<td>Preop -0.24*</td>
<td>Postop -0.25*</td>
<td>-0.10</td>
<td>-0.12</td>
</tr>
<tr>
<td>Pessimistic</td>
<td>Preop -0.16</td>
<td>Postop -0.16</td>
<td>Preop 0.66**</td>
<td>Postop 0.55**</td>
<td>0.12</td>
<td>0.20</td>
</tr>
<tr>
<td>/negative</td>
<td></td>
<td></td>
<td>Preop 0.34**</td>
<td>Postop 0.62**</td>
<td>0.12</td>
<td>0.20</td>
</tr>
<tr>
<td>Faith in</td>
<td>Preop 0.02</td>
<td>Postop 0.10</td>
<td>Preop -0.10</td>
<td>Postop -0.22*</td>
<td>-0.15</td>
<td>-0.16</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
<td>Preop -0.13</td>
<td>Postop -0.30**</td>
<td>-0.15</td>
<td>-0.16</td>
</tr>
<tr>
<td>Anger</td>
<td>Preop -0.14</td>
<td>Postop -0.31**</td>
<td>Preop 0.31**</td>
<td>Postop 0.49**</td>
<td>0.26*</td>
<td>0.21*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Preop 0.41**</td>
<td>Postop 0.50**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRQ</td>
<td>POSITIVE 0.25*</td>
<td>Negativé -0.36**</td>
<td>ANGER -0.33**</td>
<td>Behaviour -0.33**</td>
<td>-0.11</td>
<td>-0.17</td>
</tr>
<tr>
<td></td>
<td>Negativé -0.37**</td>
<td></td>
<td></td>
<td>Behaviour -0.27**</td>
<td>0.54**</td>
<td>0.30**</td>
</tr>
<tr>
<td></td>
<td>Behaviour -0.33**</td>
<td></td>
<td></td>
<td>Behaviour 0.34**</td>
<td>0.51**</td>
<td>0.39**</td>
</tr>
</tbody>
</table>

** p < 0.01  * p < 0.05
Product moment correlations assessed the relationship between the coping responses and the post-operative outcomes, recovery, affect and pain. Since the responses on the PRQ scales did not change between one and three days post-operatively correlations were calculated with the scores obtained one day post-operatively. The responses to the RSQ were seen to change preoperatively to post-operatively. Therefore, correlations were calculated with the scores obtained one day pre-operatively and three days post-operatively.

A sustained pattern of significant correlations was obtained between responses on all scales of the RSQ and the PRQ and post-operative measures of recovery, anxiety and post-operative pain, Table 5:5.

Poor recovery at three days post-op, high levels of state anxiety and high levels of pain intensity and distress are associated with the RSQ 'pessimistic/negative' and 'angry' scales and with the PRQ 'negative' and 'behavioural' scales. Good recovery, three days post-op is associated with the RSQ 'optimistic/vigilant' scale and the PRQ 'positive' scale. Lower levels of postoperative state anxiety are associated with the RSQ 'faith in others and PRQ 'positive' scale.

TRAIT ANXIETY, PREOPERATIVE AFFECTIVE STATE AND THE COPING RESPONSES

Anxiety and Coping

Preoperative measures of state and trait anxiety were significantly positively correlated; \( r = 0.58, p < 0.01 \).

Associations between the coping responses and trait anxiety and preoperative state anxiety were assessed by product moment correlation (Table 5:6). The pattern of significant correlations clearly demonstrates the association between highly anxious
subjects and a tendency to utilize pessimistic/negative, angry responses to stress and negative responses to pain. They also utilise less optimistic responses to surgery and less positive responses to pain. State anxiety reveals a similar pattern of responses.

Table 5:6. **Correlations: Coping Responses, Trait Anxiety and Preoperative State Anxiety**

<table>
<thead>
<tr>
<th>Response Scales</th>
<th>Trait Anxiety</th>
<th>State Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>preop</td>
<td>postop</td>
</tr>
<tr>
<td>RSQ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>optim/vig</td>
<td>-0.05</td>
<td>-0.09</td>
</tr>
<tr>
<td>pesim/neg</td>
<td>0.44**</td>
<td>0.57</td>
</tr>
<tr>
<td>faith others</td>
<td>-0.08</td>
<td>-0.25</td>
</tr>
<tr>
<td>anger</td>
<td>0.40**</td>
<td>0.49**</td>
</tr>
<tr>
<td>PRQ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>positive</td>
<td>-0.34**</td>
<td></td>
</tr>
<tr>
<td>negative</td>
<td>0.46**</td>
<td></td>
</tr>
<tr>
<td>behaviour</td>
<td>0.16</td>
<td></td>
</tr>
</tbody>
</table>

**p<0.01 *p<0.05

RSQ scales. optim/vig optimistic/vigilant; pesim/neg pessimistic/negative; faith others faith in others:

THE MAGNITUDE OF THE THREAT AND THE COPING RESPONSES

There was evidence to support the hypothesis that the subjective perception of the surgery and outcome (magnitude of the threat) influenced coping responses.

Magnitude of Threat

The magnitude of the threat was classified in three distinct ways:
1) The professional classification of, intermediate, major and major plus surgery.
2) Whether the surgery would effect a cure for the disease or was palliative.
3) Whether the surgery would result in overt disfigurement or not.

No differences emerged between the professional classification groups and response to surgery or pain.

Table 5:7. Effects of Magnitude of Threat on Responses to Surgery and Pain; 't' Values

<table>
<thead>
<tr>
<th>Classification</th>
<th>Response to Surgery</th>
<th>Pain Response</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>opt/vig</td>
<td>pes/neg</td>
</tr>
<tr>
<td>Cure</td>
<td>mean</td>
<td></td>
</tr>
<tr>
<td></td>
<td>33.9</td>
<td>19.79</td>
</tr>
<tr>
<td>Pall.</td>
<td>mean</td>
<td></td>
</tr>
<tr>
<td></td>
<td>33.99</td>
<td>21.53</td>
</tr>
<tr>
<td>'t' value</td>
<td>0.07</td>
<td>1.5</td>
</tr>
<tr>
<td>disfig</td>
<td>mean</td>
<td></td>
</tr>
<tr>
<td></td>
<td>31.39</td>
<td>21.07</td>
</tr>
<tr>
<td>nodisf</td>
<td>mean</td>
<td></td>
</tr>
<tr>
<td></td>
<td>34.22</td>
<td>20.41</td>
</tr>
<tr>
<td>'t' value</td>
<td>2.58*</td>
<td>0.34</td>
</tr>
</tbody>
</table>

**p<0.01 *p<0.05

RSQ scales. opt/vig optimistic/vigilant; pes/neg pessimistic/negative; faith faith in others.
PRQ scales pos positive, neg negative, beh behavioural.

Subjects for whom the surgery was palliative had significantly higher scores on the angry RSQ scale and the negative PRQ scale. Subjects who perceived that the surgery would result in no overt disfigurement scored higher on the optimistic/vigilant RSQ scale (Table 5:7). Overall the mean values for the two groups in each classification are in line with the notion that the magnitude of the surgery influences response (Table 5:7).
Subjects who perceived their operation as a palliative procedure tended to respond to stress with pessimistic/negative coping and anger. Likewise their response to pain was negative. Subjects who perceived their operation as leaving them with no disfigurement tended to respond to stress with optimistic/vigilant coping. There was no concomitant significant response to pain.

Coping responses and recovery after discharge

No consistent relationship emerged between the coping responses and date of discharge. Only 48 subjects returned the 'Recovery Diary' with sufficient data for analysis.

The recovery diary consisted of two sections;

A) Eight specified tasks which did not account for age or gender, but represented a gentle return to normal life.
B) Eight tasks which were suggested by the subjects, consisting of tasks that were part of routine life prior to their hospitalisation and surgery. These tasks were, therefore, age and gender related. The two sets of tasks were considered separately.

It took between 1 and 73 days for subjects to attempt the 8 specified tasks, the mean time was 19 days (s.d.11.89). It took between 1 and 71 days for subjects to attempt their routine tasks, the mean time was 20 days (s.d.13.23).
Table 5.8: Correlation Coefficients Between the Coping Scales and Late Recovery Items

<table>
<thead>
<tr>
<th>Response to Surgery</th>
<th>Pain Response</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key Tasks</strong></td>
<td><strong>Scales</strong></td>
</tr>
<tr>
<td>A</td>
<td>RSQ O/V optimistic/vigilant</td>
</tr>
<tr>
<td>(a) Got up and dressed at the usual time</td>
<td>(i) Once a week - household</td>
</tr>
<tr>
<td>(b) Spent all day out of bed without rest</td>
<td>(j) Once a week - recreational</td>
</tr>
<tr>
<td>(c) Took a short walk outside the house</td>
<td>(k) Twice a week - household</td>
</tr>
<tr>
<td>(d) Did a little local shopping / visited the library</td>
<td>(l) Twice a week - recreational</td>
</tr>
<tr>
<td>(e) Met friends / relatives away from home</td>
<td>(m) Once a day - household</td>
</tr>
<tr>
<td>(f) The first day at home without pain</td>
<td>(n) Once a day - recreational</td>
</tr>
<tr>
<td>(g) Made a snack for yourself</td>
<td>(o) Twice a day - household</td>
</tr>
<tr>
<td>(h) First day you 'forgot' you had an operation</td>
<td>(p) Twice a day - recreational</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TASKS A</th>
<th>O/V</th>
<th>P/N</th>
<th>FO</th>
<th>A</th>
<th>P</th>
<th>N</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>0.05</td>
<td>0.30*</td>
<td>-0.03</td>
<td>0.18</td>
<td>-0.04</td>
<td>0.03</td>
<td>0.31*</td>
</tr>
<tr>
<td>(b)</td>
<td>0.19</td>
<td>0.31*</td>
<td>0.12</td>
<td>0.22</td>
<td>0.12</td>
<td>0.18</td>
<td>0.30</td>
</tr>
<tr>
<td>(c)</td>
<td>0.17</td>
<td>0.27*</td>
<td>0.34*</td>
<td>0.13</td>
<td>0.22</td>
<td>-0.03</td>
<td>0.14</td>
</tr>
<tr>
<td>(d)</td>
<td>0.07</td>
<td>0.13</td>
<td>0.11</td>
<td>0.08</td>
<td>0.03</td>
<td>0.02</td>
<td>0.21</td>
</tr>
<tr>
<td>(e)</td>
<td>0.25</td>
<td>0.31*</td>
<td>0.24</td>
<td>0.12</td>
<td>0.13</td>
<td>0.16</td>
<td>0.16</td>
</tr>
<tr>
<td>(f)</td>
<td>0.22</td>
<td>0.27*</td>
<td>-0.05</td>
<td>0.07</td>
<td>-0.06</td>
<td>0.14</td>
<td>0.30*</td>
</tr>
<tr>
<td>(g)</td>
<td>0.16</td>
<td>0.23</td>
<td>0.35*</td>
<td>0.31*</td>
<td>0.32*</td>
<td>0.06</td>
<td>-0.01</td>
</tr>
<tr>
<td>(h)</td>
<td>0.18</td>
<td>0.23</td>
<td>0.09</td>
<td>0.15</td>
<td>0.12</td>
<td>0.02</td>
<td>0.04</td>
</tr>
</tbody>
</table>

| TASKS B |                      |                      |                      |                      |                      |
|---------|----------------------|----------------------|----------------------|----------------------|
| (i)     | 0.19                 | 0.37*                | 0.32*                | 0.22                 | 0.03                | 0.10                | 0.07                |
| (j)     | -0.04                | -0.09                | 0.33*                | 0.17                 | 0.17                | -0.11               | -0.01               |
| (k)     | -0.04                | 0.24                 | 0.17                 | 0.40**               | 0.15                | 0.02                | -0.12               |
| (l)     | 0.09                 | 0.06                 | 0.19                 | 0.03                 | 0.20                | 0.02                | -0.05               |
| (m)     | -0.02                | 0.10                 | 0.27                 | 0.17                 | 0.05                | -0.02               | -0.09               |
| (n)     | -0.01                | 0.06                 | -0.03                | -0.04                | 0.13                | 0.10                | -0.08               |
| (o)     | 0.08                 | 0.08                 | 0.07                 | 0.15                 | -0.01               | 0.15                | -0.02               |
| (p)     | 0.16                 | 0.48**               | -0.11                | 0.25                 | -0.04               | 0.42*               | 0.02                |

**p<0.01 *p<0.05
There is a pattern of significant positive correlations between the pessimistic/negative RSQ scale and the late recovery items. Subjects who employ more pessimistic/negative responses to surgery tend to take longer to resume normal daily tasks following discharge. This is most notable in the specific tasks where five of eight items are positively correlated with the pessimistic/negative scale (Table 5:8).

The pessimistic/ negative scale is also associated with poor early recovery (Table 5:6) and subjective perception of their surgery; palliative or disfigurement (Table 5:7). It is possible that subjects who have a terminal disease are coping with disfigurement are less likely to resume normal life styles post discharge. Equally subjects who have a poor early recovery may take longer to resume their normal life styles.

Three items of the specified tasks were significantly positively correlated with the behaviour scale of the PRQ. Subjects who indulged in pain behaviours tended to take longer to resume their usual life styles. No other consistent pattern of correlations between late recovery and the coping scales emerged.

LATE RECOVERY WITH TRAIT AND STATE ANXIETY, PAIN AND EARLY RECOVERY

The significant negative correlations between the recovery inventory (early recovery) and the items of the recovery diary are as expected (Table 5:9). Subjects who had high scores on the recovery inventory, indicating a steady progressive improvement in the first few days following the operation were returning to their normal level of functioning earlier after discharge from hospital. Unsurprisingly good early recovery predicts good late recovery.

There was a pattern of significant positive correlations between postoperative levels of state anxiety and items of the recovery diary (Table 5:9).
Table 5:9 Correlation Coefficients: Late Recovery, Early Recovery, Post-operative State Anxiety and Pain

<table>
<thead>
<tr>
<th>Recovery Items</th>
<th>Early Recovery</th>
<th>State Anxiety</th>
<th>Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 day</td>
<td>3 days</td>
<td>1day</td>
</tr>
<tr>
<td>A specified tasks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>-0.36**</td>
<td>-0.37**</td>
<td>0.31*</td>
</tr>
<tr>
<td>b</td>
<td>-0.33*</td>
<td>-0.48**</td>
<td>0.21</td>
</tr>
<tr>
<td>c</td>
<td>-0.28*</td>
<td>-0.27*</td>
<td>0.25</td>
</tr>
<tr>
<td>d</td>
<td>-0.33</td>
<td>-0.43</td>
<td>0.31*</td>
</tr>
<tr>
<td>e</td>
<td>-0.43**</td>
<td>-0.47**</td>
<td>0.36**</td>
</tr>
<tr>
<td>f</td>
<td>-0.33*</td>
<td>-0.42**</td>
<td>0.29*</td>
</tr>
<tr>
<td>g</td>
<td>-0.28*</td>
<td>-0.34*</td>
<td>0.21</td>
</tr>
<tr>
<td>h</td>
<td>-0.23</td>
<td>-0.24</td>
<td>0.21</td>
</tr>
<tr>
<td>B routine tasks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i</td>
<td>-0.45**</td>
<td>-0.42**</td>
<td>0.27</td>
</tr>
<tr>
<td>j</td>
<td>-0.26</td>
<td>-0.15</td>
<td>0.12</td>
</tr>
<tr>
<td>k</td>
<td>-0.32*</td>
<td>-0.40*</td>
<td>0.20</td>
</tr>
<tr>
<td>l</td>
<td>-0.27</td>
<td>-0.26</td>
<td>0.21</td>
</tr>
<tr>
<td>m</td>
<td>-0.23</td>
<td>-0.24</td>
<td>0.08</td>
</tr>
<tr>
<td>n</td>
<td>-0.21</td>
<td>-0.35*</td>
<td>0.08</td>
</tr>
<tr>
<td>o</td>
<td>-0.39*</td>
<td>-0.40**</td>
<td>0.10</td>
</tr>
<tr>
<td>p</td>
<td>-0.36*</td>
<td>-0.67**</td>
<td>0.38*</td>
</tr>
</tbody>
</table>

**p<0.01  *p<0.05

Key Tasks

A  (a) Got up and dressed at the usual time  B  (i) Once a week - household
   (b) Spent all day out of bed without rest  (j) Once a week - recreational
   (c) Took a short walk outside the house  (k) Twice a week - household
   (d) Did a little local shopping / visited the library  (l) Twice a week - recreational
   (e) Met friends / relatives away from home  (m) Once a day - household
   (f) The first day at home without pain  (n) Once a day - recreational
   (g) Made a snack for yourself  (o) Twice a day - household
   (h) First day you 'forgot' you had an operation  (p) Twice a day - recreational

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Subjects who were very anxious during the early postoperative period were slower at returning to their routine functions after discharge from hospital. Logically subjects who are very anxious in early recovery may also be anxious in late recovery. However subjects who have consistently high levels of state anxiety would be expected to score highly on trait anxiety. There is no observable relationship between trait anxiety and the items of the recovery diary.

Pain is consistently related to the specified tasks but related to only three ‘recreational’ tasks of those suggested by the patients themselves.

Discussion

The aim of the study reported here was to examine coping with surgery within the context of other variables. To examine any change in coping response during the event and what influenced the coping process.

COPING AS A PROCESS

Overall no significant sustained pattern of change emerged in the choice of coping responses to either stress or pain. However, two of the RSQ scales showed a significant change between the day prior to operation and the third post-operative day. The 'pessimistic/negative' response and the 'faith in others' response diminished preoperatively to postoperatively. The subjects chose fewer 'pessimistic/negative' and 'faith in others' RSQ responses on the third post-operative day than they did preoperatively. This change reflects an alteration in the subjective assessment of the threat as by the third post-operative day many subjects would be reassured that the operation had been a success and possibly already have a discharge date. The threat would therefore be some what diminished. This evidence lends some support to the notion of subjective responses to stress being a dynamic, changes occurring as the
subjective perception of the threat alters. There was no evidence of change in the optimistic/vigilant or angry scales of the RSQ. However, the pessimistic/negative scale of the RSQ contained several items relating immediately to the surgery, e.g. 'the anaesthetic is frightening' and having survived the operation this item, and others like it, may no longer worry the subjects. The other scales contain items more related to the entire admission and be less subject to change while the subject is in hospital. It is clear, however, that the subjects are monitoring the threat and making some small changes in their responses to it.

The optimistic and pessimistic scales of the RSQ contain items that are 'problem centred' e.g. 'I hope I don't catch something from the other patients' and items that represent emotional coping e.g. 'This illness makes you realise what is important in life'. The faith in others and angry scales are entirely emotional. Since the observed changes in coping over the event involved scales containing problem centred and emotional coping there was no evidence that either coping style was perceived as more applicable at any specific point. This contrasts with the evidence of examination stress where emotional responses were evoked whenever the subject perceived they had no control over the event e.g. while waiting for the results (Folkman and Lazarus, 1985).

The failure to find evidence for a substantial change at an individual level suggests that the observed changes are very small and the evidence must be treated with some caution. However, the smaller sample size of the repeated measure anova may account for the failure of the F ratio to reach significance.

The observed slight change in the choice of coping response can not be explained by any change in affective state pre and post surgery, since no overall change in anxiety level emerged.

There was no evidence that subjects changed their responses to post-operative pain from
one to three days post-operatively, although for many patients the pain would have diminished over this time. The apparent difference between the responses to surgery, which change and the responses to pain, which are constant supports the findings of the pilot study (chap. 4) that subjects assess and respond to the stresses differently. Admission to hospital for surgery is a rather nebulous stress evolving over time, acute pain represents a singular stress and each occurrence may evoke the same responses.

The evidence reported here supports the concept of stress response as a process and the subject as an active participator. Response to surgery and response to pain appear to be different, although the observed changes are small and should be verified in future research.

THE MAGNITUDE OF THE THREAT

There is some evidence that the magnitude of threat influences the subjective response to surgery (Table 5.7). Interestingly the professional, Royal College of Surgeons, classification has no effect on the choice of response. However, the subject's perception of the outcome of the surgery, its overall importance to them does influence the response to stress and pain. Subjects for whom the surgery is palliative respond to surgery with more anger and to pain with more negative cognitions, than those subjects whose operation is a cure. There is no indication as to where this anger is directed or to it's function it is essentially an emotional response. Conversely subjects who surgery leaves them with no disfigurement utilise more 'optimistic/vigilant' response to surgery than those subjects who perceive disfigurement. The role of subjective assessment of the surgery is similar to the 'cognitive appraisal' factor in the 'Theory of Stress and Coping' (Lazarus, 1966).

The professional classification of surgery clearly reflects medical factors that do not necessarily directly involve the patient and are totally out of the patients control. The
failure of the professional assessment of the magnitude of surgery to influence subjective response may be due to the patients not knowing the professional classification of the surgery. The majority of patients will understand that removal of a subcutaneous lump is less 'serious' than a procedure that involves penetration of the abdomen or thorax. The patients are therefore not as naïve about their surgery as might be expected. These findings reflect the importance of the patient's subjective assessment of their predicament, and how medical and nursing staff may not always predict what is important to the patient.

COPING RESPONSES AND OUTCOME

The sustained pattern of correlations between the coping responses and the outcome measures, recovery, post-operative anxiety and pain (Table 5:5) confirms the association between response to stress and its outcome noted in earlier studies (Andrew, 1970, Cohen and Lazarus, 1973, George, Scott, Turner and Gregg, 1980, Mathews and Ridgeway, 1981, Chaves and Brown, 1985 and Pick, Pearce and Legg, 1990, Manyande and Salmon, 1992). There were clear associations between RSQ 'pessimistic/negative', 'angry' responses and PRQ 'negative' and 'behavioural' responses and higher levels of postoperative anxiety and pain but poor late recovery. Conversely the optimistic/ vigilant RSQ response and the positive PRQ response predicted good recovery and lower levels of postoperative state anxiety.

The pattern of correlations between the pessimistic/negative response to surgery scale, and the items of the recovery diary suggest that coping influences late recovery (Table 8). The pessimistic/negative RSQ scale had a similar relationship with recovery 3 days postoperatively but not one day preoperatively. Taken together these results suggest that the subjects who employ more pessimistic/negative responses to surgery are making a poorer recovery. It is not clear why the effect occurs in late recovery but is not manifest in early recovery. It is not clear, either, why a pessimistic/negative response to stress
delays return to normal life. The items of this scale imply a constant thinking about the stress but in no way suggest either vigilance or denial. The items of this scale do tend to dwell on negative aspects of the experience and may increase anxiety resulting in physiological changes which are inconsistent with good recovery.

The association between the PRQ 'behavioural' scale and three items of the recovery diary suggests that subjects who employ more pain behaviours suffer post-operative pain for longer. The pain behaviours include long periods of lying down to rest and the correlations between this scale and the late recovery items are consequently uninformative.

Clearly recovery would be improved by increasing the RSQ 'optimistic/ vigilant' and PRQ 'positive' responses while suppressing the RSQ 'pessimistic/ angry' responses and the PRQ 'negative' responses.

INTERACTIONS BETWEEN COPING RESPONSES AND OTHER VARIABLES

The consistent pattern of correlation between coping and other measured variables indicates some association between them. It is not clear whether this is a direct influence or that both variables are determined by another not addressed in this study.

The relationships between coping responses and trait and state anxiety are interesting. As expected trait and state anxiety are highly correlated (r = 0.58; p<0.01). Subjects who are consistently highly anxious would be expected to responded to stress with elevated levels of state anxiety. High levels of anxiety are associated with high scores on the RSQ 'pessimistic/negative', 'faith in others' and 'anger' scales and on the PRQ 'negative' and 'behaviour' scales. Low levels of anxiety are associated with high scores on the PRQ 'positive' scale. Subjects who are of an anxious personality respond to stress with elevated state anxiety and tend to utilise less adaptive more pessimistic responses.

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However the pattern of correlations between the coping responses and late recovery (Table 5:8) is a similar pattern to that of post-operative state anxiety and late recovery. There was a pattern of significant positive correlations between post-operative levels of state anxiety and items of the recovery diary (Table 5:9). Subjects who were very anxious during the early postoperative period were slower at returning to their routine functioning after discharge from hospital as were subjects with high scores on the less adaptive RSQ scales. Logically subjects who are very anxious in early recovery may also be anxious in late recovery. However subjects who have consistently high levels of state anxiety would be expected to score highly on trait anxiety. There is no observable relationship between trait anxiety and the items of the recovery diary. The causative associations between these variables is not clear but the evidence suggests that the relationship between them is complex and probably interactive. Only further investigation will elucidate the relationship.

When subjects were assessed for the direction of change of state anxiety levels, pre-operatively to post-operatively another curious association emerged. Individually subjects who were more anxious pre-operatively than post-operatively tended to choose more pessimistic/negative responses to surgery preoperatively. This suggests that highly anxious subjects chose more pessimistic/negative responses which may reflect their tendency to view any stress as more threatening. However, high scores on the RSQ 'pessimistic/negative' scale are associated with higher levels of post-operative state anxiety.

Conventionally coping responses influence emotion later. Therefore a possible explanation to the above seeming odd results must be that subjects who are of nature highly anxious assess stress (surgery) as highly threatening and responded with avoidance and pessimism. This response, in turn, results in raised levels of post-operative affect.

Overall the results indicate a complex and interactive function between the stress, the subjective response and other relevant variables. This relationship is not clear from the
study reported here.

The implications for management of surgical patients, to enhance recovery by psychological intervention, requires further investigation of the variables that predict utilization of each style of response. Apart from further investigation into the concurrent variables influencing stress response, threat assessment, anxiety etc. preconceptions or subjective beliefs about the stress and its outcome may be influential.

Conclusions

The association between subjective coping responses to surgery and pain and the outcome in terms of general measures of recovery has received further support from the evidence reported here. However, the strong association between the coping responses and late recovery, after discharge, has not been noted before and has implications for future research. The emergence of this relationship may be due to the subjects being in a less managed and supported stage in late recovery and thus utilising more coping responses. Given the relationship between preoperative anxiety and the RSQ responses it may also be due to subjects increasing their anxiety levels after discharge from the supportive ward environment. It would seem important for future research to attempt to assess anxiety after discharge. The role of the ward environment should not be assumed to be totally beneficial without further investigation. Clearly caring support for the patient is important during recovery but the support must be tailored to assist the subjects to utilise adaptive coping responses not simply to suppress all subjective response.
ANTICIPATION AND RECALL OF POST-OPERATIVE PAIN

Introduction

In the literature review (Chaps.2 and 3) post-operative pain was identified as a separate stress to the general stress of surgery. Several studies had noted that patients separated pain from other variables (Johnstone, 1982; Salmon et. al., 1990), although surgical stress and pain are associated and probably interact. In chapter four the pilot study interviews confirmed the separation of pain and surgery from the patients perception. We have contended that post-operative pain may be legitimately regarded as a separate stress.

Post surgical pain, its duration and its control, is probably the most important factor for the surgical patient. In the pilot study reported above (Chap.4) most patients' first concern was with pain. While medical techniques and drug therapies for the control of postoperative pain have improved markedly in the past decade it is clear that pain control is still inadequate. Tigerstedt (1990) reports that in the previous decade seventy five percent of post-operative patients were reporting moderate to marked pain distress.

Control of post-operative pain has increasingly included psychological factors, most often in combination with drug regimes, with varying degrees of success. Modern clinical practice usually involves the patient in the control of their post-operative pain. Techniques include supplying accurate sensory information (Johnson, 1973. Johnson and Leventhal, 1974) teaching cognitive and behavioural strategies (Tan, 1982 for review) and 'Patient Controlled Analgesia' which incorporates 'self efficacy' with drug administration are. A common factor in all post-operative pain control is that they are discussed or taught pre-operatively and therefore prime the patient to anticipate the post-operative pain.

Anticipation

The impact and subsequent outcome of a stressful event on an individual is influenced by
the individuals perception of the threat (Folkman and Lazarus, 1985. Feifel, Strack and Nagy, 1987) and their response to it (Mathews and Ridgeway, 1981). One of the factors influencing subjective interpretation of and responses to stress may be their prior experience of similar situations and/or their beliefs about the event (Leventhal and Everhart, 1979).

Subjects admitted to hospital for elective surgery will have some preconceptions about the event. If not from prior experience then from media coverage, anecdotal evidence from other patients and any preparatory literature supplied by the ward. Given their concern with post-operative pain subjects will undoubtedly have preconceptions about it.

The anticipation of post-operative pain may be important in several ways. Where subject expectation in isolation, has been examined no direct effect on post-operative pain has been found (Wallace, 1985 and Kent, 1986). However changes in pre and post-operative anxiety (Mathews and Ridgeway, 1981. de Groot, Boeke, van der Berge, Duivenvoorde, Bonke and Passcheir, 1997) have been noted in response to pre-operative 'thinking about' surgery and post-operative pain. Heightened pre-surgical state anxiety has been associated with higher levels of postoperative anxiety and pain, (Mathews and Ridgeway, 1981. de Groot, Boeke, van der Berge, Duivenvoorde, Bonke and Passcheir, 1997). In a review article Mathews and Ridgeway (1981) conclude that higher levels of pre-operative affective states are associated with higher levels of post-operative affective state and pain. de Groot and associates (1997) demonstrated that preoperative anxiety predicted of postoperative anxiety and greater reporting of post-operative pain in spinal surgery patients. This association was linear and independent of other variables measured. The mechanism of this association is not clear, heightened pre-operative anxiety may result in raised post-operative anxiety levels and thus directly affect pain. However preoperative state anxiety is not necessarily predictive of early post-operative state anxiety, 'Coping responses to surgical stress' (chap. 5. above). The dissociation between pre and post-operative affective state has been noted before (Salmon et. al.,1988). He and his colleagues also report that pre-operative anxiety is not linearly related to levels of post-operative pain. This apparent paradox may be explained by 'stress induced analgesia'(Grevert and Goldstein,1977). In animal studies extreme stress has been associated with loss of normal responses to pain. Bolles and Fanselow (1980) have
extrapolated the theory of stress induced analgesia to humans. In a review they found no
evidence to link fear with increased reporting of pain rather subjects who described
themselves as fearful tended to report less pain. In their 'perceptual defence model' of fear
and pain Bolles and Fanslow (1980) suggest that fear induces the 'fight or flight' response
and may therefore mask or reduce pain. However the effect of fear of pain itself is not clear.
Anticipation 'thinking about surgery' may increase or reduce pre-operative anxiety. The
studies reported above clearly indicate that pre-operative anxiety/fear is not predictive of
post-operative state. The relationship between anticipation of the event and the outcome is
far from clear. The implications of the studies above are that high levels of pre-operative
affect may result in a measure of 'stress induced analgesia' and subsequent lower levels of
post-operative pain and distress. However other variables must also be considered.
Anticipation of post-operative pain may result in excessive worrying thus heightening the
pre-operative affective state and result in increased utilization of negative coping strategies
(see Chapter, 5 above).

A more direct influence of anticipation on pain may be postulated within the theoretical
framework of cognitive processing. Leventhal's 'Processing Model' of personal episodic
memory (Leventhal and Everhart, 1979) demonstrates how pain is enhanced and elaborated
by emotional state, information, behaviours and memory systems. Where the pain stimulus
is of sudden onset the elaboration of the stimulus will occur at encoding i.e. pain onset.
However in pre-operative pain the majority of patients will have considerable time to
anticipate the pain. Anticipation of pain by stimulating memory schemata relating to pain
intensity and distress may prime the system. Even where the pre-operative preparation to
operation time is short, as in 'day surgery' and comprehensive, well managed and meets
each individuals needs there will be some time for elaboration of the stimulus. Most patients
will have had waiting time pre-hospitalisation and subscribe to the prevailing wisdom,
operation equals pain, therefore they will be anticipating pain long before any preparation
for surgery commences and may thus reduce their effectiveness.
Recall

If preconceptions are related to prior experience it would also be important to assess the accuracy of recall of the current event. Post-operative pain is easily measured (Chap. 3) and was the variable of choice to assess the effects of anticipation and the accuracy of recall in the surgical patient.

Clearly the memory of pain is important within the processing model since it modifies the experience. It is equally important in facilitating assessment of any change in clinical pain state which indicate physiological change. Patients use recall to compare current pain with prior pain, a diminution of pain probably indicates healing, while increased pain suggests a worsening of the original condition and or further complications e.g. secondary infection. In either case change of pain state will influence treatment. Pain memory schemata may also be important in non-physiological pain state, e.g. phantom limb pain (Hill et. al., 1996) although it is not clear that recall is accurate. Nikolajsen (1997) and associates demonstrated a considerable difference in the patients recollection of pre-amputation pain after amputation. Although their patients believed they felt the same pain in the phantom limb. Clearly accuracy of recall is important, however it has not often been investigated (Erskine et. al., 1990). The effects of other variables, affective and mood states, on accuracy of pain recall is still unclear.

There is some evidence that anticipation of pain influences memory, but the mechanism is not clear. Significant correlations between anticipated (expected) and recalled pain have been reported for dental patients (Kent, 1985) and chronic pain (Linton and Melin, 1982). In both studies over estimation of the pain resulted in overestimation at recall. In the case of the acute pain anxiety was shown to influence the anticipation and recall, highly anxious subjects tending to overestimate. Interestingly, Bernstein et. al. (1979) cite memory of past painful experience as a cause of enhanced dental anxiety. The relationship between anticipated and recalled pain and anxiety needs clarification.
The following study aims to elucidate further the effects of anticipation of pain on postoperative pain, the recall of pain and the interactive effect with anxiety.

This study includes the variables not reported in Chapter Five. The sample is that of Chapter Five.

HYPOTHESES

a) It is hypothesised that the postoperative affective state and pain intensity and pain distress would be influenced by the anticipation

b) That highly anxious subjects would tend to overestimate the anticipated pain and the recalled pain.

As a preliminary investigation of the interaction of stimulus enhancing mechanisms cited in the processing model the effects of the anticipation on the patient's subjective responses to pain would also be assessed

c) Clear patterns of association between anticipation of pain and coping would be discernable indicating the influence of anticipation at encoding on subsequent subjective coping responses to pain.

Method

SUBJECTS

The sample is that of Chapter Five. A brief description of the sample is given below greater detail is included in the method section of Chapter Five (page 95).

Patients admitted for elective major surgery from the orthopaedic, gynaecological and
general surgical waiting lists at the City and Hackney district Hospitals over a period of seven months were asked to take part in the study. Three categories of patient were excluded:

1) Patients considered by the nursing and medical staff to be too distressed or confused by inclusion in the study.
2) Minors; patients under 16 yrs of age.
3) Patients whose 1st language was not English and who did not have sufficient command of English to fully understand the questionnaires.

The subject group consisted of 40 males and 88 females, aged 17 - 76 yrs with a mean age of 51 years.

Table 6:1 Age, Gender and Surgical Group of Subjects

<table>
<thead>
<tr>
<th></th>
<th>Gynaecology</th>
<th>Orthopaedic</th>
<th>General Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Age</td>
<td>46 yrs (sd 12.82)</td>
<td>46.36 yrs (sd 16)</td>
<td>57.3 yrs (sd 13.6)</td>
</tr>
<tr>
<td>Age Range</td>
<td>21 to 75</td>
<td>17 to 70</td>
<td>20 to 76</td>
</tr>
<tr>
<td>Gender</td>
<td>50 F</td>
<td>12 M 12 F (24)</td>
<td>28 M 26 F (53)</td>
</tr>
</tbody>
</table>

sd. Standard deviation in years

One hundred and twenty eight patients agreed to take part and completed the first anticipated pain VAS one day prior to surgery. Ninety nine patients completed the second anticipated pain VAS one hour prior to surgery. One hundred and eleven patients completed the post-operative pain VAS, eighty nine patients completed the recalled pain VAS, three days post-operatively. Fifty nine patients completed the recalled pain VAS one month post-operatively.

MEASURES

Since verbal pain scales may evoke semantic memory to aid recall the visual analogue scale
was the chosen pain measure. Pain intensity and distress were measured by separate 100mm. visual analogue scales anchored as follows:- Intensity; no pain at all and the most intense pain I can imagine; Distress; none at all and the most distress I can imagine. The VAS. scales were linked to the following questions to assess expected, experienced and recalled pain. Anticipation; "How intense/ distressing do you expect the pain to be when you first wake up after the operation?", experienced; "How intense/ distressing is the pain you are feeling now?" and recall; "When you first woke up following your operation you described your pain for us. How intense/ distressing was that pain?".

Pain response was assessed by the PRQ (acute), anxiety by STAI (Spielberger, Gorsuch and Lashene, 1970), early recovery by The Recovery Inventory (Wolfer and Davies, 1970) and late recovery by the recovery diary (see Chapter 5, measures for a detailed description of these measures, page 85).

PROCEDURE

The patients were recruited to the study on the day of their admission for surgery, normally one day before the operation. The study was explained to them and their informed written consent obtained.

One Day Prior to Operation

One day before their operation the patients completed the Trait and State sections of the STAI and the first anticipation of pain VAS. The recovery diary for completion post discharge was explained to them and tasks were selected by the patients to form the second section of the diary.

Day of Operation

On the day of operation, immediately prior to the administration of the premedication the patients completed a second anticipated pain VAS and STAI.

On return to the ward from recovery the patients completed a pain VAS as a measure of
their post-operative pain.

One and Three Days Post-operative
One day post-operatively patients completed the PRQ (acute) and the recovery inventory and the state questionnaire of the STAI

Three days post-operatively patients completed the PRQ (acute) and the recovery inventory, the state questionnaire of the STAI and the first recall pain VAS.

Day of Discharge.
On discharge the patients were given their recovery diaries and a stamped addressed envelope to return them one month later.

Figure 6.1 An Overview of the Procedure

<table>
<thead>
<tr>
<th></th>
<th>Pre-op.</th>
<th>Post-op.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 day</td>
<td>day of op</td>
</tr>
<tr>
<td>RSQ.</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>STAI. Trait</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>State</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>VAS ant.</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>VAS exp.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAS rec.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R. I.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R. D.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRQ.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RSQ: Response to Surgery Questionnaire. STAI: State and Trait Anxiety Inventory.
R. I: Recovery Inventory. R.D: Recovery Diary.

Where possible the patients were contacted at their first outpatient visit post surgery
(approximately one month) and they were asked to recall their post-operative pain and to complete the second recalled pain VAS. The recovery dairies were collected or the patients were reminded to complete and return them.

STATISTICAL ANALYSIS

Differences between the VAS scores for anticipated, experienced and recalled pain were assessed by repeated measure analysis of variance.
Stepwise multiple regression assessed the predictive power of anticipation on experienced and recalled pain.
Relationships between the anticipated, experienced and recalled pain measures, preoperative state anxiety, the PRQ scores and outcome measures were assessed by product moment correlations.
Further analysis included partial correlation and analysis of covariance of the pain measures with state anxiety.

Results

SIMPLE EFFECTS OF ANTICIPATION OF PAIN ON EXPERIENCED AND RECALLED PAIN

Overall the patterns of mean VAS values for pain intensity and pain distress are different, (Table 6:2). Pain intensity is anticipated and recalled fairly accurately, paired 't' tests revealed no significant differences between the scores. Pain distress is exaggerated when anticipated and recalled, the difference between experienced pain and recall 3 days post-operatively is significant, 't' 2.1; p<0.05.
Table 6:2: Mean Values of the VAS Scores for Anticipated, Experienced and Recalled Pain

<table>
<thead>
<tr>
<th>pain VAS scores</th>
<th>Anticipated pain</th>
<th>Experienced pain</th>
<th>Recalled pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>(N)</td>
<td>1 day preop</td>
<td>day of op</td>
<td>postop day of op</td>
</tr>
<tr>
<td></td>
<td>128</td>
<td>99</td>
<td>112</td>
</tr>
<tr>
<td>intensity mean(sd)</td>
<td>45.6 (24)</td>
<td>48.53 (24.49)</td>
<td>48.6 (30.11)</td>
</tr>
<tr>
<td>distress mean (sd)</td>
<td>39.43 (27.19)</td>
<td>44.74 (26.76)</td>
<td>39.32 (29.13)</td>
</tr>
</tbody>
</table>

Repeated measures analysis of variance revealed a similar pattern of mean VAS values, although only 51 subjects returned sufficient data, (Table 6:3).

Table 6:3: Repeated Measures Analysis of Variance: Anticipated, Experienced and Recalled Pain

<table>
<thead>
<tr>
<th>pain VAS scores</th>
<th>anticipated pain</th>
<th>experienced pain</th>
<th>recalled pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>(N)</td>
<td>1 day preop</td>
<td>day of op</td>
<td>postop day of op</td>
</tr>
<tr>
<td></td>
<td>45.10 (26.35)</td>
<td>48.77 (25.51)</td>
<td>46.26 (28.43)</td>
</tr>
<tr>
<td>intensity mean(sd)</td>
<td>43.82 (29.41)</td>
<td>44.51 (27.04)</td>
<td>39.45 (28.17)</td>
</tr>
<tr>
<td>distress mean (sd)</td>
<td>43.82 (29.41)</td>
<td>44.51 (27.04)</td>
<td>39.45 (28.17)</td>
</tr>
</tbody>
</table>

sd. standard deviation.

The overall pattern of mean VAS values suggests that pain intensity is recalled accurately but that pain distress is not. The VAS values for anticipation and recalled pain distress are very similar, suggesting that anticipation of pain distress is influencing recall. Hierarchical multiple regression was employed to assess the predictive power of anticipation on recall. Analysis was performed using SPSS® regression, stepwise. The variables, anticipated pain on the day of operation, experienced pain and recalled pain (3 days post-operatively) were entered as respective dependent variables.
MULTIPLE REGRESSION: ANTICIPATED, EXPERIENCED AND RECALLED PAIN

The pattern of mean pain VAS values (Table 6:3) suggest that:

1) anticipation of the pain experience one day pre-operatively would predict the anticipation of pain on the day of operation.
2) The anticipation of pain on the day of operation would predict the pain experience and in part the recalled pain experience.
3) Pain experience would predict memory.

This model is illustrated in Figure 6:2.

**Figure 6:2: Multiple Regression: Main Effects Model**

1 day pre-op. day of op. day of op. 3 days post-op.
anticipated anticipated experienced recalled
pain $\beta; 0.32 \rightarrow$ pain $\beta; 0.34 \rightarrow$ pain $\beta; 0.20$

2) DISTRESS

1 day pre-op. day of op. day of op. 3 days post-op.
anticipated anticipated experienced recalled
pain $\beta; 0.60 \rightarrow$ pain $\beta; 0.39 \rightarrow$ pain $\beta; 0.66 \rightarrow$ pain $\beta; 0.32$

$\beta = \text{regression coefficient.}$

In the case of pain our hypothesis has been met, both measures of pain were predicted by subjective anticipation.
The pattern of the regression coefficient, \( \beta \) (Table 6:4), indicates a significant linear effect for intensity and distress as predicted. The anticipated pain one day pre-operatively predicts anticipated pain on the day of operation which predicts the experienced pain that in turn predicts recalled pain. A difference emerges, however, between intensity and distress for the effect of anticipation of pain and recalled pain, the \( \beta \) value for intensity fails to reach significance. In the case of pain distress the \( \beta \) value 0.32, between anticipation of pain and recalled pain is of similar magnitude as that between anticipated and experienced pain, \( \beta \); 0.39. (\( \beta \) values are illustrated on the model, Figure 6:2). For pain distress the anticipated pain is as predictive of recalled pain as experienced pain. This suggests that subjects anticipation of pain has influence on their subsequent recall but that the effect is only important for pain distress.

### Table 6:4 Multiple Regression, Main Effects: Correlation Coefficient, Regression Coefficients and 't' Values

<table>
<thead>
<tr>
<th></th>
<th>1 day pre-op.</th>
<th>day of op.</th>
<th>day of op.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>anticipated</td>
<td></td>
<td>experienced</td>
</tr>
<tr>
<td>pain intensity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>anticipated -1</td>
<td>0.32</td>
<td>0.57</td>
<td>6.12**</td>
</tr>
<tr>
<td>experienced</td>
<td>0.08</td>
<td>0.21</td>
<td>1.29</td>
</tr>
<tr>
<td>recalled +3</td>
<td>0.34</td>
<td>0.04</td>
<td>0.31</td>
</tr>
<tr>
<td>pain distress</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>anticipated -1</td>
<td>0.35</td>
<td>0.60</td>
<td>6.0**</td>
</tr>
<tr>
<td>experienced</td>
<td>0.14</td>
<td>-0.22</td>
<td>-0.10</td>
</tr>
<tr>
<td>recalled +3</td>
<td>0.48</td>
<td>0.01</td>
<td>0.08</td>
</tr>
</tbody>
</table>

* p<0.05, ** p<0.01

anticipated -1: anticipated pain 1 day pre-op. recalled +3: recalled pain 3 days post-operative

However, when the correlation coefficient, \( R^2 \) values (Table 6:4) are examined the variance accounted for is greater between anticipation of pain on the day of operation and recalled
pain \( (R^2 \text{int. } 0.37, \ R^2 \text{dis. } 0.47) \) than between anticipation of pain and experienced pain \( (R^2 \text{int } 0.07, \ R^2 \text{dis. } 0.12) \), for both intensity and distress. This implies a more important relationship between anticipation and recall than between anticipation and experience for both intensity and distress. Correlation coefficient \( (R^2) \) values are listed in (Table 6:4).

Full factorial multiple regression revealed no significant interactions for the pain intensity model. For the distress model only one interaction, between anticipated pain on the day of operation by experienced pain, reached significance, adjusted \( R^2 0.48, \beta; 0.01, 't' 2.13** \), with recalled pain as the dependent variable. This confirms that for pain distress the recalled pain is composed of experience and anticipation.

**INTERACTIVE EFFECTS BETWEEN THE PAIN VARIABLES, TRAIT ANXIETY, AFFECT AND RECOVERY**

Product moment correlations were calculated between the pain ratings, and recovery, trait anxiety, pre and post-operative state anxiety.

The pattern of correlations between anticipated pain ratings and the other pain ratings is interesting. Anticipated pain on both pre-operative occasions has stronger consistent correlations with recalled pain than with experienced pain. The pattern of correlations between anticipation on the day of operation and early and delayed recall is particularly strong (Table 6:5). This measure is taken at a similar time, in relation to the surgery as that reported by Kent (1986) and yields similar results.
Table 6.5 Correlations Between the Pain Measures

<table>
<thead>
<tr>
<th>pain scores</th>
<th>anticipated</th>
<th>experienced</th>
<th>recalled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 day pre-op.</td>
<td>day of op.</td>
<td>day of op.</td>
</tr>
<tr>
<td>anticipated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>int</td>
<td>dis</td>
<td>int</td>
<td>dis</td>
</tr>
<tr>
<td>1 day pre-op.</td>
<td>dis</td>
<td>0.44**</td>
<td></td>
</tr>
<tr>
<td>day of op.</td>
<td>int</td>
<td>0.57**</td>
<td>0.36**</td>
</tr>
<tr>
<td></td>
<td>dis</td>
<td>0.54**</td>
<td>0.58**</td>
</tr>
<tr>
<td>experienced</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>day of op.</td>
<td>int</td>
<td>0.37**</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td>dis</td>
<td>0.18</td>
<td>0.10</td>
</tr>
<tr>
<td>recalled</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 days post-op.</td>
<td>int</td>
<td>0.32**</td>
<td>0.26**</td>
</tr>
<tr>
<td></td>
<td>dis</td>
<td>0.26**</td>
<td>0.24*</td>
</tr>
<tr>
<td>30 days post-op.</td>
<td>int</td>
<td>0.22</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td>dis</td>
<td>0.23</td>
<td>0.12</td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.01 Pain measures; int: intensity, dis: distress

Taken together the pattern of mean values, results of the multiple regression and the pattern of correlations implicates anticipation as an important influence on pain experience confirming the hypothesis. These results also implicate anticipation measured immediately preoperatively as an important variable influencing recall. Experienced pain also yielded strong correlations with recalled pain.

PAIN RATINGS AND RECOVERY MEASURES

The significant negative correlations between the anticipated pain one day prior to surgery and recovery measured on both days indicate that subjects who expect high levels of postoperative pain report poor recovery (Table 6.6). There is no simple explanation for this relationship but it may be attributable to some other underlying variable. For example, subjects who are very anxious may tend to anticipate high levels of pain and report poor
Table 6:6 Correlations: the Pain Ratings with the Recovery Variables

<table>
<thead>
<tr>
<th></th>
<th>Pain Ratings</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>anticipated</td>
<td>experienced</td>
<td>recalled</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 day pre-op.</td>
<td>day of op.</td>
<td>day of op.</td>
<td>3 days post-op.</td>
<td>30 days post-op.</td>
<td></td>
</tr>
<tr>
<td>recovery</td>
<td></td>
<td>int</td>
<td>dis</td>
<td>int</td>
<td>dis</td>
<td>int</td>
<td>dis</td>
</tr>
<tr>
<td>1 day post-op.</td>
<td></td>
<td>-0.36**</td>
<td>-0.20**</td>
<td>-0.19</td>
<td>-0.21*</td>
<td>-0.56**</td>
<td>-0.50**</td>
</tr>
<tr>
<td>3 days post-op.</td>
<td></td>
<td>-0.12</td>
<td>-0.22**</td>
<td>-0.17</td>
<td>-0.20</td>
<td>-0.41**</td>
<td>-0.33**</td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.01 Pain measures; int : intensity, dis : distress.

The pattern of significant negative correlations between recovery and experienced and recalled pain is predictable.

Table 6:7 Correlations: Recovery after Discharge and Experienced and Recalled Pain Ratings

<table>
<thead>
<tr>
<th>late recovery items</th>
<th>experienced pain</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>day of op.</td>
<td>3 days post-op.</td>
<td>30 days post-op.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>int</td>
<td>dis</td>
<td>int</td>
<td>dis</td>
<td>int</td>
<td>dis</td>
</tr>
<tr>
<td>getting up at usual time</td>
<td>0.31**</td>
<td>0.42**</td>
<td>0.33**</td>
<td>0.42**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>not needing to rest during the day</td>
<td>0.37**</td>
<td>0.35**</td>
<td>0.39**</td>
<td>0.48**</td>
<td>0.28*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>meeting friends outside your home</td>
<td>0.35**</td>
<td>0.32**</td>
<td>0.29*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>going for a short walk outside your home</td>
<td></td>
<td></td>
<td>0.29*</td>
<td>0.29*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>going shopping locally or to the library</td>
<td></td>
<td></td>
<td>0.32</td>
<td>0.34*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>the first day without pain</td>
<td></td>
<td></td>
<td>0.27</td>
<td>0.34*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.01 pain measures; int : intensity, dis : distress.

The observed relationship between experienced and recalled pain ratings and recovery while
in hospital is maintained during late recovery after discharge. Several items of the recovery
diary are significantly positively correlated with experienced and recalled pain, table 6:7. Subjects who report and recall high levels of post-operative pain take longer (in days) to achieve tasks associated with return to normal life styles.

PAIN RATINGS AND ANXIETY

Trait anxiety is clearly correlated with the experienced pain and recalled pain but not with the anticipated pain. The strongest correlations emerge with recalled pain 1 month (30 days) post-operatively, Table 6:8. The pattern of correlations with the two measure of pre-operative state anxiety is reversed, the strongest correlations with all pain ratings while hospitalised and rather weaker associations with recalled pain 1 month post-operatively.

Post-operative state anxiety resembles trait anxiety and is significantly correlated with experienced and recalled pain but not anticipation. Clearly in the case of post-operative affective state our hypothesis has not been met there is no evidence of influence of anticipation.

Why trait anxiety and post-operative state anxiety are associated with experienced and recalled pain but not anticipation is difficult to explain, particularly when pre-operative state anxiety is associated with anticipation. However, there is some evidence that pre-operative state anxiety is not always associated with post-operative anxiety levels (Ho, 1988) and does not always have the same relationship with other recovery variables (Johnson and Carpenter 1980, Wallace, 1986). The strong correlations between all the pain ratings and some measure of anxiety indicates a powerful influence of affect which is consistent with previous findings (Kent, 1985).
### Table 6:8: Correlations: Trait Anxiety, Pre and Post-operative State Anxiety and Pain Scores

| pain scores       | trait anxiety | state anxiety | | | |
|------------------|---------------|---------------|---|---|---|---|---|---|---|---|
|                  |               | 1 day pre-op. | day of | 1 day | 3 days | | | | | |
|                  |               |               | op.   | post-op | post-op. | | | | | |
| anticipated      |               | 0.10          | 0.16** | 0.09   | 0.15    | 0.09 | | | | |
| 1 day pre-op.    | intensity     | 0.14          | 0.30** | 0.20*  | 0.15    | 0.13 | | | | |
|                  | distress      | 0.11          | 0.20*  | 0.21*  | 0.19    | 0.11 | | | | |
|                  | distress      | 0.14          | 0.32** | 0.38** | 0.30**  | 0.24* | | | | |
| experienced      |               | 0.19*         | 0.28** | 0.44** | 0.48**  | 0.36** | | | | |
| day of op.       | intensity     | 0.25**        | 0.30** | 0.50** | 0.54**  | 0.39** | | | | |
|                  | distress      | 0.36**        | 0.32** | 0.47** | 0.42**  | 0.51** | | | | |
| recalled         | 3 days        | 0.29**        | 0.27*  | 0.41** | 0.33**  | 0.42** | | | | |
| post-op.         | intensity     | 0.41**        | 0.23   | 0.25   | 0.37**  | 0.35** | | | | |
|                  | distress      | 0.40**        | 0.19   | 0.25   | 0.46**  | 0.33** | | | | |

*p<0.05, **p<0.01

**Partial Correlations**

The strong and consistent correlations between state anxiety and pain distress may indicate that the pain distress measure is simply another measure of anxiety. To exclude this possibility the correlation coefficients between the pain rating score were recalculated with state anxiety at encoding (day of operation) and recall (3 days post-operatively) partialled out. The partial correlation matrix is included in Table 6:9.
Table 6.9 Partial Correlations Between the Pain Measures, with State Anxiety Partialled Out

<table>
<thead>
<tr>
<th>pain scores</th>
<th>anticipated pain</th>
<th>experienced pain</th>
<th>recalled pain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 day pre-op.</td>
<td>day of op.</td>
<td>day of op.</td>
</tr>
<tr>
<td>anticipated</td>
<td>int dis int dis</td>
<td>int dis int dis</td>
<td>int dis int dis</td>
</tr>
<tr>
<td>1 day pre-op.</td>
<td>dis 0.47**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>day of op.</td>
<td>int 0.61** 0.40**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>dis 0.57** 0.66**</td>
<td>0.54**</td>
<td></td>
</tr>
<tr>
<td>experienced</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>day of op.</td>
<td>int 0.24** -0.08</td>
<td>0.17 0.09</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dis 0.13 0.01</td>
<td>0.03 0.15</td>
<td>0.70**</td>
</tr>
<tr>
<td>recalled</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 days post-op.</td>
<td>int 0.27** 0.12</td>
<td>0.25* 0.39**</td>
<td>0.44** 0.47**</td>
</tr>
<tr>
<td></td>
<td>dis 0.30* 0.26</td>
<td>0.23 0.43**</td>
<td>0.36* 0.54**</td>
</tr>
<tr>
<td>30 days post-op.</td>
<td>int 0.24* 0.22</td>
<td>0.46** 0.25**</td>
<td>0.29* 0.21</td>
</tr>
<tr>
<td></td>
<td>dis 0.26* 0.08</td>
<td>0.036** 0.20</td>
<td>0.27* 0.30*</td>
</tr>
</tbody>
</table>

* p<0.05; **p<0.01 Pain measures; int : intensity, dis : distress

Comparison of the original pain ratings correlation matrix (Table 6.5) with the partial correlation matrix (Table 6.9) reveals no change in the relationship between pain intensity and pain distress, confirming the independence of pain distress from anxiety.

With state anxiety partialled out the relationship between anticipated pain ratings and the experienced pain ratings is diminished. However the pattern of significant positive correlations between anticipated pain and the recalled pain is maintained. The small changes in the correlation coefficient are probably explained by the loss of degrees of freedom in the partialling out of two measures of anxiety. The correlations between experienced pain and recalled pain ratings are maintained.

Clearly the observed effect of anticipation of pain on experienced pain may be explained as a function of state anxiety. However, the effect of anticipation on recall can not. The pattern
of correlations between anticipation of pain and pre-operative state anxiety (Table 6:8) also suggests that the anticipation of pain contributes to a raising of anxiety levels. It must be concluded that state anxiety is a powerful influence on the pain ratings but alone can not explain all of the variance.

Table 6:10 Partial Correlations, the Pain Ratings and the Recovery Variables with State Anxiety (encoding and recall) Partialled Out

<table>
<thead>
<tr>
<th>pain scores</th>
<th>recovery inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>anticipated</td>
<td></td>
</tr>
<tr>
<td>1 day pre-op.</td>
<td>intensity</td>
</tr>
<tr>
<td></td>
<td>-0.29*</td>
</tr>
<tr>
<td></td>
<td>distress</td>
</tr>
<tr>
<td></td>
<td>-0.15</td>
</tr>
<tr>
<td>day of op.</td>
<td>intensity</td>
</tr>
<tr>
<td></td>
<td>-0.15</td>
</tr>
<tr>
<td></td>
<td>distress</td>
</tr>
<tr>
<td></td>
<td>-0.11</td>
</tr>
<tr>
<td>experienced</td>
<td></td>
</tr>
<tr>
<td>day of op.</td>
<td>intensity</td>
</tr>
<tr>
<td></td>
<td>-0.43**</td>
</tr>
<tr>
<td></td>
<td>distress</td>
</tr>
<tr>
<td></td>
<td>-0.33**</td>
</tr>
<tr>
<td>recalled</td>
<td></td>
</tr>
<tr>
<td>3 days post-op.</td>
<td>intensity</td>
</tr>
<tr>
<td></td>
<td>-0.20</td>
</tr>
<tr>
<td></td>
<td>-0.25*</td>
</tr>
<tr>
<td></td>
<td>distress</td>
</tr>
<tr>
<td></td>
<td>-0.17</td>
</tr>
<tr>
<td>30 days post-op.</td>
<td>intensity</td>
</tr>
<tr>
<td></td>
<td>-0.17</td>
</tr>
<tr>
<td></td>
<td>-0.25*</td>
</tr>
<tr>
<td></td>
<td>distress</td>
</tr>
<tr>
<td></td>
<td>-0.26</td>
</tr>
<tr>
<td></td>
<td>-0.21</td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.01

Given the powerful effects of state anxiety on the pain ratings it was necessary to reassess the relationship between the pain ratings and recovery variables. Comparing the correlation matrix (Table 6:6) with the partial correlation matrix (Table 6:10) for the pain ratings and recovery measures it is clear that most of the variance between anticipation of pain and recovery is explained by state anxiety. Subjects who are very anxious are anticipating high levels of pain and reporting poor recovery. However, the observed relationship between experienced and recalled pain and recovery is not completely attributable to state anxiety.
The partial correlations confirm the importance of the influence of state anxiety on the pain ratings, particularly anticipation of pain. However state anxiety alone can not account for all of the variance between the measures and it would be premature to dismiss the effects anticipation of pain on pain recall and recovery.

State anxiety and the pain ratings probably interact, highly anxious subjects anticipating higher levels of pain and increasing their anxiety. Associations between recalled pain and pre-surgical distress has been previously reported (Bernstein, 1979). The close association between anticipated and recalled pain, with the influence of state anxiety needed further investigation.

ACCURACY OF ANTICIPATION AND RECALL OF PAIN AND THE EFFECTS OF STATE ANXIETY

The principal findings of the early statistics were the influence of anticipation of pain on the subsequent recall of pain and the powerful effect of state anxiety, at encoding and recall, on the pain ratings. These findings are in line with current literature (Kent, 1985 and Linton and Merlin, 1982) previously reported results have indicated a congruency between inaccuracies in anticipation and recall, subjects who overestimate anticipated pain also overestimate recalled pain. To assess the accuracy of recall in the above study it was necessary to calculate an accuracy scale. Since only 59 subjects returned pain ratings one month postoperatively and the repeated measure anovas (Table 6:3) implied inaccuracies occurring in both early and late recall the 'accuracy' scale was calculated for recall at three days post-operatively only.

Accuracy scales (AI: pain intensity; AD: pain distress). The difference between recalled pain ratings and experienced pain ratings was calculated and a constant of 100 added. The AI and AD scales had a range of 0 - 200 and a standard deviation of 26. Subjects whose recalled pain vas score was within 5 mm of their experienced pain vas score were assumed to have accurate recall of pain (a score between 95 and 105 on the AI and AD scales).
Eighty nine subjects completed sufficient VAS scales for assessment of exaggeration or underestimation of the pain experience at recall. On the accuracy of intensity scale 24 subjects scored between 95mm and 105mm and were considered to have accurate recall of their pain. Of the remaining subjects 33 exaggerated their pain intensity at recall and 32 underestimated their pain intensity at recall. On the accuracy of distress scale 26 subjects had accurate recall, 39 subjects exaggerated their distress and 24 subjects underestimated their distress at recall.

Product moment correlations were calculated between the accuracy scale and anticipation of pain ratings, trait anxiety, state anxiety at encoding and recall and early recovery. The only significant positive correlation to emerge was between anticipation of pain 1 day preoperatively and the accuracy of pain distress (Table 6:11). Subjects who expected high levels of post-operative pain distress also exaggerated their distress at recall. Interestingly no correlations between the accuracy scale and anxiety emerged.

When the subjects were matched for state anxiety levels, partial correlations (Table 6:10) positive correlations between anticipation of pain distress (day of operation) and the accuracy scale emerged. Subjects who were anticipating high levels of pain distress exaggerated their pain intensity and distress at recall.

Similarly a significant negative correlation between recovery one day post-operatively and accuracy of recalled pain emerged with state anxiety partialed out (Table 6:11). Subjects who report poor recovery tend to exaggerate their pain at recall.
Table 6:11 Correlations and Partial Correlations: Anticipated Pain, Trait and State Anxiety and Recovery with Accuracy of Recall

<table>
<thead>
<tr>
<th></th>
<th>Accuracy of recall scale (recall-pain +100)</th>
<th>correlation</th>
<th>partial corr (controlling for state anxiety)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>intensity</td>
<td>distress</td>
</tr>
<tr>
<td>trait anxiety</td>
<td></td>
<td>0.17</td>
<td>0.14</td>
</tr>
<tr>
<td>state anxiety</td>
<td></td>
<td>-0.03</td>
<td>-0.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.05</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.20</td>
<td>-0.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.09</td>
<td>-0.15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.15</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.03</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.013</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.24*</td>
<td>-0.17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.05</td>
<td>-0.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.27*</td>
<td>0.29*</td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.01

The pattern of correlations and partial correlations (Table 6:11) is curious, state anxiety is clearly affecting the relationship between anticipation of pain and accuracy of recall, however no relationship has emerged between anxiety and accuracy of recall. Subjects who are very anxious are not necessarily exaggerating their pain at recall.

To elucidate the complex relationships between anticipation and recall of pain and state anxiety a set of analysis of variance with polynomial contrasts were calculated. Table 6:12 includes the main effects and the significant trends.
### Table 6:12 Analysis of Variance and Covariance of the Pain Ratings and Anxiety

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Dependent Variable</th>
<th>experienced pain</th>
<th>recalled pain</th>
<th>accuracy of recall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>int</td>
<td>dis</td>
<td>int</td>
</tr>
<tr>
<td>1) antic pain 1 day pre-op.</td>
<td>A) anova: F ratio</td>
<td>5.71**</td>
<td>0.44</td>
<td>6.03**</td>
</tr>
<tr>
<td></td>
<td>linear Trend (T)</td>
<td>3.36**</td>
<td>0.64</td>
<td>3.37**</td>
</tr>
<tr>
<td></td>
<td>B) cova: F ratio control - state anx</td>
<td>4.35*</td>
<td>0.05</td>
<td>4.98**</td>
</tr>
<tr>
<td>2) antic pain day of op.</td>
<td>A) anova: F ratio</td>
<td>2.32</td>
<td>7.88**</td>
<td>6.13**</td>
</tr>
<tr>
<td></td>
<td>linear Trend (T)</td>
<td>2.15*</td>
<td>3.36*</td>
<td>2.91**</td>
</tr>
<tr>
<td></td>
<td>B) cova: F ratio control - state anx</td>
<td>1.44</td>
<td>3.25*</td>
<td>3.75*</td>
</tr>
<tr>
<td>3) experienced pain</td>
<td>A) anova: F ratio</td>
<td></td>
<td></td>
<td>12.24**</td>
</tr>
<tr>
<td></td>
<td>linear Trend (T)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4) state anxiety (encoding)</td>
<td>A) anova: F ratio</td>
<td>8.29**</td>
<td>13.23**</td>
<td>5.67**</td>
</tr>
<tr>
<td></td>
<td>linear Trend (T)</td>
<td>4.07**</td>
<td>4.90**</td>
<td>3.10**</td>
</tr>
<tr>
<td>5) state anxiety (recall)</td>
<td>A) anova: F ratio</td>
<td>6.10**</td>
<td>19.65**</td>
<td>5.90**</td>
</tr>
<tr>
<td></td>
<td>linear Trend (T)</td>
<td>3.47**</td>
<td>5.90**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quadratic Trend (T)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<0.05  **p<0.01 pain measures: int, intensity; dis, distress.

Interestingly the main effects of the anticipation of the pain experience are stronger for the recall of pain ratings 3 days post-operatively than they are for the experienced pain. The contrasts reveal linear trend effects between most of the anticipated pain ratings and experienced and recalled pain.

Subjects who anticipate high levels of pain intensity and distress are experiencing and...
recalling high levels. Subjects who anticipate low levels of pain and distress are experiencing and recalling lower levels. These results are consistent with our hypothesis. There are no main effects of anticipated pain intensity and distress on the exaggeration or underestimation of pain at recall. However, there is a small significant linear trend effect of anticipated pain distress one day pre-operatively and exaggeration of distress at recall. Subjects who anticipate high levels of pain distress would seem to exaggerate that distress at recall. Subjects who anticipate high levels of pain intensity and distress are experiencing and recalling high levels. Subjects who anticipate low levels of pain and distress are experiencing and recalling lower levels.

There are no main effects of anticipated pain intensity and distress on the exaggeration or underestimation of pain at recall. However, there is a small significant linear trend effect of anticipated pain distress one day pre-operatively and exaggeration of distress at recall. Subjects who anticipate high levels of pain distress would seem to exaggerate that distress at recall.

There are strong consistent significant main effects and linear trends of state anxiety at encoding on both pain experience and recall. Subjects who were more anxious at encoding (pre-operatively on the day of operation) rated their experienced pain as high and recalled their pain as high. Similarly there are consistent significant main effects and linear trends between state anxiety at recall and the recalled pain ratings, 3 days post-operatively. There are no significant main effects between the anxiety ratings at either time and the exaggeration or underestimation of pain. However, there is a significant quadratic trend effect between state anxiety at recall and the exaggeration of distress scale. Subjects who are highly anxious at the time of recall are making more errors when recalling the experienced distress of their post-operative pain. The direction of these errors, exaggeration or underestimation, is not determined by the level of state anxiety at recall.

There are significant main effects and negative linear trend effects of the experienced pain on the exaggeration of pain at recall ratings. Subjects rating their pain intensity and distress
as high tend to underestimate the experience at recall. Subjects who rate their experienced pain intensity and distress as low tend to exaggerate the experience at recall. This odd effect is probably explained by regression to the mean effect at recall.

Given the strong effects of state anxiety at encoding on the rating of the pain experience and the effects of state anxiety at encoding and recall on the rating of the recalled pain experience analysis of covariance controlling for the appropriate state anxiety measure were calculated. The F ratio values for the significant main effects are included in Table 6:12. The main effects between anticipation and experience and recall are diminished with state anxiety as co-variante. However these effects of anticipation on recalled pain are maintained and the difference of effect of anticipation on experienced pain and recalled pain has not changed.

THE COMPARISON OF HIGH AND LOW ANXIETY GROUPS

The evidence from the analysis above suggests that highly anxious subjects are exaggerating their anticipated pain and making errors when recalling their pain. However, the picture is far from clear. To elucidate the relationship between state anxiety and errors in accuracy when anticipating and recalling pain the subjects were subdivided according to their anxiety levels and a further set of analysis of variance were calculated.

The subjects were divided into high and low anxious groups by the median score of pre-operative state anxiety (41) on the day of operation (encoding). Split plot analysis of variance revealed no overall interactive effect between anxiety and pain ratings. However, when the group means are plotted, Figure 6:3, the curves for intensity (6:3A) are different for high and low anxiety groups, this observed effect was significant, $F_{(1,70)} = 4.95^*$. The high anxious subjects tend to rate their anticipated, experienced and recalled pain intensity and distress consistently higher then the low anxious group. For both groups the pattern of the intensity graph is widely different to the distress graph, figure F:3 (a & b). Suggesting that anxiety operates differently on the two aspects of pain measured here.
Examining the curves for pain intensity (6:3A) high and low anxious subjects anticipation of pain one day prior to the surgery is very similar. By the day of operation the high anxious group are anticipating much higher levels of pain, they experience more pain and recall higher levels of pain than the low anxious group. 't' values for simple effects between the groups are significant (Table 6:13). The high anxious group slightly underestimate their pain
intensity at recall, 3 days post-operatively, but are very accurate 1 month (30 days) postoperatively. The low anxious group experience less pain than they anticipate and underestimate their pain at recall 3 days and 1 month postoperatively.

Table 6:13 Pain Ratings for High and Low Anxious Groups: Means and 't' Values

<table>
<thead>
<tr>
<th></th>
<th>Pain intensity</th>
<th>Pain distress</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>high anx</td>
<td>low anx</td>
</tr>
<tr>
<td>anticipated pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 day pre-op.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean (sd)</td>
<td>46.00(22.4)</td>
<td>45.63(25.9)</td>
</tr>
<tr>
<td>day of op.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean (sd)</td>
<td>56.25(23.2)</td>
<td>47.00(24.1)</td>
</tr>
<tr>
<td>experienced pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>day of op.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean (sd)</td>
<td>56.64(29.0)</td>
<td>43.46(29.0)</td>
</tr>
<tr>
<td>recalled pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 days post-op.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean (sd)</td>
<td>53.51(29.2)</td>
<td>41.20(23.3)</td>
</tr>
<tr>
<td>30 days post-op.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean (sd)</td>
<td>56.04(30.1)</td>
<td>41.12(30.0)</td>
</tr>
</tbody>
</table>

* p<0.05 **p<0.01

The curves of pain distress (6:3B) are very similar in shape for both groups. Both groups anticipate on the day of operation higher levels of pain than they experience and overestimate their pain at recall 3 days post-operatively. However, 1 month post-operatively the high anxious group still overestimate the pain, slightly increasing the rating while the low anxious group overestimate their pain but decrease the rating. For both groups the recalled pain resembles their anticipated pain on the day of operation closely (Table 6:13)
Fig 6:3 anxiety groups and pain
A: pain intensity ratings

key: — high anxiety/intensity  low anxiety/intensity  —- high anxiety/distress

low anxiety/distress, antic -1; anticipated pain 1 day preop. antic 0; anticipated pain
day of op. exp 0; experienced pain. recall +3; recalled pain 3 days post- op. recall +30;
recalled pain 30 days post-op.
Clearly errors made at recall are different for each group for both aspects of pain. For distress both high and low anxious groups exaggerate their distress at recall, they seem to recall their anticipated rating rather than the experienced pain. This is consistent with Kent (1985). In the case of intensity both groups underestimate their pain at early recall, the high anxious subjects tend to increase their pain ratings at late recall. The low anxious group tend to further underestimate their pain at one month post-operatively.

Clearly the hypothesis that highly anxious subjects would exaggerate their anticipated and recalled pain has been partly met. However, our results describe a far more complex picture. Levels of preoperative anxiety influence the two aspects of pain differently and the effect is greater at recall than anticipation.

THE PAIN RESPONSES (PRQ, ACUTE) AND THE PAIN RATINGS

The Leventhal processing model of pain suggests that the pain experience is enhanced by other variables, including behaviours at pain onset. In the case of post-operative pain the responses to pain (cognitive and behavioural) may be preselected during the anticipation period. As a preliminary investigation product moment correlations were calculated between the anticipated and recalled pain ratings and the pain response scales. The correlation matrix is included in (Table 6:14)

There were a scattering of significant positive correlations between the negative cognitive and behavioural scales of the PRQ and anticipated pain ratings (Table 6:14). Suggesting that subjects who anticipate high levels of pain intensity and distress are responding to pain with less adaptive strategies.
Table 6.14 Correlations: The Pain Ratings and Pain Responses

<table>
<thead>
<tr>
<th>pain scores</th>
<th>1 day post-op.</th>
<th>3 days post-op.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>positive</td>
<td>negative</td>
<td>behaviour</td>
</tr>
<tr>
<td>1 day pre-op.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>int</td>
<td>-0.10</td>
<td>0.11</td>
<td>0.14</td>
</tr>
<tr>
<td>dis</td>
<td>-0.15</td>
<td>0.23*</td>
<td>0.12</td>
</tr>
<tr>
<td>day of op.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>int</td>
<td>-0.11</td>
<td>0.09</td>
<td>0.22*</td>
</tr>
<tr>
<td>dist</td>
<td>-0.25*</td>
<td>0.23*</td>
<td>0.14</td>
</tr>
<tr>
<td>recalled</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 days post-op.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>int</td>
<td>-0.19</td>
<td>0.31**</td>
<td>0.33**</td>
</tr>
<tr>
<td>dis</td>
<td>-0.21</td>
<td>0.31**</td>
<td>0.43**</td>
</tr>
<tr>
<td>30 days post-op</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>int</td>
<td>-0.18</td>
<td>0.42**</td>
<td>0.41**</td>
</tr>
<tr>
<td>dis</td>
<td>-0.23</td>
<td>0.34**</td>
<td>0.42**</td>
</tr>
</tbody>
</table>

* p<0.05 ** p<0.01

Subjects who anticipate high levels of pain distress also tend to respond to pain with fewer positive cognitive responses. Since there is no sustained pattern of correlations between anticipated pain and the PRQ scales these findings must be treated with caution.

The pattern of significant positive correlations between early and late recalled pain and the negative and behavioural scales of the PRQ is strong and sustained. The subjects who utilise the less adaptive responses to pain are recalling higher levels of pain.

**Discussion**

The mean pain ratings for postoperative pain, 48.68mm intensity and 39.32mm distress on the 0 to 100mm visual analogue scale, returned by the subjects of this study are consistent with Tigerstedt's (1990) findings that despite post-operative analgesia patients do experience...
quite high levels of pain intensity and distress.

The subjects had no difficulty in identifying the distress component of pain separately from its intensity and from anxiety, partial correlations controlling for state anxiety did not significantly diminish the correlations between intensity and distress. However, the strong and consistent correlations (Table 6:5 & 6:8) clearly establish an influential relationship between two components of pain and anxiety.

Despite the correlations between the two components of pain the subjects separated them and it became clear that they were anticipated, experienced and recalled differently. Initial statistics for the entire population indicated that pain intensity was more accurately anticipated and recalled than distress (Tables 6:2 & 6:3). Anticipation of pain distress was found to predict recall as powerfully as it predicted experienced pain (Figure 6:2 & Table 6:4). This was consistent with reported findings for acute (Kent, 1985) and chronic (Linton and Melin, 1982) pain.

Consistent with the hypothesis the product moment correlations indicated a relationship between anticipated pain, experienced pain, early and late recovery but not post-operative affective state. There was however, a strong relationship between pre-operative anxiety and the anticipated pain ratings. When preoperative state anxiety was partialled out it was clear that the observed relationships between the anticipated pain ratings and the postoperative measures of pain and recovery were principally accounted for by anxiety. These findings are broadly similar to those of Wallace (1985) and Kent (1986). The correlations between anticipated pain and recalled pain were, however, quite unaffected by the subjects preoperative affective state (Table 6:9). In view of this curious finding it would be simplistic to dismiss the effects of anticipation on post-operative pain. State anxiety and anticipation of pain may interact in a circular fashion, higher levels of anxiety causing higher levels of anticipation which then increase anxiety. There was some evidence that anticipating high levels of pain was consistent with selecting the less adaptive pain response strategies and avoiding the adaptive pain responses at pain onset (Table 6:14). Although further
investigation is required to tease out the complex associations between anticipation of pain, pre-operative affective state and cognitive and behavioural responses to pain, the findings of this study support the concept that anticipation has an effect on post-operative pain. Anticipating high levels of post-operative pain tend to increase pre-operative anxiety and encourage non-adaptive pain strategies to be adopted. This has implications for preparation of surgical patients, attention should be paid to helping patients to accurately anticipate pain when introducing techniques for pain control.

The strongest evidence to emerge from this study was the relationship between anticipated and recalled pain. Leventhal and Everhart (1979) suggested that memory for surgical pain contributed to possible later chronic, non-organic pain states. Nikolajsen, et. al. (1997) clearly demonstrated that patients 'chronic pain in phantom limbs' was often inaccurate when compared to the experienced pain rating pre-amputation. This inaccuracy of recall in the post-amputation pain is apparent also in both acute (Kent, 1985) and other chronic pain states (Linton and Melin, 1982 and Erskine et. al., 1990). Bernstein (1979) cites memory of pain as inducing high levels of pre-surgical anxiety. Anticipation of pain must be based on either fantasy or, more likely, memory schemata of prior experience. If the anticipation of pain is the bringing into awareness an existing pain memory then the evidence of the mean values of the pain ratings the apportioning of the variance $R^2$ of the multiple regression and the consistent pattern of correlations suggest that experience makes little difference to the schemata. Recall is seen to mimic anticipation closely. Intensity was more accurately recalled than distress but it was also more accurately anticipated. This evidence underlines the need for accurate expectations to be engendered in pre-operative patients.

The associations reported by Kent (1985) and Linton and Merlin (1982) between anxiety and accuracy of anticipation and recall of pain are only partly supported by the evidence of this study. Overall high anxious subjects do anticipate, experience and recall higher levels of pain than low anxious subjects. However, the groups differ in their accuracy of recall for the two aspects of pain measured here.
Some evidence emerged that state anxiety influenced the accuracy of early recall (Table 6:12) of pain distress but implied that highly anxious subjects made more errors but did not necessarily exaggerate their pain. When the subjects were subdivided into high and low anxious groups a different picture emerges. The high anxious group return consistently higher ratings for intensity and distress than the low anxious group. For distress the curves (Fig. 6:3) are similar for both groups up to early recall. That is subjects anticipation of pain increases from 1 day pre-operatively to the day of operation, the pain experience is rated as less than anticipated but recall three days post-operatively mimics anticipation. One month post-operative the high anxious group exaggerate their distress slightly more than at early recall but the low anxious group are reducing their ratings from early recall, although it is still an exaggeration of their experience.

The ratings for pain intensity are quite different for the two groups. The high anxious subjects anticipation ratings greatly increase between the two measures. Their experienced intensity reflects their anticipation on the day of operation (Table 6:13). They slightly underestimate their pain three days post-operatively but one month later their recall rating has risen to the anticipated level. The low anxious subjects also increase their anticipation rating on the day of operation but rate their pain as less than anticipated and underestimate it at early and late recall.

The observed differences between early and late recall is interesting. Clearly the internal and external environments are different at early and late recall. Early recall may be effected by any residual post-operative analgesia and was assessed during admission, late recall, however, was assessed at home without analgesia. However, although recall is facilitated by occurring in the same environment as the experience (Abernethy, 1940) the differences between early and late recall are consistent within the two anxiety groups. Changes in environment can not alone explain these differences. The evidence reported here is also insufficient to fully explain the observed differences and further study is indicated.

The tendency for late recall to revert to the level of anticipated pain rather than to the
experienced pain suggests that current experience is modified to better fit some existing schemata of pain. Although it is not clear from this study whether the enduring memory of pain, that would furnish anticipation of future events, would be a product of existing schemata and current experience. However, this would be consistent with Leventhal's model of episodic memory. If enduring memory is some product of existing experience and the last pain episode this may explain the inaccuracies in 'phantom limb' pain reported by Nikolajsen and associates (1997). Therefore it would seem important to assess a patient's anticipation of post-operative pain since it seems to influence not only immediate post-operative pain but may also contribute to long term chronic pain state such as phantom limb.

The increase in anticipation of pain ratings from one day pre-operatively to the day of operation for all subjects and both aspects of pain would be expected in the approach-avoidance paradigm, the ratings increasing as the event approaches. For distress the second anticipation rating is the one recalled and is an exaggeration of the experience. For intensity the second anticipation rating is important for the high anxious group since it seems to predict experience and late recall. Clearly pre-operative preparation to reduce the anticipation of pain intensity and distress on the day of operation would benefit all subjects in some measure.

The overall accuracy of recall would seem to be poor for both groups on both measures. There may be some influence from the analgesics given early post-operatively, however no uniform pattern of inaccuracy emerged, as might be expected since all subjects would have been given some measure of analgesia. The differences between early and late recall may be related to contextual cues. All the subjects were hospitalised and in the same ward environment for their experienced and early recall ratings but out patients for late recall. Again no uniform pattern of errors emerged, the low anxious group tended to decrease their ratings between early and late recall while the high anxious groups increased their ratings. One other influence that may account for the inaccuracy of recall is the subjects pain state at recall (Eich, Reeves, Jaeger, & Graf-Radford, 1985). Current pain states were not measured.
in this study since it was thought that subjects may be confused, one month post-operatively as to which pain they should recall.

Conclusion

The hypotheses set out in the introduction have been broadly met. Anticipation of pain influenced post-operative pain but not postoperative affective state. Highly anxious subjects tended to overestimate pain at anticipation and late recall. There was also evidence of some interaction between anticipation of pain and choice of response strategies.

This study clearly demonstrates the influence of anticipation of an event on the experience and subsequent recall of the event. Here the stress was post-operative pain but subjects are probably anticipating other aspects of surgery e.g. mood, recovery, mobility etc. The effects of anticipation on the physiological stress response was not addressed in this study. There was some evidence that anticipation of pain influenced the experienced post-operative pain, the choice of coping strategies and recovery. Anticipation of pain did not effect the post-operative affective state in this sample. However anticipation was clearly an important variable in stress and the subjective response to it. Further research is needed to investigate the effects of anticipation in other areas of surgical stress.

It is not clear from the study reported here what factors contribute to the anticipation. There was an association between preoperative anxiety and levels of anticipated pain. There was also evidence that some enduring memory influenced anticipated pain. There was a change in the recalled levels of pain from early to late recall. The late recall tended to be closer to the anticipated levels suggesting that some concept of post-operative pain was enduring and current experience was mapped on to it. This would be consistent with Leventhal's model of episodic memory. Clearly the recalled pain in this sample was inaccurate and if memory informs anticipation it would be important to consider what contributes to the inaccuracy. Pain state at the time of recall may be influencing memory and this is examined in the following chapter.
Anticipation of a stressful event is clearly important since there are clear associations between the anticipation and the event. The relationship between the anticipated and the recalled event reported here has implications for clinical and cognitive psychology. Clinically there are implications for patient management, accurate preconceptions by the patient would possibly improve outcome and recall. For cognitive psychology the change in accuracy from early to late recall and the tendency of the recalled pain to move closer to the anticipated pain may imply a revaluing of current experience in light of enduring concepts.
STATE DEPENDENT MEMORY EFFECTS IN POSTOPERATIVE PAIN

A recurring feature of the studies reported in the preceding chapters and in the literature is the influence on the experience of an event by an individual's preconceptions about that event. Evaluation of a stressful event as threat or challenge influences subjective coping responses (Folkman and Lazarus, 1985). Evaluation of an event coupled with a belief about one's own resources is important in 'self efficacy' (Bandura, 1986). There was clear evidence in the study reported in Chapter Six that post-operative pain and the style of coping responses to it were influenced by anticipation. Since preconceptions about an event must, in some part, be informed by memory an assessment of recalled post-operative pain was made in the above study. This revealed marked inaccuracy in recall of pain which could not be entirely explained by anxiety state. Curiously the recalled pain tended to mimic the anticipated pain rather than the experience. Accurate recall of pain is important if it informs anticipation it is also important for subjective assessment of their progress. In the previous study some of the variables that might account for the inaccuracy of recalled pain were examined but it was not possible, for methodological reasons to assess pain state at recall. The following study examines the influence of current pain state on recalled pain.

Although there is a considerable body of research on recall and a sound theoretical base for recognition pain does not readily lend itself to traditional recall experiments. As discussed before (Chapter, 3) exact reproduction of pain is difficult to achieve therefore recognition task assessment of memory has been largely avoided in pain research. However, state dependency effects on recall particularly in relation to recall of personal episodic memory are relevant to recall of pain.

The concept of 'State Dependency' effect on recall (Abernathy, 1940) is not new however early research tended to concentrate on external environment, situational conditions. Accuracy of recall improved when the environment of recall was the same as
encoding. Bower (1981) applied 'state dependency' which included subjective 'psychological state' to personal episodic memory. His 'Semantic Network Theory of Emotion and Memory' identifies accuracy of recall with congruency of emotion (mood) at encoding and recall and allows for interaction of the impact of the event and the emotional state at encoding. This concepts of emotional congruency and the interaction of event and mood intensity is relevant to pain memory research.

Pain onset (encoding) is usually accompanied by anxiety and altered behaviour. Clinical pain may also be associated with depression or occur when subjects are depressed for some other reason. Recall of pain, often after the pain is past, may not occur in the same external environment or internal psychological state. Bower's model (1981) predicts that the recalled pain will be inaccurate if there is incongruity of mood or anxiety. Some evidence of this has been reported in Chapter Six, above. Recall of post-operative pain was found to be influenced by state anxiety at encoding and at recall. High levels of state anxiety tended to increase the error rate at recall. It was not clear however from the previous study that where anxiety state at encoding and recall were congruent, accuracy of recalled pain was improved.

There is some evidence in the literature that the pain state may influence the accuracy of recalled pain. Accuracy of recall for chronic recurring headache was found to be influenced by the level of pain the patients had at the time of recall. Patients with high levels of pain tended to overestimate their recalled pain while those with little or no current pain underestimated it (Eich, Reeves, Jager and Graf-Radford, 1985). Edwards' et.al. (1992) findings that depressed and non-depressed chronic pain and non-pain patients recall pain differently implies some interactive effect between mood state and pain state at the time of recall. Their depressed pain patients recalled sensory and affective aspects of pain while the non-depressed pain patients recalled only sensory aspects of pain. Pain cues have been reported as eliciting pain related memories in experimental groups (Church, 1991 and Morley, 1993).
The evidence to date suggest that the accuracy of recalled pain would be influenced by psychological factors at the time of recall. Mood anxiety and pain state at recall have all been shown to effect pain memory and there is some suspicion of an interactive effect between one or more variables. It is also possible that environmental factors are influencing pain memory. It is not clear that in the clinical studies subjects were recalling their pain in the same environment as it was encoded. In the Eich et.al. (1985) study, for example, the patients were encoding their pain at home but recalling it in a clinic. Post-operative pain offers an opportunity to assess the effects of both psychological and environmental variables on the accuracy of recalled pain.

The aim of this study is to examine the effects of mood, state anxiety and current pain state on the accuracy of recalled pain, experienced following cardiac surgery. By obtaining all pain measures during the subject's admission congruence of environment is achieved.

HYPOTHESIS

It is predicted that where incongruence of mood, anxiety or pain state occurs between encoding and recall inaccuracies will occur.

Method

Subjects

Consecutive patients admitted to a London teaching hospital for elective coronary artery bypass surgery over a 18-month period were asked to take part in the study. Three categories of patient were excluded:-

1) Patients considered by the nursing and medical staff to be too distressed or confused by inclusion in the study.
2) Minors; patients under 16 yrs of age.
3) Patients whose first language was not English and who did not have sufficient command of English to fully understand the questionnaires.

It was important and an ethical consideration not to increase the stress of the clinical sample therefore patients were not pressed to take part in the study. Nor were they obliged to give a reason for refusing. The majority of patients readily agreed to take part in the study only five refusing. Where reasons for refusing were given they included:

1) Already taking part in a separate investigation.
2) Too frightened.
3) An attendant relative advised the subject against taking part.
4) The subject had some disability, not related to the surgery, that they thought would make participation difficult e.g. Too deaf.

Of eighty five patients approached, eighty agreed to take part of whom; one had surgery in addition to their coronary artery bypass, one received a non standard anaesthetic technique, four were lost to the study because of cancellation or postponement. The final group consisted of sixty four males and ten females with a mean age of fifty seven years (range 34-75). This sample was measured on several variables only those relevant to the state dependency effects on pain recall are included in this chapter. Chapter Nine reports all other variables. Of the seventy four subjects only seventy completed all the pain measures, sixty three males and nine females with a mean age of fifty eight (range 34-75, sd 9.7 yrs)

MEASURES

Since verbal pain scales may evoke semantic memory to aid recall the visual analogue scale was the chosen pain measure.

Pain intensity and distress were measured by separate 100mm visual analogue scales
anchored as follows:
Intensity; no pain at all and the most intense pain I can imagine:
Distress; none at all and the most distress I can imagine.

SUBJECTIVE PAIN MEASURES

The (subjective) VAS scales were linked to the following questions to assess experienced and recalled pain.

Experienced; "How intense / distressing is the pain you are feeling now?"
Recall; "When you first woke up following your operation you described your pain for us. How intense / distressing was that pain?".

ANXIETY AND MOOD QUESTIONNAIRE

Since subjects would be completing these measures within twenty four hours of surgery it was essential that the questionnaire was simple and short. State anxiety and mood (depression) were assessed by Zung Anxiety and Depression Scale (Zung, 1974). This questionnaire consists of two scales, anxiety/ depression of six items each and a four part response scale. Subjects respond to each item according to how they feel ‘right now’.

OBJECTIVE PAIN MEASURE

To obtain an objective measure of experienced pain the investigator or nurse completed a visual analogue scale assessing the pain intensity and distress. This was completed at the same time as the subjects recorded their ‘experienced’ pain on the first occasion post-operatively that the subjects indicated pain. Objective pain intensity and distress were measured by separate 100mm visual analogue scales anchored as follows:

Intensity; no pain at all and the most intense pain I can imagine:
Distress; none at all and the most distress I can imagine.
The objective ‘Nurse’ VAS scales were linked to the questions "How intense / distressing is their pain now?"

PROCEDURE

On the first occasion postoperatively that the subjects indicated pain the investigator assisted them in completion of a visual analogue scale assessing the pain intensity and distress.

The objective ‘Nurse’ VAS scale was completed by the nurse caring for the patient at this point.

On the fourth postoperative day the subjects were asked to complete the 'recalled pain' VAS followed by the 'experienced pain' VAS which assessed their current pain state.

Anxiety and depression scales were completed at the same time as the pain scales.

Other questionnaires relating to psychological preparation for surgery and the physiological and psychological stress response to surgery are reported in Chapters Eight and Nine.

**Fig. 7.1 Overview of the Procedure**

<table>
<thead>
<tr>
<th>questionnaires</th>
<th>24 hours post-op</th>
<th>4 days post-op</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjective measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experienced pain (VAS)</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Recalled pain</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>Anxiety and Depression (Zung)</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Objective pain measure</td>
<td>‘Nurse’ VAS</td>
<td>Y</td>
</tr>
</tbody>
</table>
STATISTICAL ANALYSIS

Product moment correlation assessed the relationships between the pain states. The anxiety and mood states and accuracy of recalled pain were analysed by multiple analysis of variance.

Results

The subjects reported very low levels of post-operative pain on the day of operation. Thirteen percent of the sample indicated no pain intensity at all and twenty one percent of the sample reported that their pain caused them no distress at all. Mean values of postoperative pain scores are listed in Table 7:1. The nurses assessment of their patients early post-operative pain mimicked the subjective report.

On the fourth post-operative day sixty three percent of patients were pain free. Mean values for pain on the fourth post-operative day are included in Table 7:1. The observed reduction in pain from one to four days was significant for both intensity \( F_{(1,67)} 24.0^{**} \) and distress \( F_{(1,67)} 9.31^{**} \).

Table 7:1 Mean Values for Pain VAS Scores on Postoperative Days One and Four

<table>
<thead>
<tr>
<th>pain VAS score</th>
<th>subjective measure</th>
<th>nurse measure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>day 1</td>
<td>day 4</td>
</tr>
<tr>
<td>intensity mean (sd)</td>
<td>33.67(27.8)</td>
<td>12.47((25.5)</td>
</tr>
<tr>
<td>distress mean (sd)</td>
<td>29.21(31.5)</td>
<td>13.75 (30.29)</td>
</tr>
</tbody>
</table>

The pain was recalled as being marginally less intense than experienced but similarly distressing, mean values Table 7:1. These observed small differences between the recalled mean values and the experienced mean values of pain were not statistically
significant; Intensity $t = 0.70$; Distress $t = 0.51$.

Product moment correlations revealed some interesting relationships between the pain measures (Table 7:2). While the two experienced pain measures (day 1 and day 4) are not correlated, significant relationships between recalled pain and both pain measures emerged.

Table 7:2 Product Moment Correlations: Pain on Days 1 and 4 and Recalled Pain

<table>
<thead>
<tr>
<th></th>
<th>postoperative pain</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>day 1</td>
<td>day 4</td>
<td></td>
</tr>
<tr>
<td>pain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>day 4. intensity</td>
<td>intensity</td>
<td>0.07</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>distress</td>
<td>0.08</td>
<td>0.05</td>
</tr>
<tr>
<td>recalled pain</td>
<td>intensity</td>
<td>0.39**</td>
<td>0.26*</td>
</tr>
<tr>
<td></td>
<td>distress</td>
<td>0.34*</td>
<td>0.21</td>
</tr>
</tbody>
</table>

*p<0.05  **p<0.01

ACCURACY OF RECALL

To assess accuracy of recall a 'pain error scale' was calculated. The difference between patients recalled pain scores and experienced pain scores (intensity and distress) was calculated and a constant of 100 added. These scales had a range of 0 - 200. Since the pain scales were to be compared to the anxiety and mood scales accuracy of recall was calculated differently to that of the accuracy scales in chapter six. The pain error scales were then divide into three groups:

1) Those subjects whose error score was within half a standard deviation either side of the mean were considered to be accurate in their recalled pain.
2) Those subjects whose score was greater than half a standard deviation above the mean exaggerated their pain at recall.

3) Those subjects whose score was more than half a standard deviation below the mean underestimated their pain at recall.

Table 7:3 Accuracy of Recalled Post-operative Pain Intensity and Congruency of Anxiety and Mood at Encoding and Recall

<table>
<thead>
<tr>
<th>Anxiety/Mood</th>
<th>Pain intensity</th>
<th>underrated</th>
<th>accurate</th>
<th>exaggerate</th>
<th>total %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Anxiety</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>more (E&lt;R)</td>
<td></td>
<td>5</td>
<td>12</td>
<td>8</td>
<td>35%</td>
</tr>
<tr>
<td>congruent (E=R)</td>
<td></td>
<td>12</td>
<td>14</td>
<td>6</td>
<td>46%</td>
</tr>
<tr>
<td>less (E&gt;R)</td>
<td></td>
<td>4</td>
<td>7</td>
<td>2</td>
<td>19%</td>
</tr>
<tr>
<td>total %</td>
<td></td>
<td>30%</td>
<td>47%</td>
<td>23%</td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>more (E&lt;R)</td>
<td></td>
<td>5</td>
<td>7</td>
<td>5</td>
<td>24%</td>
</tr>
<tr>
<td>congruent (E=R)</td>
<td></td>
<td>9</td>
<td>14</td>
<td>9</td>
<td>46%</td>
</tr>
<tr>
<td>less (E&gt;R)</td>
<td></td>
<td>7</td>
<td>12</td>
<td>2</td>
<td>30%</td>
</tr>
<tr>
<td>total %</td>
<td></td>
<td>30%</td>
<td>47%</td>
<td>23%</td>
<td></td>
</tr>
</tbody>
</table>

Pain: Underrated; subjects underestimated their pain at recall Exaggerate; subjects overestimate (exaggerate) their pain at recall.

Anxiety/Mood: More (E<R); subjects were more anxious/depressed at recall than at encoding. Less (E>R); subjects were less anxious/depressed at recall than at encoding.

Almost half the subjects recalled their pain accurately, Intensity 47% accurate; 30% underestimated and 23% exaggerated (Table 7:3). Distress 54% accurate; 26% underestimated and 20% exaggerated (Table 7:4).
Table 7.4 Accuracy of Recalled Post-operative Pain Distress and Congruency of Anxiety and Mood at Encoding and Recall

<table>
<thead>
<tr>
<th>Anxiety</th>
<th>Pain intensity</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>underrated</td>
<td>accurate</td>
<td>exaggerate</td>
<td></td>
<td>total %</td>
</tr>
<tr>
<td>more (E&lt;R)</td>
<td>3</td>
<td>16</td>
<td>6</td>
<td>35%</td>
<td></td>
</tr>
<tr>
<td>congruent (E=R)</td>
<td>10</td>
<td>16</td>
<td>6</td>
<td>46%</td>
<td></td>
</tr>
<tr>
<td>less (E&gt;R)</td>
<td>5</td>
<td>6</td>
<td>2</td>
<td>19%</td>
<td></td>
</tr>
<tr>
<td>total %</td>
<td>26%</td>
<td>54%</td>
<td>20%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Depression</th>
<th>Pain intensity</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>underrated</td>
<td>accurate</td>
<td>exaggerate</td>
<td></td>
<td>total %</td>
</tr>
<tr>
<td>more (E&lt;R)</td>
<td>2</td>
<td>9</td>
<td>6</td>
<td>24%</td>
<td></td>
</tr>
<tr>
<td>congruent (E=R)</td>
<td>10</td>
<td>17</td>
<td>5</td>
<td>46%</td>
<td></td>
</tr>
<tr>
<td>less (E&gt;R)</td>
<td>6</td>
<td>12</td>
<td>3</td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>total %</td>
<td>26%</td>
<td>454%</td>
<td>20%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pain: Underrated; subjects underestimated their pain at recall Exaggerate; subjects overestimate (exaggerate) their pain at recall.

Anxiety/Mood: More (E<R); subjects were more anxious/depressed at recall than at encoding. Less (E>R); subjects were less anxious/depressed at recall than at encoding.

CONGRUENCY OF ANXIETY AND DEPRESSION

To assess congruency of anxiety and mood the measures of each variable obtained at recall (4 days postoperatively) were deducted from the measures obtained at encoding (first instance of post-operative pain). The resultant scales were divided into three groups:

1) Congruent anxiety / mood; those subjects whose scores were half a standard deviation either side of the mean.

2) More anxious / depressed at recall; those subjects whose score was more than half a standard deviation below the mean.

3) Less anxious / depressed at recall; those subjects whose score was greater than...
half a standard deviation above the mean.

Forty six percent of subjects had the same level of anxiety at encoding and recall, thirty five percent were more anxious at recall and nineteen percent were less anxious at recall. Forty six percent of subjects had the same mood state at encoding and recall, twenty four percent were more depressed at recall and thirty percent were less depressed at recall (Table 7:3 & 7:4).

Table 7:5 Congruence of Mood/ Affect at Recall and Accuracy of Recall

<table>
<thead>
<tr>
<th>anxiety</th>
<th>accurate pain recall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>intensity</td>
</tr>
<tr>
<td>congruent</td>
<td>14</td>
</tr>
<tr>
<td>different</td>
<td>19</td>
</tr>
<tr>
<td>total</td>
<td>33</td>
</tr>
<tr>
<td>depression</td>
<td></td>
</tr>
<tr>
<td>congruent</td>
<td>14</td>
</tr>
<tr>
<td>different</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
</tr>
</tbody>
</table>

There is no significant effect of congruency of anxiety or depression on accuracy of recall of pain. Of the subjects whose recall was accurate less than half were mood/ affect congruent (Table 7:5).

When errors of recall are examined a pattern can be discerned from the distribution (Tables 7:3 & 7:4). Where subjects are more anxious / depressed at recall than encoding they will tend to exaggerate their pain and conversely subjects less anxious / depressed at recall will tend to underestimate their pain. The observed small differences failed to reach significance. State anxiety: i) pain intensity $F_{(2,69)} <1$; ii) pain distress $F_{(2,69)} =1.73$ ;
Depression; i) pain intensity $F, < 1$; ii) pain distress $F_{(2,69)} = 1.71$.

**Discussion**

In the case of pain state at recall the prediction in the hypothesis has been met. However there is no evidence in the study reported above to support the prediction that congruency of affect/mood results in accuracy of recalled pain.

The very low levels of post-operative pain reported by this group of coronary surgery patients was surprising. The raw pain data reveals that thirteen percent (9) of patients reported no pain intensity immediately postoperatively. Twenty one percent of patients (15) reported no pain distress. This study provided insufficient evidence to reliably explain this apparent lack of pain following surgical invasion of the thorax. However, since the intensive care nurses predicted their patients' pain accurately (Table 7:1) it may follow that where pain is detected early pain relief may be administered before the pain becomes distressing.

**EFFECTS OF INCONGRUENCE OF PAIN STATES ON RECALL**

The levels of early post-operative pain fell significantly by the fourth post-operative day. Since the recalled pain measure was assessed contiguously with the late post-operative measure the majority of subjects had different pain states at encoding and recall. Sixty three percent of subjects were pain free at recall compared to thirteen percent at encoding. However forty seven percent of subjects accurately recalled pain intensity and fifty four percent accurately recalled pain distress. Product moment correlations (Table 7:2) revealed a significant positive relationship between recalled pain and both post-operative measures but no relationship between pain measured on one and four days post-operatively. This is an important result. Clearly the post-operative pain on the first post-operative day was different to the pain on the forth post-operative day but both pain

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measures were related to recall. Taken together these findings suggest that current pain state has influence on accuracy of recall and is consistent with the literature on chronic headache (Eich et. al., 1985).

The positive correlations suggest that recall would be exaggerated when the pain state at recall was greater than at encoding and conversely underestimated when greater at encoding. It is clear from the evidence reported here that the current pain state effect is small but significant.

EFFECTS OF INCONGRUENCE OF MOOD AND ANXIETY ON PAIN RECALL

There was no discernable state congruency effect of either anxiety or depression on accuracy of recall. Approximately half the subjects who recalled their pain accurately reported the same levels of anxiety and depression at encoding and recall. However the pattern of results (Tables 7:3 & 7:4) indicates that where errors of recall occur they tend to follow the expected direction. Exaggeration of pain occurs most often where the affective state is enhanced at recall and conversely underestimation occurs when the affective state is moderated at recall.

CHANGES IN ANXIETY AND DEPRESSION FROM ONE DAY TO FOUR DAYS POST-OPERATIVELY

Comparisons between those groups of subjects who report different affective states at recall and encoding is interesting. A greater proportion of subjects, 35% are more anxious at recall than encoding and only 19% are less anxious. For depression the proportions are different 24% being more depressed and 30% less depressed. Clearly these variables are independent of action in the post-operative period. The observed tendency for one third of patients to be more anxious in late recovery than immediately after their operation is curious. The explanation may be that in late recovery patients are assuming more independence as nursing care is steadily diminished. Equally the effect may be caused by...
euphoria experienced when the patients are conscious of having survived a potentially life threatening operation. Given the influence of pre and post-operative anxiety on many aspects of recovery after surgery; pain experience, coping and physiological responses reported above, further investigation is warranted. Reduction of anxiety in the late recovery period may serve to enhance healing and improve the patients' sense of well being after discharge. Mood state would seem to be marginally improved in late recovery. However almost one quarter of the subjects are more depressed at this time than immediately after surgery. No satisfactory explanation can be given for this finding. However in current hospital practice less attention is given to patients affective state, or sense of well being, in late recovery.

PATIENT AND NURSE PAIN ASSESSMENT

The apparent consistency between nurse and subject reporting of pain may be misleading since on some occasions the nurses having completed their pain scale may have been required to assist their patients with the subjective pain scale. However this apparent congruence of pain assessment is interesting because it is different from the usually reported results (Utting and Smith, 1979). It is possible that experienced nurses involved in 'one to one' care of severely ill, often mute patients may develop a heightened awareness of non-verbal behavioural cues indicating pain. This effect may have implications for pain management and although the results reported here are flawed it would be important to examine this effect further in a rigorously controlled study.

The subjective pain ratings on the first postoperative day are interesting. Nine patients reported no pain intensity but fifteen patients reported no pain distress. Clearly six patients felt pain sensation but it caused them no distress. There are two possible explanations for this curious state of affairs. Firstly that the effect is entirely psychological. Patients had expected pain following their surgery and the quality of the pain, its location, intensity and time of occurrence matched their expectation and
therefore did not cause them any distress. Secondly the opiate medication given to relieve pain was acting on the distress factor of pain rather than on the sensation (intensity). This is consistent with current medical opinion, 'The relief of pain by morphine, like opioids is relatively selective.... Patients frequently report that the pain is still present but they feel more comfortable.' (Jaffe and Martin, 1990 p.490-491)

ANTICIPATION, AFFECT AND STATE EFFECTS ON RECALL OF PAIN

In chapter six we examined the effects of anticipation on post-operative pain and recall of pain. Anticipation was found to be closely associated with the experience and the subjective responses to it (Tables 6:4 & 6:13, Chap.6) Anticipation or preconceptions about an experience are dependent, in some measure, on recall of past experience. The accuracy of recall of post-operative pain was examined in some detail in chapter six. One important aspect of accuracy of recall, state congruency was not addressed in the previous chapter, because of methodological difficulties. Congruency of state effects of recall were examined above. Taken together the results are interesting.

In both studies recall is inaccurate. Recall had a stronger association with anticipation of pain than with experience. Late recall mimicking anticipation more closely than early recall (Tables 6:1 & 6:2). This suggested that the recent pain experience is matched on to some enduring concept of pain and is consistent with Leventhal's model of episodic memory (1979). Pre-operative anxiety was an important variable in the accuracy of recall and the direction of the error. Subjects who were very anxious pre-operatively tended to exaggerate pain at recall and those who were only slightly anxious tended to underestimate their pain at recall (Fig 6:2 a/b). In both studies the post-operative anxiety had little effect on the accuracy of recall (Tables 6:10 & 7:4). However, the direction of the difference between anxiety levels at encoding and recall predicted the direction of recall error (Tables 7:3 & 7:4, above). Pain state at recall was also important for accuracy of recall (Table 7:2, above).
The evidence from the studies reported here is important for memory. Accuracy of recall being related to anticipation of an event, suggesting that experience is mapped onto some enduring concept. Recall was also influenced by state effects at encoding and recall. The findings are also important in understanding the relationship between anticipation (preconceptions) and experience. Pre-operative anxiety state had a greater influence on experience and recall than post-operative anxiety state. Anticipation and pre-operative anxiety are very closely associated but the relationship is not clear. Subjects who are highly anxious may well anticipate the worst but equally subjects who expect the worst may increase their anxiety levels. This relationship is clearly important. Current attempts to reduce pre-operative anxiety levels have proven equivocal (Chapter 2). The relationship between anticipation and pre-operative anxiety may indicate ways of improving pre-operative techniques.

Conclusion

The low levels of pain reported by this cardiac surgery group are encouraging, contrasting with Tigerstedt's (1990) findings that seventy five percent of post-operative patients reported moderate or severe pain. The efficacy of the post-operative analgesia may be related to the experience and training of the specialist intensive care nurses who may assess pain onset from close observation of their patients body language.

From the research perspective a broader spread of pain scores may have produced a clearer pattern of result. Because patients may have found it easier to discriminate between severe or moderate pain and mild pain than discriminating between two levels of mild pain. Consequently the low levels of reported pain led to results that are only interpreted with caution. There was sufficient evidence, however to implicate 'current pain state' effect on recall. High levels of pain at the time of recall tending to increase the likelihood of exaggeration errors. Low levels of pain or no pain at recall resulting in underestimation errors.
There was no evidence that congruency of mood and affect at encoding and recall predicted accuracy of recalled pain. However examination of the errors of recall are broadly in line with Bower's (1981) 'Semantic Network Theory of Emotion and Memory'. the subjects who were more anxious / depressed at recall exaggerated their pain and conversely those less anxious / depressed underestimated their pain. 

Current pain state is clearly important to the accuracy of recall of pain. The effects of congruency of affective state and mood are of less importance. The findings of this study are sufficient to indicate further research with different clinical group, e.g. orthopaedic patients, where post-operative pain and hospital stay are of longer duration.
DEVELOPING A PSYCHOLOGICAL PREPARATION FOR MAJOR SURGERY

Introduction

This chapter reports the preliminary investigations required to develop a preparation for major surgery based on psychological techniques. We begin with the literature review of studies that underpin the psychological theories on which the preparation for surgery was based. The following chapter (Chap. 9) reports the effects of the preparation for surgery developed from these preliminary investigations.

LITERATURE REVIEW

In the discussion of the nature of stress (Chap. 1) the impact of the aversive event on the individual was considered to be an interaction between the environment and the person. On becoming aware of the threat the individual assessed its impact on them and took action to avoid or ameliorate the effects on themselves. This coping response was an attempt to control the event or its impact and subsequent outcome. The response to the event was shown to be influenced by many variables, the magnitude of the threat, the individual's assessment of their resources to meet it, personality, previous experience and their preconceptions about the event. The response to surgery was the same as the response to any other stress.

The review of the literature on the efficacy of preparation techniques for surgery (Chap. 2) and the studies reported in chapters five and six confirm the importance of subjective variables on stress. In the studies reported above the subjective coping response, the patients perception of the magnitude of the surgery and anticipation (preconceptions) were all influential during recovery. In the studies reviewed in Chapter Two the subjective coping was thought to be an attempt at control. Salmon (1992) also suggested
that an important variable influencing subjective response to stress was the social support
derived from friends and relatives. These two factors are taken into account in the
development of the psychological preparation for major surgery.

THE BENEFITS OF COPING SKILLS TRAINING

The preparations for surgery that seem universally effective are cognitive behavioural
techniques that enhance subjective coping and their sense of control (involvement) in the
event (Chap. 2). While most patients benefit in some measure from coping skills
preparation, it is not clear that the benefit gained is enhanced coping skills (Salmon,
1992). Most patients are 'prepared' for surgery in the time between admission and the
surgery itself, often somewhat less than twenty four hours and this time is often shared by
essential pre-operative tests, it is also during this time that subject's anxiety levels are
rising (see chapter on coping above). These conditions must constitute an impediment to
efficient learning at best and sensory overload at worst, which can limit information
processing considerably (Broadbent, 1958). However, since recovery is improved by
coping skills training the patients clearly gain some benefit from the preparation.

SUBJECTIVE PERCEPTION OF CONTROL OVER STRESS

Evidence from the literature on coping skills has suggested that the subject is attempting
to exercise control over the event (Auerbach, 1989; Picket and Clum, 1982). Subjective
'loss of control' over stressful events is an important variable in psychosomatic disease
(Weiss, 1970 and Horkarsan et. al., 1971; Cobb and Rose, 1973; Shadish et. al., 1981;
Wallston et. al., 1987). Salmon (1992) has suggested that subjective sense of "loss of
control" during recovery from surgery may increase the stress of surgery and alter the
subjective coping response.

Taylor and Anmer (1996) demonstrated that victims of severe trauma would make
considerable effort to reinstate 'control' over events. Subjects achieved a sense of control by the smallest of actions, establishing communication however minimal with helpers or achieving small movements to 'assist' themselves and not be reliant on others e.g. sitting up unaided or raising a damaged limb to allow for ease of examination.

Stress reduction and improved recovery or sense of well-being is associated with subjective 'perception of control' in aversive situations (Geer, Davidson and Gatchel, 1970; Johnston et. al. 1992). There is some evidence of alterations in the physiological stress response during treatment of severely phobic subjects. Bandura and colleagues (1985) reported that phobic subjects in desensitisation programs who were passive, that is did not perceive any control in their treatment had a changed pattern of plasma catecholamines when small changes in the treatment enhanced their sense of control. The subjective perception of control was enhanced by letting the subjects decide when they were ready to move on to closer association with the phobic object. The plasma catecholamines are raised in response to stress. The perception of control may therefore directly effect the physiological response to surgical stress.

SOCIAL SUPPORT IN PREPARATION FOR SURGERY

A subject's social network is important in providing support during stressful periods. A close and caring network, family, friends or work colleagues can reduce the impact of adversity by making the subject feel valued cared for and by providing material support and encouragement (Cobb, 1976). Stress resulting from several sources has been reduced by social support, work related (Cottington and House, 1987) parenting (Turner, 1981) and bereavement (Berkman and Syme, 1981). Social support may be emotional providing empathy and care as in bereavement; enhancing esteem by positive regard and encouragement as might occur when a subject is anticipating a career enhancement; tangible providing material help as when loaning money or information support simply giving information and feedback. Almost any preparation for surgery may be seen to
contain a substantial amount of social support. Information is given, comfort and caring is provided by the professionals, tangible help takes the form of provision of analgesia or aids to recovery e.g. crutches and encouragement and positive feedback occur almost naturally during patient staff interactions.

A hospitalised patient is cut off from their normal social network. Family and friends are physically at a distance and only available by telephone or during visiting hours. This dislocation of the social network may be exacerbated by the patient who is a member of others social network and may seek to protect close family. In preliminary assessment of patients worries in hospital (Pilot Study, Chap. 4) it was clear that some patients distanced themselves from close family members, keeping worries to themselves to protect their relatives.

Medical and nursing staff are an obvious replacement for the usual social network. The quality of the relationship may be rather poor for two principle reasons. Good emotional and esteem support will occur only with close and trusted family or friends, this takes time to establish. Professionals rarely have this time although they tend to be very caring and understanding individuals. The patients perception of the staff and their role in the event may also compromise social support. The assessment of patient worries (Chap. 4) revealed a tendency for patients to regard staff as too busy to seek support from. The patients seemed concerned that their seeking support, especially emotional support from the staff may distract them from attending to the material needs of other patients. Schelsenger et.al. (1980) found the anaesthetist appeared to provide a broad range of support particularly during the pre-operative visit.

It is not clear why the anaesthetist should be the prime source of social support. No doubt caring individuals they supply information, will supply material (life) support during the surgery and probably encourage the patient by a positive approach to outcome. However it is not clear that this response is peculiar to anaesthetists, surgeons and nursing staff
probably providing similar broad ranging support. If the social support is not 'person' dependent then the timing of the intervention may be critical. The anaesthetist visits pre-operatively, often on the day of the operation this may indicate a time when patients are feeling most vulnerable and isolated and most receptive to social support. Preparation for surgery occurs pre-operatively and any treatment effects may be attributable in part to social support as to the treatment itself as Salmon (1992) postulated.

PERCEPTION OF CONTROL AND SOCIAL SUPPORT AS PREPARATION FOR SURGERY

The aim of all preparation for surgery is to reduce the surgical stress response and enhance recovery. Preparation for surgery may improve the patient's sense of well being, it may also calm them and encourage cooperation with the staff. Successful preparation for surgery should also reduce the psychological and physiological response to surgery.

Above we have discussed the effects of subjective perception of control on stress reduction. It has been shown to enhance 'well-being' (Johnston, 1992) and to alter plasma catecholamines (Bandura, 1987). The principle component of the pre-operative intervention to be studied will be 'perception of control'. Given the possible importance of social support in any preparation for surgery perception of control will be compared with social support. Psychological and physiological variables of surgical stress will be measured pre-operatively, during surgery and post-operatively.

Overcoming the passive compliant effect of caring in the hospital ward without compromising the essential treatment is difficult. However it may be possible to give the patient a sense of control and active participation in their recovery by combining a well used coping skill (relaxation) with counselling which encourages a sense of real involvement in the healing process. The first aim of this study is to assess the post-operative subjective psychological and endocrine effects of a preparation for surgery that
uses relaxation to enhance a perception of control in coronary surgery patient. Secondly, to establish how much of the observed effect, if any can be attributed to social support. Thirdly, to assess the relationship between the post-operative physiological and the subjective psychological variables.

Prior to embarking on the study of the relative efficacy of perception of control as a preparation for surgery it is important to explore current preparation for major surgery. This will indicate the most appropriate time to introduce a new technique and the aspect of experience that will be the focus of the intervention.

**Developing the Intervention**

The psychological intervention, 'Perception of Control', is based on Bandura's theory, Self Efficacy and Empowerment. Self efficacy is defined as a person's belief in their own abilities to mobilise motivational, cognitive and behavioural resources required to exercise control over an event (Bandura, 1986). Psychological (Ozer and Bandura, 1990) and physiological (Bandura, O’Leary, Barr Taylor, Gauthier and Gossard, 1987, Bandura, Cioffi, Barr Taylor and Brouillard, 1988 and Wiedefeld, O'Leary, Bandura, Brown, Levine and Roska, 1990) stress response has been shown to be related, in part, to self efficacy. An event is perceived as a threat when an individual cannot exercise any control over it, either because of the magnitude of the event or because they feel they lack the resources to overcome it. Assessment of the event, challenge or harm evoked different subjective coping responses (Folkman and Lazarus, 1985). There is clearly a strong association between self efficacy, control and subjective coping responses. Any preparation for surgery intended to induce a sense of control over events must also account for subjective coping responses.

For most people major surgery is a threatening event which they perceive as being totally beyond their resources to alter. Inducing or enhancing an individual's 'perception of
control' therefore, involves either encouraging a re-evaluation of the event or improving their perception of their self efficacy. In practice it probably involves both. The psychological intervention need not necessarily effect actual control over the event but must enhance feelings of self efficacy by imparting a perception of control. This is an important consideration in preparation of patients for major surgery when actual control by the patient is limited and greater participation by the patient may lead to potentially damaging conflict with the medical professionals.

Perception of control should reflect 'self-efficacy' rather than the more generalised 'locus of control' (Wallerstone et. al., 1987). Perception of control is best achieved if it is directed at a specific behaviour, or closely related set of behaviours appertaining to a focussed event (Bandura, 1977). To identify a specific event on which to focus the intervention a short pilot study was undertaken.

The main aim of this study was to ascertain from patients themselves when they felt most out of control (focussed event) at a time when the intervention (relaxation) could be utilised with no or minimal interference from existing preparation of the patient. A second aim of the study was to assess when patients needed more social support. The pilot study was also a means of identifying objective (nurse) and subjective indices of recovery.

CURRENT PREPARATION FOR CARDIAC SURGERY

The preparation of a patient for coronary surgery is extensive. A few days prior to admission patients attend the ward as day cases to complete a battery of general health checks, e.g. X-rays, echo-cardiograms etc. This also gives them a preview of the ward environment, introduces them to the principal nursing and paramedical staff and allows them to address any problems, they may have, regarding the admission, e.g. visiting arrangements. On admission, usually the day prior to surgery, they are interviewed by the
medical team, the ward and intensive care nursing staff and the physiotherapists. They are encouraged to watch a video presentation about the intensive care unit and to ask questions. Any close relative or friend in attendance is invited to watch the video also. This is considered useful if the relative is proposing to visit the patient in the early post-operative period.

Given the comprehensive routine preparation the introduction of a psychological technique to instil perception of control had to be carefully targeted. The pilot study consisted of ward visits, interviews with patients and staff and examination of the ITU video.

Method

On four days, in two consecutive weeks the investigator attended the cardiac ward and ITU at St. Bartholomew's Hospital. All patients who were admitted for, or who had just had coronary artery bypass graft surgery were asked to take part in the study. Five patients, 4 male and 1 female agreed to take part.

PREOPERATIVE AND EARLY POSTOPERATIVE PERIOD IN ITU

Three patients (1F & 2M, mean age 67yrs) were seen pre-operatively. The nursing staff explained to the patients that the general preparation for cardiac surgery was being monitored to see if improvements could be made and that an independent researcher would 'sit in' and take notes during their nursing interviews. The researcher would also visit ITU when they returned from theatre to monitor nursing practice during the early post-operative period. The patients, having consented to take part, were introduced to the investigator who stayed with the group during their routine preparation, taking notes and watching the video. The pre-operative patients were not questioned by the investigator.
The following day the investigator visited the ITU, and noted the events occurring in the early post-operative period. Special attention was paid to the first awakening of the patients and their reaction to mechanical ventilation.

POSTOPERATIVE INTERVIEWS

Two male patients, aged 26yrs and 60yrs, agreed to be interviewed 3 days post-operatively. The investigator told the patients that she was assessing the preparation of cardiac patients with a view to making improvements as necessary. The patients were then asked if they would take part in a short interview about their current admission. The interview was prompted by the following questions.

1) How do you feel at the moment, generally (physically) and your current mood (feelings)?
2) How did you feel just before the operation?
3) Did you talk to someone about your feelings?
4) Was it helpful, how did it help?
5) Was there anything you would rather not have discussed?
6) How did you feel when you first woke up after the operation?
7) Can you tell me about the post-operative pain? How bad it was, when you first felt it?
8) What did you do when this pain began?
9) Is there anything at all, no matter how small or silly it sounds, that would have made this experience better for you?

NURSE DISCUSSIONS

The nurses of the ITU agreed informally to discuss the patients’ early recovery, the indices of that recovery relevant to them and their general thoughts on improvements that
might be achieved given the limitations of the ITU environment.

Figure 8:1 An overview of the Procedure

<table>
<thead>
<tr>
<th>1 day pre-op (1m/2f)</th>
<th>day of op (1m/2f)</th>
<th>3 days post-op (2m)</th>
<th>12 days after 1st visit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation of the hospital preparation for surgery. Nurse and Physio introduction for patients. ITU video presentation</td>
<td>Observation of patients in ITU on their return from surgery. attention paid to interaction between nurse and sleeping patient, patient responses to mechanically aided respiration and the patients first awakening after anaesthesia.</td>
<td>Interviews with patients who are recovering from surgery and returned to the general ward.</td>
<td>Discussion with ITU nursing staff. Issues include: - Indices of recovery important to nurses; postoperative pain, especially recognition of pain behaviours in semi-conscious patients and the ITU environment, limitations and possible improvements.</td>
</tr>
</tbody>
</table>

Results

The pilot investigations were unsuitable for formal analysis. However, the notes taken during the pre-operative preparations, the nursing discussions and the transcriptions of the post-operative interviews (Appendix 4) were reviewed by two clinical psychologists and then discussed with the investigator. The principal findings are outlined below:

Preoperative preparation: The patients are interviewed separately by the junior medical staff and routine notes taken. There is an opportunity for the patients to ask questions. Any questions asked tend to be medical, or reassurance is sought regarding the post-operative pain control. The patients as a group, with close relatives in attendance, are then addressed by the nurses and physiotherapists. The preparation is comprehensive, all aspects of the procedures are explained, occasionally repeated. Besides procedural
information some effort is made to describe sensation, e.g. the pre-medication will make you feel drowsy, relaxed and sleepy, if you try and move suddenly, sit up, you might feel a bit dizzy. Patients' questions here seem to relate to visiting arrangements, particularly to the ITU and pre-operatively on the day of operation. Visitors are acceptable to the nursing staff on both occasions, although patients seem to want to deter their relatives from visiting. Discussion occurred between the patients and their relatives. The patients were concerned that their relatives would be too upset seeing them immediately prior to the operation or ventilated post-operatively. The patients questioned the nurses about their appearance in ITU but less to reassure themselves than to discourage the relatives from visiting. Following these discussions the patients and relatives watched the ITU video presentation, with a physiotherapist present. They were encouraged to ask questions after the video. The majority of questions related to post-operative pain. The next most important issue seemed to be artificial ventilation, the patients not liking the notion of being out of control. This notion of loss of control was then generalised to the pre-medication, being anaesthetised and the early post-operative period.

**ITU:** On return from the operating theatre the patients are settled on the ventilator and assorted monitors. The nurse always speaks to the patient before any procedure which the patient may feel. The patients wake approximately 2 to 4 hrs after arrival in ITU, although some spontaneous movement occurs before this. On waking the patients tend to 'fight' the ventilator and are generally agitated. All patient movement is responded to by the nurses who speak to the patient by name and reassure them. 'Let the machine breath for you, don't worry, everything is fine' are the most common phrases. The patients were sedated to reduce the ventilator distress. Although in two cases relatives waited outside the ITU for news, they did not wish to see the patient at this time.

**Post-operative Interviews:** Both patients said they found all the pre-operative preparation interesting and helpful. Both also described their anxiety and isolation on the day of operation prior to surgery and both were glad when the process began with transportation
to theatre. Their other major concern was post-operative ventilation. They both described
the feelings related to assisted respiration as frightening, no control over breathing,
swallowing and unable to speak. They praised the ITU staff for their reassurance and
support. Both patients recalled some pain, but thought it was well controlled initially.
The pain was apparently worse when they returned to the cardiac ward but they felt more
able to cope with it. The older patient described persistent fatigue post-operatively and
felt he could not recall all the information he had been given pre-operatively.

*Nurse Discussion:* The nurses suggested they would make an assessment of the patient’s
recovery at about 5 hours post-operatively. Besides completing a pain assessment they
would also comment on the physical, neurological and psychological state of the patient.
They explained that on some occasions they felt the patient was not recovering well but
could not specify a reason, the term 'can't quite put my finger on it' was suggested.

**Discussion**

The purpose of this investigation was to examine the current preparation for major
surgery from the patients' perception. To identify focal events or times when the patients
would be receptive to additional psychological intervention and what form of
intervention would be beneficial.

The pre-operative preparation of the patients was comprehensive, the staff were
understanding and encouraged questions. However, the patients seem slightly over
burdened with information and slightly in awe of the whole procedure. This was
consistent with the notion of major surgery being perceived, quite understandably, as an
event of such magnitude to constitute a threat. Apart from pain and the ventilation
procedure patients questions were limited at this time. Although they seemed reluctant to
allow their relatives to visit them in ITU and some patients discouraged visiting
immediately prior to the surgery.

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The patients interviews demonstrated that they recalled some of the preparation post-operatively. They also referred to a period of isolation prior to the operation on the day of surgery. They felt that the staff were allowing them to rest quietly when they were not engaged in any preparation e.g. bathing and changing into a hospital gown. Since the majority of patients had no visitors at this time they were acutely aware of the isolation and seemed to miss the social support.

In ITU the principal problem was a tendency to fight the ventilator, biting the tube and general agitation. These behaviours suggest that despite inordinate difficulties and gross physical frailty the patients were trying to restore some measure of personal control and has echoes of reported behaviours in response to trauma (Taylor and Anmar, 1996) This 'ventilator' distress was recounted by the patients interviewed post-operatively as well as being observed by the investigator. Within four hours of the operation the patients did respond to their names and questions about pain. Taken together the self reported distress and the observed patient nurse interaction suggested that patients would be receptive to any psychological intervention at this very early post-operative stage.

The patients clearly felt most out of control during assisted ventilation in the initial post-operative period but were receptive enough utilise relaxation as a coping response. The chosen focal event for perception of control was therefore assisted ventilation.

To exclude the effects of social support from the treatment effects of perception of control it was necessary to include a control group of subjects who received the same amount of attention as the treatment group. During early recovery in ITU patients were isolated from their normal social network although the nursing staff did supply some support and assistance. There was a second time of social isolation for the patients, often self imposed, on the day of operation prior to the surgery. These two occasions would form the focus for social support.
Enhanced perception of control would be achieved by relaxation training, a reliable coping skill. The relaxation would be targeted to the muscle groups related to breathing and accompanied by counselling which emphasised the patients role in 'breathing with the ventilator'. Thus the relaxation could form a specific behavioural set relating to a focussed event and reflect 'self efficacy' rather than a more nebulous 'locus of control'. Although the relaxation of the respiratory muscles during ventilation might make the subjects feel more comfortable there would be no effect on assisted respiration. The relaxation would be taught by the investigator pre-operatively on the day prior to surgery and rehearsed again on the day of surgery. Audio-taped instructions would be left with the pre-operative patient for practice. Taped instructions would be played to the patients in ITU as they woke from the anaesthetic.

Social support subjects would be seen at the same schedule, but their instructions would be to leave everything to the highly experienced staff. They too would have taped instructions which would reflect the need to rely on the staff to 'do everything for them'.

The nurses were willing to provide an objective recovery and pain measure. A 'nurse recovery' questionnaire was devised. (Appendix 5)

Conclusion

During the investigation into the preparation of patients for major surgery it was very clear that the patient disliked the loss of control and suffered a sense of social isolation. Curiously the isolation was sometimes self imposed usually at times when the patient felt most vulnerable and out of control. The patients clearly gained some social support from the staff and other patients but it was not clear that either the patient or the staff were aware of this interaction. The patients also clearly struggled to regain control at the first opportunity.
This investigation demonstrated a relationship between social support and control over events. The patients divorcing themselves from their social network at the point they felt most out of control. These were the focal points to introduce the psychological intervention which would enhance subjective perception of control. It was also important to establish how much of the observed effect of the treatment was due to the enhanced social support.

This investigation informed the choice of intervention thought to be most beneficial to the major surgery patient. While it would have been ideal to teach the ‘relaxation’ to the perception of control group prior to admission for surgery the admitting procedure at the time of the study made this impossible. However since the ‘social support’ schedule was fitted to the times that patients felt most isolated, immediately pre-operatively and in ITU, the other groups preparations mirrored this schedule. The following chapter examines the efficacy of perception of control as a preparation for major surgery.
PERCEPTION OF CONTROL AS PREPARATION FOR MAJOR SURGERY: THE PSYCHOLOGICAL AND PHYSIOLOGICAL OUTCOMES

Introduction

The preceding Chapter Eight reports the findings of a preliminary study to enable the development and timing of a psychological preparation for cardiac surgery. This chapter reports the effects of that intervention.

The literature relating to preparation for surgery, coping and the concept of perception of control has been discussed in the introduction at the beginning of the previous chapter, 'developing the intervention'. In this section the important points are reiterated and related to the results of the study (Chap. 8) and to the measurements used to assess recovery.

Preparation for surgery frequently includes psychological variables other than the those inherent in the treatment e.g. social support inherent in professional/patient interaction. Sadly as Salmon (1992) points out there is no measure of the subjective effect of these treatments. We do not know precisely what 'benefit' the subjects gain from individual treatments. For example, patients are given detailed information regarding their post-operative pain control which reduces their pain. Is the mechanism underlying this attenuated pain the reduction of patient anxiety, the sense of control over an aversive event or the social support inherent in the information giving? These are not new questions and studies discussed in 'Developing the Intervention' (Chap. 8) have addressed them. The mechanism underlying psychological treatments has not been explored neither has the interactions between the variables been assessed.

COPING SKILLS AS A FORM OF CONTROL

Manyande and her colleagues (1992) demonstrated a relationship between high levels of pre-operative anxiety and less adaptive coping. Further evidence of the pre-
operative anxiety, coping relationship was reported in the study of 'coping response to surgery' (Chapter 5). Ho and colleagues (1998) found 'coping skills' the most effective treatment in reducing psychological and physiological stress. Coping skills were considered to operate through the mechanism of control (Picket and Clum, 1982). Trauma patients attempt to regain some control over events (Taylor and Anmer, 1996). Inability to exercise control over events has long been known to result in psychosomatic diseases (Weiss, 1970).

Hospitalisation and surgery by their very nature reduce or eliminate the subject's control over events. Restoring subjective control would be difficult and potentially dangerous for surgical patients. There is, however, evidence that subjective 'perception of control' is sufficient to reduce psychological aspects of stress (Johnston et.al., 1992) and the physiological aspects of stress (Bandura et.al., 1988).

The aim of the study reported here was to further examine the importance of subjective perception of control as a psychological factor in preparation for surgery.

SOCIAL SUPPORT

Inherent in the teaching of a coping skill is increased attention to the patient by key staff. These caring professionals frequently replace the patients social network from whom they are temporarily separated (Chap. 8). Pre-operative preparation for surgery may well be providing social support (Salmon, 1992). Social support has been shown to alleviate stress in a variety of situations (Cobb, 1976; Cohen, 1985; Berkman and Syme, 1981). To establish whether perception of control was effective in altering the stress response it was important to exclude any effect of social support.

THE EFFECTS OF PREPARATION FOR SURGERY ON PHYSIOLOGICAL STRESS VARIABLES

The physiological changes associated with the stress response (Chap. 1) are considered detrimental during recovery and may be harmful (Kehlet, 1984; Hall,
These physiological changes may be induced psychologically where individuals anticipate stress (Toison et al., 1965). Successful preparation for surgery should reduce the stress response, both psychologically and physiologically. Although the mechanisms underlying the modification of physiological responses by psychological means are as yet unknown, it is possible to examine the relationship between a preparation for surgery and common physiological factors of stress, e.g., endocrine changes. Coping skills training has been shown to enhance the patient's subjective well-being (Manyande et al., 1992) and reduce the post-operative endocrine response (Ho, Hashish, Salmon, Freeman and Harvey, 1988). It is important to ascertain which factors of preparation for surgery are effective in changing plasma levels of stress-related endocrines.

SUBJECTIVE CONFIDENCE IN THE TREATMENT

Subjective preconceptions about an event are influential on the stress response (Helman, 1979). In chapter six we demonstrated a close association between anticipation (preconceptions) anxiety and post-operative pain. Since preconceptions influence experience then a patient's confidence (preconception) in a treatment will probably influence the efficacy of that treatment. Perception of control by its nature relies on the patient's faith in the treatment. It is important to ascertain a patient's confidence in the pre-operative preparation.

TIMING AND FOCUS OF THE INTERVENTION

A principal finding of the study in Chapter Eight was the patients sense of bewilderment and isolation. A great deal of effort went into the preparation of the patient, information being given clearly and repeatedly. The staff encouraged questions and gave reassurance. Video presentations introduced the patients to intensive care. In general the patients were encouraged to form an accurate and detailed picture of the whole procedure. Surprisingly the patients asked few questions and seemed not to want their relatives to visit immediately prior to the surgery or
during the period in ITU. Clearly the preparation may have been comprehensive and so the patients need not seek more information, but they did not even seek clarification. The self induced isolation at perhaps the most anxious stages of the procedure was also curious. It was clear however that the patients were bewildered and did feel alone despite all efforts alleviate these responses.

The preparatory study (Chap. 8) also demonstrated a focus of attention on the mechanical ventilation. The patients talked about it both pre and post-operatively. There was a very strong sense of being out of control during assisted ventilation and the behaviours observed during the procedure suggested that the patients were agitated and trying to reassert their spontaneous breathing despite the ventilator and their own weak position.

The preparatory study clearly identified the 'focussed event' for the perception of control, the assisted ventilation. It also identified the period when the treatment could be taught which would coincide with times that the subjects would be open to social support. The treatment would consist of relaxation training that concentrated on the respiratory muscles which would help the patient to control the urge to fight the ventilator. The relaxation would in no way alter the assisted respiration but the subjects were encouraged to feel that they had more control over their treatment. Social support consisted of attention paid to the subjects by the investigator at the time of their greatest sense of isolation. Subjects would be reassured about the procedure and encouraged to rely on the staff to do everything for them.

POST-OPERATIVE FATIGUE

The study of patients undergoing coronary artery surgery (Chap. 8) highlighted the sense of fatigue post-operatively, particularly in the older patient. Post-operative fatigue has been examined and contrary to predictions has not been shown to arise from the physiological impairment, immobility and poor nutrition associated with surgery (Christensen, 1982 and 1987). The literature suggests that post-operative
fatigue may be associated with affective state similar to chronic fatigue states e.g. post viral fatigue (Wesley and Powell, 1989). It was important therefore to further explore the post-operative fatigue noted by the cardiac surgery patients. Consequently measurement of post-operative fatigue was included in the post-operative assessment of the patients.

Associated with fatigue is a reported loss of cognitive abilities, lack of concentration, poor coordination etc. Temporary loss of cognitive abilities or diminution of mental skills has been reported following cardiac surgery (Newman, 1989). Therefore two simple cognitive skill tests were included in the post-operative assessment.

The principal aim of the study reported here was to assess the post-operative psychological and endocrine effects of a preparation for surgery that uses relaxation to enhance a perception of control in coronary surgery patient. Secondly, to establish how much of the observed effect, if any can be attributed to social support. Thirdly, to assess the relationship between the post-operative physiological the subjective psychological variables.

HYPOTHESIS

It is predicted that those subjects who perceive a greater personal and active control over events during their admission, will respond to surgery with a diminished physiological (endocrine) response and improved subjective assessment of their recovery. This modified stress response will not be attributable to social support.

Method

SUBJECTS

Consecutive patients admitted to a London teaching hospital for elective coronary artery bypass surgery over a 18-month period were asked to take part in a study which
aimed to assess the effect of peri-operative anxiety (thoughts and feelings) on circulating catecholamines (stress hormones). Three categories of patient were excluded:

1) Patients considered by the nursing and medical staff to be too distressed or confused by inclusion in the study.
2) Minors; patients under 16 yrs of age.
3) Patients whose first language was not English and who did not have sufficient command of English to fully understand the questionnaires.

It was important and an ethical consideration not to increase the stress of the clinical sample therefore patients were not pressed to take part in the study. Nor were they obliged to give a reason for refusing. The majority of patients readily agreed to take part in the study only five refusing. Where reasons for refusing were given they included:

1) Already taking part in a separate investigation.
2) Too frightened.
3) An attendant relative advised the subject against taking part.
4) The subject had some disability, not related to the surgery, that they thought would make participation difficult e.g. Too deaf.

Of eighty five patients approached, eighty agreed to take part of whom; one had surgery in addition to their coronary artery bypass, one received a non standard anaesthetic technique, four were lost to the study because of cancellation or postponement. The final group consisted of sixty four males and ten females with a mean age of fifty seven years (range 34-75). The remaining 74 patients were randomly assigned to receive coping skills training (N = 21 males, 4 females; mean age: 58 range 46 -74), emotional support (N = 22 males, 3 females; mean age: 56 years range 34 - 74), or to a no-treatment control group (N =21 males, 3 females; mean age: 61 range 37 - 75).
Table 9.1 Treatment Groups

<table>
<thead>
<tr>
<th></th>
<th>Perception of Control</th>
<th>Social Support</th>
<th>No Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age range; mean (sd)</td>
<td>46-74; 58 (7.3)</td>
<td>34-74; 56 (9.9)</td>
<td>37-75; 61 (9.7)</td>
</tr>
<tr>
<td>Gender</td>
<td>21m 4f</td>
<td>22m 3f</td>
<td>21m 3f</td>
</tr>
</tbody>
</table>

PSYCHOLOGICAL PREPARATION

*Coping skills training:* (Perception of Control) Patients in this group were visited individually by the researcher on the preoperative day, then immediately before pre-medication on the day of operation and twice during the first 36 hours post-operatively. Each visit lasted about 30 minutes. In the initial interview patients were encouraged to focus on the early post-operative period when they would be ventilated. They were given a short section of endotracheal tube to examine and hold in their mouth in a way approximating the ventilator position. The sensations associated with assisted breathing were explored, particular attention was paid to the sensation of "fighting the ventilator" and the discomfort and distress that may result. To combat this sensation patients were told that relaxation of the head, neck and chest muscles would help them control the desire to "fight" and facilitate the assisted breathing. Patients were instructed in a relaxation technique based on progressive muscular relaxation, but without instructions for muscle tensing. They were asked to assume the supine position they would be in to be ventilated and encouraged to breath through their practice tube while relaxing. An audio tape of these instructions, including references to the patient "helping themselves to breath with the ventilator by relaxation" was left with the patients to practise the technique. A second audio-tape of these instructions were played to the patient approximately 2 hours after arrival in intensive care when they were first waking from anaesthesia. Transcription of the tapes are included in Appendix 6.

*Social support:* Patients were visited by the researcher according to the same schedule as the coping skills group. Patients were encouraged to express and discuss their
worries and feelings about their hospitalisation and surgery. The researcher reflected
these concerns, showing that she understood and accepted them as natural. She
emphasized her own concern for the patient's well-being and at the first visit,
explained that she would follow the patient through their hospital stay. Approximately
2 hours after arrival in intensive care when they were first arousing from the
anaesthetic, these patients were played an audiotape of the researcher's voice
reassuring the patient that the operation was complete, identifying and explaining
sensations that the patient might be experiencing and that they should simply let the
staff do everything for them.

Control: The no-treatment control was visited by the researcher only to monitor
completion of questionnaires (see below).

SURGERY AND ANAESTHESIA

The patients were starved for at least 6 hrs pre-operatively. Pre-medication by
papaveretum (15-20mg) and hyoscine (0.3-0.4mg) was administered intramuscularly
60-90 minutes before arrival in the anaesthetic room. Immediately before anaesthesia,
patients were monitored with ECG and pulse oximetry and peripheral venous and
radial arterial cannulae were inserted. Anaesthesia was induced with thiopentone
(50-70mg) and phenoperidine (3-5mg) intravenously. Intubation of the trachea was
facilitated with pancuronium (8mg) intravenously. Mechanical ventilation was
instituted with 50% nitrous oxide in oxygen with enflurane (0-1%)and adjusted to
maintain an end-tidal PCO$_2$ of 4.5-5.0 kPa. Three 16g cannulae were inserted into the
right internal jugular vein. A nasopharyngeal and oesophageal temperature probe and
nasogastric tube were inserted. One unit of blood was removed and replaced with
500-1000mls Hartmanns solution. Analgesia was maintained with further increments
of phenoperidine. Following surgical preparation, a median sternotomy was
performed. The patients were heparinised with 300i.u./kg, the aorta and right atrium
were cannulated and cardiopulmonary bypass instituted. The patients underwent
hypothermic cardiopulmonary bypass at 28°F for the duration of grafting of two or
three coronary vessels. Asystole was achieved with 10mls/kg of ice-cold Ringers solution containing 20mls of St. Thomas' Solution (16mmols of potassium, 16mmols of magnesium and 1mmol of procaine). Ringers and St. Thomas' solution (1-2mg/kg) was given immediately prior to 'bottom' end anastomosis between coronary artery and graft. All patients were taken off cardiopulmonary bypass without requiring pharmacological support. Heparinisation was reversed with protamine 1.5mg per 100i.u of heparin. Patients were removed to ITU where they were ventilated for at least 6 hours.

MEASUREMENTS

Subjective Questionnaires: Immediately after consent, patients completed the following:-

~ Trait Anxiety (Speilberg,1970)
~ Type 'A' personality scale (Bortner, 1969). This scale measures fourteen behaviours consistent with Type ‘A’ personalities. A seven point scale is anchored by two extremes of behaviour e.g. ‘Never late for appointments/ Casual about appointments’ subjects rate their behaviour on the scale.
~ Response to Surgery Questionnaire (RSQ) this questionnaire assesses subjective responses to surgery, see developing the RSQ (chapter, 4).
~ Zung Anxiety and Depression Scale (Zung,1974). This questionnaire consists of two scales, anxiety/ depression of six items each and a four part response scale. Subjects respond to each item according to how they feel ‘right now’.
~ The Cognitive Failures Questionnaire (Broadbent, 1982), this questionnaire assesses minor cognitive errors in perception, memory and motor function e.g. ‘how often do you enter a room and forget what you came in for’. A second part, to be completed by spouse or close other is an objective measure of minor cognitive failings.
~ A 'Confidence Scale', a ten point scale (anchored; 1 no help at all - 10 very helpful) to indicate their confidence in the pre-surgical preparation. This scale served to identify those patients who achieved 'perception of control'. Those with no confidence in the psychological treatment were unlikely to enhance their sense
of involvement in their recovery. In the case of the "no treatment" controls patients were asked to indicate whether setting down their feelings by answering the questionnaires was helpful.

~ Pain VAS scales. On the first occasion that the patients reported pain post-operatively they completed visual analogue scales to record the intensity of the pain and the distress it was causing them. The pain VAS was repeated four days post-operatively. At the same time subjects were asked to recall their first instance of pain mark a separate VAS (recalled pain is reported in chapter 7).

~ Anxiety and depression were measured on days one and four post-operatively.

~ A recovery inventory (Wolfer & Davis, 1970) was added to each post-operative assessment.

~ Fatigue scale to measure mental and physical fatigue (Wessely, 1989) was added to each post-operative assessment. This asks patients to evaluate their fatigue in relation to 'how they felt before' providing ratings in relation to their state before surgery.

~ The Pain Response Questionnaire was added on the first post-operative day.

~ The RSQ on the fourth post-operative day.

One month following surgery approximately 21 days after discharge (for completion at 30 days) each subject was sent the anxiety and depression questionnaire and cognitive failure questionnaire (self and other).

Objective questionnaire: On the first occasion post-operatively that the subjects indicated pain the investigator or nurse completed a visual analogue scale assessing the pain intensity and distress. On the first and fourth post-operative days the nursing staff completed the nurse recovery assessment.

Neuro-psychological assessment: Following major surgery patients often complain of failure of cognitive function, loss of concentration, short attention span and an increase in occurrence of minor mistakes. Two simple tasks were devised to assess loss of cognitive ability in the early post-operative period.
1) Digit span; subjects are asked to recall a short sequence of numbers to assess short term memory function. The patient's base line digit span was established pre-operatively and assessed immediately post-operatively, when the patient was able to communicate and in early recovery.

2) Perceptual motor ability was measured by placing different shapes into holes against the clock. This test was repeated on the same schedule as the digit span.

The pre-operative and first post-operative questionnaires were completed by all patients. All but one patient completed the questionnaires on the forth post-operative day and 58 (79%) returned completed questionnaires 30 days post-operatively.

*Catecholamines and cortisol*; Blood samples were drawn (A) at 18.30 hours on the pre-operative day (B) immediately before induction of anaesthesia (C) immediately after median sternotomy (D) when the patient was rewarmed following cardiopulmonary bypass (E) 2 hours after removal to the intensive care unit (F) 2 hours after disconnection from the ventilator (which normally occurred at 08:00 hours on the post-operative day) (G-I) at 18:30 on the first, second and third post-operative days. All samples were taken from resting patients and drawn into heparinized tubes. Samples A, B and I were normally taken from a peripheral vein through a cannula inserted at least 30 minutes prior to sampling. All other samples were drawn from a central line and frozen at -70°C until assay by HPLC for epinephrine (adrenaline) and norepinephrine (noradrenaline).

Figure 9:1 Sample Time for Plasma Levels of Catecholamines and Cortisol

<table>
<thead>
<tr>
<th>pre-op.</th>
<th>per-op.</th>
<th>post-op.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td><strong>B</strong></td>
<td><strong>C</strong></td>
</tr>
<tr>
<td>18.30</td>
<td>prior to</td>
<td>post median</td>
</tr>
<tr>
<td>1 day pre-op.</td>
<td>anaesthesia</td>
<td>sternotomy</td>
</tr>
<tr>
<td></td>
<td>on</td>
<td>on</td>
</tr>
<tr>
<td></td>
<td>2 hrs</td>
<td>2 hrs</td>
</tr>
<tr>
<td></td>
<td>after</td>
<td>after</td>
</tr>
<tr>
<td></td>
<td>2 hrs</td>
<td>18.30</td>
</tr>
<tr>
<td></td>
<td>after</td>
<td>after</td>
</tr>
<tr>
<td></td>
<td>removal</td>
<td>removal</td>
</tr>
<tr>
<td></td>
<td>from</td>
<td>from</td>
</tr>
<tr>
<td></td>
<td>arrival</td>
<td>arrival</td>
</tr>
<tr>
<td></td>
<td>in ITU</td>
<td>in ITU</td>
</tr>
<tr>
<td></td>
<td>18.30</td>
<td>18.30</td>
</tr>
<tr>
<td></td>
<td>1 day</td>
<td>2 days</td>
</tr>
<tr>
<td></td>
<td>post-op.</td>
<td>post-op.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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### Figure 9.2 Overview of the Psychological Procedure

<table>
<thead>
<tr>
<th>Intervention groups</th>
<th>1 day pre-op.</th>
<th>pre-op. day of op.</th>
<th>post-op. day of op.</th>
<th>1 day post-op.</th>
<th>4 days post-op</th>
<th>1 month post-op.</th>
</tr>
</thead>
<tbody>
<tr>
<td>perception of control</td>
<td>relaxation training + tape</td>
<td>relaxation with tape.</td>
<td>postop relaxation tape. pain vas</td>
<td>anxiety/ depression, fatigue, recovery inventory, PRQ, digit span, sensory motor.</td>
<td>anxiety/ depression, fatigue, recovery inventory, PRQ, digit span, sensory motor.</td>
<td>anxiety/depression, cognitive failure self and others</td>
</tr>
<tr>
<td>social support</td>
<td>emotional support + tape Type A, trait anx. Anxiety/ depression, RSQ, confidence scale Base line Cognitive failure, digit span and sensory motor</td>
<td>emotional support tape. pain vas</td>
<td>postop support tape. pain vas</td>
<td>anxiety/ depression, fatigue, recovery inventory, PRQ, digit span, sensory motor.</td>
<td>anxiety/ depression, fatigue, recovery inventory, PRQ, digit span, sensory motor.</td>
<td>anxiety/depression, cognitive failure self and others</td>
</tr>
<tr>
<td>No Treatment</td>
<td>Type A, trait anx. Anxiety/ depression, RSQ, confidence scale Base line Cognitive failure, digit span and sensory motor</td>
<td>no visit</td>
<td>pain vas</td>
<td>anxiety/ depression, fatigue, recovery inventory, PRQ, digit span, sensory motor.</td>
<td>anxiety/ depression, fatigue, recovery inventory, PRQ, digit span, sensory motor.</td>
<td>anxiety/depression, cognitive failure self and others</td>
</tr>
</tbody>
</table>

### STATISTICAL ANALYSIS

Catecholamines were log-transformed (log10 X+1) to normalise distributions. Groups were compared first by one-way analyses of variance on age, start time and duration of surgery, trait anxiety and baseline measures of anxiety, depression,
cognitive failures and catecholamines.

The sex ratio was compared between groups by $\chi^2$.

Then epinephrine, norepinephrine and postoperative emotional state (fatigue, depression and state-anxiety) were analysed by two-way repeated-measures analyses of variance in which a polynomial expansion to quadratic level was fitted to the time factor. Product-moment correlations were used to assess the relationships between fatigue, personality, anxiety, depression, cognitive function, responses to surgery and pain, subjective and objective recovery and pain, and catecholamine levels.

Figure 9:3 Overview of Statistical Analysis

| catecholamines and cortisol log transformed ($\log_{10}X+1$) |
|-----------------|-----------------|-----------------|-----------------|
| $\chi^2$        | 1 way anova     | 2 way anova     | correlations    |
| group x gender  | group x age,    | catecholamines x| fatigue,        |
|                 | surgery (start time, | fatigue,        | personality,    |
|                 | duration) trait anx,| anxiety/depression, | anxiety/depression, |
|                 | type 'A',       | with polynomial contrasts on time factor | cognitive function, |
|                 | anxiety/depression,|                   | RSQ, PRQ,       |
|                 | cognitive failures|                   | recovery.       |

Results

The final sample comprised 64 men and 10 women, with a mean age of 58 yr. Current or most recent employment was professional for 20 patients, skilled for 18 patients and unskilled for 36 patients. The mean time of starting surgery was 12.20 hr (range 08.30-15.30). Mean duration of the anaesthesia was 2.5 hrs (range 2.3 - 2.75). Eighteen subjects admitted to smoking.

CORTISOL AND CATECHOLAMINES

Graphical representation of the mean levels of cortisol (Fig 9:4) epinephrine and norepinephrine (Fig. 9:5) clearly indicate a rise in levels per and post-surgery.
Fig. 9:4 Cortisol
Plasma levels nmol/l

Fig. 9:5 Catecholamines
Plasma levels nmol/l

Sample times: A & B preop, C & D perop, E to I postop

Sample times: A & B preop, C & D perop, E to I postop

Sample times: A & B preop, C & D perop, E to I postop
The levels are falling as recovery proceeds but except for epinephrine the levels do not reach base line by the 3rd post-operative day. The mean values of base line sample 'A', taken late afternoon on the day prior to surgery are within normal limits for epinephrine (0.50 nmol/l), norepinephrine (2.12 nmol/l) and cortisol (195 nmol/l). Plasma levels of the catecholamines and cortisol are raised over base line, sample 'B' drawn immediately prior to induction of anaesthesia. Per-operatively sample 'C' (post sternotomy) and sample 'D' (rewarming) represent the points of greatest and least anaesthetic effect respectively. Post-operatively the catecholamines and cortisol attain their highest levels on the first post-operative day, samples F and G, when all the patients were awake. The pattern of mean values of plasma levels of catecholamines and cortisol are consistent with those reported in the medical literature (Kehlet, 1984) for surgical patients.

Log transformation (log_{10}+1) of the endocrine plasma levels modified the substantial individual variation, and were used in all subsequent analysis.

**PSYCHOLOGICAL PREPARATION**

The psychological preparation groups did not differ on age, employment, surgery (start/duration), smoking or in the type 'A', trait anxiety, pre-operative emotional state, cognitive failures or baseline catecholamine levels (p > 0.05). Neither did any difference emerge post-operatively in anxiety, depression, fatigue, coping responses, self rated recovery and cognitive failure or baseline catecholamine levels (p > 0.05).

**Treatment Groups and Plasma Levels of Catecholamines**

Post-operatively analysis of variance between the pre-operative treatment groups and the endocrines (repeated measure) revealed a significant interaction with epinephrine (adrenalin) (F_{(14,40)} 2.10; p, 0.05). That is the preoperative preparation groups responded to surgery with significantly different patterns of plasma epinephrine (adrenalin). No other differences between the treatment groups on the psychological
And physiological measures emerged in the initial analysis (p>0.05)(Table 9:2)

Table 9:2 Interactive effects; Endocrines, Treatment Groups and Treatment/Confidence Groups (F ratios)

<table>
<thead>
<tr>
<th></th>
<th>Epinephrine</th>
<th>Norepinephrine</th>
<th>Cortisol</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Treatment groups (3)</strong></td>
<td>F(14,40) 2.10*</td>
<td>F(14,39) 1.14</td>
<td>F(14,14) 0.62</td>
</tr>
<tr>
<td><strong>Treatment/confidence groups (6)</strong></td>
<td>F(40,59) 1.43*</td>
<td>F(40,58) 1.02</td>
<td>F(40,59) 1.03</td>
</tr>
<tr>
<td><strong>Contrasts: Linear</strong></td>
<td>F(5,55) 1.23</td>
<td>F(5,55) 1.52</td>
<td>F(5,55) 3.94**</td>
</tr>
<tr>
<td><strong>Quadratic</strong></td>
<td>F(5,55) 3.38**</td>
<td>F(5,55) 0.92</td>
<td>F(5,55) 0.70</td>
</tr>
</tbody>
</table>

The treatment groups were subdivided according to whether they were confident that the preoperative preparation would help their recovery ("confidence scale"). Repeated measure analysis of variance confirmed the interactive effect for epinephrine (F(40,59) 1.43*) as a significant quadratic effect (F(5,55) 3.83**).

The interaction between the treatment, confidence and epinephrine is graphically represented in figures 9:6 and 9:7. Graphical representation of the group means for epinephrine (Figure 9:6 & 9:7) illustrates how for the two significant groups, perception of control/no confidence and no treatment/confidence the curves are opposed. The perception of control/no confidence group shows a rise in epinephrine levels early post-operatively returning to base line levels day 3, (Figures 9:6 & 9:7). The no treatment/confident group shows a fall in epinephrine in the early post-operative period again returning to baseline levels on day 3 (Figures 9:6 & 9:7).

The curves for the social support groups (Figure 9:6) are very similar, although that of the confident group peaks sharply early post-operatively. Statistically the curves are not significantly different and it must be concluded that the two social support groups maintain similar epinephrine levels throughout the post-operative period.
Sample times: A & B preop, C & D perop, E - I postop. PoC, perception of control, SS, social support, NoT, no treatment; con, confident, nocon, not confident.
The observed difference between the other groups was significant, the no treatment group who had confidence in the completion of the questionnaires $t = 2.77$, $p<0.05$ (Table 9:3). The perception of control group who had no confidence in their treatment $t = -3.39$, $p<0.05$.

Table 9:3 Means and 't' Values for the Six Treatment/Confidence Groups and Epinephrine

<table>
<thead>
<tr>
<th>Treatment groups</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>confident</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NoT</td>
<td>SS</td>
<td>PoC</td>
<td>NoT</td>
<td>SS</td>
<td>PoC</td>
<td>PoC</td>
</tr>
<tr>
<td>means (nmol epinephrine)</td>
<td>0.0062</td>
<td>0.0006</td>
<td>-0.005</td>
<td>0.0017</td>
<td>0.0007</td>
<td>-0.0076</td>
</tr>
<tr>
<td>'t' values</td>
<td>2.761*</td>
<td>0.268</td>
<td>-0.223</td>
<td>0.757</td>
<td>0.312</td>
<td>-3.385*</td>
</tr>
<tr>
<td>mean standard error</td>
<td>0.002245</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No effects emerged between the groups and norepinephrine levels or plasma cortisol.

These results clearly indicate that subjects who do not perceive any control have a raised endocrine response to surgery. This finding offers some support of the hypothesis that subjects who perceive control over events have diminished endocrine response to surgery, although rather negatively.

The post-operative recovery appeared to be uniform for all three treatment groups on most of the indices measured here. However some small differences emerged between the treatment groups in pain, cognitive function (digit span and sensory/motor coordination) and cognitive failures as observed by spouses. There were also some minor differences between the group ratings of early recovery by the nursing staff.
Pain

Table 9.4 Mean Postoperative Pain Ratings for Treatment Groups

<table>
<thead>
<tr>
<th>Treatment groups</th>
<th>Pain Intensity</th>
<th>Pain Distress</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 day postop</td>
<td>4 days postop</td>
</tr>
<tr>
<td>No Treatment</td>
<td>28.86</td>
<td>15.67</td>
</tr>
<tr>
<td>Social Support</td>
<td>33.75</td>
<td>6.96</td>
</tr>
<tr>
<td>Perception of Control</td>
<td>38.42</td>
<td>14.33</td>
</tr>
</tbody>
</table>

Self rated pain (intensity and distress) was measured by 100mm visual analogue scale one and four days post-operatively. Overall the ratings of both intensity and distress fell from day one to day four (Table 9:4) however the social support group reported considerably less pain and distress on day four than the other two groups. This observed difference failed to reach significance (F, <1) for either measure of pain.

Cognitive Function

Changes in cognitive function were assessed by a 'digit span' test and a test of sensory/motor coordination which consisted of fitting solid shapes through shaped holes against the clock, subjects were scored for time and number of errors. Their achievements one and four days post-operatively were assessed against their pre-operative baselines.

On the first post-operative day only half the subjects (39) attempted the tests but by the fourth post-operative day (73) all but one subject had completed the tests (Table 9:5). The majority of patients achieved or improved on their base line scores by the fourth post-operative day. However, 20% of the sample were still cognitively impaired at this time. Analysis of variance between the pre-operative scores and the post-operative scores on the fourth day, revealed a slight difference between the groups for 'digit span'. The perception of control group improved their performance while the no
treatment group's performance was impaired. However, the perception of control group were slower and made more errors in the sensory/motor coordination test post-operatively, while the other two groups achieved or improved their pre-operative scores. The observed differences failed to reach significance (F<1).

Table 9:5 Postoperative Performance on 'Digit Span' and Sensory/Motor Coordination Tests

<table>
<thead>
<tr>
<th>Performance, as a percentage of the sample</th>
<th>Test</th>
<th>Better than pre-op</th>
<th>Same as pre-op</th>
<th>Worse than preop</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>digit span</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 day post-op.</td>
<td></td>
<td>22.2%</td>
<td>47%</td>
<td>30.5%</td>
</tr>
<tr>
<td>4 days post-op.</td>
<td></td>
<td>30.1%</td>
<td>49.3%</td>
<td>20.5%</td>
</tr>
<tr>
<td><strong>sensory/motor</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 day pre-op. time</td>
<td></td>
<td>10.3%</td>
<td>74.3%</td>
<td>15.4%</td>
</tr>
<tr>
<td>error</td>
<td></td>
<td>10.3%</td>
<td>61.5%</td>
<td>28.2%</td>
</tr>
<tr>
<td>4 days post-op. time</td>
<td></td>
<td>6.8%</td>
<td>82.2%</td>
<td>9.6%</td>
</tr>
<tr>
<td>error</td>
<td></td>
<td>11%</td>
<td>82.2%</td>
<td>6.9%</td>
</tr>
</tbody>
</table>

No differences emerged between the groups for self reported cognitive failures one month post-operatively. However the objective reports of cognitive failures (by spouses) indicate a clear difference between the groups (Table 9:6). The social support group makes more errors than the no treatment controls who make more errors than the perception of control group (F_{2,50}, 2.85, p<0.06).

No differences between the treatment groups emerged for the nurses observations on the patients recovery, or for self reported recovery.
Table 9:6 Group Mean Values of Self Reported Cognitive Errors Pre-operatively and 1 Month Post-operative and Spouses 1 Month Post-operative Assessment of Errors

<table>
<thead>
<tr>
<th>treatment group</th>
<th>Self assessed cognitive errors</th>
<th>Spouse assessed cognitive errors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean (sd)</td>
<td>mean (sd)</td>
</tr>
<tr>
<td></td>
<td>F ratio</td>
<td>F ratio</td>
</tr>
<tr>
<td>pre-op.</td>
<td>post-op.</td>
<td></td>
</tr>
<tr>
<td>No Treatment</td>
<td>63.63 (14.93)</td>
<td>60.16 (16.67)</td>
</tr>
<tr>
<td></td>
<td>22.95 (4.15)</td>
<td></td>
</tr>
<tr>
<td>Social Support</td>
<td>61.07 (13.50)</td>
<td>59.36 (15.13)</td>
</tr>
<tr>
<td></td>
<td>24.47 (3.43)</td>
<td></td>
</tr>
<tr>
<td>Perception of Control</td>
<td>57.95 (11.79)</td>
<td>52.21 (10.19)</td>
</tr>
<tr>
<td></td>
<td>0.47</td>
<td>21.05 (5.12)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.85</td>
</tr>
</tbody>
</table>

Inter-correlation of Preoperative and Postoperative Psychological Measures and Catecholamines for the Entire Sample

To explore the interactive effects of the factors of the stress response relationships between the measures were assessed by Pearson’s correlation.

No associations emerged between type 'A' behaviours and the other psychological measures.

Trait Anxiety, Pre-operative and Post-operative State Anxiety and Mood and Fatigue

Personality (trait anxiety) predicted anxiety, depression and mental fatigue throughout the study period but not consistently (Table 9:7). However personality (trait anxiety) is consistently correlated with physical fatigue on all three occasions post-operatively.
Table 9.7 Inter-correlation of Trait Anxiety, Emotional State and Fatigue
Pre-operatively and at Different Times Postoperatively

<table>
<thead>
<tr>
<th>Post-operative measures</th>
<th>Pre-operative measures</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Trait Anxiety</td>
<td>State Anxiety</td>
</tr>
<tr>
<td><strong>Day 1:</strong> anxiety</td>
<td>0.11</td>
<td>0.42**</td>
</tr>
<tr>
<td>depression</td>
<td>0.29*</td>
<td>0.43**</td>
</tr>
<tr>
<td>mental fatigue</td>
<td>0.25*</td>
<td>0.20</td>
</tr>
<tr>
<td>physical fatigue</td>
<td>0.27*</td>
<td>0.18</td>
</tr>
<tr>
<td><strong>Day 4:</strong> anxiety</td>
<td>0.36*</td>
<td>0.21</td>
</tr>
<tr>
<td>depression</td>
<td>0.22</td>
<td>0.20</td>
</tr>
<tr>
<td>mental fatigue</td>
<td>0.08</td>
<td>-0.07</td>
</tr>
<tr>
<td>physical fatigue</td>
<td>0.25*</td>
<td>0.10</td>
</tr>
<tr>
<td><strong>Day 30:</strong> anxiety</td>
<td>0.31**</td>
<td>0.22</td>
</tr>
<tr>
<td>depression</td>
<td>0.41**</td>
<td>0.17</td>
</tr>
<tr>
<td>mental fatigue</td>
<td>0.06</td>
<td>0.11</td>
</tr>
<tr>
<td>physical fatigue</td>
<td>0.25*</td>
<td>0.14</td>
</tr>
</tbody>
</table>

**p<0.01  *p<0.05

Curiously state anxiety and mood pre-operatively have no relationship to any of the post-operative measures (Table 9.7).

On the first post-operative day, mean item scores for mental and physical fatigue were 0.05 and 1.3, respectively (signifying levels of mental fatigue between 'same' and 'worse' and levels of physical fatigue between 'worse' and 'much worse' by comparison with preoperatively). High levels of both mental and physical fatigue on the first post-operative day declined to low levels one month post-operatively (mental fatigue \( F_{(2,104)} = 4.20 \); Physical fatigue \( F_{(2,102)} = 46.36 \)). Conversely levels of state anxiety and depression rose, although there was no statistical support for the observed pattern of change for depression (state anx. \( F_{(2,106)} =7.09 \); depression \( F_{(2,106)} = 1.78 \).
Table 9:8 Inter-correlation of Postoperative State Anxiety, Mood and Fatigue

<table>
<thead>
<tr>
<th></th>
<th>1 day</th>
<th></th>
<th></th>
<th>4 days</th>
<th></th>
<th></th>
<th>30 days</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>anx</td>
<td>dep</td>
<td>men</td>
<td>phys</td>
<td>anx</td>
<td>dep</td>
<td>men</td>
<td>phys</td>
<td>anx</td>
</tr>
<tr>
<td>dep</td>
<td>0.26*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>men</td>
<td>0.12</td>
<td>0.35**</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>phys</td>
<td>0.11</td>
<td>0.30**</td>
<td>0.46**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 days</td>
<td>anx</td>
<td>0.14</td>
<td>0.21</td>
<td>0.12</td>
<td>0.21</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>dep</td>
<td>-0.07</td>
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<td>0.04</td>
<td>0.12</td>
<td>0.43**</td>
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<tr>
<td>men</td>
<td>0.15</td>
<td>0.02</td>
<td>0.52**</td>
<td>0.39**</td>
<td>0.19</td>
<td>0.16</td>
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</tr>
<tr>
<td>phys</td>
<td>-0.04</td>
<td>0.24*</td>
<td>0.36**</td>
<td>0.48**</td>
<td>0.20</td>
<td>0.26*</td>
<td>0.56**</td>
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<tr>
<td>30 days</td>
<td>anx</td>
<td>0.10</td>
<td>0.01</td>
<td>0.23*</td>
<td>0.11</td>
<td>0.01</td>
<td>0.07</td>
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</tr>
<tr>
<td>dep</td>
<td>-0.19</td>
<td>0.21</td>
<td>0.19</td>
<td>0.01</td>
<td>0.14</td>
<td>0.25*</td>
<td>0.22</td>
<td>0.65**</td>
<td></td>
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<tr>
<td>men</td>
<td>0.23*</td>
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<tr>
<td>phys</td>
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*p<0.05 **p<0.01  anx, state anxiety; dep, depression; men, mental fatigue; phys, physical fatigue

From the correlations in Table 9:8, it is clear that 30 days post-operatively, all the measures of patients' state inter-correlated; i.e. patients who reported fatigue were also anxious and depressed. On the first and fourth day however emotional state and fatigue were less closely related; only depression showed any relationship to fatigue. Patients who were fatigued on day one tended to be fatigued on day four also but fatigue at thirty days was not clearly related to earlier measurements (Table 9:8).

Table 9:9: Correlation of Cognitive Failure and Fatigue

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<tbody>
<tr>
<td></td>
<td>day 1</td>
<td>day 4</td>
<td>day 30</td>
</tr>
<tr>
<td></td>
<td>men</td>
<td>phys</td>
<td>men</td>
</tr>
<tr>
<td>cognitive failure (self)</td>
<td>0.29*</td>
<td>0.37**</td>
<td>0.38**</td>
</tr>
</tbody>
</table>

*p<0.05 **p<0.01
Both mental and physical fatigue were associated with cognitive failure in late recovery (Table 9:9). Subjects who had high levels of fatigue during their recovery reported making more minor cognitive errors after discharge from hospital e.g. they would go to the kitchen to get a spoon and forget what they had wanted.

**Fatigue and Catecholamines**

Fatigue measured at one and four days was unrelated to norepinephrine measured on any occasion (Table 9:10).

**Table 9:10 Pearson’s Correlations: Postoperative Emotional State and Fatigue with Plasma Norepinephrine Levels Sampled Before During and After Surgery**

<table>
<thead>
<tr>
<th></th>
<th>day-1</th>
<th>day of surgery</th>
<th>day+1</th>
<th>day+2</th>
<th>day+3</th>
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<td></td>
<td>18.30</td>
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<tr>
<td>Anxiety</td>
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<td>0.42**</td>
<td>0.08</td>
<td>-0.09</td>
<td>0.03</td>
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<td>depression</td>
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<td>-0.17</td>
<td>0.15</td>
<td>0.10</td>
</tr>
<tr>
<td>men fag</td>
<td>-0.09</td>
<td>-0.02</td>
<td>-0.17</td>
<td>-0.09</td>
<td>-0.02</td>
</tr>
<tr>
<td>phys fag</td>
<td>-0.03</td>
<td>0.01</td>
<td>0.05</td>
<td>0.14</td>
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<tr>
<td>anxiety</td>
<td>0.24*</td>
<td>0.02</td>
<td>-0.07</td>
<td>0.57**</td>
<td>0.20</td>
</tr>
<tr>
<td>depression</td>
<td>0.02</td>
<td>-0.04</td>
<td>-0.10</td>
<td>0.26*</td>
<td>-0.28*</td>
</tr>
<tr>
<td>men fag</td>
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<td>-0.01</td>
<td>-0.10</td>
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<td>anxiety</td>
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<td>0.27*</td>
<td>0.24*</td>
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<td>depression</td>
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<td>0.27*</td>
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<tr>
<td>men fag</td>
<td>-0.01</td>
<td>0.46**</td>
<td>0.40**</td>
<td>-0.09</td>
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<td>phys fag</td>
<td>0.06</td>
<td>0.26*</td>
<td>0.28*</td>
<td>0.40**</td>
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</tr>
<tr>
<td>cognitive failure (self)</td>
<td>0.06</td>
<td>0.33**</td>
<td>0.11</td>
<td>-0.15</td>
<td>-0.04</td>
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</tbody>
</table>

Day-1; one day preoperative. Day +1,+2,+3; one to three days postoperative. Pre-ana; prior to the anaesthetic. Stem; at division of sternum. Rewarm; body temperature is raised to normal. ITU; postoperatively on being settled in ITU.
Contrastingly, fatigue at 30 days was clearly related to peri-operative norepinephrine levels; 10 of the 14 relevant correlations (with norepinephrine values on the day of surgery and subsequently) were significant. The relationship was strongest with levels sampled immediately before and during surgery itself.

Post-operative cognitive failure did not resemble fatigue in this respect, correlating with norepinephrine sampled on only two occasions (Table, 9:10). Significant correlations also link anxiety and depression to norepinephrine levels; the proportion of relevant correlations which were significant increased over the post-operative period.

Neither epinephrine (adrenalin) nor cortisol levels were related to fatigue or emotional state at any time.

Discussion

Although the pre-operative psychological preparations were based on well utilised treatments no clear differences emerged between the three treatment groups. However when the groups were subdivided according to their expectations of treatment effect (confidence) differences emerge in the patterns of epinephrine. The pattern of post-operative epinephrine responses in the perception of control group with no confidence in the treatment is substantially different to the epinephrine responses of the no treatment group who are confident in the treatment. The effect cannot be attributed to either the treatment alone, since no effect was apparent in the original analysis of the three groups. Nor can the effect be attributed to the subjects pre-operative confidence in the treatment, since there is no significant difference between the social support groups (Figure 9:6). While this effect is difficult to interpret, interaction between attitude to treatment and treatment has been noted in previous studies (Smith, 1984; and Echabe et. al., 1992). In this study the subjects who had no confidence in the treatment and presumably failed to achieve a perception of control responded with elevated levels of epinephrine post-operatively. The subjects with confidence in the treatment, even when only filling out questionnaires, responded with depressed levels.
reported here so these findings must be treated with caution. They may however indicate a path for further research and subsequently treatment.

The results reported here are further evidence of the complexity of responses to pre-operative preparation. The catecholamine evidence broadly supports the contention that 'benefit' gained from coping skills training is not entirely enhanced coping. It may indeed be a sense of control, utilised or not, that influences the stress response.

The only significant and sustained relationship to emerge between the endocrine levels (physical stress response) and the psychological outcome measures was with post-operative fatigue. Patients who had shown greater norepinephrine levels peri-operatively were the most fatigued one month post-operatively. One explanation for this could be that fatigue is a long-term effect of the norepinephrine response. However, attempts to link fatigue to peripheral changes that can in turn be attributed to the stress response have been unsuccessful. Most attention has been focussed on changes in muscle function, but this is unlikely to explain post-operative fatigue (Zeiderman et. al., 1990; Christensen et. al., 1984 and Kehlet, 1988)). An alternative possibility is that a greater norepinephrine response identifies patients who are prone to be fatigued for another reason; for example, an enduring tendency to respond to stress in general with exaggerated norepinephrine responses. This, in turn, could simply be an expression of another variable, such as myocardial performance (French, Lam, Rashid, Sear, Fox and Howell, 1999) or physical fitness. This, reasoning would be consistent with the report that the extent of fatigue after abdominal surgery correlated with the increase in heart rate caused by orthostatic stress (Christensen et. al., 1982).

The present results show that fatigue is, however, not purely a physiological variable. There was evidence of a psychological component also. One month postoperatively, fatigue correlated with concurrent levels of anxiety and depression. It is at this time, as discussed above, that fatigue correlated with peri-operative norepinephrine. Further more, anxiety and depression one month post-operatively also correlated with per-
operative norepinephrine values. The correlation of fatigue and emotional state with norepinephrine do not overlap consistently enough to constitute clear evidence that the relationship of fatigue with norepinephrine could result from its relationship with emotional state or vice versa. Nevertheless it is possible that a common basis links peri-operative norepinephrine with fatigue and emotional state one month post-operatively. In particular, sensitivity to stress might underlay all these variables. The consistent correlations (Table 9:7) between trait anxiety and physical fatigue may indicate a relationship between personality and stress response.

The results do very little to illuminate the basis of fatigue in the early post-operative period. Fatigue followed the expected time-course; post-operative levels declined significantly within four days and continued declining during the post-operative month. However, the results emphasise that fatigue is influenced by different factors early postoperatively and one month later. Consistent with this, individual patient's complaints of fatigue were not consistent over the post-operative period. Fatigue at one and four days correlated only minimally with fatigue one month later. Furthermore our data do not explain the change in fatigue post-operatively. Clearly this cannot be attributed to changes in emotional state; fatigue decreased from four to thirty days post-operatively, whereas neither anxiety nor depression declined during this period.

Conclusion

The results highlight the complex and interactive nature of the physiological and psychological stress responses to major surgery. There is some support for the hypothesis in that those patients who felt actively involved with their treatment had lower levels of endocrine response than those who failed to perceive any active control over events. This altered stress response could not be attributed to the influence of social support. However, the evidence is not conclusive, neither is it a full explanation.

The results clearly indicate that treatments that are beyond the subject's capability or that the subject has no confidence in may actually be detrimental. The perception of
control group who had no confidence in the treatment and presumably failed to achieve any sense of control had markedly elevated epinephrine levels. It is important that future studies address this confidence/treatment interaction to clarify the position. Effective management of surgical stress should include assessment of the subject's understanding of pre-operative preparation. Since lack of understanding may damage confidence and lead to non-compliance or engender false expectations which the treatment fails to meet and further undermine confidence.

One further important finding was preliminary evidence to indicate that fatigue is related to both endocrine and psychological aspects of surgical stress. Because of the importance of fatigue in the convalescence of post-operative patients it would be important to investigate the basis of each relationship. To the extent that fatigue is related to psychological factors, it may yet prove possible to ameliorate it psychologically.
The general aim of the thesis was to 'enhance our understanding of the psychosocial aspects of surgery' (Marks, 1994). The evidence from the studies reported here demonstrates that psychological, physiological and social factors operate in a complex interactive way to influence the outcome of elective surgery. Taken together the results indicate that the adult surgical patient is far from the passive receiver of total care but in fact an active participant in the process. They monitor the unfolding experience, interpreting all aspects of their surgery and recovery in the broad context of their lives. They respond with behaviour which they expect will maximise the outcome. The evidence reported here demonstrates that the 'experience of surgery' is dynamic and the participants are active in the process.

The studies reported above emanated from the psychological and medical literature on surgical stress, pain and the preparation of the patient. The aim of psychological preparation for surgery is to improve the experience for the patient. To increase their sense of well-being, to restrict pain to a minimum and to enhance recovery by reducing the interference effect of aspects of the survival stress response. Common pre-operative psychological treatments have tended to focus upon reducing anxiety by a variety of means; detailed relevant information (e.g. preoperative talks with nurses, leaflets etc.) cognitive behavioural coping (e.g. breathing exercises to ease painful procedures) and enhancing a patients sense of control (e.g. patient controlled analgesia). All of these treatments proved equivocal despite being based on sound research.

The literature on stress and the responses to stress indicated aspects of preparation for surgery that may be based on misconceptions. Recent literature on clinical stress and pain indicated five aspects of preparation for surgery where failure may occur.

- First, communication failures may occur on three levels. Straightforward
misunderstanding of language, verbal and non-verbal conflict and failure to know what patients understood by non-emotive information. Overall a failure to perceive the surgery from a patient's perspective, in the context of their lives (Johnston, 1984).

~ Second, viewing all pre-operative anxiety as detrimental and attempting to reduce it with preoperative preparation. Moderate levels of pre-operative anxiety may encourage patients to prepare for the surgery Manyande (1992).

~ Third, a failure to know what aspect of any preparation is effective, particularly if we disregard any social support the patient may derive from it (Salmon, 1992).

~ Fourth, a tendency to regard patients as passive receivers of treatment and a disregard of any subjective coping.

~ Fifth, a failure to investigate the interactions between the stress variables, the responses to the stress and the treatments.

Questions Addressed

The failure of preparation for surgery to be consistently effective and the issues identified above suggested four fundamental questions needed to be addressed.

~ What are the potential interactions of the stress response variables and the nature of the relationship between psychological and physiological stress response variables?

~ The nature and the strength of the subjective coping responses - what informed them and how abiding where they?

~ What is the influence of social support on preparation for surgery?

~ Were the beneficial effects of pre-operative preparation enduring beyond discharge from hospital in late recovery?

The studies reported above attempted to address these questions. The equivocal effects of
preparation for surgery and the potential reasons for their failure dictated the course of
the research.

A Summary of the Results

The Response to Surgery Questionnaire

To address some of the issues of communication failure identified above, it was
necessary to develop a measure whose items were couched in 'patient' language and
reflected subjective 'worries' about surgery. The Response to Surgery Questionnaire was
developed from subject generated items. Four styles of coping response were identified
'Optimistic', 'Pessimistic', 'Anger' and 'Faith in Others'(Chap. 4). These scales contrast
with those reported in the literature since they do not readily divide into previously
described categories being neither emotional or problem centred (Folkman and Lazarus,
1985) nor avoidant or vigilant (Mathews and Ridgeway, 1984).The two principal RSQ
groups to emerge were broadly 'optimistic' and 'pessimistic' containing items which could
be construed as representing all four previously described categories. Heim et. al. (1997)
report similar findings in coping responses in cancer patients, no precise division into
emotional, problem focussed, vigilant or denial categories being evident.

The two other scales 'Anger' and 'Faith in Others' represented a more consistent
emotional style. Anger is often noted as a response to stress and pain but in the RSQ
anger emerged as a unified 'coping style'. Anger is clearly an emotional response to stress
and distinct from anxiety. The items of the 'Faith in Others' scale are statistically and
psychologically consistent but difficult to interpret. The style is emotional but it is not
clear what that emotion might be. The items suggest a lack of self confidence which
contrasts with anger. They seem to reflect a fear of social isolation and a strong reliance
on others and this scale may be an emotional response to the loss of support normally
available through an individual's social network.
Overall the items of the RSQ reflect a great diversity of patient 'worries'. This diversity is important. Pre-operative preparation often focuses on the very personal concerns of the surgical patient e.g. details about the procedures of the operation and recovery. It emerged from the development of the RSQ that patients were concerned with the effect of their surgery on their life. These concerns centred on the effects on their family or work and the consequences on their life style. The patient's perspective was much broader than previously considered or addressed in preparation of the patient. The RSQ is based on real surgical patient responses and reflects their concerns and worries in a sensitive questionnaire form. The RSQ was utilised throughout the research reported here.

*Coping with Surgery*

The results confirm the importance of subjective coping, certain styles of responses being associated with poor early and late recovery and high levels of post-operative pain. High scores on the pessimistic and angry scales of the RSQ and the negative and behaviour scales of the PRQ were closely related, and all four scales were associated with high levels of post-operative anxiety, pain and poor recovery.

There was some evidence that coping with surgical stress changed over the course of the event indicating a close subjective monitoring of events. Coping with pain appeared not to change, suggesting that subjectively pain and stress are separated.

Although no strong evidence emerged of predictors of subjective coping response to surgery, the findings imply that coping is multi-factorial. Anxious personalities, high levels of pre-operative emotion and the patients perception of the outcome all had strong associations with subjective coping responses in the studies reported above. This is consistent with current opinion that stress response is determined by several factors (Suls, David and Harvey, 1996; Wiebe and Christensen, 1996) of which emotion,
outcome, environment and personality are important variables.

Post-operative Pain

The prime concern of the majority of surgical patients is pain and its control (Chap. 4). Although much is done to attempt to relieve post-operative pain, many patients, for various reasons, report moderate to severe pain post-operatively (Chaps. 6 and 7). The levels of early post-operative pain were different for the subjects of both major studies. In the mixed surgical sample patients reported moderate to severe levels of pain but in the cardiac surgery sample much lower levels of pain were reported. Pain measured on the fourth post-operative day was not related to pain on the first post-operative day (Chap. 7).

The results reported here confirm the notion that post-operative pain is clearly influenced by many factors other than straightforward nociception. The principal factors thought to influence pain are stress, coping and affective state (Chap. 3). Our results confirm the influence of these variables but also indicate a complex relationship between the variables and pain. Trait anxiety and anticipation of pain tended to predict pain levels. High levels of pain were associated with high levels of post-operative affect. Pre-operative affective state was not directly associated with post-operative affective state (Chaps. 6 & 7). Coping responses to surgery and pain were associated with anxiety and with levels of post-operative pain. In the major surgery (cardiac) sample consistent utilisation of pain behaviours as a coping response resulted in prolonged pain. To complicate matters further our results clearly associate pain levels with the patient's perception of the outcome of their surgery. High levels of pain being associated with palliative measures and disfigurement (Chap. 5). Patient perception of outcome is also associated with pre and post-operative affect.

Anxiety emerges as an important variable influencing pain, however our results suggest
that reducing levels of affect alone will not necessarily reduce pain. Anticipation and coping for example, are influenced by factors other than anxiety and they also influence pain. These results further indicate the importance of the interactive nature of the psychological variables of surgical stress.

Anticipation of Pain, Anxiety, Pain, Recovery and Coping

It is evident from our study (Chap.6) that the subjects had pre-operative concerns about pain. This anticipation of pain must be informed by pre-existing concepts and prior experience but also probably by 'common knowledge'. Anticipation of an event may also be influenced by other variables e.g. affective state. In our clinical sample it was not possible to explore pre-existing concepts or 'common knowledge' but associations between pre and post-operative variables and anticipation were assessed.

The results reported here demonstrate a complex relationship between pre-operative state anxiety and anticipation of post-operative pain which has not been previously reported. High levels of anticipation were associated with high levels of pre-operative anxiety and levels of both variables tended to rise in the pre-operative period. The results also demonstrate a predictive relationship between anticipation of pain and post-operative levels of anxiety. This relationship has been noted before. Dental phobia/anxiety has been thought to result in part from preconceptions about dental pain (Bernstein et. al., 1979). Curiously pre-operative state anxiety did not predict post-operative anxiety.

The anticipation of pain was influential in the subsequent reporting of experienced pain and predictive of several indices of poorer recovery. Broadly subjects who anticipated high levels of pain intensity also reported their pain as moderate to severe. Anticipation of high levels of distress were less predictive of the reported experience. Anticipation of pain was also associated with coping response style, high levels of anticipated pain distress being predictive of utilisation of negative and maladaptive responses to pain and
fewer adaptive responses. An association emerged between anticipation of both aspects of pain and recovery. Subjects who on the day prior to surgery anticipated high levels of pain also consistently reported poor recovery.

Recall

In the studies reported here the pain measure was a simple visual analogue scale which was chosen to avoid semantic clues interfering at retrieval. There was a high error rate for both early and late recall of pain. The influence of anxiety, environment, current pain state and anticipation on recall was demonstrated.

High levels of anxiety post-operatively led to an increased error rate in recalled pain (Chap.6). Somewhat surprisingly the errors were not necessarily an exaggeration of the experienced pain. Highly anxious subjects were simply wrong, suggesting an association between emotional arousal and poor cognitive processing, at least with regard to memory. The direction of errors however cannot be predicted by the emotion.

In the cardiac study the subjects' current pain state was measured at recall and found to have some slight influence on the recalled pain. High levels of pain contiguous with the recalled pain tended to lead to overestimation. Low levels of pain or no pain at the time of recall resulted in accuracy of recall (Chap.7).

Recall of prior experience is an important influence on anticipation of future events. It may also contribute to the pre-existing concept of pain. In our studies late recall of pain tended to mimic anticipation rather than the pain. Anticipation is in part based on the subjective concept of pain. Our results suggest that subjects recall their concept of pain rather than the pain. This implies that the concept of pain is enduring and not much influenced by new experience.
Psychological Interventions as Preparation for Surgery

The preparation for surgery utilising relaxation to enhance subjective perception of control, and social support was initially disappointing (Chap.9). There was no strong evidence of improvement of spontaneous coping nor any clear associations between the treatment and recovery. When patient confidence in the treatment was entered into the equation a marked interaction between a patient's confidence in the treatment, the treatment itself and epinephrine levels emerged. Subjects who had no confidence in their treatment clearly did not enhance their perception of control and responded with elevated levels of peri-operative epinephrine. Conversely subjects who had no treatment other than a visit to administer questionnaires but were confident that this would help them responded with lower levels of peri-operative epinephrine (Chap. 9, Fig 9:2). This finding is important because it suggests that patients who are given a treatment that they feel is useless or beyond their ability to utilise, increase their endocrine response to surgery. The implication is that in some cases psychological pre-operative treatments may not only fail to enhance recovery but actually be harmful.

There was no clear evidence that social support per se was an effective pre-operative treatment. Although patients in this group tended to report less post-operative pain and better early recovery, this failed to be maintained one month later. Subjects in this group tended to take longer to return to their normal life style and their partners/relatives reported that the patients made more cognitive errors. Conversely the subjects of the perception of control group made the swiftest return to normal functioning and fewer minor cognitive errors.

The results indicate that there is some influence of social support in the cognitive behavioural pre-operative treatments. Although the differences in outcome suggest that the treatment is not merely an elaborate social support.
Additional General Findings

Anxiety, depression and post-operative pain are all well documented as psychological variables influencing recovery from surgery. Less well known is post-operative fatigue, a curious syndrome which is characterised by overwhelming tiredness which cannot be explained by physiological means (Christensen et. al., 1986). Similarly less often included in studies of psychological post-operative effects is 'cognitive failure', a tendency for subjects to feel they make more errors in everyday mental activity than usual. This failing usually recovers with the subject's improving health (Mayou, 1986).

These were the principal variables and with a recovery inventory, assessed the subjects' sense of well being and recovery from surgery. The interaction between the variables and their association with subjective coping responses and pre-operative measures were of particular interest. Some of these interactions have been discussed above particularly those of pain, anxiety and coping and will not be reiterated here.

Post-operative Fatigue

Post-operative fatigue is a persistent and debilitating condition that interferes with a patient's recovery and affects their sense of well being. In the studies reported above fatigue peaked immediately post-operatively and declined steadily over the recovery period. Curiously fatigue at one and four days post-operatively was not related to fatigue one month later. It is tempting to attribute post-operative fatigue to the patient's general physical fitness. Our study however demonstrated associations between fatigue and both personality and affective state, indicating a clear psychological component of post-operative fatigue. Affective state and fatigue were correlated with peri-operative norepinephrine levels. However anxiety and mood were less consistently associated with the endocrine than fatigue. Therefore it cannot be concluded that they are aspects of the same variable and supports the findings of Lambert and David (1988) that mood and
mental' fatigue are separate entities.

Trait anxiety was predictive of reports of physical fatigue on all occasions it was measured, suggesting that personality may be common to both affect and fatigue. Clearly highly anxious personalities may have persistently high plasma levels of catecholamines which lead to fatigue but there were no direct associations between trait anxiety and norepinephrine.

Cognitive Factors in Surgery and Recovery

The studies reported here explored two aspects of cognition associated with surgery. First, subjective cognitive failures during early and late recovery. Post-operatively patients often complain of lack of concentration and of making numerous minor cognitive errors e.g. mislaying spectacles etc. The second aspect explored was recall of pain, its relationship to anticipation and factors that influence accuracy. This was discussed above in the section on pain.

Cognitive Failure

Post-operative patients often report temporary cognitive failure, inability to concentrate and frequent small errors of everyday function being the most common complaints. For a recovering patient cognitive failures are not merely an irritation but may influence their sense of well being or increase their anxiety. The cognitive errors reported above follow the predicted pattern, early post-operatively subjects being poor but quickly recovering their pre-operative levels of function. Twenty percent of subjects tested were however still performing less well at a later stage of recovery than pre-operatively.

Self reported cognitive failure was closely associated with levels of post-operative fatigue but not affective state during the hospital stay. Post discharge there is a clear and
robust association, more cognitive errors being reported by highly anxious or depressed patients.

Taken together the evidence from the studies reported here indicates a complex interaction between the variables of the stress response to surgery. Changes in one variable have concomitant effects on others.

**Patient Experience of Surgery**

The well being of the surgical patient is the primary consideration and it is important to try and understand surgery from their perspective. Successful management of the surgical patient will only be achieved when patient concerns are addressed. The results reported above shed considerable light on the experience of a surgical patient.

The results outlined above suggest that the surgical patient is anxious, dis-empowered and socially isolated, but in the face of seemingly overwhelming odds they exert some influence over the outcome. In our samples the surgical patients clearly had expectations of their surgery and recovery but they had a very broad view. The surgery was not an isolated event but perceived within the context of their lives. Despite their vulnerability they struggled to maintain their role within their social network maintaining responsibilities toward their significant others. They were not passive receivers of treatment although they tried not to trouble the staff. Their coping responses suggested that the surgical patient is active in determining the outcome of the surgery.

**Themes Emerging from the Research**

The important findings of the research reported here are those that have influence on the outcome in terms of the patients sense of well being and return to usual life style. Also those factors which have significant associations with the physiological stress response to
surgery. These findings will improve our knowledge of the psychological aspects of surgery and subsequently inform future management of the patient to maximise outcome. The important factors to emerge from the research are, anxiety, anticipation, the influence of environment, social support, the diversity of subjective coping, anger, post-operative fatigue and possibly most important of all, the interactive nature of the variables.

_Angiety - Pervasive and Pernicious?_

The principle associations with state anxiety reported here confirm the importance of this variable from a psychological perspective of surgery. Anxiety is influential in stress coping responses, higher levels of anxiety tending to increase the choice of pessimistic or negative responses. High levels of anxiety for prolonged periods are also associated with post-operative fatigue. Memory, at least recall, is also affected by high levels of emotion. Anxiety may also be the mediator of the observed environmental effects, different environments being assessed in terms of threat with a resulting alteration in emotion. Clearly anxiety is pervasive.

The evidence is clear that high levels of anxiety have a detrimental effect on many aspects of recovery from surgery. There is however an emerging role for moderate levels of pre-operative anxiety. By anticipating the disruption of normal life associated with surgery patients may cope with it in a more organised and positive way. The studies reported above and the results reported by Manyande et. al. (1992) do not indicate what level of anxiety may be beneficial. It is not possible to generalise as to what may constitute 'good' levels of anxiety. There may be individual differences, the beneficial level may be stress reliant. It is clear that for the surgical patient at least, anxiety is not necessarily perfidious.
Anticipation

Anticipation of the surgery and the outcome is clearly influential on both the experience and the outcome. It is important that patients have an accurate concept of surgery, recovery and treatment effects. This may be difficult to achieve in the immediate pre-operative period since the concepts informing anticipation seem to be enduring. When recalling post-operative pain, the pain levels tended to mimic anticipation not experienced pain. This suggests that some enduring concept of pain exists and that any new experience is somehow modified to fit this concept. This finding has implications for cognitive psychology and the management of the surgical patient.

Free recall of events is a daily occurrence for most of us, simply finding misplaced items requires mostly free recall. Given the number of errors and difficulties reported in finding lost spectacles for example, implies that free recall is inaccurate. Inaccuracy of recall is much researched in cognitive psychology because of its importance to our daily functioning and its social consequences e.g. in giving evidence at trials. Our findings suggest that for an intimate and often severely distressing event, recall is influenced as much by anticipation as the experience. Later recall tended to mimic anticipation more closely than early recall. It is possible, and our results imply that some state effects influence recall, and inaccuracies in late recall may reflect this but this does not explain why recall should decay to mimic anticipation. The more compelling argument is that we fit current experience to our pre-existing concept although this would not exclude influence of other factors on recall. This is an important finding for two reasons. First, the implications for recall of events. Inaccuracy of recall may be exposed if the concept of the event was known. For example when conflict of witness reports of a road accident occur some of the confusion may be resolved if the individual's concepts of normal driving behaviours in this context were known. Second, the results suggest how subjective experience is fitted into the cognitive framework and therefore the individual's perception of the world.
This finding also has clinical implications. Medical aid is often sought following an instance of pain, diagnosis often relying on a patient's recall of their symptoms. Our findings imply that this recall will be inaccurate and that some of the inaccuracy may be explained by the individual's concept of pain. It was clear from our findings that the experience of post-operative pain was influenced by subjective anticipation and the patient's concept of pain would be a factor that informed that anticipation. It would seem essential therefore to ascertain the patients' concepts of pain per se. In elective surgery this could help in understanding the patient's expectation of pain and to provide effective pain relief.

**Confidence and Treatment**

The interaction effect of pre-operative preparation and confidence with plasma epinephrine levels raises questions as to why some patients have no confidence in the treatment. Although the studies reported above provide no evidence, some discussion of possible cause may be important to guide future research.

Confidence in a treatment and its subsequent efficacy may be undermined by the patient's preconceptions, their abilities to acquire the skill and the environment of the ward. Theoretically preparation for surgery techniques are sound but the administration of them may be less so. To benefit from pre-operative psychological treatments for surgery new ways must be found to ensure the patient is not confused by the 'mixed messages' of teaching and environment.

Patients may have no confidence in a treatment because it is irrelevant to them or to their perception of their role in the event. A procedure may be irrelevant because it conflicts with a patient's beliefs about treatment e.g. they may believe that relaxation is 'new age mumbo-jumbo'. Equally they may believe that 'it is the medical profession's business to cure the sick' and that they have no part in their own recovery. In either case it is the
subject's preconceptions and anticipation of events that are important and as discussed above, anticipation is emerging as a consistently important variable influencing recovery from surgery.

Patients may have no confidence in a treatment because they feel it is beyond their capacity. This may arise from their evaluation of the stress and their own resources or probably a combination of both. If surgery is perceived as a threat of great magnitude and one's own resources are seen as inadequate to meet the threat then it is probably very difficult to achieve relaxation. This inability to meet the requirements of the treatment may exacerbate the overall feeling of loss of control or raise anxiety levels.

Patients may have no confidence in a treatment which appears to be contrary to the ward environment. Encouraging patients to participate in their recovery may be undermined by the caring nature of the staff and general environment. Carefully crafted preparations for surgery are often taught during the busy pre-operative period. The teaching will have to compete with other vital procedures e.g. taking blood samples. Apart from 'patient controlled analgesia' few psychological treatments designed to aid recovery are reinforced by encouragement during the recovery period. Where they are reinforced the staff then on duty may themselves be unfamiliar with the technique and raise doubts about the procedure in the patients mind.

It is clear that cognitive behavioural techniques are useful as preparation for surgery but professionals must ensure that patients have fully understood the treatment and mastered any skill required.

Social Support

Surgical patients inevitably are isolated from their normal social network and the support inherent in it. The responses to the loss of a social network are quite varied. There was a
tendency for patients to protect their relatives. This suggests that the patient did not abandon their role within the network maintaining some responsibility for other members. They fulfilled their supportive function despite extraordinary difficulties by trying to reassure relatives. There was a reliance on other patients who would seem to substitute for the patient's now absent normal social network. However the social interactions were not all supportive. Social support was not consciously sought from staff principally because of the patient's preconceptions of the role of the nurses and doctors. However some support may have been achieved in the necessary patient staff interactions.

The difference between the treatment and social support effects on early and late recovery are equally important. Ideally patients recover steadily and confidently before and after discharge. The pattern of results suggest that social support helps during early recovery but enhancing the patient's sense of control over events is beneficial for recovery after discharge. One reason for this effect may be that during admission the support came from a professional, on discharge support was available from the patients regular social network. During the development of the RSQ (Chap.4) some evidence emerged indicating that a patient's social network is mutually supportive. Taken together these results suggest that the patient's social network is not sufficient support during an intimate stressful event like surgery. There is some tacit support for this notion in the success of patient self help groups which offer support after major surgery e.g. cardiac surgery. These groups have formed to allow patients to exchange experiences. The support from individuals who have had similar experiences presumably is of a different quality to that supplied by a patient's intimate network. The role and source of social support needs further investigation.

*Anger*

Anger emerged as a consistent style of response to the stress of surgery. Anger as a
separate emotion has not been reported in response to other stresses. Although intuitively anger may be a response to examination stress it is not separated from general emotion in the Folkman and Lazarus (1985) studies. It is not clear what function anger has in response to surgery but it must be present in the form of aggression in the survival flight or fight response. Surgery is a very intimate threat and may even threaten life itself. Anger may have emerged more strongly in response to surgery because of its role in the survival mechanism. The studies above do not explain the cause or function of anger as a response to surgery. In the measures of outcome utilised above anger was detrimental. A strong apparently maladaptive response to surgery, it requires further investigation.

Surgery in Context

It was clear in all the studies reported above that the surgical patient did not relinquish their normal roles. They remained parents, children and spouses their responses indicated a sense of responsibility for visiting relatives. They seemed to feel some sense of responsibility for the other patients in the ward, encouraging them and trying to keep their own demands on the staff to a minimum.

The relationship between the patient's perception of the surgery and the outcome suggests that they view the surgery within a broad perspective. Patients who perceived disfigurement or regarded the surgery as palliative responded differently to those who envisaged a cure. The patient's responses were strongly associated with subsequent outcome. The patient's perception of the surgery is important and the patients in the studies above perceived their surgery as an event in their lives. Preparation for surgery tends to concentrate on the procedures, sensations and general recovery of the patient. The broader issues of the surgery within an individual's life are not much discussed yet our studies indicate that these are of concern to the patient. Ignoring the consequences of surgery on lifestyle is peculiar to surgical stress. In other major stressful events, examinations for example, the event is perceived as life changing and plans for the future
are discussed with reference to probable and possible outcomes. The well being of the surgical patient may be improved and the stress response to surgery diminished if the patient is encouraged to take a realistic long term view of the consequences of surgery for them.

The studies above do nothing to clarify these associations. All could be determined by some other factor e.g. personality. Attempts to associate the variables with either trait anxiety or Type 'A' personality were not successful for the sample above. The associations between the variables are important and changes in one may induce concomitant changes in others. It would seem important for future studies to further explore this complex pattern.

Hindsight

It is the nature of clinical research that a balance must be struck between the demands of science and ethical consideration of the subjects' well being. All the studies reported here had to strike that balance. However it is inevitable that over the course of the studies reported here that decisions about the course of the research are taken which with hindsight may have been different. Some decisions are the result of experience and outcomes of the studies e.g. the use of tape recordings for patient interviews in the later studies. Over the course of the research other areas of psychology and physiology advanced and current knowledge may have influenced our decisions.

It was clear from the first pilot study interviews that communication was more than a matter of words. Although in later studies tape recordings were made and allowed for vocal but non-verbal communication to be taken into account it is a criticism of the research that a wider knowledge of non verbal communication did not inform the course of the work. When the later study involving intensively nursed patients is reviewed it is clear that the close association between nurse and patient involved subtle non verbal
communication. The experienced nurses apparently anticipated the unconscious patients needs. How this was achieved, through body language, touch or some other sense is not clear. Communication between patient and staff is important and despite our efforts to address the patients worries in patient terms the studies would have benefited from a more extensive knowledge of non verbal communication.

Our results did little to identify the predeterminates of coping responses. There were many close associations between the variables investigated but no one unifying concept emerged. Two personality traits were included in the research but their association with other variables was patchy. The research adds little to knowledge of the role of personality in coping. Psychology of personality has advanced recently and current theories have redefined personalities as several associated variables that replace the more numerous traits (Suls et. al., 1996). The studies above may have been more informative about the role and importance of personality in coping had the current concepts of personality been utilised rather than the traits.

Other methodological changes that might have been made with hind sight are:
- Some measure of pre-operative fatigue may have better informed our understanding of post-operative fatigue by making direct comparison possible.
- Measures of affective state immediately pre and post-operatively on the day of operation would have allowed closer comparison with other variables e.g. pain, measured at the same time.

However it was considered that the work load for the patient had to be practical and per-operatively the subjects were less able to attend questionnaires and may have been stressed by them.

**Future Research**

The research reported here provides some insight into the psychological aspects of the
experience of surgery. The findings also indicate areas that need further investigation and these have been touched on in the relevant chapters and discussions. In the following section the important questions arising from our work are reiterated and some tentative suggestions made as to how future research may address them.

Perhaps the most important finding is the complex associations between the variables. Any future research should take account of this interactive nature of the variables, and variables should not be investigated in isolation. These studies do not identify cause and effect but there is some suggestion that personality may be an important factor. Two important questions emerge from this aspect of our results.

- First, are the reported interactions occurring in response to stress per se or only in the intimate stress of surgery?
- Second, is any variable e.g. personality, a common cause of the observed associations?

Comparative studies exploring interaction of important variables e.g. personality, anxiety and coping in similar stresses that are intimate and non-intimate e.g. moving house and surgery may address these questions.

Anxiety has been widely researched in association with stress but our studies indicate the role of anxiety is still not clear. The results of our studies suggest that there is a beneficial level of pre-operative anxiety, the level at which patients focus on the event and resolve problems related to it. What is not demonstrated is what that level is, if it is the same level for all subjects and how that level is achieved. Future research must address these questions. The levels of affect at which subjects are cognitively competent would seem particularly important.

Anticipation emerged as an important variable in our research but our investigations only explored its effects on post-operative pain. Anticipation must in some part inform subject confidence and this was clearly associated with treatment efficacy. Exploring patients'
preconceptions about other aspects of surgery e.g. their expectations of specific interventions, their progress during recovery and outcome would clarify the role of anticipation.

Social support was clearly important to our sample of surgical patients but the giving and receiving of social support emerged as quite complex. Subjects in our sample were reluctant to receive support from busy staff and seemed to offer support to their worried relatives. It would seem important to explore social support in other stresses particularly those which involve long term life changes e.g. examinations. The teacher/student relationship and parental involvement would seem important areas to explore. Where do students seek support and what type of support is supplied by different people? A clinical trial where social support is supplied by a specific but unrelated and non medical person may also clarify the role of social support.

Two important associations were demonstrated between psychological variables and the physiological variables. It is important psychologically and surgically to understand the nature of the association between the affective state, fatigue and norepinephrine. High levels of norepinephrine may identify subjects who are prone to respond to stress with an enduring high affective state which results in fatigue. Equally prolonged high levels of affect may result in elevated levels of circulating catecholamines. In either case the debilitating condition, post-operative fatigue, may be relieved by psychological measures and careful management of affect may reduce norepinephrine levels. The association between subject confidence, treatment and epinephrine also needs further clarification. Accurate assessment of any treatment may be compromised by the subject's confidence in that treatment.

**Clinical Implications of the Findings**

Preparation for surgery should reassure the patient, give them a sense of security,
improve well being and ameliorate the stress response to surgery and maximise outcome. The research above suggests ways by which this ideal may be achieved.

Anticipation of surgery and pain had associations with many variables and influenced outcome. Realistic preconceptions about surgery and early and late recovery would seem important. In our studies anticipation seemed to be informed by an enduring concept and it is probable that patients for elective surgery have formed this concept long before admission to hospital. Preparation for surgery tends to occur immediately prior to surgery although sometimes information leaflets are distributed at a pre-operative outpatient consultation. Currently patients also have a far wider source of information available to them. Internet sites, television documentaries and magazines all feature health information some of which is of dubious validity. Patients often access this information prior to that supplied by the hospital. Even valid well presented information may give patients false impressions or elevate their expectations. Their surgery and care will be tailored to their specific requirements e.g. patients with hypertension may be treated differently from those with hypotension. The surgical patient may not always appreciate the individual nature of their treatment. It would seem important to ascertain the patient's preconceptions about their treatment before offering them further information which may conflict with their concept of events. Correcting misconceptions about their treatment may be a more effective preparation for surgery than information alone.

Associated with preconceptions about surgery are the spontaneous coping responses. Some responses appeared to change over the event suggesting that patients were monitoring their progress. Not all of the coping responses were adaptive but patients seemed to ignore the efficacy of the spontaneous response. Like anticipation, coping responses probably occur prior to admission. Outcome, in terms of patient well being, pain reduction and even early recovery may be enhanced if during preparation for surgery patients' coping responses are discussed and they are encouraged to utilise more optimistic, adaptive responses.
The Timing of Preparation for Surgery

In the intervention study reported above the treatment was slotted into the routine preparation. It was considered that the treatment may have been compromised because it competed with many other procedures occurring immediately prior to surgery. Patients probably experience some cognitive overload and failing to understand or achieve the skill required of the treatment was associated with elevated norepinephrine levels. These results taken together with the comments on preconceptions above suggest that preparation for surgery should begin a considerable time before admission. For emergency surgical admissions this is not possible, but elective surgery often occurs a considerable time after outpatient consultation. Such time might be usefully spent in correcting any misconceptions patients may have and possibly even attaining cognitive behavioural skills useful for coping with surgery. Currently women are prepared for labour by attending antenatal clinics. Preparation for surgery may be more effective if pre-surgery clinics were introduced.

Current preparation for surgery tends to encompass the entire event. Patients are given information and advice about their outcome and recovery. Our studies indicate that patients are often reluctant to bother the staff and little or no reinforcement of preparation for recovery occurs post-operatively. The high level of cognitive failure that persisted into late recovery suggests that it is unlikely that pre-operative information is successfully retained post-operatively. Information and advice about recovery may be more effective if regular reinforcement occurred post-operatively.

Pre-operative Anxiety - Is there an Ideal Level?

Taken together the results reported here suggest that at higher levels of affect the organism is less effective in dealing with the world but some level of anxiety is beneficial.
This raises questions as to whether in surgery, professionals should merely accept the inevitable failure of psychological preparations in some highly anxious subjects and 'cope' for them or attempt to reduce the emotion to less incapacitating levels? The answer depends in some part on resources and current medical practice tends to encourage self reliance in most cases. If highly emotional patients are to be more self reliant then it is important that they are identified and their anxiety levels reduced. To date there is little evidence of any formal psychological assessment for surgical patients, medical professionals relying on observation to identify highly anxious patients. Since many treatments to reduce anxiety have proven equivocal it seems reasonable to assume that such observation is not a reliable method of assessing a relative stranger's anxiety level.

A further question arises as to whether psychological preparation for surgery should include techniques for focussing a patient's attention on problems associated with lifestyle disruption as well as with variables directly associated with surgery. In other words raise the anxiety levels of subjects with 'too low' preoperative anxiety. The answer here also relies on accurate assessment of patients' anxiety levels. It also relies on the accurate evidence based knowledge of beneficial levels of anxiety. That is the province of future psychological research.

_Social Support_

Social support emerged as an important variable and may if used in conjunction with another treatment, enhance that treatment. It may also be possible to utilise the beneficial effects of social support where other forms of pre-operative preparation are inappropriate. The evidence suggests that the patient's usual social network is not sufficient to provide the support they require. Patients do not abandon their role within that network and feel responsible towards their significant others. Management of the surgical patient must provide support which is not compromised by the patients sense of responsibility to the supporter. This support may be provided by professionals or by
encouraging the mutual support of patients in self help groups.

A solution to the different effects on recovery of the preparation and social support may be to restructure the management of the patient to alter treatments over time. Current psychological interventions tend to be restricted to pre-operative preparation, yet it is clear that post-operatively patients coping responses are an attempt to utilise some techniques to ease post-operative difficulties e.g. deep breathing to ease pain. Aspects of preparation for surgery may be usefully reiterated post-operatively although care should be taken to focus active treatment and more passive social support appropriately. The active cognitive behavioural techniques may be useful prior to surgery and immediately prior to discharge, since patients who had access to cognitive behavioural techniques reported faster return to their usual life style post discharge. Social support may be most effective in early recovery when patient are vulnerable, physically restricted and possible mentally fatigued and confused. Patients in the social support group reported a better quality of early recovery. Small changes in the management of the patient may improve outcome. Considerable effort is invested in pre-operative preparation of the patient. This may in fact be wasted effort if the patients are suffering a cognitive overload and their learning capacity is reduced by rising levels of affect. Restructuring the management to spread out the psychological aspects of the preparation for surgery targeting interventions to the time they are most useful will ease the burden on the pre-operative patient and may result in more effective treatment overall.

Controlling Post-operative Pain

Post-operative pain and its control was of prime importance to the patient and current preparation for surgery includes information and advice on combatting pain. However, an interesting aspect of pain control emerged from the studies above. The patients of the cardiac study reported very low levels of post-operative pain during early recovery during which time they were in the intensive care unit. Although the study was flawed and the
results must be treated with caution there was some evidence that the experienced nursing staff of ITU were making accurate assessments of their patients' pain and intervening at an early stage. This is an interesting finding because ventilated patients are unable to communicate verbally and their hand movements may be impeded by other medical equipment. This suggests that experienced staff are monitoring other indices of pain possibly minor facial movements. This finding is important and should be rigorously investigated in future research. We can only know another's pain if it is communicated. Many post-operative patients have restricted communication and if it is possible to acquire a skill such as the ITU nurses in the study seemed to have done, it is possible to teach that skill to others improving pain relief post-operatively and generally.

Preparation for surgery will always be dependent on resources available but small changes to current practice may substantially improve patients well being and recovery. This may have economic as well as clinical benefits since patients who feel well and confidently return to their normal life style may make less demands on resources after discharge from hospital.

Conclusion

Entering the hospital is a novel and bewildering experience for most patients. They feel dis-empowered by their condition, the loss of their social network and their lack of comprehension of the new environment. Sadly the attempts to address these problems by psychological measures has been less than effective. However the psychological aspects of surgery are important and failure to achieve consistent results is not an excuse for not addressing them.

The studies reported above clearly demonstrate the multi-factorial and interactive nature of the psychological aspect of surgery. Important variables, anxiety, coping and control are mutually interactive. They are also influenced by a subject's beliefs about the surgery,
their social support needs, the general environment and their perception of change in the situation. They also demonstrate two strong but complex links between the psychological and physiological stress response. Post-operative fatigue and state anxiety are associated with norepinephrine and subjective confidence and pre-operative treatment are associated with epinephrine.

Further research is indicated to clarify the observed relationships between the variables to inform future psychological care of the surgical patient. The important relationship between subjective confidence and treatment and endocrines raises many questions about the patient's understanding of any treatment. Until these questions are addressed not only will pre-operative preparation for surgery fail on some occasions but research into treatment effectiveness will be examining the patient's understanding of the treatment and not the treatment itself.

The evidence above demonstrates the importance of the psychological response to surgical stress. Effective management of this response to enhance the beneficial effects and moderate those that undermine the subject's well being would constitute effective preparation of the surgical patient. Further the associations between the psychological variables and the endocrines suggest that the undesirable aspects of the physiological stress response to surgery may yet be ameliorated by psychological means.


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Appendix 1

PATIENT CONSENT FORMS

A Pilot study (chapter 4)

Patient Consent Form
Consultant............. Investigator......

Purpose of study and brief description of the procedure to be carried out.

We are interested in finding out how patients cope with a hospital admission for surgery. The hopes, fears and worries that may attend on admission and how these thoughts may effect a patients' hospital stay. This information will be used to help us prepare future patients for operation.

We are running a study here at St. Bartholomew's, to find out how people cope with a proposed hospital stay and surgery. We are interested in any thoughts you have, however irrelevant or unimportant they may seem to you, about your forthcoming hospital stay and operation. It would be very helpful to us if you would take part in a short interview now and answer a few about your future/current hospital stay.

This study will in no way effect your treatment or admission and you may withdraw from the investigation at any point should you so chose. All information will be treated in strictest confidence and your name will not be required for this study.

It has been explained to me and I understand:-
(a) What the study involves.
(b) That refusal to participate will not affect my treatment in any way.
(c) That I may withdraw at any time.
I therefore agree to take part in this study.

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 the patient:... ............................
B Coping responses to surgery study (chapter 5).

Patient Consent Form

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

Purpose of study and brief description of the procedure to be carried out.

We are interested in finding out how patients cope with hospital admission for surgery. This information will be used to help us prepare future patients for operation. In this study you will be asked to fill in some questionnaires about your thoughts before an operation.

You will be asked to fill in some questionnaires about how you feel after your operation. This study will in no way affect your treatment and you may withdraw from the investigation at any time should you wish to.

It has been explained to me and I understand:-
(a) What the study involves.
(b) That refusal to participate will not affect my treatment in any way.
(c) That I may withdraw at any time.
I therefore agree to take part in this study.

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 the patient: ...................
C. Cardiac study (chapters 9)

**Patient Consent Form**

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

**Purpose of study and brief description of the procedure to be carried out.**

We are interested to find out what patients feel and think about just before heart surgery. We need to find out whether these feelings and thoughts effect the body's stress hormones. We can measure these hormones by taking small samples of blood (about 1/2 an egg cup full on each occasion).

In this study you will be asked to fill in some questionnaires before the operation to assess your thoughts and feelings. On and three days after the operation you will be asked to fill in some questionnaires, to tell us how you feel. The first blood sample will be taken before the operation at the same time as the routine sample. Blood samples will be taken during the operation and on three days after the operation, usually from a cannula (tube) already in a vein.

This study will in no way affect your treatment. The results of the study may help us to improve the way we prepare future patients.

It has been explained to me and I understand:-

(a) What the study involves.
(b) That refusal to participate will not affect my treatment in any way.
(c) That I may withdraw at any time.

I therefore agree to take part in this study.

   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 the patient: ......................
Appendix 2

RESPONSES TO SURGERY

A Responses to the pilot study interviews

Text in italics represents stressed words, phrases. Text in [ ] represents small variations from different individuals. Text in ( ) clarifies ambiguous pronouns/phrases.

1) I worry that my illness may be cancer.
2) I talk to my relatives about my worries.
3) I don't talk to my relatives, they are worried enough, I try not to worry them.
4) I try not to say cancer, when I talk to my children and husband (wife).
5) I try to put on a brave face when my visitors come.
6) I'm glad that something is being done for me (my illness) at last.
7) I'm worried what the doctor (surgeon) will find when they open me up (the operation is begun).
8) I expect everyone feels a bit nervous [anxious, worried, frightened] at this stage.
9) The Doctors always [don't always] explain what will happen (what the procedure will be).
10) They (hospital staff) give you lots of information now, about what will happen.
11) They (hospital staff) give you too much information these days.
12) It's important that we (the patients) are given as much information about the hospital, the operation and the illness as possible.
13) I always [never] ask the Dr's. and nurses to explain things to me clearly.
14) I always [never] ask for pain killers when I am in pain, even if I am in hospital.
15) I sometimes [never] take pain killers at home.
16) If I'm in pain or a bit worried I try to read, watch T.V. or do something to take my mind off it.
17) I can't take my mind off my worries [pain]. I just don't seem to be able to read, knit or concentrate on anything.
18) I am worried about having that drip [catheter, tube] in me, even for a little while.
19) I try not to bother the nurses [Doctors] too often, they are so busy aren't they?
20) I try to help the other patients if I can, help them put on their slippers or call a nurse.
21) I would rather grin and bear a bit of pain than make a fuss.
22) It's important to help out isn't it. We are all in this together, I don't mind giving out the meals or talking to another chap [patient] who is a bit down [lonely].
23) I would much rather be in a room by myself, I don't like all this chumminess on the ward.
24) They (the patients) always want to tell you about their operation, I don't like all that.
25) It's nice when someone (other patient) who has had their operation, the same as yours, cheers you up, telling you what to expect.
26) I don't like all this noise on the ward, I try to be as quiet as possible, not make a fuss.
27) The noises, and smell of hospital doesn't upset me, you expect it don't you.
28) It's nice to know who's who on the ward, who is sister and staff nurse (nurses belt colour/ uniform identification)
29) I think that it is important when the patients are friendly, laugh and joke together, help each other. You keep an eye on each other. Look out for one another, that's nice.
30) This (the illness/operation) makes you realize what is important in life, really important I mean.
31) Facing up to this (illness/ operation) well it sort of frees you doesn't it.
32) I tell myself "one step at a time, see you through, one step at a time".
33) I sometimes hope that they (Dr's and nurses) have made a mistake and it's not as serious as they think.
34) I pray for help, all the time.
35) The Dr's and nurses really [never really] listen when you try and explain your worries [fears, problems] to them.
36) I'm really [not very] pleased with my progress so far.
37) I always think you can help yourself to get better.
38) I don't think it is possible to help myself much.
39) I think things could be much worse [better].
40) It is a relief to be in hospital where they can do something, look after you, take care of you.
41) I am worried what being in hospital will be like.
42) The Dr's [never] tell you everything now.
43) It [they] took too long to find out what was really wrong with me.
   (this was always an accusation)
44) It makes me really angry when they can't get even routine things right. The lunch is always cold [the bath is never on time, there are no vases, newspapers, telephones that work].
45) I get so worried I just can't eat.
46) I like to leave all the decisions to the Dr's [nurses], they know what's best for you.
47) It's the first hour or two after the operation that worries me.
48) It was very difficult [easy] to talk about [tell] my family about the operation.
49) It's lovely to talk about the operation, it really helps.
50) I don't like discussing my problems [illness] with anyone.
51) I just hope and, pray everything will be alright.
52) I just can't help myself from asking the same questions (about my illness/operation) over and over again.

53) I think it's best to toy and shut everything out of your mind.

54) I get angry when people keep asking (about the illness/operation) it makes you remember and you worry about it all over again.

57) I have to organise things [make special preparations], get ready before I can come into hospital.

58) I worry [think] about things [family/colleagues] at home [work] all the time I'm in here.

59) I don't know how they will cope (at home or work) without me. I will have all the problems to sort out as soon as I get out of here.

60) I think the anaesthetic is the most worrying thing.

61) I don't like to think of being out of control of myself (body function), after the operation.

62) I just don't know what the others (patients) think of you, its a bit of a worry isn't it?

63) I always try to look my best, even if I don't feel too well, it makes you feel better, I think.

64) I don't know how I will manage (cope) when I get home, after all this.

65) I would prefer [not like to] to be given a choice of anaesthetic (local or general)

66) I think, these days they should let you have your say, discuss your treatment options.

67) I think that they (nurses and Dr's) know what's best for you.

68) I don't think that they (medical staff) are really interested in your (the patients) health.

69) I don't think that they (nurses/relatives) really appreciate how serious my condition is.

70) I always worry I might catch something, from one of the other patients.

71) I'm not sure that the hospital is really clean.

72) I feel quite safe now I am in the hospital.

73) It's silly to worry about being in the hospital.

74) I think that the other people (patients) are always looking at you, watching you.

75) It's important to pretend that everything is O.K. even when it's not.

76) Of course I knew all about [nothing about] this hospital before I came in.

77) Being in the ward is much worse than I expected, the sight and smells are terrible.

78) I quite like the routine of the ward, it's comforting really.

79) I'm happy to think the nurses and other patients are keeping an eye on me.

80) It was really not necessary for them (medical staff) to explain this operation to me.

81) I knew I needed this operation, it was my idea anyway.

82) I will see to things (financial arrangements) before I come in to make sure everything at home [work] runs alright. And... in case anything happens (to me) for the [their] future.

83) I find it a comfort to talk to my priest about all this.

84) I just think things are meant to be. Whatever happens.

85) I think [don't think] I can help myself in this present difficulty.
86) I always feel a positive attitude helps.
87) If you are at home you can just run and get a tablet (painkiller) for yourself, can't you?
88) It's silly to put up with things (pain) if you can take something to help.
89) I think it helps if they (medical and nursing staff) think you are a good patient.
90) It's up to them (Dr's and nurses) to know, anticipate, the problems I [the patients] might have.
91) They (medical staff) don't really know what's best for you do they?
92) I don't think that the head man (consultant) really comes to see me [the patients] often enough. It makes me cross really.
93) Sometimes you can have too much visiting. It's a relief when they go and you can stop pretending that you feel better than you do.
94) Nothing ever worries me.
95) I just take everything in my stride.
96) It's important to be confident. It helps the others (patients), shows them it's alright.
97) I always keep my feelings in. Bottled up. You know.
98) I think it's shameful to cry in public. A sign of weakness really
99) Sometimes you just feel you would like to run away and hide, don't you?
100) If you see the others (patients) recovering well, it gives you a boost [confidence, a lift]. Especially if they have had the same operation that you are having.
101) Sometimes I think that coming into hospital has finally made them (relatives/colleagues) realize I'm really ill.
102) I read all the books [leaflets, saw the video] about my condition [operation] and tried to find out what it was all about before I saw the specialist [consultant].
103) It's 'out of, 'out cold' on the table (under anaesthetic) that worries me.
104) I keep [sometimes] thinking that I will die.
105) I feel I can't really keep asking them (medical staff) about my worries.
106) When they explain things they (Dr's and nurses) use all the medical terms that are not easy to understand.
107) I think you have to ask them (Dr's and nurses) to explain words that you just don't understand.
108) I'm really looking forward to taking a fall part in my own life again when this is over.
109) I keep telling myself that I will be so much better after the operation.
110) You can only get better from here, can't you.
111) I felt really frightened [scared] when he (consultant) said I had to have an operation. I don't know why really, it just came over me.
112) I think you have to take their (Dr's and nurses) advice about the pain.
113) I think that they (Dr's and nurses) should be able to tell you how long it (the operation) will take.
114) I'm so frightened of the needles [injections, jabs].
115) I don't think that the nurses know what its like to be a patient.
116) I think you have to make light of the worst bits.
117) I worry that I might cry out when I'm in pain.
118) I think it will be better when I've had the premed, the worst will be over for me then.
119) Sometimes I think [worry] that I am still not getting the right treatment.
120) [you have to wait so long, after they tell you if's your turn next, you think they have forgotten all about you.]
121) I worry that I won't find my way, get back to the right room [ward], will get lost and go to the wrong place.
122) I worry that they won't do the right operation, you hear about these things.
123) I don't think that they always get the right patient, I worry that the staff don't know who you are really.
124) I wish the others (patients) would just leave you alone.
125) I find it's best to just grit your teeth [hang on, be brave] until the pain has past.
126) In the end its only you who can know what's best for yourself.
127) I'm sure that they (Dr's and nurses) tell the family things that they don't tell you.
128) I think they (Dr's and nurses) should ask you what you want the family [relatives] to know, some things are better kept from them (family).
129) I think that they (Dr's and nurses) only tell you what they think you should know [are not always truthful].
130) I [don't] believe that I will be quite well again after this operation.
131) I will remember this experience to the end of my days.
132) This is the very worst thing that has ever happened to me.
133) I wake up at night worrying about the stitches [injections, operation]. Its silly to worry and fuss about little things like injections.
134) You come into hospital to get help don't you.
135) I think it is important to keep to your usual routine even in hospital.
136) The staff should encourage you to bring your make up/nice things into hospital If you look nice you feel better.
137) It doesn't really matter how you look in hospital, no one cares do they.
138) If you look like death you are bound to feel worse.
139) I worry that they [patients] won't be nice, friendly.
140) It is very important to encourage each other in the ward.
141) I think its best to leave all your troubles at home.
142) I feel its better not to be left too much on your own, you can be too alone.
The waiting is hard but if you try and read [knit, chat watch T.V.] you can take your mind off it.

I like to plan ahead, feel it's important to have something (holiday/treat) to look forward to.

I think it's important to stifle the negative thoughts.

I try and put off the worrying. I tell myself time enough to worry when you get there (hospital).

I like to try and look for the best in the experience.

I worry [don't worry] about how I will look after this (operation).

I take the sleeping pills they (Dr's and nurses) offer you, they stop the black thoughts coming at night.

It's important to have [bring] someone along when you come to the hospital.

I prefer to face up to this by myself [alone, without anyone to see].

I feel it is important to share your experiences with someone you can really trust [who is close, who cares about you]

When he (doctor) told me about this [operation, disease] I was just numb [couldn't take it in, too numb to think].

It would be better if they let it (news of disease/operation) sink in, gave you a bit of time and then explained things.

It was terrible when I first knew I was really ill.

I think some people just like to make a fuss [make too much fuss] about coming into hospital.

I think it's best to look away when you have a jab.

They (doctors) should spend more time with each patient, to make sure that everything is clear to you.

I worry about how long it (fall recovery) will all take.

I think you [some people] might die before they get you to hospital.

The Dr's [don't] try to make it clear that you will take time to get back to normal.

I don't think I can stand all this waiting.

If I had the chance I'd go private.

I don't think they (Dr's and nurses) take my illness seriously enough.

I think if this was really an emergency they (doctors) would admit me straight away [faster, sooner]

I think that while you wait it is important to actively prepare yourself for the operation.

You have to learn to trust the professional, have complete confidence in them.

If something goes wrong, something not really important, you wait too long, or miss lunch or something, you must let your anger out and then best to forget about it.

I find it is very tempting to overdo things while you are waiting to come in, trying to get your mind off things.

I worry that I might have a complication after the operation and not be able to leave here at the right time [be delayed by slow recovery],

It is important to remind yourself to take care, not overdo things until you are quite recovered.
172) It is so hard, after the operation, to discipline yourself to do only so much each day, not try to rush your recovery.

173) I think sometimes you try too hard to get better.
### RESPONSES TO SURGERY

**B Response to surgery questionnaire (42 items)**

<table>
<thead>
<tr>
<th>Pt. no.</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
</table>

Here are some statements that people having an operation have made. Some of the statements may seem silly, some are based on unfounded fears and some may not seem to apply to your condition. However you may have found yourself thinking about some of these things. Would you look at each statement and indicate how often you have thought it in the last 24 hours, by circling the appropriate number.

In the last 24 hours how often have you had the thoughts contained in the following statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>not at all</th>
<th>sometimes</th>
<th>often</th>
<th>most of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>I try to think about other things to keep from worrying</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>It's a relief to get something done about my problem at last</td>
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<td>4</td>
</tr>
<tr>
<td>They tell you too much about the operation, these days</td>
<td>1</td>
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<tr>
<td>I would be happier with a room of my own, away from other patients</td>
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</tr>
<tr>
<td>I should try to grin and bear this pain rather than make a fuss</td>
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<td>I worry about needing a drip</td>
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<tr>
<td>By helping others on the ward I keep my mind off my own problems</td>
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<td>It is important to understand as much as possible about the operation and recovery</td>
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<td>Are they coping without me either at home or work</td>
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Appendix 3

RECOVERY DIARY
(measures recovery after discharge.)

After an operation most people need some time to recover before resuming a full active life. During this recovery period patients often slowly increase their range of activities until they have returned to their usual life style. It would be very helpful to us if you could record your recovery for us during the weeks between your discharge from hospital and the first out-patient clinic you attend.

Below you will find a list of activities, some general and some tasks you have said you normally carry out, please make a note of the date when you first achieve each task/activity. The activities are not listed in any particular order and should not be regarded as a recovery program. Not all patients will achieve all these tasks.

Please bring your completed recovery diary to the first out-patient clinic you attend and return it to the investigator. Thank you for your help.

Please answer all the following questions.

A) What date were you discharged from the hospital. ..... day .....month .....year.

B) Please note the date that you first achieved each of the following, day. month year.

1) got up and dressed at your usual time.
2) Spent all day out of bed without needing to he down for a rest.
3) Took a short walk outside of the house.
4) Did a little local shopping or went to the library.
5) Met friends/relatives outside of your home.
6) The first day at home without pain related to your operation.
7) Made a snack for yourself.
8) The day you woke up and forgot you had an operation.
C) Please list four household and four recreational activities that you normally do.

<table>
<thead>
<tr>
<th>Household</th>
<th>Recreation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ironing</td>
<td>sport</td>
</tr>
<tr>
<td>Shopping</td>
<td>walk to pub.</td>
</tr>
<tr>
<td>Dusting</td>
<td>knitting</td>
</tr>
<tr>
<td>wash up.</td>
<td>watch T. V.</td>
</tr>
</tbody>
</table>

Please note the date that the following tasks were achieved, the first time and routinely.

<table>
<thead>
<tr>
<th>First time</th>
<th>Routinely</th>
</tr>
</thead>
<tbody>
<tr>
<td>day month year</td>
<td>day month year</td>
</tr>
</tbody>
</table>

1) once a week. household
   recreation.

2) twice a week. household
   recreation.

3) once a day. household
   recreation.

4) twice a day. household
   recreation.

*Text in italics represents the tasks most often suggested by the patients*
Appendix 4

PILOT STUDY INTERVIEWS WITH CABG PATIENTS

Text in [ ] represents interjections by the investigator. Text in ( ) represents non-verbal communication.

Interview 1 MALE 57 YRS PROFESSIONAL

Ah I felt I was coming in for something...ah... good. I had taken the advice of the...surgeon in good faiti, although concerning the nature of the operation some people may have opted otherwise, (short laugh) yes [yes] yes, yes. [so you felt you had a decision there?] It was a big decision to make. because...ah...symptom wise, I had minimum, minimum symptoms. Only a first mild attack, ah.. a little bit I passed off at work and all the investigations proved surprisingly negative, for cardiac. ahh. myocardial infarction, didn't get it. Finally they said it was a mild infarct. and it was ah... one, ..one particular investigation, the angiogram, showed marked.. ah. narrowing of the artery. Only on that particular investigation the...ah operation was recommended, yes. [so you had a particularly hard decision]. Yes. ah. in fact my family are not here with me at the moment they are on their way from Sri Lanka. Urn. they probably,..! thought from what they were saying, my son in law and my daughter they were not quite 100 in favour of our having the operation. And so in that sense I had to decide, because of the time factor, if I have to postpone the operation and postponement would be indefinite, and having to wait too long. With that in mind.. ah... deciding to do..to have or not to have the operation. I thought at once I would like to have it, to go through it as early as it was offered yes. [when you came into hospital what happened to you then?].

When I came in it was all routine, hospital admission. The Dr. with a preliminary examination, and so on... and then I was put in to bed and ah from then on prepared for the operation next morning. Nothing special about it, I wasn't very excited or agitated so it was routine, and of course having been a Dr. myself, having seen patient's going through
the same procedure it wasn't anything particularly new to me. So (short laugh) I was trying myself, (laugh) it sounds dreadful! to be as a good patient (laugh) yes, yes [ so you were trying to be a good patient] yes, yes (laugh). [Did you feel anxious at all?] I was not anxious, not anxious about the operation at all. Ah.. I took ..ah one main factor. It was between the surgeon and myself. He said. . ah. there were no other. . ah. alternative forms of treatment at all, in my case. So I took that word in full faith, that was the deciding factor, yes yes yes. [How about after the operation?] Umm yes.[ what do you recall about that.]After the operation .. ah.. I was.. I was told I was in Intensive care in the. ah.. the first moments of. ah. wakefulness, in Intensive care I ..ah.. must have been. .ah.. rolling or trying to be unrest on bed the nurse had to speak softly... to hold my head and what she said *you're in the ward sir. its alright., its all over* and at that minuet I was a bit calm down. When she said it was all over and I was in the Intensive care unit I.. ah.. couldn't speak you know because of the ..ah. (gesticulating at mouth), [tube]. . the tube in the throat. That moment was. ah.. a very... satisfying moment.. at that time when she said it was all over and I was back in the ward.. or a ward so released again from the theatre, .yes. I can't remember that theatre set up.. [no]. . I was a completely knocked out.. yes. [So the nurse, immediately postoperatively was very helpful to you?] She was I should say.. very helpful. Those words are very nice that she said.. and so.. I don't know.. ahhh. probably from what she said I ..ah. gather I was reactions following the operation; I restless.. trying to groan and sound trying to come out, and her voice was very calming and very, very soothing so you might (laughing) say.. yes. [Did you have any pain, after the operation?] Not at that very moment, ah.. but few minuets later, hours later pains began to show up. Because. .ah.. I was under heavy. .ah. heavy drug sedation, anti pain drugs so the pain wasn't showing up very much.. . ah the. .ah the drugs I was taking. [Do you recall any pain on the ward, once you came back here?] While I was in the intensive care unit,. a few hours. .ahah. I was there about a day and a half; I think. During that time I experienced real pain (short laugh) what pain there was picking up. Before the operation I had little pain, serious pain. .umm. there while that had to give injections, while I was there [ITU]] for
those pain. [did you ask for them?] No. They were given, [they just gave them?] I'm not for injections, I had no choice, they were giving it to me and...er. while I was there they had to remove the drainage tube from the chest wall, three tubes. To remove those tubes the existing drugs were insufficient, they had to give gas, ah.. nitrous oxide, additional sedation to pull the tubes out...yes,yes (laugh) it was the laughing gas. I wasn't complete out, I could. ah.. felt the pull of the tubes.. I could fell the ..ah fairly wide tubes coming out the chest. I couldn't see the size of the tubes.. ah. ah.. because I would have to raise my neck to see the tubes. I wasn't aware how big they were, until then, at the time of pulling off I was roughly aware how long they were inserted inside and how wide they were.

Although it wasn't painful with all the ..er.er.[gas] the gas yes,yes.

[Was there anyone who was particularly helpful, during your stay?] You couldn't pick out any one particular person, in particular. Ah. first of all the surgeon (Mr. E.) I think he, ah, he must be mentioned first and foremost. I think he done his best under the circumstances, I saw him once after the operation and once before the operation, he was busy, otherwise. Of course the house surgeons, registrars they see me on the days and the ward sisters, senior staff all the staff, they all very nice and kind and helpful (laugh), yes, yes [ People always say that which is nice. But it is just if any particular time any one talking to you has been helpful..... You mentioned coming round [Yes that particular time, uhuh that moment of coming back, ah how to say, returning back to this world. that .ah "its alright, its all over" that's very, very welcome statement I thought, yes, yes.

After the tape was switched off the patient returned to the postoperative pain, he had moved and triggered a spasm He commented that movement triggered pain, a tight pain that prevented breathing. He breathed rhythmically for a few breaths. Then explained that concentrating on breathing and walking helped. Getting out of bed slowly he said he found it a "real effort to do anything" He was utterly weary. He tried to follow instructing but there was so much to remember. He wanted to walk to the ward door. We walked he commented on the amount of information he was given preoperatively," hard to remember it all"
Interview 2 MALE 26 YRS (GRAFTS FOR ANOMALOUS RT CORONARY ARTERY)

Ah.. I arrived about Thursday. Umm. Then I was told to go and wait in the waiting room and someone would be in shortly to explain what's going to be happening on the first day. When nurse did come up to us eventually it was about a quarter past three... cause they had to wait for the beds and everything. Once I'd got settled down into my bed and everything I went back up into the waiting area to see a couple more docs. The first Dr I see was the anaesthetist, he explained to me what they would actually be doing for me on the Thursday morning, they wouldn't actually give me the pre-med it was one of the sisters on the ward would give me the pre-med and everything, and then they would call me down as soon as I was ready. After seeing them I see the staff nurse on the ward and she got us to go and look at a video of after the operation. Umm.. what would actually be involved in intensive care, how I would be when I came out of the operation, explaining that there were certain tubes that I'd need for draining off the excess blood, er... helping me breathing. Just basically things that will be there, what aren't normally there in a normal operation. That was interesting, it helped a lot... when I did come out of the operation it was frightening...umm. I was worried and I couldn't swallow or breath because of the tube you have down your throat but I knew it was going to happen so I wasn't that much shocked through it. Ah.. on the night before all the nurses and everything they pay a lot of attention to you, they do give you a lot of attention, they see you are O.K.. That your sleeping alright, if you can't sleep they help you to sleep with medication. Umm... I didn't get that much sleep, about 3 or 4 hours I think, in the end. [ was that because you were anxious?] Umm. anxious about getting down there and getting it all one and getting out and getting back home and starting again, ahh. I knew it was something that had to be done so there was no way of getting out of it, so the sooner the better.

When I got done after having the pre-med the next morning the two of them, there were two anaesthetists down there, there was a young lady and a gentleman, they both explained to me what they would be doing, they'd be giving me an injection into the back of he hand. Er.. I'd feel a bit drowsy, I won't be able to speak or anything like that and then won't remember noting after that. The next thing I remember is about 1/2- 3/4 hr
after the operation, waking up in intensive care. They explain well enough for you to understand, I men for anybody to understand. [How did you feel, particularly before the operation? The day of the operation, when you had woken up, when you knew it was going to happen?] Nervous, tummy was all upset and everything and I was hungry, well you hadn't eaten for 12 hours. Umm. Basically frightened, [the nurses were around then to talk to you, were they?] IS, every time you wanted, if you wanted to have a chat, or ask another question about the operation, they was right there, right, you know, every time. [What about your visitors?] Thy say they prefer you not to have visitors before you go into surgery, because it does work you up a bit more and I didn't have no visitors anyway. [You didn't have visitors?] No, [were you pleased not to have them?]. Ah..I think I was yes, because I would have worried more. [really, why?] Umm. because it would have been even my parents or my girlfriend or something like that and they'd worry more for me than what they would have been anyway, [right. How did it feel when you first woke up after the operation?] Horrible! [horrible] UMMM.. cause you couldn't speak, couldn't ask any questions, because you had these tubes down your throat and all you want to do is get them out and ask is everything alright am I going to be O.K.. [Did they tell you it would be alright?] They was explaining to you that it went O.K., there's been no mishaps or nothings gone wrong, um. basically just you are going to be O.K....ah.. just sort of hold in there, just take the breathing apparatus as it is try not to fight it. ahh.. its difficult to do. [Can you remember anything about the pain? Did you have any pain when you woke up?] I didn't feel anything apart from me throat. I couldn't feel any pain in me chest or me leg, it was just me throat. [Did you ever feel pain in your chest or leg?] Not until about the 2nd day, when I came out of intensive care, back onto the ward..uh.. by that time I had had several tubes removed. I still had two drainage tubes in my stomach and one in the bladder which was about the most painfulllest because where I was on a drip it was just fluids and it was blowing me up and I was having stomach ache all the time. That's basically the worst part but me chest and everything its been.... its Monday now, Monday afternoon and its been three days and the only time it does hurt is when I cough. Or when I get up
too quick I tend to stretch the stitches and the rib cage other than that you get plenty of pain killers if you need them. [Did you ask for them if you needed them or did that just give them to you?] I've, since I've come out of the operation I've had them when they have offered them to me, apart from today I've had one this morning, and that was it, since then I've had nothing.

[When you said people came to chat to you about the operation, was there anyone who you talked to who you thought was very helpful to you?...Any particular person?] There was a couple of nurses that have been on this ward for several months and that they had seen people come in and go through the same operation what I have done and they just told me, because of my age and everything, I'm a lot younger than the normal heart patient, um. I should cope with it a lot better. And I've looked at some of the older patients in the ward and thought God how lucky I am because they have... and seem to have suffered a lot more than what I would have. [You think you are fairly lucky do you?]

yes.
Appendix 5

NURSE RECOVERY ASSESSMENT

Of the patients principle carers the nurses, who tend to spend most continuous tune in contact with the patients, are in a unique position to assess recovery. We are therefore, interested in your assessment.

A Please answer all the questions by underlining one answer

In your opinion:-

1) Is the patient's general condition? poor fair good
2) Is the patient's general recovery? declining stable improving
3) Is the patient's condition giving cause for greater concern than usual? yes no

B If the answer to 3) is YES please answer the followin2 by ticking the appropriate statement

Is this concern due to:-

a) the patient's poor physical condition.
   i) routine checks [pulse, temp. b. pressure] are not satisfactory?
   ii) a major crisis has occurred [bleeding]?

b) The patient's neurological condition is poor.

c) The patient's psychological condition is poor.
   i) the patient is confused.
   ii) the patient is agitated.
   iii) the patient is depressed.

d) A "Can't quite put my finger on it, but something is not quite right" feeling.
Appendix 6

TRANSCRIPTION OF TREATMENT TAPES

Social Support Group

Preoperative instruction.

When you wake up after your operation you will be in the intensive care ward do not worry the staff are very experienced and will know how best to help you. It will seem very strange at first but remember you saw what the intensive care ward was like on the video and how the nurses did everything for you. Remember the nurses are there to help you do not worry. You will feel the tube in your mouth and the machine breathing for you. Try to rest. This will seem very strange at first, try to relax let the machine breath for you let the machine do the work. It will feel very strange at first you will get used to it just try to relax let the machine breath for you let the nurses help you. The nurses will tell you what is happening try not to worry They will give you medication for any pain that you have. Try to rest let the machine do the work for you. Let the nurses help you they are very experienced and they know what to do to help you. You will be aware of other machines around you these are recording your blood pressure and your heart rate they help the doctors and nurses take care of you try not to worry about the other machines around you. You will feel the machine breathing for you try to relax let the machine do the work try to rest. ITU will seem a little strange at first you will recall from the video what it is like. Try to relax try to rest and let the machine breath for you and let the nurses help you. They will tell you what is happening. They will give you medication for your pain. The staff are very experienced they will take good care of you try to rest let the staff help you they will know best how to help you let the machine breath for you let the machine do the work. It will feel strange at first but try to rest try to relax try not to worry.
Postoperative instruction

You are waking up. Your operation is over. You are doing fine. You are in the intensive care ward. Do not worry everything is fine. You are waking up. It's all over. You are in the intensive care ward. Try to relax you are doing fine. You are in the intensive care ward. Your operation is over. Try to relax. The staff are very experienced and know how best to help you. Try to relax let the staff do everything for you. It will seem a little strange at first but remember you saw what ITU was like on the video. The nurses will do everything for you try to relax. Try not to worry. Remember the nurses are here to help you. You will feel the tube in your mouth and the machine breathing for you. Try to relax. It will feel strange at first but let the machine do the work. Let the machine breath for you. Try to rest. Try not to worry. The nurses are here to care for you. They know how best to help you. You are waking up. You are in the intensive care ward. Try to relax. You are doing fine. You will feel the tube in your mouth. You will feel the tube in your mouth and the machine breathing for you. Try to relax. Let the machine do the work. The nurses are here to help you. They will do everything for you. Let the machine do the work. The nurses are here to help you. They will do everything for you. Try to rest. Try to relax. You are doing fine. It will feel a little strange at first. Try not to worry. Let the machine breath for you. You will be aware of the machines around you they are measuring your temperature and your heart beats. They will help the nurses and the doctors take good care of you. Try to relax don't worry about the machines. Let the machine breath for you. Let the machine do the work. Let the nurses help you. They are here to care for you. The nurses will tell you what is happening and they will give you medication for your pain. Try to relax. Your doing fine. You are in ITU the operation is over. The machine is helping you to breath. Let the machine do the work. The nurses are here to care for you. Let the nurses care for you. Let the nurses help you. They know what best to do. The machines are monitoring your heart rate, your pulse and temperature and helping you to breath. Let the machines help you. The nurses will give you medication if you feel any pain. Let the nurses help you they no best what to do pain.
Perception of Control Group

Preoperative instruction

When the operation is over you will wake up in the intensive care ward. This ward is very
different to the usual hospital ward and may seem very strange at first. You will be
surrounded by machinery which monitors your heart rate, temperature and other physical
signs and a ventilator will assist you with your breathing through a tube which you will
feel in your throat and side of mouth. Because assisted breathing with a ventilator is
unusual it does seem strange but you can control your chest and jaw muscles easing the
tension out of them. Learning to relax will help you to help yourself to be more
comfortable to have control of your chest muscles so that you breath in rhythm with the
ventilator and make it work for you.

Now lying quietly on your bed on your back with your hands at your sides close your eyes
it may help you. Breath quietly through the tube in your mouth if you can. Breath quietly.
Begin to feel rather heavy, begin to feel the bed supporting you. Let your body rest
heavily on the bed. Now think about your face think particularly about the mouth and the
jaw and feel the tension and the tightness in your jaw. Let that tension go let your mouth
feel loose let your jaw sag and just let your jaw relax. Feel the tension slip away. Feel the
muscles around your jaw relax. Feel the tension just slip away. Let your mouth rest loosely
let jaw your sag and just breath quietly feeling heavy feeling relaxed. Now think about
your shoulders and your chest feel the slight tension and tightness in your shoulders and
your chest and your stomach. Think about those muscles and let the tightness slip away
breath quietly feel the tension slip away feel the muscles relaxing enjoy the heavy relaxed
feeling in your chest. Feel the bed supporting you let your chest muscles relax and feel
yourself falling softly into the bed. Feel the heaviness of your head and chest as the tension
slips away let the muscles sag let your mouth rest let your jaw rest feel the bed supporting
you feel yourself relaxing breath quietly and enjoy the heavy resting feeling feel yourself
relaxing and resting and breathing quietly and now imagine yourself in the ITU after the operation on your back. Relaxed muscles feeling heavy and loose your waking up slowly let your muscles relax let them go loose. Imagine yourself coping with the sensation of the assisted breathing. Feel the tube resting in your mouth feel your muscles relaxing. The bed supporting you tell yourself you know what’s happening and you know what to do. You’ll enjoy feeling heavy, enjoy feeling relaxed. Imagine yourself coping breathing in rhythm with the machine doing well. Your mind is a powerful tool let it help your body to recover learning to relax your chest and your jaw feeling relaxed and heavy will help you to breath in rhythm with the machine. Feel yourself relaxed now. Imagine yourself relaxed in ITU, imagine how it will be, see yourself coping and doing well. Relaxing and feeling you can cope will help you with all your recovery. But for now concentrate on relaxing concentrate on imagining how you are going to be how you are going to cope in ITU. You know how to cope now. You know how ITU will look so it won’t seem strange to you, you know what to expect, you know how the breathing tube feels resting in your mouth, you know how to relax you know how to cope.

Listen to this tape as often as you like. Practice will make the relaxation easier. Imagining yourself waking up and coping with the unusual sensations will make them more familiar and you will help yourself to feel more comfortable and this will help your recovery.

Postoperative instruction

You are waking up in the intensive care ward your operation is over every thing is fine. You are waking up. You are in the intensive care ward. You will feel the tube of the ventilator in your mouth. It will feel a little strange. Remember you have learnt how to relax your jaw and your chest muscles. You can control those muscles you can feel more comfortable. Listen to the tape now it will remind you to relax. Listen quietly you are doing fine. You are feeling heavy. Wake up slowly and feel the bed supporting you let your body rest heavily on the bed. Think about your face and particularly your mouth and
your jaw. Feel the tension, the tightness in your jaw and mouth. Let the tension go let the
tightness slip out of your muscles let it slip away let your mouth feel loose. You will feel
the tube resting in your mouth. Let your jaw sag let your mouth relax. Feel the muscles
around your jaw relax. Feel the tension slip away. Let your mouth rest loose let your jaw
rest. Just feel the tube resting in your mouth you are working with the machine everything
is fine you are just relaxing the operation is over. Think about your shoulders and chest.
Feel the slight tension, tightness in your chest and in your shoulders and in your stomach
muscles. Think about that tightness and let it slip away. Feel the muscles relaxing. Enjoy
the heavy relaxed feeling in your chest. Feel the bed supporting you and let your chest
muscles relax. Feel yourself sinking softly into the bed. Feel the heaviness of your head
and your chest as the tension slips away. Let the muscles sag let the mouth rest loose.
Your jaws relaxing. The beds supporting you are doing fine you are working with the
machine you are feeling more comfortable just relax. Its all over you are waking up you
are easing the tension out of your muscles you are working with the machine you are
doing well feel easy you know what to do you know how to cope. Feel heavy let your
chest and jaw relax. Breath with the machine just relax you know how to cope you are
waking up its all over your doing fine.
# Appendix 7

ROYAL COLLEGE OF SURGEONS CLASSIFICATION OF SURGERY

## Head and Neck.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Category</th>
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<tbody>
<tr>
<td>Torticollis, open correction</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Cervical rib</td>
<td>Major</td>
</tr>
<tr>
<td>Branchial cyst</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Branchial fistula, excision</td>
<td>Major</td>
</tr>
<tr>
<td>Block dissection</td>
<td>Major</td>
</tr>
<tr>
<td>Thyroid nodule excision</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Thyroidectomy</td>
<td>Major</td>
</tr>
<tr>
<td>Parathyroid(s), any procedure</td>
<td>Major</td>
</tr>
<tr>
<td>Aneurysms (carotid, within neck)</td>
<td>Major plus</td>
</tr>
<tr>
<td>Carotid endarterectomy</td>
<td>Major plus</td>
</tr>
<tr>
<td>Carotid body tumour</td>
<td>Major</td>
</tr>
<tr>
<td>Major vessels, any other procedure</td>
<td>Major plus</td>
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## Salivary glands.

<table>
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<th>Category</th>
</tr>
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<tbody>
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<td>Duct, dilatation</td>
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</tr>
<tr>
<td>Sialography</td>
<td>Minor</td>
</tr>
<tr>
<td>Stricture of duct, excision</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Calculas, removal</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Fistula, repair</td>
<td>Major</td>
</tr>
<tr>
<td>Submandibular abscess, incision</td>
<td>Minor</td>
</tr>
<tr>
<td>Submandibular gland, excision</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Parotidectomy: without preservation of facial nerve</td>
<td>Major</td>
</tr>
<tr>
<td></td>
<td>Major plus</td>
</tr>
</tbody>
</table>
Breast.

Biopsy Minor
Abscess, drainage Minor
Cyst(s) or benign tumouts), excision Intermediate
Mastectomy: Partial Intermediate
    Total, Radical Major
Gynaecomazia Intermediate
Microchdectomy Intermediate
Breast augmentation, reduction, reconstruction Major
Post mastectomy prosthetic implants, insertion or removal Intermediate
Excision of inverted nipples Intermediate

Abdomen

stomach
Gastroscopy Minor
Gastrostomy Major
Gastrectomy: Partial Major
    Total Major plus
Antrectomy Major
Perforated gastric ulcer Major
Pyloroplasty (including vagotomy) Major
Ramstedt's procedure Major
Gastro-enterostomy Major

Duodenum

Duodenoscopy Minor
Diverticulum, excision Major
Duodenectomy Major
Perforated duodenal ulcer
Jejunum and Heum
Enterotomy
Mockers diverticulum, excision
Resection and anastomosis
Fistula repair
Obstruction (including intussusception)
Jejunal biopsy

Colon
App endicectomy
Caecostomy
Colostomy
Colostomy closure
Fistula repair
Diverticulitis, other operative treatment
Obstruction
Colectomy: partial
  total
Procto-colectomy
Sigmoidoscopy, diagnostic or removal of polyp
Colonoscopy
Bowel resection

Rectum
Resection, anterior
Abdomino-perineal (combined synchronous) excision
Prolapse: total repair
  partial repair

Major
Major
Major
Major
Major
Major
Major
Intermediate
Major
Major
Major
Major
Major
Major
Major plus
Major
Major plus
Minor
Intermediate
Major plus
Major plus
Intermediate
<table>
<thead>
<tr>
<th>Procedure</th>
<th>Complexity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fistula</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Stricture, dilatation</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Polyp, removal</td>
<td>Minor</td>
</tr>
<tr>
<td>Abdominal wall and Peritoneum</td>
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</tr>
<tr>
<td>Abscess: subphrenic, drainage</td>
<td>Major</td>
</tr>
<tr>
<td>pelvic/other peritoneal, drainage</td>
<td>Minor</td>
</tr>
<tr>
<td>Laparoscopy</td>
<td>Minor</td>
</tr>
<tr>
<td>Laparotomy: exploratory, post-traumatic,</td>
<td>Major</td>
</tr>
<tr>
<td>division of adhesions</td>
<td></td>
</tr>
<tr>
<td>Staging for Hodgkin's disease</td>
<td>Major plus</td>
</tr>
<tr>
<td>Hernia: simple, inguinal, femoral, ventral(umbilical)</td>
<td>Intermediate</td>
</tr>
<tr>
<td>para-umbilical, epigastric, recurrent</td>
<td>Major</td>
</tr>
<tr>
<td>complicated (strangulated/obstructed)</td>
<td>Major</td>
</tr>
<tr>
<td>intra-abdominal, diaphragmatic, hiatus</td>
<td>Major plus</td>
</tr>
<tr>
<td>Liver Gall bladder. Pancreas</td>
<td></td>
</tr>
<tr>
<td>Liver abscess, drainage</td>
<td>Major</td>
</tr>
<tr>
<td>Cholecystectomy</td>
<td>Major</td>
</tr>
<tr>
<td>Pancreatectomy, all procedures</td>
<td>Major plus</td>
</tr>
<tr>
<td>All hepatectomy</td>
<td>Major plus</td>
</tr>
<tr>
<td>Kidney, Renal pelvi and Ureter</td>
<td></td>
</tr>
<tr>
<td>Nephrectomy</td>
<td>Major</td>
</tr>
<tr>
<td>Partial nephrectomy</td>
<td>Major plus</td>
</tr>
<tr>
<td>Perineal exploration, drainage</td>
<td>Major</td>
</tr>
<tr>
<td>Nephro-ureterectomy</td>
<td>Major plus</td>
</tr>
<tr>
<td>Ureter, transplantation, reimplatation</td>
<td>Major plus</td>
</tr>
<tr>
<td>Ureter other procedures</td>
<td>Major</td>
</tr>
</tbody>
</table>
Renal transplant                      Major plus
Nephrolithotomy                      Major plus
Percutaneous nephrolithotomy         Major plus
Lithotripsy Major                    Major plus

Bladder
Cystoscopy                           Minor
Cystoscopy: including minor intra-vesical procedures Intermediate
   extensive intra-vesical procedures Major
Cystostomy                           Major
Cystectomy                           Major plus
Bladder rupture repair                Major
Fistula                               Major
Prostatectomy: trans-urethral, abdominal Major

Vessels
Any procedure on: Aorta, iliac other major arteries Major plus
Anastomosis: Porta-cava, spleno-renal, meso-caval Major plus
Ruptured aortic aneurism               Major plus
Inferior vena cava, ligation           Major
Endarterectomy                        Major plus
Hepatic artery, ligation and perfusion of the liver Major plus

Gynaecology
Ovarian abscess                       Intermediate
Colposuspension                        Major
Hysterectomy: abdominal, vaginal      Major
   Wertheim's                           Major plus
| Orthopaedic                                      |  |
|-------------------------------------------------|  |
| Manipulation under general anaesthetic          | Intermediate |
| Osteotomy, large bone                          | Intermediate |
| Arthrectomy                                     | Major        |
| Arthroplasty:                                   | Intermediate |
| hip, knee, shoulder, elbow                      | Major        |
| Bone tumour, radical procedure                  | Major        |
| Major deformity                                 | Major        |
| Excision of coccyx                              | Intermediate |
| Cervical rib Major                              | Intermediate |
| Nail bed radical procedure                      | Intermediate |
| Ganglion, excision                              | Intermediate |
| Diac bone graft                                 | Intermediate |
| Bone biopsy                                     | Intermediate |

| Fractures                                       |  |
|-------------------------------------------------|  |
| Long bones, closed reduction                    | Intermediate |
| Removal, pins, screws, plates                   | Intermediate |
| Open reduction, compound, operative reduction    | Major         |
| Femoral neck, pin and plate etc.                | Major         |
| Spine: uncomplicated                            | Major         |
| complicated                                    | Major plus    |

| Heart and Mediastinum                           |  |
|-------------------------------------------------|  |
| Cardiac pacemaker                               | Intermediate |
| Heart and/or adjacent great vessels procedures  | Major plus    |
| requiring heart/lung machine                    | Major plus    |
| Other vascular by-pass procedures               | Major plus    |
| Ruptured aneurysm not involving heart-lung machine | Major plus    |