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**Cognitions Associated with Chemotherapy:
Assessment of and Intervention for Pretreatment
Symptomatology**

by

Gary B. Challis, B.Sc., M.Sc.

**A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE OF DOCTOR OF PHILOSOPHY**

DEPARTMENT OF PSYCHOLOGY

CARLETON UNIVERSITY

OTTAWA, ONTARIO

MAY, 1991

c GARY B. CHALLIS, 1991

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ASSESSMENT OF AND INTERVENTION FOR PRETREATMENT
SYMPTOMATOLOGY"

submitted by

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ABSTRACT

The development of anticipatory nausea and vomiting (ANV) has been considered to be one of the more distressing side-effects to cancer chemotherapy. It has been suggested that the administration of chemotherapeutic medication to disrupt the rampant cellular differentiation associated with cancer reliably elicits a posttreatment response of nausea or vomiting. This postchemotherapy nausea and/or vomiting (PCNV) occurs in the majority of patients receiving chemotherapy. In addition to the nauseous potential of the drugs toxicity it can also lead to secondary effects such as anemia, anorexia and, in some cases, non-compliance with future treatments. After a number of administrations of chemotherapy there can occur, in a minority of patients, a response known as anticipatory nausea and/or vomiting (ANV). It is believed that the ANV response occurs as a result of conditioning and may be mediated by an individual's level of anxiety to their susceptibility to motion sickness. While each of these factors have been associated with ANV, the majority of these studies has been retrospective and therefore it is possible that the occurrence of ANV itself has modified the patient's reporting of the extent of these influences. Retrospective studies, while indicating current levels of functioning, fail to indicate what factors may put a patient at risk for development of ANV. Prospective

studies, on the other hand, may be able to differentiate those factors that are important in identifying why only a portion of patients who are undergoing chemotherapy go on to develop the anticipatory response. It has been suggested, but not yet established, that response development may be mediated by such factors as depression, imagery capabilities and successful coping strategies. Furthermore, it may be possible to alleviate the occurrence of ANV if appropriate coping strategies are subsequently implemented. It was the intent of this study to prospectively identify individual characteristics that may put an individual at risk for the development of ANV. Depression, imagery capacity, coping ability, and anxiety related to cognitions associated with treatment were hypothesized to place an individual at risk for ANV development. Furthermore, a behavioural intervention was implemented for those patients who experienced ANV in an attempt to: 1) understand what influence such intervention would have on specific measures of anxiety and coping and, 2) evaluate its influence upon the occurrence and severity of ANV. The results confirmed previous contentions that the likely developmental process of ANV could be likened to a conditioned response, but that this model specified conditions that were necessary but perhaps insufficient to fully account for its occurrence. It was shown that prospective measures of cognitions associated with

treatment, anxiety and coping predicted the subsequent development of ANV above and beyond what could be accounted for by post-chemotherapy nausea severity and state anxiety measures (variables commonly associated with the conditioning model). Furthermore, a self-directed behavioural intervention not only reduced levels of anxiety and increased levels of coping, it also reduced the severity of anticipatory nausea. The findings suggest that cognitive activities can mediate response development and that these activities can be modified to the extent that some specific negative treatment effects can be minimized or eliminated.

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I thank my son Bennett for giving me more smiles, joy, and cherished moments than can be imagined. His frailty and unspoken love provided a tremendous impetus to complete this research when procrastination taunted.

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**Professing themselves to be wise, they became fools
(Romans 1, verse 22).**

INTRODUCTION

Chemotherapy is one method of medical intervention that is utilized in an attempt to modify the rampant reduplication of cancerous cells (Redd, Rosenberger and Hendler, 1982). It is unfortunate that while this treatment protocol is potentially life-extending it also elicits a variety of physically noxious and psychologically distressing side-effects (Cotanch, 1983). Direct pharmacological side-effects include immunosuppression, alopecia, nausea and vomiting (Burish and Carey, 1986) while common secondary pharmacological effects may include anorexia, anemia and electrolyte imbalances (Cotanch, 1983). Some psychological consequences of chemotherapy can also occur and may be expressed as increased levels of anxiety and depression as well as the development of anticipatory nausea and/or vomiting (ANV; Burish and Carey, 1986; Ingle, et al., 1984).

While the direct physiological effects of chemotherapy account for much of the severity of the posttreatment responses they are inadequate to describe why some patients develop anticipatory responses (e.g., nausea, vomiting, severe anxiety; Burish and Carey, 1986). The development and persistence of such anticipatory responses has been conceptualized in various ways ranging from classical and

operant conditioning models to the labelling of patients as suffering from hysterical or psychosomatic disorders (Morrow and Dobkin, 1988). It is the intent of this study to clarify some of the issues related to the development of anticipatory nausea and/or vomiting (ANV) and other psychological responses associated with cancer chemotherapy protocols. As well, the effectiveness of a behavioural intervention will be evaluated to establish what, if any, moderating effect psychological therapy might have upon the severity and frequency of these responses.

Chemotherapy

In order to understand many of the issues related to the development of ANV it is important to understand some aspects of the chemotherapy treatment process. Outpatients (patients not currently admitted to hospital) may receive their treatment injections of antineoplastic medication at a cancer centre or regional clinic on a daily, weekly, or monthly basis. While some chemical-based treatments may be self-administered (e.g., oral medications such as Tamoxifen), most patients continue to receive treatment as outpatients to allow the treatment team to ensure that blood profiles (adequate red and white blood cell production) and accurate dosages are maintained (Tannock, 1987). Depending upon the success of a given treatment protocol, there may be ongoing changes in the specific

drugs or dosages used during treatment as well as the frequency or method of their administration.

Chemotherapy is defined as any treatment protocol that utilizes drugs (Golden, 1975). When initially introduced as a method of cancer management, chemotherapy was considered to be effective in terms of palliation (alleviation of symptoms; Golden, 1975). During the past thirty years however, greater refinement and sophistication of this method has proven its utility not only for palliation but also as an adjunct to treatment (used in combination with other forms of therapy--radiation, surgery, hyperthermia etc.) and a primary treatment protocol (Tannock, 1987). There are approximately eighty different drugs that have been shown to have a significant negative influence on the proliferation of cancerous cells (Tannock, 1987). The numerous combinations and dosages of these drugs provide the oncologist and the patient with a variety of treatment options (Golden, 1975).

Chemotherapy directly damages malignant cells by destroying their surrounding cell membrane (cytotoxic) thereby disrupting differentiation (Golden, 1975). It may also create sufficiently adverse "local" conditions around the malignant cells so that cellular differentiation can no longer occur (cytostatic; Tannock, 1987). Cancer cells are differentiated from normal cells in that their growth is considered to be rapid, uncontrolled, progressive, and

invasive (Dorland, 1974). Furthermore, whereas benign cells are localized to the site of the tumour, malignant cells have the potential to metastasize.

While chemotherapy is an effective cytotoxin for rapidly growing malignant cells it also interferes with the reduplication of other rapidly dividing normal cells (Tannock, 1987). Chemotherapy can therefore lead to a variety of cell-based side-effects such as alopecia (hair loss), gastro-intestinal upset (due to disruption of the rapidly dividing cells in the stomach lining), stomatitis (oral ulcers), and taste disturbances (tissue damage on the tongue; Frytak and Moertel, 1981; Golden, 1975). In addition to these treatment side-effects, most chemotherapy patients (80-100% depending upon the dose and type of drugs administered) also experience nausea and/or vomiting as a direct result of chemical infusion (Frytak and Moertel, 1981). The nausea and/or vomiting that occurs following treatment (postchemotherapy nausea and/or vomiting: PCNV) and in anticipation of treatment (ANV) have been identified as being two of the most disturbing consequences of cancer chemotherapy (Frytak and Moertel, 1981).

It is important that effective management techniques of these responses be utilized as research has shown that chemotherapy-related nausea and/or vomiting is negatively correlated with treatment compliance (Maule and Perry, 1983). Maule and Perry (1983) reported that 10% of those

cancer patients participating in their study, who also reported experiencing PCNV, refused ongoing treatment for their diagnosed cancer due to the severity of their posttreatment side-effects such as PCNV. Other studies have suggested that up to 19% of all chemotherapy patients may decide to stop therapy solely on the basis of the severity of nausea and vomiting that they are experiencing (e.g., Penta, Poster and Bruno, 1983; Wilcox et al., 1982). Furthermore, it has been suggested that non-compliance with all or even some aspects of treatment can lead to increased morbidity, decreased curability, and diminished survival (Laszlo, 1980). The severity of a patient's response to the toxicity of their treatment protocol can also lead the oncologist to limit the aggressiveness of the treatment program in an attempt to moderate these responses (Stoudemire, Cotanch and Laszlo, 1984).

Nausea, Retching and Vomiting

The emetic process is commonly divided into three separate stages: nausea, retching and vomiting (Scott, 1983; Seigel and Longo, 1981). Although often considered to represent three points along a continuum, nausea does not necessarily result in or from vomiting or retching (Plezia and Alberts, 1983). Previous research, specifically in the ANV literature, that has combined nausea and vomiting into one category fails to acknowledge

the individual physiological and psychological factors that are involved in their development and occurrence.

NAUSEA: Nausea is subjectively defined as a feeling that one is about to vomit (Plezia and Alberts, 1983).

Clinically it is defined as an urge to vomit accompanied by a significant loss of gastric tone and "peristalsis with contraction of the duodenum and reflux of intestinal contents into the stomach" (Seigel and Longo, 1981, p. 352). For many lay people, however, motion sickness, intestinal cramps and menstrual cramps, although involving different physiologic responses and causal mechanisms, may be subjectively defined as nausea despite the lack of an urge to vomit. Nausea, given that it is a subjective response, may also be difficult to assess clinically. Stam and Challis (1989) found that there were significant differences between physicians' and nurses' ratings of the potential toxicity (nausea/vomiting) of a variety of drug treatment protocols. Furthermore, these ratings were only moderately correlated with patients' ratings of the severity of their side-effects. Not only do these differences lead to difficulties in the prediction and assessment of nausea associated with chemotherapy, they also make the prescription of appropriate antiemetic medication extremely difficult.

RETCHING: Retching describes a response that commonly precedes vomiting and involves rhythmic, laboured,

spasmodic respiratory movements that include the diaphragm and abdominal muscles (Seigel and Longo, 1981). Retching is most commonly experienced immediately preceding and often alternating with vomiting (Scott, 1983). Although it is difficult to separate retching from vomiting due to their temporal proximity, separate clinical definitions exist because retching can occur without vomiting (e.g., choke or gag reflex; Plezia and Alberts, 1983).

VOMITING: Vomiting is defined as the forceful expulsion of gastric contents through the mouth combined with strong contractions of the abdominal wall (Seigel and Longo, 1981). While its severity remains subjectively evaluated vomiting is an all or none response. The act of vomiting is controlled by the vomiting centre and the chemoreceptor trigger zone (CTZ; Golden, 1975). The vomiting centre is located in the fourth ventricle (Plezia and Alberts, 1983). The CTZ lies in paired structures on the surface of the dorsal medulla oblongata on the floor of the fourth ventricle (Pratt, Lazan, Penman and Holland, 1984). When the vomiting centre and the CTZ (a chemosensor for the presence of a number of toxic substances such as cancer chemotherapeutic agents) are stimulated the vomiting reflex is initiated (Plezia and Alberts, 1983). In addition to these sensors, gastro-intestinal irritation, vestibular disturbances and specific cellular damage have all been implicated in the onset of emesis (Plezia and Alberts,

1983). It has been suggested that the occurrence of any of these three responses involves a complex interaction of pharmacological, biological and possibly cognitive factors (Plezia and Alberts, 1983), however, the process through which psychological elements are able to influence these physiological responses has not been clearly defined.

Postchemotherapy Nausea and/or Vomiting (PCNV)¹

Nausea and/or vomiting that occurs for up to six weeks after the administration of chemotherapy is commonly considered to be a direct physiological response to the emetogenic effects of the chemical agents (Morrow and Morrell, 1982). Although PCNV has been identified as a critical problem in the treatment of cancer patients its severity varies according to the emetogenic nature of the drugs used as well as the patients subjective interpretation of their response (Carey and Burish, 1988). This variability, combined with inherent physiologic differences between patients and the influence that varying stages and sites of cancer may have on treatment responsivity, makes it difficult to predict the severity and frequency of any one patient's PCNV (Carey and Burish, 1988). Unpredictability is further compounded when drug treatments are combined with other methods of treatment such as immunotherapy, hyperthermia, and fractionation

¹ Glenda Gilliland is thanked for her assistance with the research of this section.

radiation. Nonetheless, clinical trials have confirmed the highly distressing nature and frequency of occurrence of PCNV (Frytak and Moertel, 1981). Interestingly, there are consistent findings that the persistence of nausea, as well as the secondary discomforts that it commonly produces (e.g., eating disorders, sleep disturbances, diarrhea) are often more distressing for the patient than vomiting (Plezia and Alberts, 1985).

In a sample of 238 outpatients with breast cancer or malignant lymphoma receiving a variety of drug combinations Love, Leventhal, Easterling and Nerenz (1989) stated that 87% of patients experienced postchemotherapy nausea (PCN) at some point during their first six courses of treatment while only 54% percent reported postchemotherapy vomiting (PCV) during this same time period. Cohen, Blanchard, Ruckdeschel and Smolen (1986) evaluated 149 patient across a variety of sites and stages of cancer, as well as different treatment protocols, and reported that 84% of patients reported experiencing PCN or PCV during their initial six treatments.

Jacobsen et al. (1988) found that 71% of their patients reported PCN and 16% reported PCV after at least one of their first six treatment infusions. Furthermore, the severity, frequency and duration of PCNV was shown by Jacobsen et al. (1988) to be influenced by a patient's previous susceptibility to gastrointestinal upset, their

expectations of treatment toxicity, and their degree of pretreatment state anxiety. The development of PCN was unrelated to treatment toxicity or the use of antiemetic medications. On the other hand, Rhodes, Watson and Johnson (1986) reported no significant correlations between levels of pretreatment state anxiety and the occurrence of posttreatment vomiting or nausea. It may be that these apparently contradictory results can be explained by the variable influence that specific personality characteristics and/or coping strategies play in mediating the reported subjective severity of PCNV (Challis and Stam, 1990; Gralla, 1981; Morrow, 1982).

Not only have these studies described the incidence of PCNV among chemotherapy patients, they have also verified how resistant PCNV can be to additional drug therapy aimed at controlling its occurrence. The effectiveness of these pharmacologic interventions, termed antiemetics, in controlling or eliminating these symptoms has been shown to vary widely as a result of a number of factors (Scott, 1986). Individual factors such as site and stage of cancer (e.g., gastrointestinal carcinomas, ovarian cancer), the dose and combination of drugs used in therapy (e.g., methotrexate-related PCNV is more easily controlled than cisplatin; Scott, 1986), as well as the patient's willingness to take additional drugs that may themselves have side-effects (e.g., extreme fatigue, disorientation;

Scott, 1986) have made it difficult to predict the success of antiemetic interventions in clinical patient samples (Pratt et al., 1984).

In addition to those drugs that are strictly classified as antiemetics (e.g., halodol, stemitol; CPS, 1986) other drugs may be effective in reducing treatment related anxiety and PCNV severity. Delta-9-tetrahydrocannabinol (marijuana) has been shown to be useful for mild to moderate PCN and some cases of PCV (Pratt et al., 1984). In addition to patient fears regarding the social and familial acceptance of marijuana, its use and dosage continues to remain limited because of the potential for disturbing side-effects that include perceptual disturbances, incontinence, hypotension and transient amnesia (Laszlo, Clark, Hanson, Crumpler and Gralla, 1985). Lorazepam has been shown to be effective as an antiemetic that, while unable to reliably control the occurrence of PCNV, may result in a reduction, but not an elimination, of the severity and duration of ANV (Laszlo et al., 1985). Despite the development of a dependency in some patients an important additional benefit of Lorazepam therapy is the direct reduction of subjectively reported levels of treatment-related anxiety associated with treatment. Unfortunately, the memory impairment that can result from aggressive Lorazepam treatment often makes it contraindicated for many patients (Laszlo et al., 1985).

Psychological Influences

Although many cancer patients undergoing chemotherapy receive similar dosages and combinations of drugs, there exists considerable variability with respect to the frequency and severity of the side-effects that they may experience. While such variability may be considered to be the result of differences in the site and stage of cancer as well as the drugs and dosage administered, Gralla (1981) found that when these differences were statistically controlled considerable variation remained in the frequency and severity of side-effects among patients. It has been argued that the variability that persists may be, in part, the result of individual psychological differences (Cassileth et al., 1985). Gard, Edwards, Harris and McCormack (1988) reported that it was possible to exacerbate patients' experiences of posttreatment side-effects by asking them to focus on the aversive side-effects of chemotherapy. Cassileth et al. (1985) suggested that a patient's cognitions and expectancies concerning treatment produced a self-fulfilling prophesy. According to this hypothesis negative treatment expectations led to psychological changes that influenced the severity of treatment side-effects. Morrow (1986) found that behavioural interventions to relieve ANV commonly resulted in a corresponding decrease in the severity, but not the

frequency, of PCNV. Not only do these results suggest the presence of a modifiable component related to certain elements of the postchemotherapeutic response, they also provide a starting point for studying the involvement of psychological influences on anticipatory responses (Morrow, 1986; Morrow and Dobkin, 1988).

Anticipatory Nausea and/or Vomiting--ANV

The importance of studying anticipatory responses lies in the fact that experimental and anecdotal reports indicate that given certain protocols a proportion of chemotherapy patients may fail to comply with treatment based solely upon the severity of their nausea and vomiting associated with treatment (Wilcox et al., 1982). It has also been reported that of those patients refusing treatment as a result of PCNV upwards of 70% were also experiencing ANV (Wilcox et al., 1982). The logical conclusion to this argument suggests that if the compounded effects of ANV were to be removed perhaps fewer patients would be non-compliant with treatment.

The incidence of ANV varies anywhere from 9% to as high as 63% of adult chemotherapy patients (Morrow and Dobkin, 1988). The variability of these estimates is commonly attributed to differences in the definition and variety of ANV assessment methods, as well as the influence that the drug type or dosage or the number of treatments

prior to the assessment may have upon its occurrence (see below for discussion; Burish and Carey, 1986; Ingle, Burish and Wallston, 1984; Jacobsen et al., 1988; Pratt et al., 1984). After summarizing the data from 2,452 chemotherapy patients in 28 separate studies Morrow and Dobkin (1988) calculated the overall prevalence of anticipatory nausea to be 33%. While anticipatory nausea (AN) is a common occurrence, the frequency and severity of anticipatory vomiting (AV) is a less frequently reported problem for most patients. Research suggests that anticipatory vomiting is less prevalent and occurs in approximately 5% of adult chemotherapy patients (Cella, Pratt and Holland, 1986).

A number of reasons may account for the variability in incidence rates for ANV. First, considerable disagreement appears to exist with respect to the exact nature of the responses being studied. There is little acknowledgment in this literature that nausea and vomiting are physiologically and psychologically separate responses. Previous studies that have combined both of these responses into one without explanation (e.g., Nicholas, 1982) are at risk for reporting associations and incidences that describe one of these responses but not the other (Jacobsen et al., 1988).

Second, most studies have not been longitudinal, but rather, have assessed the frequency of AN and/or AV based

upon only one treatment session (Jacobsen et al., 1988). As will be discussed the likelihood of ANV occurring has been shown to increase after repeated exposure to chemotherapy treatment sessions (Morrow, 1982). Thus, the incidence of AN and AV is dependent upon the stage of treatment patients were at when they were assessed (Morrow, 1982). There is also evidence to suggest that once it has developed AN or AV may not necessarily occur prior to every subsequent treatment (Morrow, 1982). Thus, the assessment of AN or AV at only one treatment session may lead to a number of false negatives wherein patients who actually have experienced AN or AV do not report doing so prior to every treatment. Morrow (1982) found that 21% of his patients experienced AN or AV when asked prior to only one particular treatment while 51% stated that they had experienced AN or AV at least once during their entire treatment experience.

Third, if the response of ANV develops along lines similar to those of a conditioning paradigm then this response should not occur without the patient first experiencing the unconditioned response of PCNV (Bolles, 1972). Research that has ignored this element commonly report the incidence of AN and AV in terms of the entire sample used in the study, however, since not all patients report experiencing PCNV the incidence of ANV may have been underrepresented by previous studies (Cohen et al., 1986).

Cohen et al. (1986) reported that while 38% of their entire sample experienced AN or AV, 46% of those patients who experienced PCNV (85%) experienced ANV. It is important that future research specify how their incidence rate was determined in order to allow for comparisons across studies.

The fourth factor concerns the nature of the patient sample being studied (Morrow, 1982). Patients with specific cancers (e.g., gastro-intestinal, ovarian, brain) may experience nausea and/or vomiting in the absence of any treatment due entirely to the nature of their cancer while others receiving specialized forms of chemotherapy (e.g., intraorgan, intramuscular, oral) may experience no PCNV despite the injection of known toxic drugs (Tannock, 1987). Given these possibilities, researchers who have failed to control for such extraneous variables may report inflated incidence rates for ANV and PCNV due to type-two error.

Respondent Learning Model

Anticipatory nausea is believed to develop in a manner similar to associative learning or conditioning/respondent learning (Carey and Burish, 1988). While it may be difficult to provide conclusive data demonstrating that ANV is learned, there is substantial indirect empirical evidence to support this conceptualization (Carey and Burish, 1988; Morrow and Dobkin, 1988). The general

hypothesis states that after one or more pairings an association develops between the pharmacological side-effects of treatment (specifically PCNV: the unconditioned response) and the physiological and cognitive stimuli that are associated with the chemotherapy session (the unconditioned stimuli). With repeated associations these conditioned stimuli begin to elicit a conditioned response of nausea and vomiting that is physiologically similar to the chemotherapy induced nausea and vomiting (Andrykowski, Redd and Hatfield, 1985).

If ANV is a conditioned response then it should be influenced in a similar manner to other responses by factors that have been shown to mediate conditioning (Andrykowski et al., 1985). Specifically, there should be no occurrence of the conditioned response in the absence of the unconditioned response. Numerous studies have, in fact, shown that ANV does not occur without the patient first experiencing PCNV (e.g., Morrow and Dobkin, 1988). Although there are occasional reports of a patient experiencing ANV without previous exposure to PCNV (e.g., Hoffman, 1982) it is possible that these rare occurrences, out of thousands of reported cases in the literature, are the result of the site of the patient's cancer and/or inaccurate assessment by the researcher.

A conditioning paradigm also predicts that a greater number of associations should result in a strengthening of

the association between the UCS and the UCR thereby leading to the elicitation of the CR (Bolles, 1972). In fact, a variety of studies have shown that as the number of treatment sessions where PCNV is evident increases there is an increment in the patient's likelihood of developing ANV (e.g., vanKomen and Redd, 1985). It has been reported that ANV commonly develops in patients at some point prior to their third or fourth treatment session with initial occurrences of ANV rarely being reported after the sixth treatment session (Nicholas, 1982). In one study, patients developed ANV, on average, after 3.3 treatment sessions (Nicholas, 1982; Olafsdottir, Sjoden and Westling, 1986).

While much of this evidence supports a conditioning model, such a conceptualization remains inadequate to explain many of the other findings that have been associated with the development of ANV. Specifically, if ANV follows a strictly classical model it would be expected that ANV should develop to some degree in all patients with PCNV (Morrow, 1982). In fact, the majority of studies to date indicate that less than 50% of patients develop ANV. It has been suggested that there are other intervening influences that are functioning to mediate response development (Burish and Cary, 1986). Unfortunately, while much has been written regarding such variables as anxiety, there is little acknowledgement and even less understanding of the possible influence that other cognitive influences

may have upon the initiation of ANV (Andrykowski and Redd, 1987).

Factors Associated with the Development of ANV

Although empirical evidence strongly suggests that ANV is a learned response it differs from classical conditioning in a number of ways: first, the response often develops after only one or two associations rather than after several exposures: second, the interval between the presentation of the UCS and the onset of the UCR may be as great as twenty-four hours instead of the brief interval that is commonly used in most conditioning experiments: third, the response of ANV is often intermittent. Once it has developed it does not necessarily occur prior to each subsequent treatment session (Carey and Burish, 1988; Morrow and Dobkin, 1988).

In an attempt to understand some of the shortcomings of a strict conditioning model of ANV a number of studies have attempted to draw conclusions based upon strong correlations between specific personality factors and ANV occurrence (e.g., Altmaier et al., 1982; Nerenz et al. 1986). Unfortunately, the majority of these studies are retrospective in design and thus may be biased by the patients previous experience with ANV.

PRIOR SUSCEPTIBILITY: In their review of the literature Carey and Burish (1988) reported that patients who

indicated a prior susceptibility to nausea and/or vomiting (e.g., previous illnesses, anxiety, motion sickness) were at an increased risk for the development of ANV. The suggestion is that a susceptibility to nausea or vomiting in a variety of non-contiguous situations may increase one's likelihood of a similar response prior to treatment. On the other hand, Nesse, Carli, Curtis and Kleinman, (1980) did not find any significant differences on the basis of prior susceptibility.

MOTION SICKNESS: Morrow (1984) reported that patients with ANV were more likely to be susceptible to motion sickness than patients who did not develop ANV. Morrow suggested that the association between motion sickness and ANV illustrated a vestibular influence capable of mediating who was at risk for the onset of the conditioned response. Leventhal, Easterling, Nerenz and Love (1988) reported that previous research failed to clarify whether motion sickness was associated with anticipatory nausea due to a vestibular influence, due to its correlation with increased levels of posttreatment nausea or due to the possibility that motion sickness might facilitate the association of external stimuli to posttreatment nausea and vomiting. Subsequent research has failed to support this facilitation hypothesis (e.g., Challis and Stam, 1990; Dolgin et al., 1985). As well, the low frequency of motion sickness in the general population and the cancer patient population prevents it

from being considered a useful predictor of ANV development.

TASTE AVERSIONS: The development of ANV has been considered by some to be similar in some respects to the learned taste aversion often reported in the animal literature (Schwartz, Davidson and Goleman, 1978). When a rat is given a flavoured liquid to drink and is then mildly poisoned so that it eventually becomes sick any subsequent presentations of the flavoured drink are quickly refused. Rats learn the contingency between the flavoured drink and the poisoning in one trial (Schwartz et al., 1978). It is argued that the immediate learning of this contingency is due to the extreme salience of the CS and UCR to the organism (Bernstein and Webster, 1980). The cognitions and events associated with chemotherapy are likely to be very salient and novel stimuli for the majority of individuals. This salience may increase the likelihood of rapid conditioning for many patients (Fetting et al., 1983). Furthermore, the noxious side-effects to treatment are similar in kind to the animal response to the toxic fluid.

Fetting et al. (1983) found a significant difference between patients who did or did not develop ANV in terms of the presence or absence of taste disturbances that could be directly attributed to their treatments. As well, Nerenz et al. (1986) found that a lower incidence of ANV response could be obtained by blocking certain taste disturbances.

However, Nerenz et al. (1986; see also Andrykowski, 1987) also reported that if the effects of PCNV were statistically controlled then taste no longer significantly predicted ANV development. Furthermore, few patients (5-7%) actually report experiencing taste disturbances (Andrykowski, 1987; Challis and Stam, 1990) thereby preventing it from being considered a common predictor of ANV. On the basis of these findings it remains possible that taste aversion facilitates response development for some patients, however, remains insufficient to describe the acquisition process of this response for the majority of patients.

ANXIETY: There are consistent findings that patients with ANV also report significantly higher levels of state anxiety prior to their treatment sessions (Altmaier et al., 1982; Andrykowski and Redd, 1987; Nerenz et al. 1986).

Borkovec, Weerts and Bernstein (1977) suggested that unavoidable punishment, in this case the lack of a contingency between pretreatment behaviour and the occurrence and severity of the posttreatment responses, leads to higher levels of anxiety. As stated previously, however, it is difficult to determine whether anxiety is the cause or a response to the high levels of ANV. Nesse et al. (1980) stated that while anxiety alone was unlikely to account for the development of ANV it may increase the

likelihood of conditioning (see also, Carey and Burish, 1985).

Andrykowski and Redd (1987) stated that anxiety was not necessary for ANV to develop, however, escalation in anxiety, along with increased severity of PCN, may help to trigger ANV in some patients. The literature does not, in fact, support the suggestion that patients with ANV have a prior susceptibility to experiencing nausea or vomiting as a result of high levels of anxiety (Nesse et al., 1980).

DEPRESSION: There have been few prospective studies that allow for a direct evaluation of the influence that depression may have upon ANV development (Andrykowski, Redd and Hatfield, 1985). Nonetheless many retrospective studies have indicated that there are significant differences between patients with and without ANV on measures of depression (Yasko, 1985). Altmaier et al. (1982) suggested that the elevated levels of depression in patients with ANV indicated that these patients lacked the resources for adequately coping with the stressors associated with the diagnosis and treatment of cancer. Interestingly, Burish and Lyles (1981) found that reductions in the severity and occurrence of ANV due to a behavioural intervention technique resulted in a corresponding reduction in the patients' subjectively reported level of depression. Suggestions that behavioural interventions may increase patients' levels of coping with

stressors (e.g., Schwarz, Michel and Hornburg, 1985) provides some support for the claims made by Altmaier et al. (1982).

OTHER FACTORS: Nesse et al. (1980) interviewed eighteen chemotherapy patients prior to their starting their chemotherapy treatment protocol. During their subsequent treatment sessions, eight patients reported experiencing severe nausea in anticipation of their treatment injection. The authors report that these patients were three times as likely than patients who did not develop ANV to have later stage cancer diagnoses, to be receiving twice as much chemotherapy, were involved in more treatment sessions over a longer period of time and reported experiencing more severe PCNV. Unfortunately, these components are highly confounded. Later stage cancers are often treated with more aggressive drug protocols in larger dosages that may elicit more extensive PCNV (Tannock, 1987). Furthermore, given that many cancers are diagnosed in their early stages it is likely that late stage cancer patients have been receiving various forms of treatment for a longer period of time. These confounds make the identification and influence of any or all of these factors difficult to evaluate.

Ingle, Burish and Wallston (1984) attempted to retroactively identify factors related to conditionability in a sample of sixty chemotherapy patients each of whom had

experienced at least four prior treatments. ANV was found to be correlated with younger age, depression, more severe posttreatment nausea and vomiting, greater levels of anxiety, and hostility. Furthermore, these same patients reported trying a greater variety of methods in an attempt to to cope with their illness.

Prospective Studies

Andrykowski, Redd and Hatfield (1985) interviewed seventy-one chemotherapy patients prior to their first treatment and followed them for a period of six months. Thirty-seven percent of patients presented with ANV. A multiple regression analysis with ANV occurrence as the dependent variable indicated that 23% of the variance could be accounted for by the severity of PCNV and 14% accounted for by state anxiety. The authors noted that high levels of anxiety preceded the initial occurrence of AN therefore suggesting its role as a causative factor. Patients at risk for the development of ANV could also be identified by more severe posttreatment nausea, more time consuming infusions, greater state anxiety levels, age, trait anxiety and extraversion. The influence of these factors were downplayed by the authors since they accounted for minimal increase in discrimination. The authors concluded that their results supported a respondent conditioning model of

ANV development and provided support for the mediating influence of anxiety on ANV occurrence.

Nerenz, Leventhal, Easterling and Love (1986) interviewed 192 patients prior to their first treatment session. Their results indicated that patients who developed ANV could be characterized by taste disturbances during injection, higher levels of state anxiety, PCN and PCV and age. The authors suggested that the correlation between age and taste disturbances and the development of ANV may have been inflated due to the fact that younger patients are often given more toxic treatments due to their ability to withstand their effects and protocols that elicit greater taste disturbances (metal-based drugs such as cisplatin) are inherently more toxic.

Challis and Stam (1990) conducted a prospective, longitudinal study involving chemotherapy outpatients. Their results suggested that patients who went on to develop ANV could be prospectively identified at baseline as being at risk based upon their reported higher level of absorption. While subjectively reported levels of depression and anxiety became elevated once treatment began and were thus correlated with ANV occurrence, they were not accurate predictors of ANV development.

Operant Models

There have been suggestions in the literature that the development of ANV may be best described in terms of an operant conditioning model (Gard et al., 1988). An operant model suggests that patients with ANV obtain some reinforcement for this behaviour/response that is sufficient to maintain the ANV response. It is difficult however to establish what would be a sufficient reinforcer for experiencing nausea or vomiting. Perhaps the increased attention and sympathy that continued nausea/vomiting may elicit is sufficient to serve as a positive reinforcer for some patients. It is suggested that the attention garnered by this behaviour may elicit and be reinforced by "symptom-specific attention in combination with the relative lack of attention to non-symptomatic, adaptive responses" (Klonoff, Fliell and Janata, 1984, p. 264). It may also be that patients perceive the occurrence of ANV as an indication that the treatments are of sufficient toxicity and must therefore be worrying, or perhaps that patients want to be seen as being too ill to continue to receive the specified treatment regimen that they are currently enduring (Gard et al., 1988). The avoidance behaviour is thus hypothesized to be a component of the patient's motivation to appear more ill through their experience with ANV (Gard et al., 1988). However, many practitioners and patients fail to perceive these reasons as being sufficient to warrant the

occurrence of additional nausea and vomiting prior to treatment when there is commonly extensive bouts of both of these responses posttreatment (Gard, et al., 1988).

Conditioned Fear

Klonoff, Knell and Janata (1984) suggested that the development of ANV should not be conceptualized as a conditioned response, but rather should be considered as a secondary response to a conditioned fear of the treatment session and its resultant effects. The authors argued that a conditioned fear of nausea and vomiting accounts for the previously noted avoidance behaviour and that it is this fear that results in the pretreatment responses of depression and anxiety. The occurrence of ANV is explained by this model as being a conversion symptom of the unexpressed fear (Klonoff, Knell and Janata, 1984). Contrary to this hypothesis research has failed to find any significant differences between patients with ANV and those without on the basis of their reported fear of nausea or vomiting (Morrow, 1984). Furthermore, while patients with ANV are more likely to be non-compliant with treatment they do not do so to the extent that is implied by a conditioned fear model (Klonoff, Knell and Janata, 1984). Finally, Lachman (1972) suggests that it is unlikely that the feared responses (in this case nausea or vomiting) would occur as the conversion response. Conversion responses typically

involve the loss of some sensory or motor function and the occurrence of the symptom acts to solve the imminent problem for the individual (Lachman, 1972). As per this definition, the experience of pretreatment nausea and vomiting does not resolve, and would more likely enhance, the patient's fear of posttreatment nausea and vomiting.

Cognitive Models of ANV Development

A number of researchers have recently postulated a cognitive model of conditioning whereby certain psychological influences may increase a patient's conditionability (e.g., Morrow and Dobkin, 1988). Dobkin, Zeichner and Dickson-Parnell (1985) found that 40% of patients who developed ANV reported ruminating about various aspects related to their treatments. vanKomen and Redd (1985) reported that 75% of their patients claimed that their anticipatory symptoms were elicited by thoughts related to their treatment session and its side-effects (c.f., Yasko, 1985). It would have been helpful if the authors had provided information regarding the content of these thoughts. Furthermore, these ruminations were assessed retrospectively thereby making it difficult to determine whether the thoughts were a result of, or causative influence in, the development of ANV.

As noted, a common characteristic among those patients with ANV appears to be their self-reported cognitive

activity prior to treatment. It should be recalled that in a conditioning paradigm an increase in the salience of any of the components of the model should lead to a greater likelihood of conditioning. If we suppose that patients with ANV are good imagers, that is they not only can imagine their treatment and its side-effects but can also become absorbed and actively involved in such images, then it may be possible to identify a subpopulation of patients who, given the necessary conditions of the respondent learning model, are also at risk for ANV (Challis and Stam, 1990). The subjective rating of PCNV severity and thus its salience may be increased for highly imaginative patients simply because they focused their attention/imagination upon it (Gard et al., 1988). Similarly, the cues associated with the treatment may also become more salient as patients elaborate images associated with the treatment setting. In fact, research indicates that patients with ANV do have a greater propensity to imagine and become anxious about events related to treatment (Challis and Stam, 1990).

Challis and Stam (1990) have suggested that the development of ANV may be best described by a cognitive model of development that is capable of reconciling some of the shortcomings noted with a strict classical conditioning model. The issue of rapid conditioning after only one treatment may be due, in part, to conditions similar in

result but different in process to one trial learning often exhibited in taste aversion learning (Bernstein and Webster, 1980). The unique experience of chemotherapy and the treatment setting, as well as the extreme severity and toxicity of the response, may be sufficient to create one trial learning. As well, cognitive reconstruction of treatment-related stimuli and the response of PCNV may further reinforce the associations between the UCS and the UCR.

It is also possible that the long interval between the presentation of the UCS and the occurrence of the UCR could be bridged by cognitive factors such as vivid imagery (Challis and Stam, 1990; Dobkin et al., 1985). Vivid, recurrent images may function to maintain aspects of the treatment in the patients memory in such a manner so as to bridge the temporal gap. The issue of the intermittent occurrence of ANV is less easily explained by either a conditioning or a cognitive model. Nonetheless, it may be that the automaticity of classical conditioning is mediated by a variety of cognitive factors including imaginative abilities or situational coping such that certain conditions and cognitions may be necessary for the response of ANV to occur with cognitive elements enhancing or minimizing the influence of these factors (response specificity; Challis and Stam, 1990).

Unfortunately for this model, many people who get anxious at the thought of a stressful event or treatment do not develop ANV. Recently Challis and Spanos (1990) suggested that not only must levels of imagination and anxiety be considered but also how patients cope with their anxiety. Their investigations found that patients with ANV reported being less able to cope with the images, ruminations and anxiety associated with an upcoming treatment than those patients who did not develop ANV. Challis and Spanos (1990) suggested that while cognitive involvement may modify individual susceptibility to ANV occurrence in a manner similar to that for anxiety and depression, it is the subject's ability to adequately cope with the negative images related to treatment that determine whether or not ANV will develop. However, the Challis and Spanos study was retrospective in design. Consequently, it was unclear whether subjects reported less coping ability because they developed ANV, or developed ANV because they coped less well.

A conditioning model also predicts that the greater the salience of the UCS and UCR the greater the probability that conditioning will occur (Andrykowski, 1985). Wilcox et al. (1982) reported that 56% of those patients who reported experiencing severe PCNV also reported ANV. The authors suggested that the greater the salience of the unconditioned response (PCNV), the greater the likelihood

of conditioning (ANV). Related to this is the issue of the unconditioned stimuli. Previous research (e.g., Challis and Stam, 1990; Dobkin et al., 1985) has indicated that personality characteristics that increase the salience of the unconditioned stimuli may also lead to a greater susceptibility to conditioning. Such factors as a vivid imagination related to cognitions and ruminations about treatment may therefore maintain and/or increase the salience of the stimuli associated with the treatment setting.

Coping Strategies

A number of studies have shown that cognitive/behavioural treatments may reduce psychological side-effects in chemotherapy patients (e.g., Morrow and Dobkin, 1988; Telch and Telch, 1986). Altmaier et al. (1982) reported that the development of ANV was correlated with statements that reflected a perceived inability on the part of patients to cope with their illness. Ingle et al. (1984) and vanKomen and Redd (1985) reported that ANV was also correlated with coping styles that could be described as introverted and worrisome. It should be noted that since these studies were retrospective it is possible that the patient's inadequate style of coping developed subsequent to the development of ANV.

Schwarz, Michel and Hornburg (1985) reported that patients who developed ANV had inadequate coping strategies for some of the stresses related to their illness and its treatment. Their findings suggested that active coping with treatment-related difficulties was important in mediating treatment side-effects, especially anticipatory symptoms. Felton and Revenson (1984) reported that patients whose coping style could be characterized as actively involved and information seeking were better able to adjust and resolve issues related to their illness and treatment than were individuals whose coping style utilized wishful thinking, self-blame and emotion-based strategies. Carey and Burish (1988) reported that skill-focused interventions were significantly more beneficial than emotionally supportive interventions in patient adjustment to treatment. One hypothesis suggests that the effectiveness of many of the behavioural interventions that have been shown to reduce and/or eliminate ANV may be due, in part, to the development of coping strategies that help the individual adjust to and confront the conditioned response (Carey and Burish, 1988).

Although it has been shown that psychological interventions can be extremely helpful in reducing psychological side-effects associated with chemotherapy, such interventions are rarely employed in some cancer centres (Hoffman, 1982). As well, due to difficulties in

early identification of the patients in need of assistance, interventions often are not initiated until the patient has undergone a large proportion of their treatment protocol (Redd and Andrykowski, 1982). One reason for this may very well be that current methods of intervention are time-consuming and are typically conducted on an individual basis. In short, they are neither cost nor time effective for the day-to-day functioning of a large cancer centre (Stam, Bultz and Pittman, 1986). Furthermore, it is recognized that not all patients, even those who may be in need, would welcome or actively solicit such an intervention (Stam, Bultz and Pittman, 1986). It remains to be determined whether a briefer intervention conducted in a group setting would be therapeutically effective. Furthermore, there is a lack of studies that have examined whether the low levels of coping that have been associated with the development of ANV can be modified through the implementation of behavioural techniques.

Behavioural Interventions for ANV

If a respondent learning or cognitive conditioning model is appropriate although incomplete to describe the acquisition process of ANV then it is logical that counter-conditioning procedures should prove effective in modifying or even eliminating its occurrence (Hoffman, 1982; Morrow and Morrel, 1982).

HYPNOSIS: Redd et al. (1982) reported that patients involved in their hypnotic intervention reported decreases in the frequency of their AN and completely eliminated their AV. Three patients chose not to utilize their hypnotic training during one of their subsequent treatments at which time the anticipatory symptoms returned. The ANV response was subsequently controlled (at the next treatment) when the hypnotic technique was reintroduced. LaBaw, Holton, Tewell and Eccles (1975) reported significant reduction in pediatric patients' reported anxiety, depression and the occurrence of ANV after a hypnotic intervention.

SYSTEMATIC DESENSITIZATION: Morrow (1986) stated that systematic desensitization was more effective than a standard muscle relaxation procedure in reducing both the severity and duration of AN but not AV. He reported that systematic desensitization may have reduced cognitively evaluated levels of anxiety thereby disrupting the conditioning procedure. This disruption was hypothesized to be due to the fact that patients no longer focused their attention on potential conditioned stimuli (c.f., Hoffman, 1982). Research with Lorazepam has also shown that drugs that affect a patient's memory of a stressful event acts to decrease the likelihood of conditioning. This is taken as additional support for the need for patients to focus on

salient cues in order to facilitate conditioning (Laszlo et al., 1985).

Although systematic desensitization is an effective method of intervention it is difficult to implement. The development of a hierarchy is not only time consuming and often difficult for the patient, but, can change significantly over the treatment regimen. While not downplaying its utility there are other more efficient methods that have been shown to result in similar positive effects.

RELAXATION: Cotanch (1983) and others (e.g., Morrow, 1986) have reported successfully reducing the occurrence of ANV and even the severity and duration of PCNV with relaxation in the absence of associated hypnotic procedures and/or guided imagery. Burish and Lyles (1981) found that subjects participating in a relaxation program reported less nausea, anxiety and depression than did controls or patients who were seeing a therapist. The inclusion of the control group was an attempt to control for any influence that could be attributed to nonspecific factors such as emotional support or encouragement.

The efficacy of the above mentioned behavioural interventions in reducing the severity of ANV has been explained in a variety of ways. Cotanch (1983) has suggested that distraction may play a large role in their effective implementation. Most of the behavioural

techniques focus the patient's attention strictly upon the procedure itself and away from the cognitions or fears related to treatment. Previous research with pediatric oncology patients has shown that by involving patients in video games it was possible to significantly reduce the occurrence of ANV (Redd et al., 1987). It was assumed that this activity was sufficiently distracting for the children so as to prevent ruminations related to treatment. As well, relaxation procedures may produce low levels of physiological arousal that interrupt or inhibit some of the muscle activity required for nausea and vomiting (e.g., Lumsden and Holden, 1969).

Hypotheses

What remains to be studied in this field requires longitudinal evaluation of patient responses. Studies of the development of anxiety and depression as well as the actual influence that interventions have upon behaviour are essential in order to further understand and better control psychological side-effects to treatment. Does intervention reduce anxiety, increase coping and/or mediate ANV occurrence?

This study attempted to prospectively identify specific personality characteristics that predict the subsequent development of ANV. Furthermore, the influence

of an intervention upon ANV was assessed.

It was hypothesized that patients who developed ANV could be identified as having higher levels of pretreatment state anxiety and more severe postchemotherapy nausea (PCN) than patients who did not develop ANV. For this study, an averaged rating of state anxiety and PCN over the first three treatments (prior to any intervention effect) was used. A failure to reject this hypothesis would support research relating these factors to the occurrence of ANV.

It was also hypothesized that the occurrence of ANV would be predicted by greater levels of imagery ability (Bett's imagery scale and absorption), higher scores on a scale that measures the frequency of and anxiety produced by cognitions associated with treatment (CAT) and lower scores on the CAT coping scales. Furthermore, coping resolution (perceived effectiveness of strategy used) and depression were hypothesized to mediate susceptibility and would thus be predictive of ANV development.

Finally, it was hypothesized that those patients participating in a relaxation training program would report a significant reduction in pretreatment anxiety, as well as lower scores on the CAT anxiety scale (less anxiety) and higher scores on the CAT coping scale (more coping) than those who did not receive relaxation. It was also expected that the relaxation training would reduce the occurrence and severity of ANV.

METHOD

Subjects

Cancer outpatients scheduled to receive their first cycle of chemotherapy for a diagnosed cancer were identified by the Day Care nurses at the Ottawa Regional Cancer Centre (both the Civic and General Divisions) immediately after a treatment decision had been made by the Oncologist. This decision was typically made a number of days prior to the start of treatment thereby allowing sufficient time for the initial baseline interview to be conducted. Upon agreeing to the recommended treatment protocol patients were presented with a brief introductory letter (Appendix A) by their attending nurse. The names of those patients who agreed to further contact were forwarded to the author by the nursing staff.

Patients were required to be over the age of eighteen and to have not undergone any chemotherapy for a diagnosed cancer within the past year. It is possible that some proportion of patients may have had previous chemotherapy treatments, unfortunately, the influence and prevalence of this factor was not assessed. When contacted, patients were reminded of the introductory letter and given further information about the study. Patients were told that the study was concerned with the side-effects some individuals experience as a result of treatment and whether personality characteristics may modify their occurrence.

Patients were informed that during the course of the study they would be asked a number of personal questions concerning their diagnosis, how they typically respond in stressful situations, and how they feel they are able to cope with treatment-related stressors. It was explained that the study would take approximately two hours; the first hour of which involved an initial interview to be conducted at any time up to and including three days prior to their first treatment. The remaining hour was to consist of six brief interviews (approximately 5 - 10 minutes) to be conducted at the Cancer Centre immediately prior to each of their next six treatment sessions.

Patients were further informed that one in four participants would be asked to take part in a coping and relaxation training program. Patients agreeing to this component of the study would be instructed in this procedure at their home for approximately one hour after which they would be given a cassette tape that would allow them to practice the exercises alone. In actuality, the decision of who was to receive the relaxation training was not random but rather was restricted to those patients who developed ANV. It was felt that this deception was necessary to ensure that patients would not feel that they had been selected due to some specific personality, behavioral or physiological characteristic(s).

Patients who refused to take part in this study were thanked for their time and no further contact was made. Patients agreeing to participate were asked when their next treatment was and the initial interview was scheduled. Patients who were from out of town or for whom no mutually convenient time or place for the initial interview could be arranged were provided with copies of the questionnaires and asked to complete them at least three days prior to returning for their first treatment session. The researcher's name and phone number were included in this package to ensure that any problems concerning the questionnaires could be readily answered. At the time of the initial interview, or if patients were completing the questionnaires on their own, the informed consent form was signed by the patient and witnessed by the researcher before the completion of any of the questionnaires (Appendix B).

Materials

All patients were required to respond to questions about their age, sex and diagnosis. Patients also responded to each of the following questionnaires:

The Absorption scale (Tellegen and Atkinson, 1974) is a forty-item true or false questionnaire that measures an individual's ability to become absorbed or involved in imaginary activities and imaginative pursuits such as

watching a movie or listening to poetry. Only twenty items on this scale are scored with the other twenty items being distractors (see Appendix C). This scale correlates to a slight degree with Spielberger's state anxiety scale (.15) and measures of hypnotizability (.20) and has been shown to have good discriminant validity (O'Grady, 1980).

The Berkman Scale (Berkman and Syme, 1979) is a four-item questionnaire that estimates an individual's social network on the basis of marital status, number of friends and relatives with whom individuals have ongoing contact as well as membership in church and other social groups. The authors differentiated four levels of social network and found that there were significant differences between individual mortality rates on the basis of patient scores on this scale. Low network scores were positively correlated with earlier mortality.

Shor's modified version of the Bett's Imagery Scale (Shor, Orne and O'Connell, 1966) is a fifteen-item questionnaire that assesses how vividly certain objects or situations are imagined. The vividness of each imaged situation is subjectively rated on a seven-point scale ranging from no image at all to completely clear as if it were present. This scale correlates to a slight degree with measures of hypnotic susceptibility (e.g., .20; see deGroh, 1989 for review). The internal consistency of this measure was reported by Shor et al. (1966) to be .91.

The Centre for Epidemiology Depression Scale (Radloff, 1977) is a twenty-item measure that asks individuals to rate negative experiences and feelings over the previous week on a four-point scale ranging from not at all to extremely. Devins and Orme (1985) have shown that acceptable levels of validity and lack of differences in mode of administration have made this scale an accurate measure of depression for medical populations.

The Cognitions Associated with Treatment questionnaire (CAT: Challis and Spanos, 1990: Appendix D) is a three-part questionnaire that evaluates various components of treatment-related cognitions. Patients rate, on an eleven point scale anchored at one end with zero (none) and at the other with ten (extreme), their level of anxiety (CATa) during the past week associated with any of the fourteen cognitions included in this scale. Secondly, patients report the degree to which they felt they were able to cope (CATc) with the cognitions at various times during the past week (e.g., one week prior to treatment, morning before treatment etc.). Finally, patients rate the frequency (CATf) with which they experienced any of these cognitions during the past week (zero indicating not at all, and ten indicating almost constantly). This scale is patterned after the self-efficacy and control of anxious cognitions measure originally presented by Kent and Gibbons (1987) for use with dental patients. Previous evaluation (Challis and

Spanos, 1990) of the CATa component of this questionnaire indicated that it was correlated with state anxiety ($r = .67$) and with ANV occurrence ($r = .82$). The CATa had an acceptable internal reliability ($\alpha = .87$). The CAT coping scale originally asked patients to rate how well they felt that they were able to cope with the anxiety of their cognitions related to treatment only during the past week (Challis and Spanos, 1990). This scale had an acceptable internal reliability ($\alpha = .76$) and was moderately correlated with the CAT anxiety scale ($r = -.67$; Challis and Spanos, 1990). In evaluating the utility of this component of the scale for this study it was questioned whether the original coping scale was sensitive to changes that may occur in patient's perception of how well they may be coping with the cognitions over time. In light of this, the coping scale was revised to assess patients' retrospective perceptions of how well they had coped with their anxiety at five distinct times during the previous week (see above). As well, patients were asked how well they expected they would be able to cope with their anxiety during the injection procedure. Finally, patients were asked to report the frequency with which they experienced these cognitions during the past week. It was felt that these additional questions would, when combined with the other components of the scale, increase the

sensitivity of the CAT scale to identify patients at risk for ANV.

The Coping Strategies Inventory (CSI: Tobin et al., 1984) also assesses the thoughts and behaviours that patients may have used to cope with a specific stressor. For the purpose of this study each patient was again asked to consider their response to their diagnosis of cancer. The CSI is a seventy-two item questionnaire that establishes eight dimensions of coping, four sub-scales and ultimately two specific dimensions of problem engagement and problem disengagement. This scale has been shown to have a reliability of .83 and a two week test-retest correlation of .73.

Eysenck's Neuroticism and Extraversion (1968) scale is a twelve-item true or false scale that assesses the presence of the specific trait characteristics of neuroticism and extraversion.

The General Coping Strategies Inventory (COPE: Weisman and Worden, 1976) is a fifteen-item true or false questionnaire that assesses the patients style of coping with a specific stressor. Patients are requested to recall when they were initially told of their diagnosis and to consider this as the specific stressor to which they were to refer. The questionnaire also asks whether or not the patients believed that their particular style of coping led to a resolution of the stress.

The Morrow Assessment of Nausea and Emesis (MANE: Morrow, 1984) scale measures a patient's subjective experience with nausea and vomiting as a result of their most recent chemotherapy session. Patients rate the severity of these two responses on a seven point scale ranging from not at all to intolerable. Duration is also reported in hours. Patients rate the severity and duration of nausea and vomiting experienced posttreatment as well as any anticipatory nausea and/or vomiting they may have experienced (see Appendix E). This scale has a test retest reliability of .78 over a seven-month interval.

The Perceived Stress Scale (PSS: Cohen, Kamarck and Mermelstein, 1983) is a fourteen-item questionnaire that measures the degree to which events or situations during the past month have been appraised by the individual as being stressful. It has been shown to have a test re-test reliability of .85 after six days and .55 after six weeks.

The Physical Symptoms Checklist (Andrykowski and Redd, 1985) is a ten-item measure that assesses whether a patient has experienced any specific physical symptoms (including nausea and vomiting) during the twenty-four hours prior to treatment.

The Pre-illness Nausea and Vomiting Pattern (Farber, 1982) is a brief questionnaire that determines a patient's previous experience with nausea and vomiting prior to their current illness. Patients rate the frequency and identify

the specific situations that may have elicited episodes of nausea or vomiting.

Rosenberg's Self-Esteem Scale (Rosenberg, 1979) is a ten-item measure designed to assess an individual's current level of self-esteem. This scale has been shown to have a test re-test reliability of .72.

Spielberger's state-trait anxiety scale (Spielberger, 1966) consists of two separate scales. The first assesses an individual's current or state level of anxiety while the second assesses the individual's long-term, typical or trait level of anxiety. Dreger (1978) has indicated that this scale is a valid measure of both components of anxiety.

Procedure

PRETREATMENT INTERVIEWS: All patients were met at the Cancer Centre immediately prior (within one hour) to each of their first six treatments. In order to be included in the final results of this study patients must have been seen prior to at least three consecutive treatments. It was felt that on the basis of previous research this was sufficient time to allow for an accurate assessment of the development of ANV. At the time of the pretreatment interview patients were asked to respond to questionnaire measures of State anxiety, Depression, Cognitions

Associated with Treatment, the Morrow Assessment of Nausea and Emesis and the Physical Symptoms Checklist.

RELAXATION TRAINING: Patients who stated that they had experienced nausea or vomiting prior to any of their treatments were told at either the third or fourth pretreatment interview (selection alternated) that they had been chosen to take part in the relaxation training program. The program was described to the patients as involving a one hour training session that was to be conducted at their home or some other convenient place. They were provided with a taped recording of a relaxation session that allowed them to practice the techniques on their own. At the time of instruction it was stressed that the success of the training was dependent upon the patient's willingness to "let go" and experience the sensations that the relaxation produced. Patients were told that the purpose of the training session and the tape was to provide an understanding of what it is to be totally relaxed. Although use of the tape was encouraged it was made clear that the ideal of the intervention was to allow patients to experience relaxation during potentially stressful situations without the aid of the tapes. Patients were informed of the need for practice and were told that relaxation is a learned skill requiring daily practice. It was also stressed that patients put aside at least one-half hour per day to quietly listen to the tape

and/or practice their relaxation techniques. They were reassured that there was nothing magical about the ability to relax and that they would not be asked to do anything that would be embarrassing. It was encouraged that patients utilize these skills when they arrive at the Centre to help them relieve some of the stress related to treatment. No specific reference was made to the ANV response.

The training session followed the script for the relaxation tape (see Appendix D). The training procedure and the script for relaxation loosely followed a number of common relaxation procedures such as autogenic training and Stam and Steggles' (1986) emesis control program. Upon completion of the training session the entire process was discussed and any questions were answered.

Patients taking part in the relaxation program were subsequently asked the Self-Report Questionnaire at each pretreatment interview. This questionnaire inquired about the usefulness and effectiveness of the relaxation tape during the previous week and the frequency of its use.

DEBRIEFING: Upon completion of all six pretreatment interviews, or at the time of any change in treatment that necessitated the withdrawal of the patient from the study, patients were asked if they had questions regarding any aspect of the study. Although the specific purpose of this study was not stated (the development of ANV), it was

clarified that the study involved an evaluation of the relationship between personality characteristics and psychological and physiological responses to treatment.

RESULTS

One-hundred and ten English speaking cancer patients receiving an initial cycle of chemotherapy and who had not undergone any chemotherapy during the past year were contacted to participate in this study. Of that total ninety-three patients (84.5%) agreed to take part. Patients refusing to take part stated that they were uncertain of some aspects of their treatment protocol and did not want to commit themselves to the study (8); four patients felt that they were too ill to participate in a long-term study; three patients were unable to speak English with sufficient fluency to allow them to clearly understand or complete the questionnaires; and two patients felt that their participation would be of no immediate personal benefit and that it would serve no purpose for them to participate.

All patients were seen prior to at least four treatments, 89 (96%) were seen prior to five treatments, and 86 (92.5%) of patients seen at baseline were seen for the entire complement of six treatment sessions. Of those who did not complete all six pretreatment interview sessions three patients had substantial changes in their treatment regimen that prevented their continuation in the study (e.g., radiation, chemotherapy changes, surgery); the chemotherapy for three patients was discontinued (e.g., treatment was no longer effective and palliative care was

instituted or treatment was effective and no further chemotherapy was required); and 1 patient died.

While the majority of baseline interviews were conducted in the patient's home ($N = 58$; 62%), four (4%) of the interviews were conducted at the Cancer Centre during a patient's regular appointment with the oncologist a number of days prior to the beginning of treatment. Due to time or travel restrictions, 31 (33%) patients were given photocopies of the questionnaires which they were able to complete at home. A Hotelling's T^2 with type of interview (personal vs. self-completed) as the independent variable and the baseline questionnaires as the dependent variables was not significant ($T^2 = 1.27$, ns, $df = 82$).

Demographics

Of the ninety-three patients participating in this study fifty-six (60%) were female and thirty-seven (40%) were male. While the majority of patients were married ($N = 62$, 67%), fourteen patients were divorced, eleven patients were widowed and six patients were single. The mean age was 50.45 years with a range of 23 years to 73 years. Patients were most commonly diagnosed with breast cancer (35), lymphoma (16), colon/rectal (13), lung (11), ovarian (10), brain (2) or "other" (6) where the site of the primary cancer was either uncertain or was not the cancer

for which the patient was currently being treated (e.g., the metastases was being treated by the chemotherapy).

Anticipatory Nausea and Vomiting (ANV)

All ninety-three patients participating in this study reported experiencing at least one episode of PCN or PCV. Whereas previous studies suggest that not all patients experience PCN or PCV it is possible that the high prevalence rate of these responses in this study was due, in part, to the method by which the primary day care nurses referred patients. It may be that the names of patients who were severely ill or whose treatment was unlikely to elicit PCNV were withheld. Obviously all studies of this nature are secondary to the complete care of the patient and as such the decision of whether a patient should be referred for inclusion is necessarily at the discretion of the attending physician or nurse. It is unlikely that the criteria used to refer patients for this study biased the findings as they directly relate to ANV development. On the other hand the incidence of PCNV and ANV in this study is marginally higher than in studies that include patients who have not experienced PCNV in their totals.

Forty patients (43%) reported experiencing at least one episode of ANV. No patient experienced ANV without first experiencing PCNV. Further, while all 40 patients reported AN, only 5 patients (12.5% of those with AN; 5% of

the entire sample) reported experiencing AV. Of those patients who developed ANV, 21 (52.5%) did so by the time of their second treatment, 34 (85%) by the time of their third treatment, and all of the patients who reported ANV had done so by the time of their fourth treatment. On average patients developed ANV after 2.6 treatments. While ANV tends to persist following its first occurrence it does not necessarily occur prior to each subsequent treatment session. Thus, a patient reporting ANV at treatment two may not report it again until treatment five (see Table 1).

ANV vs. NA: Baseline Questionnaires

The following analyses of the baseline questionnaires were based upon differences between patients who reported ANV (40) and those who did not (no-ANV, NA; 53). Group membership was determined on the basis of patient responses to direct questions from the Physical Symptoms Checklist concerning their experience of nausea or vomiting during the 24 hours prior to treatment. Patients responding true to either question were classified as having ANV.

GENDER: Chi-square analysis indicated that there was no significant relationship between gender and ANV occurrence ($X^2 = 1.39$, ns, df = 1).

DIAGNOSIS: A Chi-square was conducted between group membership (ANV, NA) and the site of the treated cancer.

Table 1

Frequency of ANV Reported at Each Treatment Session

<u>Treatment</u>	<u>Frequency</u>
Baseline	0
Session 1	0
Session 2	21
Session 3	34
Session 4	38
Session 5	36
Session 6	25

<u>ANV Experienced Prior to:</u>	<u>Frequency</u>
One Treatment	0
Two Treatments	2
Three Treatments	8
Four Treatments	21
Five Treatments	9
Six Treatments	0

	<u>N</u>	<u>% of sample</u>
Anticipatory nausea	40	43%
Anticipatory nausea and vomiting	5	5%

The results was not significant for this comparison ($\chi^2 = 4.69$, ns, $df = 6$).

AGE: In accord with previous studies there was a significant difference found between groups (ANV, NA) on the basis of age ($\bar{M} = 46.7$, $sd = 11.92$ vs. $\bar{M} = 53.25$, $sd = 12.46$, respectively; $t = 2.54$, $p < .05$, $d.f. = 91$) with younger patients being more likely to report ANV than older patients. While a significant negative correlation was found between age and the occurrence of ANV ($r = -.26$, $p < .05$) previous research has suggested that age may be correlated with treatment toxicity as a result of younger patients being subjected to more toxic drug combinations. This assumption can perhaps be supported by the finding that the severity of PCN was correlated with age ($r = -.37$, $p < .01$). The correlation between PCV severity and age was not significant ($r = -.13$). Unfortunately, a rating of the relative toxicities of each patient's treatment protocol could not be obtained to further evaluate this assumption.

PREVIOUS EXPERIENCE: No significant differences were found with respect to who did or did not develop ANV on the basis of either their previous experience with nausea or vomiting (frequency or severity; $T^2 = .82$, ns, $df = 88$) nor with those situations that may have caused them to vomit in the past (e.g., anxiety, allergies: see Table 2). There were no significant differences between groups on the basis of their experience with nausea related to pregnancy nor was

Table 2

Previous Experience of Nausea and Vomiting
(ANV, N = 40; NA, N = 53)

	ANV		NA	
	Mean	(sd)	Mean	(sd)
Vomiting Severity	2.32	.91	2.45	1.14
Vomiting Frequency	2.45	.96	2.51	.93
Nausea Severity	3.20	.79	3.41	.99
Nausea Frequency	3.07	.73	3.19	.92

Frequency of Positive Responses

	ANV	NA*
Anxiety	3	1
Illness	4	5
Pregnancy	15	14
Motion Sickness	3	10
Food Poisoning	11	7
Prescription Drugs	8	10
Non-prescription Drugs	1	2
Allergies	3	4
Anaesthesia	3	7

* Chi-square tests indicated that none of the differences between groups were significant

there an association between the occurrence of ANV and patients who reported that they experience motion sickness. The fact that so few patients reported experiencing motion sickness (only 13 [14%] out of all patients, only 7% of those with ANV) further illustrates its limitations as a predictor of ANV.

PHYSICAL SYMPTOMS: An evaluation of the means indicated that there were no significant differences between patients with ANV and without ANV on the Physical Symptoms Checklist on the mean frequency of positive responding to any of the symptoms on this scale (see Table 3).

The lack of significance and low affirmative response rate for some of the symptoms including taste and smell suggests that these factors do not likely represent reliable predictors of ANV development.

COPING: The General Coping Scale (COPE) measured fifteen coping strategies that patients could have adopted as a method of coping with their diagnosis. Overall, while the majority of patients (67%) reported that they were compliant with someone in authority regarding decisions related to their illness and its treatment, very few patients reported using alcohol or drugs as a coping resource (12%) or attempted to laugh off the severity of their condition (1%) (see Table 4). There were significant group differences (ANV, NA) on some of the measures

Table 3

Physical Symptoms Checklist*

(mean frequency of positive responses across treatments)

	NA	ANV	
Symptom	Mean (sd)	Mean (sd)	t
Appetite loss	8.50 (3.1)	9.25 (2.9)	0.31
Dizziness	6.25 (3.1)	6.75 (2.9)	0.81
Dry Mouth	18.51 (2.7)	20.25 (3.9)	1.13
Fatigue	23.00 (2.3)	23.75 (3.4)	1.20
Headache	13.75 (3.3)	15.12 (2.2)	1.52
Sleep Loss	12.11 (4.5)	14.55 (2.4)	1.58
Changes in Smell	2.25 (1.9)	2.52 (2.4)	0.57
Changes in Taste	3.75 (1.7)	3.50 (1.9)	0.71

* none of the differences between groups are significant

Table 4

Significant Differences on General Coping Strategies (COPE)
(ANV, NA)

<u>Coping Strategy</u>	<u>Frequency</u>		<u>χ^2</u>
	<u>ANV</u>	<u>NA</u>	
Seek information	20	40	6.46a
Distract self	30	23	9.28a
Take affirmative action	13	37	12.77a
Look for silver lining	28	20	9.51a
Accept the situation	8	35	17.94a
Withdraw socially	21	11	10.18a
Blame someone/thing	16	9	6.15b
Blame self	18	5	15.49a
	(N=40)	(N=53)	

(a) $p < .01$

(b) $p < .05$

assessed by this scale. Importantly, patients with ANV reported significantly less resolution obtained by their mode(s) of coping with the stress associated with their diagnosis than did those patients who did not go on to develop ANV ($\bar{M} = .93$, $sd = .73$ and $\bar{M} = 2.15$, $sd = .77$ respectively; $t = 6.68$, $p < .01$, $df = 91$; see Table 5).

The result of a Hotelling's T^2 with group membership (ANV, NA) as the independent variable and the eight primary dimensions of the Coping Strategies Inventory (CSI) as the dependent variables was significant ($T^2 = 5.22$, $p < .01$, $df = 76$). Significant differences were also noted for the four composite scales of problem and/or emotion focused engagement and/or disengagement ($T^2 = 5.61$, $p < .01$, $df = 80$) and the two overall scales of engagement and disengagement ($T^2 = 10.24$, $p < .01$, $df = 82$; see Table 6).

OTHER MEASURES: A Hotelling's T^2 with group membership as the independent variable (ANV, NA) and each of the remaining baseline measures as the dependent variables was significant ($T^2 = 14.74$, $p < .01$, $df = 78$). Subsequent analyses found that there were no significant differences between groups on the basis of their social economic status ($t = .75$, ns , $df = 91$), their social network ($t = .84$, ns , $df = 91$), their self-esteem ($t = 2.04$, ns , $df = 91$), their scores on the intraversion-extraversion scale ($t = 2.53$, ns , $df = 91$) or the neuroticism scale ($t = .92$, ns ,

Table 5

Resolution Achieved by General Coping Strategies (COPE)
 (ANV, NA)

	<u>Frequency</u>	
	<u>ANV</u>	<u>NA</u>
None at all	12	0
Some or a little	19	12
Very much	9	21
Definite or complete	0	20
	(N=40)	(N=53)

Table 6

Significant Differences--Coping Strategies Inventory*
(ANV, NA)

<u>Dimension</u>	NA	ANV	<u>t</u>
	Mean (sd)	Mean (sd)	
Express emotion	16.89 (6.61)	20.00 (7.47)	2.13b
Wishful thinking	17.79 (6.14)	23.80 (8.49)	3.96a
Self-criticism	14.15 (5.97)	19.67 (8.86)	3.60a
Self-withdrawal	15.70 (5.22)	21.65 (7.29)	4.59a
Emotion focused engaged	37.47 (16.63)	43.20 (14.55)	2.04b
Problem focused disengaged	33.49 (10.37)	41.17 (12.51)	3.24a
Emotion focused disengaged	29.83 (10.15)	41.33 (13.74)	4.64a
Disengagement	62.69 (18.94)	82.10 (21.76)	4.59a

* non-significant differences are presented in Appendix E

df = 91

(a) $p < .01$

(b) $p < .05$

df = 91). Furthermore, no significant differences were found between groups (ANV, NA) on baseline measures of trait anxiety or state anxiety. There were significant differences found on measures of depression, the absorption questionnaire, the Bett's imagery scale and the perceived stress scale (see Table 7).

CAT: There were significant differences between groups (ANV, NA) on each of the baseline components assessed by the CAT questionnaire. Patients who went on to develop ANV reported significantly greater anxiety associated with their cognitions associated with treatment than did those patients who did not develop ANV (see Table 7).

Significant differences were also found between groups on the basis of the frequency with which patients reported experiencing cognitions associated with treatment (CATf) during the past week. There were also significant differences between groups on the basis of how well patients felt that they were able to control the anxiety related to their cognitions associated with treatment at the time of the baseline interview. Furthermore, patients' expectations of how well they felt they would be able to control these thoughts during treatment also differed significantly (see Table 7). The correlations between the CAT subscales and the baseline measures are presented in Table 8.

Table 7

Significant Differences Baseline Measures
(ANV, NA)

Measure	NA	ANV	t
	Mean (sd)	Mean (sd)	
Trait Anxiety	31.60 (9.17)	35.57 (10.52)	ns
State Anxiety	32.45 (11.36)	36.22 (10.44)	ns
Depression	13.11 (10.21)	19.63 (9.86)	3.05a
Absorption	18.34 (7.87)	29.40 (5.97)	7.42a
Bett's Imagery	43.43 (18.36)	54.07 (15.92)	2.93a
Perceived Stress	19.04 (8.57)	28.13 (5.59)	5.83a
CATa (anxiety)	22.40 (18.63)	55.15 (16.93)	8.67a
CATf (frequency)	3.70 (1.99)	6.38 (2.05)	6.22a
CATc (coping)	8.94 (1.20)	5.83 (2.23)	8.45a
CATe (expectancy)	9.03 (1.47)	5.70 (2.21)	8.62a

df = 91

(a) $p < .01$

(b) $p < .05$

Table 8

Correlations--CAT and Baseline Measures

	<u>CATa</u>	<u>CATf</u>	<u>CATc</u>
Depression	.33	.18	-.32
State anxiety	.37	.12	-.13
Bett's Imagery	.43	.39	-.23
Perceived Stress	.52	.39	-.40
Absorption	.59	.49	-.46
Trait Anxiety	.29	.02	-.11
Self-esteem	-.32	-.33	.09
Neuroticism	.21	.05	.00
Introversion/extraversion	-.08	-.06	.08
CATa	---	.66	-.53
CATf	---	---	-.57

A study of each component of the CAT coping scale indicated that the first five questions (week before, day before, morning before, on the way to treatment and waiting for treatment while in the clinic) were highly correlated (mean correlation between all five components at: baseline, $r = .90$; treatment 1, $r = .91$; treatment 2, $r = .92$; treatment 3, $r = .93$; treatment 4, $r = .93$; treatment 5, $r = .91$; treatment 6, $r = .91$). Given these findings it was decided that there was sufficient justification to combine each of the first five items into one measure of subjective ratings of coping with patient cognitions associated with chemotherapy. Each patient's score for each of the five components were combined and an average value obtained at every treatment session.

Relaxation Effects (treatment 3 vs. treatment 4)

It will be recalled that approximately half (18/40) of all patients who developed ANV were given the opportunity to become involved in a relaxation training program after their third treatment session while the other half (17/40) were recruited after their fourth treatment session. Five patients who reported experiencing ANV chose not to participate in the relaxation intervention. A Hotelling's T^2 conducted using the two relaxation groups (relaxation after three treatments, relaxation after four treatments) as the independent variable and each of the baseline

questionnaire measures as the dependent variables was not significant thereby supporting the assumption that the means of the baseline measures did not differ on the basis of group membership (relaxation after three treatments, relaxation after four treatments: $T^2 = 1.13$, ns, $df = 22$).

A series of 2x3 mixed ANOVA's with group membership (relaxation after 3 vs. relaxation after 4 treatments) as the between variable was conducted on each of the CAT scales for treatments two, three and four. It was expected that differences at treatment four could be attributed to the effects produced by the relaxation intervention. No significant effects were found for the CAT anxiety or the CAT frequency scales (see Tables 9 and 10, Figure 4). There were significant group and treatment differences for the CAT expectancy scale and significant group differences for the CAT coping scale (see Tables 11 and 12, Figures 5 and 6). Post-hoc tests for the treatment main effect for the CAT expectancy indicated significant differences between treatment two and treatment four ($p < .01$).

ANV Group Comparisons: Relaxation vs. no-Relaxation

Three groups were defined for the following analyses (ANV relaxation after 3 treatments, $N = 18$; ANV relaxation after four treatments, $N = 17$; ANV no relaxation, $N = 5$). While the ANV no-relaxation group was an unexpected occurrence the presence of this group, despite its small

Table 9

Summary Table -- CAT anxiety*
 (relaxation after 3 vs. 4 treatments)

	MS	df	F	prob
Group	427.96	1	0.62	ns
error	693.05	33		
Treatment	11.89	2	0.23	ns
Treatment x Group	76.04	2	1.54	ns
error	49.53	66		

* the means are presented in Table 22

Table 10

Summary Table -- CAT frequency*
 (relaxation after 3 vs. 4 treatments)

	MS	df	F	prob
Group	0.19	1	0.10	ns
error	1.90	33		
Treatment	0.23	2	0.33	ns
Treatment x Group	0.53	2	0.63	ns
error	0.84	66		

* the means are presented in Table 28

Table 11

Summary Table -- CAT expectancy*
 (relaxation after 3 vs. 4 treatments)

	MS	df	F	prob
Group	20.62	1	5.07	.05
error	4.07	33		
Treatment	6.98	2	5.27	.01
Treatment x Group	3.72	2	2.80	ns
error	1.33	66		

Group Means (sd)

T3 5.43 (1.61)

T4 4.84 (1.24)

Treatment Means

Treatment 2a 4.52 (1.87)

Treatment 3 5.23 (1.32)

Treatment 4a 5.67 (1.34)

a these means differ significantly $p < .01$

* the overall means are presented in Table 26

Table 12

Summary Table -- CAT coping*
 (relaxation after 3 vs. 4 treatments)

	MS	df	F	prob
Group	11.43	1	6.22	.05
error	1.84	33		
Treatment	0.27	2	0.19	ns
Treatment x Group	0.96	2	0.65	ns
error	1.47	66		

Group Means

T3 27.13 (7.24)

T4 23.91 (4.82)

* the overall means are presented in Table 24

size, provided a small control group against which the ANV relaxation groups could be compared. It is important to consider that only five patients constitute the no-relaxation group and as such the scores are at risk of being easily distorted by extreme scores. Nonetheless, it was felt that further analysis of this group would allow for some speculation as to why some patients may refuse to take part in an intervention aimed at alleviating some treatment-related symptoms.

BASELINE MEASURES: Since no significant differences were found between the two relaxation groups at baseline (relaxation after 3 treatments, relaxation after four treatments) they were combined into one group (patients complying with relaxation training, $N = 35$) and compared to patients with ANV who did not comply with the relaxation intervention ($N = 5$). A Hotelling's T^2 with group membership as the independent variable (ANV relaxation, ANV no-relaxation) and each of the baseline questionnaires as the dependent variables was not significant ($T^2 = 1.43$, ns, $df = 27$). None of a series of Hotelling's T^2 's were found to be significant for the CSI based on either the eight primary dimensions of the CSI ($T^2 = 1.38$, ns, $df = 31$), the four composite scales ($T^2 = 2.19$, ns, $df = 35$) or for the two principle composite dimensions of engagement/disengagement ($T^2 = 2.23$, ns, $df = 37$).

Groups Comparisons: All Groups

Each of the four possible groups (ANV relaxation after 3 treatments--T3, ANV relaxation after 4 treatments--T4, ANV no-relaxation--NR and NA) were compared on each of the longitudinal questionnaires (CATA, CATc, CATE, depression, state anxiety, MANE). The three ANV groups were compared for anticipatory nausea responses. Since no NR patients experienced AV no comparisons were made on this variable.

Postchemotherapy Nausea

DURATION: A 4x5 repeated measures design with group membership as the between variable and treatments as the within variable was conducted on patients' responses to the MANE questionnaire. The results indicate a significant main effect for groups ($F_{3,82} = 9.19, p < .01$), however, no significant treatment effect or interaction (see Table 13). Post-hoc analysis of the group means collapsed across sessions indicated significant differences between T4 ($M = 50.28, sd = 36.75$) and the NA ($M = 29.95, sd = 21.16$) group; and between T3 ($M = 49.82, sd = 21.66$) and the NA group ($p < .05$). Newman-Keuls post-hoc tests for significance were conducted. This test is sensitive to the number of means being tested (Kirk, 1982) and the correction for unequal n's (Glass and Hopkins, 1984; Kleinbaum and Kupper, 1978) adjusts the test so as to ensure accurate analyses. It is possible that the small

Table 13

Repeated Measures Summary Table -- PCN Duration*

	MS	df	F	prob
constant	385113.02	1	157.27	
Group	22512.51	3	9.19	.01
error	2448.78	82		
Treatment	244.50	4	.69	ns
Treatment x Group	380.03	12	1.07	ns
error	356.07	328		

* the means are presented in Appendix F

group sizes for the NR group masked the presence of other significant group differences (Glass and Hopkins, 1984). The two relaxation groups were not combined to increase the sample size since it was important to verify or disconfirm the suggestion that relaxation may have a mediating effect upon some aspects of PCNV (Cotanch, 1983; Morrow, 1986).

SEVERITY: For PCNS there was a main effect for groups ($F_{3,82} = 10.91, p < .01$), however, there was no significant main effect for treatment nor was there a significant interaction (see Table 14). Post-hoc tests indicated there were significant differences between T3 ($M = 3.53, sd = 0.56$) and the NA group ($M = 2.48, sd = 0.81; p < .05$).

Postchemotherapy Vomiting

DURATION: For PCVD there was no significant main effect for groups or for treatments, however, there was a significant interaction ($F_{12,328} = 2.11, p < .05$). A test of the simple effects indicated significant group differences at treatment one ($F_{3,82} = 4.50, p < .01$) and treatment three ($F_{3,82} = 3.34, p < .05$; see Table 15-16, Figure 1). Post-hoc comparisons indicated significant differences at treatment one between T3, and the NA group ($p < .05$); and T4 and the NA groups ($p < .05$). At treatment three there were significant differences between T3 and the NA group; and T4 and the NA group ($p < .05$).

Table 14

Repeated Measures Summary Table -- PCN Severity*

	MS	df	F	prob
constant	2064.98	1	845.77	
Group	26.63	3	10.91	.01
error	2.44	82		
Treatment	.74	4	1.22	ns
Treatment x Group	.50	12	.83	ns
error	.61	328		

* the means are presented in Appendix G

Table 15

Repeated Measures Summary Table -- PCV Duration*

	MS	df	F	prob
constant	39107.32	1	29.62	
Group	3064.79	3	2.32	ns
error	1320.46	82		
Treatment	290.08	4	1.50	ns
Treatment x Group	385.30	12	2.11	.05
error	182.10	328		

Simple Effects

Treatments

	F	df	p
Treatment 1	4.50	(3,82)	.05
Treatment 2	1.89	(3,82)	ns
Treatment 3	3.34	(3,82)	.05
Treatment 4	0.51	(3,82)	ns
Treatment 5	0.75	(3,82)	ns

Groups

	F	df	p
T3	3.21	(4,328)	.01
T4	5.94	(4,328)	.01
NR	0.35	(4,328)	ns
NA	2.02	(4,328)	ns

* the means are presented in Table 16

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Table 16

Means and Standard Deviations -- PCV Duration (hrs)

<u>Treatment</u>	<u>T3</u>	<u>T4</u>	<u>NR</u>	<u>NA</u>
1	31.33 (18.34)	33.67 (25.63)	16.00 (12.00)	10.82 (18.51)
2	25.50 (29.51)	22.80 (25.39)	19.50 (9.71)	12.20 (21.06)
3	16.83 (17.10)	20.87 (23.86)	15.00 (12.48)	7.32 (14.31)
4	17.83 (22.68)	16.93 (25.22)	15.50 (13.41)	12.76 (21.99)
5	13.77 (16.01)	13.07 (21.18)	9.00 (13.00)	7.37 (12.56)
	n = 18	n = 17	n = 5	n = 49

Significant Differences

Within Rows

Treatment 1: T3 -- NA
T4 -- NA

Treatment 3: T3 -- NA
T4 -- NA

Within Columns

T3: 1 -- 3,4,5

T4: 1 -- 2,3,4,5

Figure 1
Postchemotherapy Vomiting

There were also significant simple effects across treatments for T3 ($F_{4,328} = 3.21, p < .05$) and T4 ($F_{4,328} = 5.94, p < .01$). Post-hoc analyses indicated that for T3 there were significant differences between treatment one, and treatments three, four and five ($p < .05$); and between treatment two and treatment five ($p < .05$). For T4 significant differences were between treatment one, and treatments two, three, four and five ($p < .05$).

SEVERITY: For PCVS there were no significant main effects and there was no significant interaction (see Appendix H).

Anticipatory Vomiting

Patients who declined to participate in the relaxation training did not report experiencing any anticipatory vomiting and since only five patients experienced this response (T3, $n = 2$; T4, $n = 3$) it was decided that their was insufficient data to allow any accurate evaluation.

Anticipatory Nausea

Comparisons between the three ANV groups (ANV relaxation after 3 treatments, ANV relaxation after 4 treatments, ANV no relaxation) were analyzed on anticipatory nausea severity and duration scores using a 3x5 repeated measures design with group membership as the between variable and treatments as the within variable.

DURATION: The results indicated a significant main effect for treatments ($F_{4,136} = 6.79, p < .01$) and a significant interaction ($F_{8,136} = 2.32, p < .01$), there was no significant group main effect (see Table 17-18, Figure 2).

Simple effects indicated significant differences for groups at treatment three ($F_{2,34} = 5.78, p < .05$) and six ($F_{2,34} = 3.89, p < .05$). Post-hoc comparisons showed that significant differences were between T3 and the NR group, and T4 and the NR group at treatment three ($p < .05$); and between T3 and the NR group at treatment six.

A test of the simple effects indicated significant differences for treatments for T3 ($F_{4,136} = 3.98, p < .01$) and NR ($F_{4,136} = 4.95, p < .01$). There were significant differences for T3 between treatment two, and treatments three, four and five; and between treatment three and treatment six ($p < .05$). For the NR group significant differences were between treatment two and five ($p < .05$).

SEVERITY: There was a significant main effect for treatments ($F_{4,136} = 10.59, p < .01$) as well as a significant interaction ($F_{8,136} = 3.17, p < .01$; see Table 19-20, Figure 3. There was no significant main effect for groups. Simple effects indicated significant group differences at treatment three ($F_{2,34} = 3.77, p < .05$) and treatment six ($F_{2,34} = 3.29, p < .05$). Post-hoc analyses indicated that at the third treatment differences were between T3 and NR ($p < .05$); and between T4 and NR ($p <$

Table 17

Repeated Measures Summary Table -- AN Duration*

	MS	df	F	prob
constant	337.93	1	157.27	
Group	3.22	2	0.58	ns
error	55.71	34		
Treatment	257.31	4	6.79	.01
Treatment x Group	88.11	8	2.32	.05
error	37.92	136		

Simple Effects

Treatments				Groups			
	F	df	p		F	df	p
Treatment 2	1.23	(2,34)	ns	T3	3.98	(4,136)	.05
Treatment 3	5.78	(2,34)	.05	T4	2.46	(4,136)	ns
Treatment 4	1.13	(2,34)	ns	NR	4.95	(4,136)	.01
Treatment 5	0.69	(2,34)	ns				
Treatment 6	3.89	(2,34)	.05				

* the means are presented in Table 18

Table 18

Means and Standard Deviations -- AN Duration (hrs)

<u>Treatment</u>	<u>T3</u>	<u>T4</u>	<u>NR</u>
2	5.28 (6.49)	6.36 (8.78)	0.69 (1.89)
3	11.16 (7.87)	9.91 (6.41)	3.00 (6.00)
4	10.44 (6.67)	12.02 (5.06)	6.00 (5.16)
5	10.22 (6.12)	10.67 (6.70)	12.70 (5.26)
6	5.40 (6.05)	8.02 (5.14)	10.50 (4.43)
	n = 18	n = 15	n = 4

Significant Differences

Within Rows

Treatment 3: T3 -- NR
 T4 -- NR

Treatment 6: T3 -- NR

Within Columns

T3: 2 -- 3,4,5
 3 -- 6

NR: 2 -- 5

Figure 2
Anticipatory Nausea

Table 19

Repeated Measures Summary Table -- AN Severity*

	MS	df	F	prob
constant	469.71	1	341.34	
Group	.41	2	0.30	ns
error	1.37	34		
Treatment	12.41	4	10.59	.01
Treatment x Group	3.72	8	3.17	.01
error	1.17	136		

Simple Effects

Treatments				Groups			
	F	df	p		F	df	p
Treatment 2	1.81	(2,34)	ns	T3	5.18	(4,136)	.01
Treatment 3	3.77	(2,34)	.05	T4	3.40	(4,136)	.01
Treatment 4	1.70	(2,34)	ns	NR	7.85	(4,136)	.01
Treatment 5	0.77	(2,34)	ns				
Treatment 6	3.29	(2,34)	.05				

* the means are presented in Table 20

Table 20

Means and Standard Deviations -- AN Severity

<u>Treatment</u>	<u>T3</u>	<u>T4</u>	<u>NR</u>
2	1.50 (1.62)	1.18 (1.18)	.20 (0.45)
3	2.28 (1.24)	2.11 (1.22)	1.00 (1.46)
4	2.66 (1.49)	2.41 (0.87)	2.00 (0)
5	2.30 (0.98)	2.35 (1.14)	2.00 (0)
6	1.23 (1.33)	2.06 (2.69)	2.51 (1.68)
	n = 18	n = 15	n = 4

Significant Differences

Within Rows

Treatment 3: T3 -- NR
T4 -- NR

Treatment 6: T3 -- NR

Within Columns

T3: 2 -- 4
3,4,5 -- 6

T4: 2 -- 3,4,5,6

NR: 2 -- 6

Figure 3
Anticipatory Nausea

.05). At the sixth treatment there were significant differences between T3 and NR ($p < .05$).

Simple effects also indicated significant treatment differences for T3 ($F_{4,136} = 5.18, p .01$), T4 ($F_{4,136} = 3.40, p < .01$) and NR ($F_{4,136} = 7.85, p < .01$). Post-hoc comparisons found that for T3 the differences were between treatment two and treatment four ($p < .05$); and between treatment six, and treatments three, four and five ($p < .05$). For T4 significant differences were present between treatment two, and treatments three, four, five and six ($p < .05$); and for the NR groups significant differences were between treatment two and treatment six ($p < .05$).

CAT: Anxiety, Coping and Frequency

Each of the CAT scales was analyzed using a 4x7 repeated measures design using the four previously identified groups and the seven within variables representing each of the assessment interview sessions.

CATa: For the CAT anxiety scale there was a significant main effect for groups ($F_{1,82} = 50.39, p < .01$), treatments ($F_{6,492} = 7.65, p < .01$) and for the interaction ($F_{18,492} = 1.96, p < .01$; see Table 21-22, Figure 4). Simple effects indicated significant difference for groups for each of the seven treatment sessions. Further analysis revealed that significant differences were between the NA group and the other three groups ($p < .01$) at all seven sessions.

Table 21

Repeated Measures Summary Table -- CAT anxiety*

	MS	df	F	prob
constant	447588.50	1	421.45	
Group	54045.65	3	50.89	.01
error	1062.01	82		
Treatment	668.03	6	7.65	.01
Treatment x Group	171.48	18	1.96	.01
error	87.29	492		

Simple Effects

Treatments				Groups			
	<u>F</u>	<u>df</u>	<u>p</u>		<u>F</u>	<u>df</u>	<u>p</u>
Baseline	21.41	3,82	.01	T3	6.50	6,492	.01
Treatment 1	24.89	3,82	.01	T4	4.43	6,492	.01
Treatment 2	33.21	3,82	.01	NR	0.74	6,492	ns
Treatment 3	47.66	3,82	.01	NA	6.43	6,492	.01
Treatment 4	49.38	3,82	.01				
Treatment 5	47.06	3,82	.01				
Treatment 6	38.21	3,82	.01				

* the means are presented in Table 22

Table 22

Means and Standard Deviations -- CAT anxiety

<u>Treatment</u>	<u>T3</u>	<u>T4</u>	<u>NR</u>	<u>NA</u>
Baseline	51.06 (16.43)	54.36 (17.98)	54.00 (9.69)	21.45 (18.64)
1	49.39 (20.17)	52.13 (19.11)	45.00 (25.71)	18.20 (15.24)
2	51.50 (17.47)	54.20 (21.67)	41.00 (28.77)	15.51 (13.41)
3	52.06 (12.89)	51.07 (14.76)	41.75 (29.78)	13.67 (12.99)
4	48.44 (15.05)	54.60 (16.17)	38.75 (17.73)	13.89 (12.19)
5	39.89 (12.49)	48.07 (12.99)	42.25 (10.59)	12.94 (11.52)
6	37.66 (13.04)	40.67 (14.61)	43.04 (12.45)	11.79 (10.79)
	n = 18	n = 15	n = 4	n = 49

Significant DifferencesWithin Rows

At all Treatments
including baseline: NA -- T3,T4,NR

Within Columns

T3: B,1,2,3,4 --5,6

T4: B,1,2,3,4,5 -- 6

NA: B -- 2,3,4,5,6
1 -- 3,4,5,6

Figure 4
CAT (anxiety)

A study of the simple effects for treatments showed significant differences for T3 ($F_{6,492} = 6.50, p < .01$), T4 ($F_{6,492} = 4.43, p < .01$) and for NA ($F_{6,492} = 6.43, p < .01$). Post-hoc comparisons indicated that for T3 there were significant differences between the first five assessment interviews (baseline through four inclusive), and treatment five and six ($p < .05$). For T4 there were significant differences between the first six assessment interviews (baseline through treatment five inclusive), and treatment six ($p < .05$). For the NA group there were significant differences between baseline, and treatments two through six inclusive ($p < .01$); and between treatment one, and treatments three through six inclusive ($p < .05$).

CATc: For the CAT coping scales there was a significant main effect for groups ($F_{1,82} = 27.91, p < .01$), treatments ($F_{6,492} = 105.53, p < .01$) and for the interaction ($F_{18,492} = 4.89, p < .01$; see Table 23-24, Figure 5). Simple effects for groups showed significant differences for baseline and each of the six treatment sessions. Post-hoc analyses found significant differences between the NA group and both the T3 and T4 groups at each assessment session (baseline through treatment six inclusive ($p < .05$); between the NA group and NR at baseline, treatment one, two, four, five and six ($p < .05$); between T3 and NR at treatment six ($p < .05$).

Table 23

Repeated Measures Summary Table -- CAT coping*

	MS	df	F	prob
constant	22355.70	1	861.86	
Group	7240.49	3	27.91	.01
error	259.39	82		
Treatment	3754.02	6	105.53	.01
Treatment x Group	174.12	18	4.89	.01
error	35.57	492		

Simple Effects

Treatments				Groups			
	F	df	p		F	df	p
Baseline	24.31	3,82	.01	T3	43.89	6,492	.01
Treatment 1	18.16	3,82	.01	T4	29.43	6,492	.01
Treatment 2	43.49	3,82	.01	NR	0.94	6,492	ns
Treatment 3	15.37	3,82	.01	NA	9.89	6,492	.01
Treatment 4	16.86	3,82	.01				
Treatment 5	13.82	3,82	.01				
Treatment 6	8.08	3,82	.01				

* the means are presented in Table 24

Table 24

Means and Standard Deviations -- CAT coping

<u>Treatment</u>	<u>T3</u>	<u>T4</u>	<u>NR</u>	<u>NA</u>
Baseline	27.57 (9.45)	27.69 (6.42)	28.18 (7.20)	42.91 (8.96)
1	25.27 (11.65)	25.33 (4.42)	29.50 (8.23)	39.29 (8.23)
2	24.11 (8.49)	22.93 (3.62)	30.50 (6.45)	40.55 (6.45)
3	27.56 (5.88)	24.20 (3.14)	32.50 (7.59)	39.81 (7.59)
4	29.72 (4.94)	24.60 (5.14)	28.00 (7.44)	40.64 (7.44)
5	31.67 (4.76)	26.60 (5.86)	26.50 (4.97)	40.90 (4.97)
6	34.06 (5.23)	31.87 (4.22)	24.80 (3.40)	40.51 (3.40)
	n = 18	n = 15	n = 4	n = 49

Significant DifferencesWithin Rows

At all Treatments
including baseline: NA -- T3,T4

At all Treatments
including baseline
but not treatment 3: NA -- NR

Treatment 3: T3 -- NR

Within Columns

T3: 6 -- B,1,2,3

T4: 6 -- 1,2,3,4,5

NA: B -- 1

Figure 5
CAT (coping)

The simple effects also indicated significant differences for treatments for T3 ($F_{6,492} = 43.89$, $p < .01$), T4 ($F_{6,492} = 29.43$, $p < .001$) and NA ($F_{6,492} = 9.89$, $p < .01$). Post-hoc comparisons indicated that for T3 there were significant differences between treatment six, and baseline, treatment one, two and three ($p < .05$); and between treatment five, and treatment one, two and three ($p < .05$). For T4 there were significant differences between treatment six, and treatments one through five inclusive ($p < .05$). For NA there were significant differences between baseline and treatment one ($p < .05$).

CATe: For the CAT expectancy scale there was a significant main effect for groups ($F_{1,82} = 27.28$, $p < .01$), treatments ($F_{6,492} = 3.65$, $p < .01$) as well as a significant interaction ($F_{18,492} = 2.44$, $p < .01$; see Table 25-26, Figure 6). A test of the simple effects showed significant group effects each interview sessions including baseline. Post-hoc analyses found that the T3 group and the NA group differed at each assessment interview. T3 also differed significantly from NR at treatment two and three ($p < .05$). T4 differed from NA at treatments one, two, three, four and five ($p < .05$). T4 differed from NR at treatment two and three ($p < .05$).

For the treatment simple effects significant findings were present for T3 ($F_{6,492} = 6.66$, $p < .01$), T4 ($F_{6,492} = 3.66$, $p < .05$) and NA ($F_{6,492} = 2.39$, $p < .05$). Post-hoc

Table 25

Repeated Measures Summary Table -- CAT expectancy*

	MS	df	F	prob
constant	11173.89	1	899.59	
Group	355.97	3	27.28	.01
error	13.05	82		
Treatment	7.87	6	3.65	.01
Treatment x Group	5.27	18	2.44	.01
error	2.16	492		

Simple Effects

Treatments				Groups			
	F	df	p		F	df	p
Baseline	24.05	3,82	.01	T3	6.66	6,492	.01
Treatment 1	14.22	3,82	.01	T4	3.66	6,492	.05
Treatment 2	29.33	3,82	.01	NR	2.04	6,492	ns
Treatment 3	12.38	3,82	.01	NA	2.39	6,492	.05
Treatment 4	13.32	3,82	.01				
Treatment 5	11.52	3,82	.01				
Treatment 6	4.25	3,82	.01				

* the means are presented in Table 26

Table 26

Means and Standard Deviations -- CAT expectancy

<u>Treatment</u>	<u>T3</u>	<u>T4</u>	<u>NR</u>	<u>NA</u>
Baseline	6.21 (1.94)	6.08 (1.26)	7.80 (1.17)	7.53 (1.84)
1	4.78 (2.82)	5.00 (1.09)	6.00 (1.63)	7.94 (2.02)
2	4.50 (2.34)	4.53 (1.30)	7.20 (1.71)	8.24 (1.63)
3	5.51 (1.45)	4.94 (1.16)	7.25 (2.87)	8.12 (2.36)
4	6.27 (1.47)	5.06 (1.19)	6.30 (1.71)	8.18 (2.26)
5	6.18 (1.29)	5.96 (1.25)	6.70 (1.71)	8.57 (2.27)
6	7.30 (1.45)	6.58 (1.06)	6.50 (1.26)	8.41 (2.24)
	n = 18	n = 15	n = 4	n = 49

Significant DifferencesWithin Rows

At all Treatments
including baseline: NA -- T3

Treatment 1: T4 -- NA

Treatment 2: T3 -- NR
T4 -- NR
T4 -- NA

Treatment 3: T3 -- NR
T4 -- NR/NA

Treatment 4-5: T4--NA

Within Columns

T3: B -- 1,2
1 -- 4,5,6
2 -- 4,5,6
3 -- 6

T4: B -- 1,2,3,4
2 -- 5,6
6 -- 1,3,4

NA: B -- 5,6

Figure 6
CAT (expectancy)

comparisons indicated that for T3 differences were between baseline, and treatments one and two; between treatment one, and treatments four, five and six; between treatment two, and treatments four, five and six; and between treatment three and treatment six ($p < .05$). For T4 differences were between baseline, and treatments one, two, three and four; between treatment two, and treatment five and six; and between treatment six, and treatments one, three and four ($p < .05$). For NA there were differences between baseline, and treatments five and six ($p < .05$)

CATf: For the CAT frequency scale there was a significant main effect for groups ($F_{3,82} = 69.53, p < .01$) and treatments ($F_{6,492} = 5.52, p < .01$), however, there was no significant interaction (see Table 27-28). Post-hoc analyses for the group main effect indicated differences between the NA group and each of the other groups (T3, $p < .01$; T4, $p < .01$; NR, $p < .05$). For the treatment effect there were significant differences between baseline, and treatments five and six ($p < .05$); between treatment one, and treatments three, four five and six ($p < .05$); between treatment two, and treatments five and six ($p < .05$).

Depression

Depression scores were also analyzed using a 4x7 repeated measures design. The seven within variables represent the baseline assessment and each of the six

Table 27

Repeated Measures Summary Table -- CAT frequency*

	MS	df	F	prob
constant	8020.42	1	880.70	
Group	633.09	3	69.53	.01
error	9.11	82		
Treatment	9.69	6	5.52	.01
Treatment x Group	2.57	18	1.47	ns
error	1.76	492		

* the means are presented in Table 28

Table 28

Means and Standard Deviations -- CAT frequency

<u>Treatment</u>	<u>T3</u>	<u>T4</u>	<u>NR</u>	<u>NA</u>	<u>Mean</u>
Baseline	5.92 (1.91)	6.30 (1.97)	6.25 (2.21)	3.67 (2.05)	5.54 (2.36)
1	6.61 (1.65)	7.00 (1.08)	6.50 (2.10)	3.14 (1.80)	5.81 (2.43)
2	6.72 (1.02)	6.67 (1.58)	6.00 (1.41)	2.71 (1.83)	5.53 (2.48)
3	6.55 (0.93)	6.53 (0.92)	5.25 (1.71)	2.43 (2.19)	5.19 (2.56)
4	6.33 (0.89)	6.73 (1.09)	5.35 (0.96)	2.51 (1.78)	5.23 (2.37)
5	5.77 (0.88)	6.27 (1.04)	5.50 (1.00)	2.22 (1.98)	4.94 (2.40)
6	5.05 (1.76)	6.27 (1.19)	5.25 (0.50)	2.16 (1.67)	4.68 (2.18)
	-----	-----	-----	-----	
Mean	6.14 (1.12)	6.54 (0.87)	5.78 (1.05)	2.69 (1.36)	
	n = 18	n = 15	n = 4	n = 49	

Significant Differences

Within Rows
(overall means)

NA -- T3,T4,NR

Within Columns
(overall means)

B -- 5,6
1 -- 3,4,5,6
2 -- 5,6

pretreatment interviews, with the four groups (T3, T4, NR, NA) representing the between variables. Results indicated a significant main effect for groups ($F_{1,82} = 10.50, p < .01$) and for treatments ($F_{6,492} = 3.27, p < .01$). There was no significant interaction (see Table 29-30). Post-hoc analysis indicated that for the group main effect there were significant differences between T3 and the NA group as well as between T4 and the NA group ($p < .05$).

For the treatment main effect there were significant differences between the baseline measure, and each of the six pretreatment assessments ($p < .05$).

State Anxiety

The results of the 4x7 repeated measures test was conducted on state anxiety scores. The seven within variables represent the baseline assessment and each of the six pretreatment interviews, with the four groups (T3, T4, NR, NA) representing the between variables. The results indicated a significant main effect for groups ($F_{1,82} = 12.32, p < .01$), a significant main effect for treatments ($F_{6,492} = 3.00, p < .01$) as well as a significant interaction ($F_{18,492} = 2.52, p < .01$; see Table 31-32, Figure 7). Simple effects indicated significant group differences at treatments one through six inclusive. Post-hoc comparisons indicated that T3 and NA differed significantly at treatments one through five inclusive ($p <$

Table 29

Repeated Measures Summary Table -- Depression*

	MS	df	F	prob
constant	50335.45	1	166.36	
Group	3177.29	3	10.50	.01
error	302.57	82		
Treatment	116.38	6	3.27	.05
Treatment x Group	43.79	18	1.20	ns
error	35.63	492		

* the means are presented in Table 30

Table 30

Means and Standard Deviations -- Depression

<u>Treatment</u>	<u>T3</u>	<u>T4</u>	<u>NR</u>	<u>NA</u>	<u>Mean</u>
Baseline	22.11 (8.82)	21.03 (11.10)	10.99 (2.71)	10.03 (10.54)	16.04 (10.56)
1	18.41 (12.58)	16.39 (9.99)	8.75 (2.63)	7.67 (7.49)	12.81 (11.29)
2	14.89 (10.16)	16.24 (8.45)	10.25 (6.60)	9.12 (8.49)	12.63 (9.49)
3	14.61 (8.81)	16.02 (10.11)	10.25 (3.77)	7.53 (6.34)	12.10 (9.38)
4	16.39 (11.60)	16.92 (13.81)	11.00 (2.16)	7.55 (5.68)	12.96 (10.51)
5	15.39 (12.39)	16.00 (8.34)	12.25 (3.86)	7.53 (6.06)	12.79 (11.32)
6	13.55 (9.25)	14.21 (8.67)	12.00 (3.50)	7.45 (5.90)	11.80 (10.13)
	-----	-----	-----	-----	
Mean	16.48 (7.16)	16.69 (7.81)	10.78 (2.03)	8.32 (6.08)	
	n = 18	n = 15	n = 4	n = 49	

Significant Differences

Within Rows
(overall means)

NA -- T3,T4

Within Columns
(overall means)

B -- 1,2,3,4,5,6

Table 31

Repeated Measures Summary Table -- State Anxiety*

	MS	df	F	prob
constant	415098.70	1	930.37	
Group	5498.49	3	12.32	.01
error	446.16	82		
Treatment	144.50	6	3.00	.01
Treatment x Group	121.35	18	2.52	.05
error	48.11	492		

Simple Effects

Treatments				Groups			
	F	df	p		F	df	p
Baseline	1.09	3,82	ns	T3	4.56	6,492	.01
Treatment 1	6.90	3,82	.01	T4	3.48	6,492	.05
Treatment 2	17.59	3,82	.01	NR	1.63	6,492	ns
Treatment 3	10.19	3,82	.01	NA	2.69	6,492	.05
Treatment 4	10.84	3,82	.01				
Treatment 5	9.53	3,82	.01				
Treatment 6	7.73	3,82	.01				

* the means are presented in Table 32

Table 32

Means and Standard Deviations -- State Anxiety

<u>Treatment</u>	<u>T3</u>	<u>T4</u>	<u>NR</u>	<u>NA</u>
Baseline	36.78 (11.18)	37.86 (11.42)	32.50 (8.32)	33.69 (11.79)
1	46.34 (14.57)	42.23 (6.37)	39.75 (10.09)	32.39 (11.69)
2	44.89 (8.24)	43.26 (6.94)	39.15 (13.84)	30.14 (9.79)
3	38.67 (7.30)	43.11 (7.85)	43.25 (13.17)	30.02 (10.69)
4	42.80 (8.07)	42.78 (12.13)	44.00 (12.83)	29.71 (10.82)
5	37.66 (9.74)	42.27 (11.33)	44.15 (13.55)	28.82 (10.46)
6	33.47 (6.01)	37.89 (9.06)	43.10 (12.53)	28.53 (9.09)
	n = 18	n = 15	n = 4	n = 49

Significant DifferencesWithin Rows

Treatment 1: T3 -- NA
 T4 -- NA

Treatment 2: T3 -- NA
 T4 -- NA

Treatment 3/4/5: T3 -- NA
 T4 -- NA
 NR -- NA

Treatment 6: T4 -- NA
 NR -- NA

Within Columns

T3: B -- 1,2
 1 -- 3,5,6
 2 -- 3,5,6
 4 -- 6

T4: B -- 2,3
 6 -- 2,3

NA: B -- 2,3,4,5,6
 1 -- 5,6

Figure 7
State Anxiety

.05). T4 and NA differed significantly at treatments one through six inclusive ($p < .05$). NR and NA differed significantly at treatments three through six ($p < .05$).

For the treatment effects there were significant results for T3 ($F_{6,492} = 4.56, p < .01$), T4 ($F_{6,492} = 3.48, p < .05$) and NA ($F_{6,492} = 2.69, p < .05$). Post-hoc analysis found that for T3 there were significant differences between baseline, and treatments one and two; between treatment one, and treatments three, five and six; between treatment two, and treatments three, five and six; and between treatment four and treatment six ($p < .05$). For T4 there were significant differences between baseline, and treatments two and three; and between treatment six, and treatments two and three ($p < .05$). For the NA group there were significant differences between baseline, and treatments two through six inclusive ($p < .05$); and between treatment one, and treatments five and six ($p < .05$).

Relaxation Tapes

The mean reported frequency of use of the tapes was 3.4 times per week. All patients stated that they found the tapes useful and comparisons of levels of anxiety prior to and subsequent to use of the tapes indicated significant differences during the week prior to the fourth treatment (first treatment session after the intervention; $t = 10.35, p < .01, M = 7.24, sd = 1.48; M = 3.94, sd = 1.16$), the

fifth treatment ($t = 17.69$, $p < .01$, $M = 6.91$, $sd = 0.73$; $M = 3.30$, $sd = 1.13$) and the sixth treatment ($t = 13.60$, $p < .01$, $M = 6.55$, $sd = 1.41$; $M = 2.69$, $sd = 1.28$).

Hypotheses

HYPOTHESIS 1: A discriminant function analysis aimed at discriminating the ANV from the NA group with averaged ratings of state anxiety and PCN severity was conducted. Averaged ratings were used since prospective ratings of PCN severity cannot be obtained and baseline ratings of anxiety are rarely reported in the literature to allow for cross-study comparisons. Secondly, studies in this field typically do not utilize variables prospectively in order to predict group membership (ANV, NA). The results showed a significant Chi square ($X^2 = 41.22$, $p < .01$, $df = 2$) with both of the variables being entered. The discriminant function structure coefficients were .758 (anxiety) and .485 (severity). Structure coefficients are bivariate correlations and are not influenced by the possibility of multicollinearity between predictors (Klecka, 1984). These variables correctly classified 81.4% of patients into their respective groups (ANV, NA). A canonical correlation for the variables and the discriminant function was .63.

HYPOTHESIS 2: The following baseline measures: CATa, CATc, CATe, CATf, Bett's Imagery, depression, absorption and coping resolution were all entered into a discriminant

analysis. Neither the CATe, CATf, depression or the Bett's Imagery scale met the minimum criteria for inclusion into the analysis. The four remaining variables resulted in a significant Chi-square ($F = 91.02, p < .01, df = 4$) and correctly classified 95.51% of all cases into their respective groups (see Table 33). A study of the discriminant function structure coefficients suggests that coping resolution and the CATc measure were the most important variables in the analysis. Coefficients of a large magnitude best describe the information carried by the variable itself (Klecka, 1984). A McNemar's square change test indicated that these four variables correctly classified a significantly greater number of subjects into their appropriate groups ($F = 8.57, p < .05$) than did those variables in hypothesis one. The correlations between PCNV and the four predictor variables used in this analysis are presented in Table 34.

AN severity and duration was accurately predicted by the four predictor variables at treatment three (severity: $F(4,88) = 17.14, p < .01$; duration: $F(4,88) = 13.08, p < .01$). At treatment six AN severity was not predicted by these variables, however, AN duration was (duration: $F(4,88) = 10.59, p < .01$

HYPOTHESIS 3: It appears, on the basis of the analyses already mentioned, that the third hypothesis that patient reported levels of CATa, CATc, state anxiety and

duration/severity of ANV were modified by the relaxation intervention can be supported. Results of the repeated measures tests, as well as the results pertaining to the CAT scores were in accord with the hypothesis.

Table 33

Discriminant Function Summary Table

Structure Coefficients

Coping Resolution	.54
CATc	.47
CATa	.43
Absorption	.25

Percentage of Cases Correctly Classified

		Predicted	
		NA	ANV
Actual	NA	45 (91.8%)	4 (8.2%)
	ANV	0 (0%)	40 (100.0%)
Total Percentage Correctly Classified		95.51%	

Table 34

Correlations--PCNV Severity and Predictor Variables

	PCN Treatment 1	Mean PCN (T1-T5)
Coping Resolution	-.35	-.28
CATc	-.28	-.26
CATa	.30	.16
Absorption	.31	.24

	PCV Treatment 1	Mean PCV (T2-T5)
Coping Resolution	-.33	-.32
CATc	-.16	-.09
CATa	.16	.10
Absorption	.22	.07

DISCUSSION

The results from this study and other research in this field provide strong evidence that the occurrence of ANV is a frequent and aversive component of most standard chemotherapy regimens. This response occurs in a significant proportion of chemotherapy outpatients and has been suggested to lead to increased levels of depression, anxiety and non-compliance to treatment (Cotanch, 1983). While the toxicity of treatments and levels of patient-reported anxiety appear to be related to ANV occurrence, these factors are insufficient to prospectively identify patients at risk. Recently, it has been suggested that while there appear to be necessary conditions for the development of ANV, its occurrence and severity is mediated by individual characteristics (see Morrow and Dobkin, 1988 for discussion). The present findings indicate that cognitive factors, combined with the patient's abilities to cope, are more influential in mediating response development than previously acknowledged.

For this study, AN occurred in 43% of the patient sample who also experienced PCNV. The incidence of this response is well within the range reported by most studies as is the low incidence of AV (5%). It is important to recall that these results are based upon a sample in which all patients experienced some degree of PCNV. While

this is not unusual, many studies include in their totals the entire sample of patients, some of whom may not have experienced any PCNV (Cohen et al., 1983). The lack of a no-PCNV group in our sample may be due to a referral bias. It is possible that some severely ill patients were not referred by the nurses due to a belief that any further intrusions might interfere with their adjustment to illness, overall health, or treatment. As well, patients who were to be receiving protocols that did not commonly result in PCNV may not have been referred by staff because of their lack of symptomatology. While these influences may have resulted in an increased prevalence rate of ANV for this study, the fact that ANV does not occur without the prior experience of PCNV suggests that the non-random effects did not distort the results that relate to the prediction of ANV development. In fact, in order to make accurate comparisons between groups (ANV, NA) the control group (NA) should be experiencing many of the same responses to treatment as the experimental group (ANV). Not only does the inclusion of no-PCNV patients in a control group lead to decreases in mean ratings of PCNV severity and duration, but, it may also distort the correlations reported between ANV and pretreatment anxiety or depression. Research that has failed to consider these possibilities (see review, Morrow and Dobkin, 1988)

may have reported biased findings as they relate to any comparisons of these groups (ANV, NA).

In accord with a conditioning model of response development no patients in this study reported experiencing ANV prior to their experience of PCNV. Patients developed ANV, on average, after 2.6 treatment sessions. Although no patients reported experiencing ANV for the first time at any point after the fourth treatment session, this is not to say that some patients did not go on to develop this response later in the treatment cycle after their involvement in this study. Previous findings have suggested that in some rare cases ANV may not develop until the tenth or twelfth treatment session (Andrykowski and Redd, 1987). Why this is so has yet to be clarified, however, it may be that patients' initial treatments did not result in PCNV, or that the first cycle of treatments were administered on a daily basis making it difficult to separate anticipatory responses from those attributable to the treatment itself. Nevertheless, the frequency of this latent development is extremely low and is not commonly considered to interfere with the accuracy of most studies' conclusions (Andrykowski and Redd, 1987).

The demographic findings of this study are in accord with the results of other studies. While the occurrence of ANV was not significantly related to gender, there was an indication that the occurrence of ANV was correlated with

age. Andrykowski et al. (1985) suggested that this relationship occurs because younger patients are often administered more aggressive chemotherapy than are older patients. There was a small, but significant, correlation between age and patient-reported PCN severity ($r = -.37$, $p < .01$) and PCN duration ($r = -.21$, $p < .01$) that is consistent with such a hypothesis. It may also be that this relationship reflects differences in the way in which younger and older patients report the severity of their responses (Jerry, 1990, personal communication). However, without an assessment of the toxicity of each patients' drug protocol at each treatment session it is not possible to determine whether the subjective reporting of severity and duration reflects actual drug toxicity or other variables.

There were no differences between groups (ANV, NA) on previous experience with, or the frequency or severity of, nausea or vomiting. The lack of an adequate number of patients with ANV who reported having experienced nausea or vomiting as a result of anxiety (3/40) calls the influence of anxiety in precipitating ANV into question. These findings indicate that patients who develop ANV do not have this propensity as a result of some specific factors related to nausea or vomiting, nor do they perceive the nausea or vomiting that they experienced as being more

frequent or more severe than patients who do not develop ANV.

The lack of significant findings related to each of the symptoms assessed by the Physical Symptoms Checklist fails to support previous results (e.g., Andrykowski and Redd, 1987) which suggested that such somatic complaints are a prevalent problem for patients undergoing chemotherapy. While patients in both groups (ANV, NA) frequently reported experiencing fatigue and dry mouth, there were relatively few patients who reported any notable changes in sense of smell or strange changes in taste. As well, despite Morrow's contention that motion sickness may influence ANV development its low frequency of occurrence also makes it of limited value as a predictor of ANV.

Previous research on ANV development has not adequately addressed the influence of patient coping strategies. The present results provide information concerning which aspects of coping may be inadequate for those patients who develop anticipatory responses. As noted previously, there were some strategies which, given the nature of the population under study, were rarely utilized. Few patients indicated that they attempted to laugh off the seriousness of their situation or utilized drugs or alcohol to help them cope. Similarly, given the importance of following physicians' orders, patients commonly reported being compliant with an authority figure.

Patients who subsequently developed ANV reported that their style of coping commonly involved self-distraction, social withdrawal, wishful thinking and/or the assignment of blame for their current condition either upon themselves or upon others. Patients at risk for ANV also reported that their attempts at coping resulted in significantly less resolution of the situation than did those patients who did not develop ANV. On the other hand, patients who did not develop ANV reported taking affirmative action in order to resolve their situation and acknowledged an acceptance of their current condition. These findings suggest that patients who are at risk for developing ANV differ from patients who are not at risk both on the basis of the coping strategies that they utilized, and with respect to how successful those strategies were perceived to be in helping to resolve their problems.

The results of a second coping measure indicated similar patterns. Patients with ANV reported greater levels of self-criticism, withdrawal and wishful thinking than those who did not develop ANV. Furthermore, patients who developed ANV also reported being more focused on their emotions (significantly higher scores were noted for the expression of emotion and emotion focused engagement) rather than having a problem-focused approach when compared to NA patients. The two findings of greater levels of emotion-focused engagement and emotion-focused

disengagement are not contradictory, but rather, suggest that patients who develop ANV are polarized on this measure while the NA group are not (Tobin et al., 1984). Patients with ANV also reported an overall pattern of coping that involved disengagement from disease related issues. In summary, patients who developed ANV could be characterized by coping strategies that involved an avoidance of any confrontation of the issue (disengagement, wishful thinking) and were focused more on either the denial of some and enhancement of other emotional aspects of their condition. They were also eager to attribute blame for their current condition (self or other focused) and did not feel that this issue was resolved by the coping strategies that they adopted. These findings are supported by those reported by Altmaier et al. (1982) who suggested that patients who develop ANV reported a greater frequency of inhibitive coping statements and fewer facilitative statements than did those patients who did not develop ANV. These findings also suggest that a failure to cope with disease-related issues may maintain and exacerbate patient cognitions as they relate to the negative elements associated with treatment. This, in association with the possible influence that cognitions have upon modifying conditionability, may lead to an increased susceptibility to ANV development.

The lack of significant differences for baseline measures of state or trait anxiety indicates that patients who go on to develop ANV cannot be identified prospectively by either of these measures. While not denying the possible important role that anxiety may play in the modification or persistence of ANV once treatment has begun (Nesse et al., 1980), it does not account for or predict the development of ANV prior to therapeutic treatment. Spence (1964) may have been correct when he speculated that higher levels of anxiety may act to facilitate, but not determine, the acquisition of some conditioned responses.

Significant differences were found on baseline measures of depression. The importance of this finding and its relation to the development of ANV remains unclear. It is possible that higher levels of depression are maintained by patients' cognitions that they possess inadequate resources for coping (Altmaier et al., 1982). Thus a perceived inability to adjust to or cope with diagnosis may increase a patient's level of depressive symptoms. Not surprisingly there were significant correlations between levels of depression and subjective ratings of coping resolution ($r = -.30$) and with baseline CATc scores ($r = -.50$). It is also possible, as outlined by Stam, Bultz and Pittman (1986), that increased levels of depression may reflect the recency of the patient's diagnosis (c.f., Cassileth et al., 1984). Recently diagnosed patients

(within three months) may be experiencing sufficient distress to inflate and thus distort the reported levels of depression and anxiety (Cassileth et al., 1984; Stam, Bultz and Pittman, 1986). Unfortunately, the recency of diagnosis could not be adequately evaluated for the patients in this study.

Significant differences were found between groups (ANV vs. NA) on baseline measures of imagery (Absorption and Bett's Imagery Scale) and levels of perceived stress. Perceived stress may also be a component of increased levels of depression given that some individuals experiencing depressive symptomatology may report a greater severity of specific conditions related to a negative event (i.e., cancer diagnosis; Pennebaker, 1983). Significant findings related to imagery also support previous research (e.g., Challis and Stam, 1990; Morrow and Dobkin, 1988) indicating propensities towards imaginative activities may have an influence on ANV development. As suggested in the introduction it may be that patients who become actively involved in ruminations related to treatment maintain and exacerbate the salience of the cues related to their chemotherapy which, in turn may further increase their conditionability.

Longitudinal Analyses

PCNV: The results of the longitudinal measures provides support for previous research that suggested patients with ANV could be characterized by more severe posttreatment nausea and vomiting (Wilcox et al., 1982). Patients with ANV experienced increased duration and severity of their PCNV as compared to patients without ANV. The subjective nature of nausea in response to treatment, as mentioned earlier, makes it a difficult side-effect to quantify and a difficult response for health professionals to manage. It is likely that these difficulties were contributing influences to the fact that the duration of PCN remained consistent across treatments. On the other hand, the tangible nature of vomiting may be considered to be a more recognizable and serious side-effect by oncologists and therefore receives more aggressive intervention (Stam and Challis, 1989).

A close examination of the results related to PCNV indicated that the relaxation intervention did not have a significant influence upon self-reported duration of severity of these responses. While some changes were noted across treatments, there were not specific to any one group (T3, T4, NR or NA).

ANV: The results for AN provide important information regarding the variables that may have an influence upon its maintenance and severity. While no prospective differences

(based on baseline measures) could be found between the no-relaxation and relaxation groups, differences noted at treatment three suggest that the patients who declined the intervention procedure were experiencing AN of significantly less duration and severity than were patients who agreed to the intervention. This difference may explain why these patients did not feel a need to become involved in the relaxation instruction. However, as stated earlier, the small sample size of the NR group not only necessitates that caution be used when extrapolating these findings, but other differences (at treatment two for example) may have been masked. Stam, Bultz and Pittman (1986) reported that 8% of those patients involved in their study refused any interventions by the Psychosocial Department treatment team. Despite the fact that the rate of non-compliance to the intervention found in this study (12.5%) is comparable to that found by Stam, Bultz and Pittman, the nature of the intervention procedure, as well as the problems focused upon in these two studies, are different. Unfortunately, this does therefore not allow for a direct extrapolation of the findings in this study to non-compliant patients outside of the issue of ANV.

The differences present at treatment six indicate that patients who declined the relaxation intervention reported a significant increase in the duration and severity of their AN across treatments. While a similar increase was

noted in the relaxation groups, the severity and duration was mediated and reduced subsequent to the relaxation intervention. The lack of notable changes for T4 may simply reflect the fact that patients were not followed for a long enough time post-intervention to identify the changes. Certainly in viewing the relevant figures, T3 and T4 reflect similar trends.

CAT: The utility of the CAT scales in differentiating between patients who develop ANV and those who do not was substantiated by the longitudinal assessments. The CAT scales, while also able to differentiate the ANV-NA groups, appeared to be sensitive to the influences of the relaxation intervention. Differences across treatments suggest that scores on the CATa, CATc and CATe decreased post-intervention for the ANV relaxation groups alone. Similar results were not found for the NR group. The frequency of these cognitions, while still differentiating group membership (ANV, NA) appeared to decrease across treatments for all groups and appeared to be uninfluenced by the intervention. These findings suggest that the decreased CATa and increased CATc scores can be associated with decreases in patient-reported AN duration and severity. The discriminant function analyses for hypothesis two carry this conclusion one step further to suggest that CATa and CATc are predictive, and therefore

have a mediating effect upon the development and persistence of ANV.

The improvement in reported levels of coping with treatment-related cognitions for the relaxation groups also provides an important theoretical base for the utility of relaxation procedures. While distraction is likely to aid in reducing levels of anxiety associated with treatment changes in depression scores (see Altmaier et al., 1982), the frequency of treatment related cognitions (CATf) and improved CATc and CATE scores indicate that the changes reflect improvements in patient coping with treatment and diagnosis related stressors rather than simply distracting their thoughts.

Specific analyses on the CAT scale across treatment two, three and four assessed the influence that the behavioural intervention may have had for those patients with ANV who received relaxation training after their third treatment. While some notable effects were expected, it was uncertain whether or not substantial differences would be present after such a short period of time. Nonetheless, there was a significant increment in patients' reported levels of CAT coping skills regarding cognitions associated with treatment and their expectations of how well they felt they would be able to cope with these same cognitions during treatment. The lack of significant differences on the other measures (CATa, CATf) may very well be due to the

short interval between the introduction of the relaxation procedure and the subsequent treatment. A lack of practice or comfort with the procedure may have made immediate changes for some responses unlikely. Redd (1982) suggested that one difficulty with audiotaped relaxation procedures is that they cannot be individualized for the needs of each patient and regardless of how well the patient is doing the tape continues. While difficult for short-term immediate effects, Redd goes on to suggest that in the long run this is rarely a problem and that patients are commonly able to individualize their experience after some practice (five or six practice sessions). This may account for the notable differences across treatments for many of the measures.

The lack of significant differences between the two relaxation groups at the fourth pretreatment interview may also be due to the fact that this was the first opportunity for patients to practice the techniques while the cues were actually present. Despite practicing the techniques at home, it may be that the actual presence of previously imagined cues requires that the patient make some adjustments to their new style of coping.

DEPRESSION: The differences noted between groups on the measure of depression may be explainable in terms of coping strategies. Patients who subsequently went on to develop ANV reported significantly higher levels of depression measured at baseline. This may be indicative of the style

of coping which was used as well as the fact that there was significantly less resolution of the issues with which they were dealing when compared to patients who did not go on to develop ANV. The relaxation procedure appeared not to influence levels of depression for the ANV groups, suggesting that such an intervention, while influential for some psychological influences to treatment, does not resolve issues that may help to maintain depressive symptomatology. The relatively high levels of depression may also have been exacerbated by the proximity of diagnosis to the time of assessment. This information was not obtained from the patients and as such its influence cannot be clearly defined.

STATE ANXIETY: It is important to note that in accord with previous research on anxiety (e.g., Andrykowski and Redd, 1987) the findings of this study suggest that patients with ANV do report higher levels of pretreatment anxiety than patients without ANV. The lack of baseline differences and the presence of pretreatment differences on measures of state anxiety indicates that this component may be more directly attributable to conditions related to treatment but is not a reliable predictor of ANV development.

Hypotheses

HYPOTHESIS I: The results of the discriminant function analyses confirmed the findings of previous studies that

have shown statistical support for a respondent learning model. The variables commonly attributed to a respondent learning model (state anxiety, PCNV severity), while correctly classifying a large percentage of patients into their respective groups (81.4%), remains retrospective (e.g., PCNV severity) and includes state measures that can only be assessed once the patient is already in the treatment setting. The close proximity of the state measure to the actual treatment process leaves insufficient time to implement any appropriate intervention strategies and thus an inadequate model for the prediction of patients at risk for ANV. Furthermore, it does not delineate specific personal characteristics that may have an influence upon response development.

HYPOTHESIS II: The purely prospective measures of the cognitive model of ANV proposed in this study accurately predicted group membership (95.51% cases correctly classified). This is a significantly larger percentage of patients than was classified by the respondent learning model and is prospective. Closer evaluation of the percentage of cases classified (see Table 22) indicates that while four cases were incorrectly classified, all patients who went on to develop ANV were identified correctly.

HYPOTHESIS III: Despite this lack of short-term treatment effects the immediate utility of the tapes in reducing

anxiety was verified by patients' retrospective evaluation of their anxiety prior to and subsequent to the use of the tapes. Although the tapes were not always used on a daily basis Cunningham (1989, personal communication) suggested that once the behavioural technique has been taught to patients its efficacy does not necessarily lie in its continued practice but rather in the individual's knowledge that they now have the capacity or the skills to effectively deal with the situation in question. The relaxation intervention appeared to be relatively successful in reducing the patient's self-reported levels of anxiety and increasing the coping with cognitions associated with treatment. The intervention also appeared to reduce patient reported duration and severity of AN. Unfortunately, because ANV did not occur prior to every treatment, it was difficult to assess the effect that the relaxation may have had upon ANV frequency. Nonetheless, a study of the overall frequencies of occurrence of AN at each treatment session does suggest a trend towards lowered frequency subsequent to the intervention.

Conclusion

Not only has this study verified the utility of a cognitive model of response development, but it has also shown that the specific components of patients' cognitions associated with treatment are indicative of their

susceptibility towards developing specific pretreatment responses. Behavioral interventions are not only effective for mediating the occurrence of these responses, but are also relatively easy and quick to implement. Early intervention helps to avoid the development of higher levels of anxiety, distress and non-compliance that are evident in long term patient care with ANV. The CAT, a brief prospective measure has been shown to be both an accurate predictor of ANV development as well as accurately reflecting improvement or decrements in patients' ability to cope with cognitions associated with treatment. This scale may therefore be useful as a predictive measure of specific difficulties related to treatment and may prove beneficial to physicians and other health care professionals in preparing the patient for the treatment process. As well, it could be used as an ongoing assessment measure that will allow for early identification of patients who may be at risk for developing difficulties related to their treatment. It may also be capable of identifying subtle changes or evaluating the utility of intervention procedures across treatments.

Given that the occurrence of AN can accurately be predicted; what remains to be accomplished with this information? Although early identification is possible, claims of preventing this response may be somewhat optimistic. While improved coping strategies may be of

assistance in mediating AN occurrence the lack of an immediate effect upon ANV severity or duration suggests that it may be difficult to prepare and/or quickly modify conditionability prior to experiencing the response. Nevertheless, a preventive study has yet to be done and it may prove more successful than is expected. It may be that given individualized assistance and greater monitoring of patient compliance with intervention instructions that greater effects can occur in a shorter time span.

Unfortunately, unless all PCN or PCV is prevented ANV is likely to persist as a pretreatment response. While it appears as though the developmental process of ANV and effective intervention methods can be understood in terms of a cognitive model of development, not all patients are receptive to such interventions. Nonetheless, these individuals appear to effectively cope with treatment related difficulties without the need for intervention. Stam, Bultz and Pittman (1986) stated that "it is generally recognized that whereas these coping patients may have difficult moments...for the most part they require little or no special intervention" (p. 539). Although this study has shown that such patients may not accomplish the reduction in AN severity or anxiety that patients using these techniques are able to achieve, an 87.5% compliance rate with the intervention procedure suggests that it is a desirable component of complete care and that substantial

benefits are possible for those patients who agree to participate.

It is important that physicians be aware that although patients may not stop treatment simply because of ANV, it is a distressing problem and induces much anxiety in a substantial proportion of patients undergoing treatment. This response is controllable and it is serious if to no one else but the patient. It is important that patients, physicians and nurses be aware that the occurrence of ANV is not without a remedy.

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APPENDICES

APPENDIX A

Chemotherapy Study

The Department of Psychosocial Resources is conducting a study on the side effects of chemotherapy. We are interested in your experiences with chemotherapy and if you are willing, we would like to ask you a number of questions about yourself and your responses to treatment. The initial interview should not take more than one hour to complete and will be conducted at a time and place that is convenient for you. As well, prior to each of your next six treatment sessions we would like to ask you a few questions about your experiences. These interviews should take no longer than ten minutes.

We will be telephoning you in the near future to ask if you would be willing to participate in this study. Please be advised that all of your responses will be kept confidential and that whether you participate or not will in no way affect your treatment here at the Centre.

Thank You

Gary B. Challis, M.Sc.
Carleton University

APPENDIX B

INFORMED CONSENT FORM

I, _____, do hereby give permission to be interviewed by Gary Challis, a graduate student from Carleton University who is conducting research at the Ottawa Regional Cancer Centre under the direction of the Department of Psychosocial Resources. I understand that this research is directed at explaining some of the factors related to the side effects of cancer chemotherapy.

I understand that at the time of a personal interview I will be asked to respond to a number of questions concerning myself, my disease, my treatment, and how I feel about them. Additionally, I will be required to respond to a number of questions prior to a maximum of six of my chemotherapy sessions. I understand that the initial interview will not exceed one hour in length, and that each of the subsequent testing times will require no more than fifteen minutes to complete. I am also aware that I may be chosen to take part in a relaxation training program. This training will consist of an initial one-hour session to be conducted by the researcher in my home. All subsequent relaxation sessions will be self-conducted through the use of a cassette tape. I am aware that my participation in all aspects of this study is voluntary and that I may withdraw at any time. I may also refuse to answer any question I so desire.

I know that my answers will be kept confidential and anonymous and that I can ultimately decide whether the researcher may use my responses in his report. I also know that my withdrawal from this study will have no effect upon the care or treatment that I am to receive from the Centre.

Signature

Date

APPENDIX C

ABSORPTION

Please answer true or false to each of the following questions.

1. I enjoy daydreaming about future projects, activities or problems.
2. I would rather be a writer than a banker.
3. Sometimes a certain smell can remind me of a place or experience in my past.
4. I can be greatly moved by the eloquence of poetic language.
5. While watching a movie or a television show I may become so involved that I forget about myself and my surroundings and experience the story as if it were real and as if I were taking part in it.
6. If I stare at a picture long enough and then look away from it, I can sometimes "see" an image of the picture, almost as though I were still looking at it.
7. It is sometimes possible for me to be completely immersed in nature or in art and have a feeling of awe or inspiration come over me, and to feel as if my whole state of consciousness has somehow been temporarily altered.
8. I like to watch cloud shapes change in the sky.
9. While acting in a play I can sometimes really feel the emotions of the character and become him/her for the time being, forgetting both myself and my surroundings.
10. If I wish I can imagine some things so vividly that they hold my attention the way a good story does.
11. Certain pieces of music remind me of pictures or moving patterns of colour.
12. The sound of some people's voice is so fascinating that I could go on listening to them for hours.
13. I am occasionally taken in by new books and ideas.

14. If I wish I can imagine that my body is so heavy that I couldn't move it even if I wanted to.

15. I dream frequently.

16. I begin projects by daydreaming about how they might be done.

17. I can sometimes recollect certain past experiences in my life with such clarity and vividness that it is like living them again or almost so.

18. I often feel that one of the main characters in a movie or play is like me.

19. I am able to wander off into my own thoughts while doing a relatively routine task, and then find a few minutes later that I have completed it without even knowing that I was doing it.

20. I enjoy, or would enjoy, getting beyond the world of logic and reason and experience something new and different.

APPENDIX D

Cognitions Associated with Treatment

Please indicate the extent to which each of these statements reflect your thoughts prior to receiving treatment.

1. I think that the nausea and/or vomiting which I may experience as a result of my treatment will be severe.

Degree of anxiety which this thought provokes

None 1 2 3 4 5 6 7 8 9 10 Extreme

2. I think that I may be ill prior to my treatment.

Degree of anxiety which this thought provokes

None 1 2 3 4 5 6 7 8 9 10 Extreme

3. I think that the insertion of the needle used for treatment will be painful.

Degree of anxiety which this thought provokes

None 1 2 3 4 5 6 7 8 9 10 Extreme

4. I think about getting my blood taken.

Degree of anxiety which this thought provokes

None 1 2 3 4 5 6 7 8 9 10 Extreme

5. I think that it will be difficult for the nurse to find a vein for the needle.

Degree of anxiety which this thought provokes

None 1 2 3 4 5 6 7 8 9 10 Extreme

6. I think that other patients or the nurses will disapprove if I appear nervous.

Degree of anxiety which this thought provokes

None 1 2 3 4 5 6 7 8 9 10 Extreme

7. I think that I may have to stay in hospital for more treatment and/or tests.

Degree of anxiety which this thought provokes

None 1 2 3 4 5 6 7 8 9 10 Extreme

8. I think that the treatment I am receiving is not helping me.

Degree of anxiety which this thought provokes

None 1 2 3 4 5 6 7 8 9 10 Extreme

9. I think about how other people at the Cancer centre look at me as a result of changes in my appearance due to treatment (e.g., loss of weight, hair loss).

Degree of anxiety which this thought provokes

None 1 2 3 4 5 6 7 8 9 10 Extreme

10. I think that they will find something more that may be physically wrong with me.

Degree of anxiety which this thought provokes

None 1 2 3 4 5 6 7 8 9 10 Extreme

11. I think that I may throw up in front of other patients or staff.

Degree of anxiety which this thought provokes

None 1 2 3 4 5 6 7 8 9 10 Extreme

12. I think that I may not be able to receive treatment this week due to a low blood count,

Degree of anxiety which this thought provokes

None 1 2 3 4 5 6 7 8 9 10 Extreme

13. I think about sitting by myself and not having anyone to talk to during my treatment.

Degree of anxiety which this thought provokes

None 1 2 3 4 5 6 7 8 9 10 Extreme

14. I think about receiving my treatment from a nurse whom I do not know.

Degree of anxiety which this thought provokes

None 1 2 3 4 5 6 7 8 9 10 Extreme

How well did/do you feel you can control or dismiss any of these thoughts?

1. I am certain that I was able to control these thoughts during the week before my treatment session.

Seems impossible
to control

Definitely can
be controlled

1 2 3 4 5 6 7 8 9 10

2. I am certain that I can control these thoughts an other concerns I might have related to my diagnosis and treatment in the future.

Seems impossible
to control

Definitely can
be controlled

1 2 3 4 5 6 7 8 9 10

APPENDIX E

Morrow Assessment of Nausea and Emesis (MANE)

1. Did you experience nausea after your last treatment?
2. How long did the nausea last? _____ hrs
3. How would you describe it at its worst?
 - 1 very mild
 - 2 mild
 - 3 moderate
 - 4 severe
 - 5 very severe
 - 6 intolerable
4. Did you experience vomiting after your last treatment?
5. How long did the vomiting last? _____ hrs
6. How would you describe it at its worst?
 - 1 very mild
 - 2 mild
 - 3 moderate
 - 4 severe
 - 5 very severe
 - 6 intolerable
7. Did you experience nausea during the last 36 hours?
8. How long did the nausea last? _____ hrs
9. How would you describe it at its worst?
 - 1 very mild
 - 2 mild
 - 3 moderate
 - 4 severe
 - 5 very severe
 - 6 intolerable
10. Did you experience vomiting during the last 36 hours?
11. How long did the vomiting last? _____ hrs
12. How would you describe it at its worst?
 - 1 very mild
 - 2 mild
 - 3 moderate
 - 4 severe
 - 5 very severe
 - 6 intolerable

APPENDIX F

SCRIPT FOR RELAXATION TAPE

First of all get yourself comfortable in the chair...just move around until you find a comfortable position...just get yourself comfortable and relaxed.

You can unclasp your hands and just let them rest loosely on your lap or on the edge of the bed, also uncross your legs and let them find a comfortable position.

If at any time during the session you find that the position you are in is uncomfortable you can simply adjust it to a more comfortable one without in any way disturbing the relaxation your feeling.

I would like you now to look at your hands and find a spot on one of them...look for a fingernail or a knuckle and just focus your attention on it...it doesn't matter which spot you choose, just select some spot on which to focus. I'm going to be referring to this spot as the target.

In the meantime, I'm going to be giving you some simple instructions that will help you experience relaxation. You will find the instructions very easy to follow and that you will be able to experience all of the things I will be describing to you.

As you stare at the target you have chosen, you may find occasionally that your gaze will wonder or that your vision will even blur...if this happens I want you to simple refocus your eyes and continue staring evenly at the target.

Now...I want you to take a deep breath in and hold it...hold it until it starts to feel a little uncomfortable then very slowly...just let it out. You will find that you start to experience a comfortable feeling...a feeling of well-being will begin to develop as you continue to rest in the chair...looking at the target...listening to my voice.

Now...take another deep breath in and hold it...notice the feeling of the tightness and tension in your abdomen and then...as it starts to feel uncomfortable...just as you did before...very slowly...let it out. Notice that on breathing out the tension is let out of your lungs. It makes you become even more aware of a feeling of comfort

and well-being settling over you. Just sink deeper and deeper.

Now...focus your attention closely on feelings of warmth and relaxation in various parts of your body...in your head...in your neck...in your arms...and in your legs...in your chest...and in your back. Just breath freely and evenly and deeply...freely... evenly...and deeply...not too quickly...and not too slowly. Just at a comfortable rate for you to notice that the relaxation increases gradually as you breath out. You may even be aware of the walls of your chest becoming looser. Continue relaxing your chest so that feelings of warmth and comfort irradiate to your back...your shoulders...your neck...your arms...and your legs.

You're probably starting to notice some changes in the target as well...changes that occur from staring at them for so long. Sometimes the target may look as though it is moving up and down, or from left to right. At times it may appear very distinct and clear, while at other times it may appear fuzzy and blurred...it may even change colour. You may see one of these things or even all of these things...whatever you see just continue staring at the target...continue listening to my voice...and continue to become more deeply, deeply relaxed.

As you watch the target your eyelids will become heavier...your eyes have become tired from staring for so long...your eyelids start to feel very tired and heavy as you sit there breathing freely...and evenly...and deeply....breathing in...and breathing out...freely...and evenly...and deeply. Your eyelids are becoming so heavy, so tired, that soon they will close at their own accord as if they were coated with a lead paste...as if there were magnetic fields in the eyelashes drawing your eyelashes closer and closer and together...I want you to relax completely...I want you to relax every muscle of your body. Relax the muscles of your legs...relax the muscles in your arms...make yourself perfectly comfortable...let yourself be limp...relax more...and more...and more...relax completely...relax completely...relax completely.

If they are not already closed, I would like you now to close your eyes. I want you to concentrate again on every muscle of your body. Notice your legs...how heavy and limp...heavy and limp they feel. Your arms feel heavy...heavy...heavy...heavy as lead. Your whole body feels heavy...heavier and heavier. You feel tired and sleepy...tired and sleepy...you feel drowsy and sleepy...drowsy and sleepy. Your breathing is slow and regular...slow and regular. You feel pleasantly drowsy and sleepy as you continue to listen to my voice. Just keep

your thoughts on what I am saying. You are going to get much more drowsy and sleepy. Soon you will be deep asleep, but you will have no trouble hearing what I am saying. I shall now begin to count. At each count you it will be from ten back to one. You will feel yourself going down...down...down...into a deep and comfortable sleep...a deep and restful sleep. I am going to start to count now. Ten...imagine yourself going deeply asleep...nine...down...down into a deep, sound sleep...eight...seven...more and more... more and more asleep...six...five...four...image yourself sinking, sliding into a deep, deep sleep...let nothing disturb you...pay attention only to my voice and the things I tell you...three...two...one...deep asleep.

You are feeling comfortable and relaxed and you are in a deep, sound sleep...a deep, sound sleep. Your entire body now is completely relaxed. Let your entire body sink into the chair as all the muscles become completely relaxed...calm and relaxed...very...very relaxed.

While you continue to allow your body to go on relaxing I want you to focus on the muscles of your jaw and your lips. Increase the tension by clenching your teeth and simultaneously pull the corners of your mouth back into a very tight grimace. Feel the tension in your lips and your jaw...just hold that for a moment...now relax.

Let the muscles of your jaw and your lips become very relaxed. If you find that your mouth wants to drop open a little bit that's okay...your jaw muscles are now beginning to relax...the tension being smoothed away as the muscles begin to relax even more deeply and then more deeply..even more deeply...deeply relaxed.

Now, focus on your eyes. Close your eyes tightly as if you were squinting. Notice the tension around your eyes...in your cheeks...and in your forehead. Now, hold that for a moment...relax...let your eyes relax...let your cheeks relax...let your forehead relax. Feel the muscles become very smooth and relaxed.

Now, focus on your forehead and your scalp. While keeping your eyes closed gradually raise your eyebrows up tighter and tighter. Notice as you tense your forehead your scalp muscles tense, you may feel a tightening band around your forehead and around your scalp. Just hold that for a moment...now relax.

Let the muscles of your forehead and scalp become very, very relaxed. Allow the lines in your forehead to smooth away, as all the muscles in your forehead, eyes and scalp

become very, very relaxed. Feel the relaxation spreading down through your neck and down into your body. Your entire body is becoming very deeply and comfortably relaxed.

Now, that you are relaxed I want you to have some practice in controlling the sensations from your body. I want to imagine your left arm as being numb and insensitive. Imagine it as if it were a piece of rubber...completely without feeling...imagine your arm as numb insensitive and unable to feel any sensations. While you are imagining your arm as if it were a piece of rubber you may also notice how relaxed it is. You may notice how difficult it is to move that arm. You also may notice that your mind has simply shutoff any sensations from your arm until you decide that you will pay attention to that arm again. Until then, however, you have simply decided not to take any notice of that arm...it is hanging numb and insensitive as if it were a piece of rubber. Now, just keep imagining your arm as numb and insensitive. Notice how you can control certain sensations in your body. Notice too how relaxed you feel and how limp your arm truly is.

Now, I want you to transfer that feeling of numbness to the left side of your face...allow the numbness to travel up your arm. Imagine it slowly moving up your arm and settling into your jaw...your muscles are relaxing...feel your jaw dropping open...the tension is flowing away. You feel it flowing out and the numbness flowing in. Slowly you notice that your arm has begun to feel sensations again...first in your fingers...and slowly moving up your hand to your arm...to your elbow ...to your shoulders. The numbness has now reached your jaw. It is settling in to the muscles of your jaw. Notice how your jaw is losing all sensations...it is becoming numb and insensitive. Feel your mouth as it hangs limp.

Your arm is now fully able to feel again, but your jaw is limp and relaxed. It is unable to feel any sensations. All the numbness has settled in to your jaw. I want you to feel as though your jaw is beginning to feel again. The numbness is slowly moving to the side of your face and your jaw. You could move it if you want because you can feel the sensations once again flowing back into your jaw.

I want you now to concentrate once again, even more carefully, on feelings of relaxation and comfort in all parts of your body. First of all, think of the relaxation in the muscles of your left arm...the left hand...the fingers of the left hand...the left forearm ...the left upper arm...and the left shoulder.

I want you to make a small fist with your right hand. Notice how tense the muscles feel in your right forearm...in your right upper arm...in your right shoulder...now relax the fist and relax all of the muscles of the right arm...the right hand...the fingers of the right hand...the right forearm...the right upper arm...and the right shoulder. Think of relaxation in each of these areas and as you think of relaxation the muscles become progressively more relaxed.

Now, I want you to relax the muscles of your neck...your chest...and your back. Relax each of these muscle groups. The neck...the chest...and the back. As you relax these muscles you will also notice that your facial muscles are also relaxing and loosing all of their own accord.

I want you now to tighten your stomach muscles. Make your abdomen very hard. Now, I want you to let the tension out and relax your stomach muscles. Notice a feeling of well-being that comes with relaxing your stomach muscles...very much like a gentle massaging action all over your stomach and even perhaps up to your chest.

Now, I want you to point your toes of both of your feet towards your head. Feel how tight the muscles feel in your calves...in your thighs...now, I want you to relax them. I want you to relax your feet and relax all of the muscles of your legs...the right leg, notice how relaxed the right foot is. Try to feel it in the toes of the right foot...and then the right calf...and then the right thigh.

Now, do the same with the left leg...the left foot...the toes of the left foot...the left calf...and the left thigh. Just thinking about relaxation in each of these areas causes the muscles to become more and more relaxed and you may even find an interesting thing begins to happen. The feelings of relaxation you feel in each of these areas start to spread so that they may seem to join up like the parts of a jigsaw puzzle. You may feel a deep feeling of overall relaxation...of contentment...of well-being...permeating the whole of your body.

Finally, I'm going to let you go even deeper and deeper into relaxation. You can end this session any time you want simply by opening up your eyes. Give yourself a few minutes before you stand up...but when you are ready to finish you can simply open your eyes. If you wish to stay deeply relaxed you can do so and simply lay there until you feel that you want to get up.

To become even more and more relaxed I want you to imagine yourself standing at the top of an escalator. I want you

to visualize the scene of the escalator... one you have seen many, many times. I want you to stand at the top and notice the stairs and steps moving down...slowly...in a continuous...rhythmical fashion. Now, I want you to imagine the handrail and picture it moving down...slowly...and smoothly. I am going to count backward slowly from ten to one. I want you to imagine, as I count that, you are stepping on to the first step of the escalator at ten and standing with your hand on the railing...while the steps and the handrail moves down...carrying you deeper and deeper into relaxation. I want you to plan it so that just as we reach one you reach the bottom of the escalator...at that time will be deeply...deeply relaxed.

Ten...you are at the top of the escalator, slowly stepping onto the slowly moving steps...nine... eight, you are going down, down ever so slowly down...seven...you are moving slowly...deeper and deeper into relaxation...six...five...we are halfway there...four...three...two...we are almost at the bottom, almost asleep...one...you are now deeply...deeply relaxed. Feel your entire body relaxing...feel it sinking deeper and deeper into the bed or the chair...your eyes are closed...your body is relaxed... and you are deeply...and comfortably asleep.

APPENDIX G

Non-Significant Differences--Coping Strategies Inventory
(ANV, no-ANV)

<u>Dimension</u>	<u>Mean Score</u>	
	<u>no-ANV</u> <u>(sd)</u>	<u>ANV</u> <u>(sd)</u>
Problem solving	25.61 (9.99)	22.55 (9.15)
Cognitive restructure	19.19 (9.27)	22.37 (8.44)
Social support	20.79 (7.80)	23.22 (7.89)
Problem avoidance	15.81 (4.93)	17.12 (6.17)
Problem focused engaged	44.57 (13.25)	45.20 (15.66)
Engagement	81.87 (26.53)	88.17 (23.26)

APPENDIX H

Means and Standard Deviations -- PCN Duration (hrs)

<u>Treatment</u>	<u>T3</u>	<u>T4</u>	<u>NR</u>	<u>NA</u>
1	56.44 (47.39)	57.12 (28.92)	42.02 (40.33)	26.29 (29.21)
2	49.55 (41.72)	48.67 (22.75)	36.24 (36.40)	27.34 (23.03)
3	48.44 (36.41)	46.40 (18.68)	41.14 (46.80)	23.35 (28.21)
4	49.33 (32.86)	47.29 (24.15)	44.21 (30.19)	30.43 (26.50)
5	47.66 (33.10)	49.60 (21.57)	43.04 (19.09)	27.33 (21.75)
	-----	-----	-----	-----
Mean	50.28 (36.75)	49.82 (21.66)	41.33 (25.97)	29.95 (21.16)
	n = 18	n = 17	n = 5	n = 49

Significant Differences

Within rows (overall means only)

T3 -- NA

T4 -- NA

APPENDIX I

Means and Standard Deviations -- PCN Severity

<u>Treatment</u>	<u>T3</u>	<u>T4</u>	<u>NR</u>	<u>NA</u>
1	3.61 (1.33)	3.56 (1.19)	3.00 (0.82)	2.21 (1.26)
2	3.83 (0.86)	3.76 (1.25)	3.25 (0.50)	2.49 (1.02)
3	3.72 (1.01)	3.33 (0.90)	3.50 (0.58)	2.73 (0.28)
4	3.33 (0.59)	3.20 (0.86)	3.25 (0.50)	2.63 (0.99)
5	3.16 (0.71)	3.20 (0.77)	3.50 (0.58)	2.37 (0.95)
	-----	-----	-----	-----
Mean	3.53 (0.56)	3.41 (0.66)	3.30 (0.28)	2.48 (0.81)
	n = 18	n = 17	n = 5	n = 53

Significant Differences

Within rows (overall means only)

T3 -- NA

APPENDIX J

Means and Standard Deviations -- PCV Severity

<u>Treatment</u>	<u>T3</u>	<u>T4</u>	<u>NR</u>	<u>NA</u>
1	2.00 (2.08)	2.76 (1.70)	1.60 (2.30)	1.41 (1.43)
2	3.11 (1.18)	2.52 (1.46)	2.40 (1.54)	2.10 (1.37)
3	2.67 (1.49)	2.76 (1.48)	2.00 (1.22)	1.73 (1.23)
4	2.61 (1.58)	1.94 (1.64)	2.00 (1.26)	2.30 (2.28)
5	1.98 (1.52)	2.29 (2.70)	2.40 (2.13)	2.13 (2.36)
	n = 13	n = 17	n = 5	n = 49

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS
STANDARD REFERENCE MATERIAL 1010a
(ANSI and ISO TEST CHART No 2)

END

28.02.92

FIN