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Vincent Egan, PhD

Submitted as a thesis for the D.Clin. Psy.

1993/96 Clinical Psychology M.Sc. Training Course,
University of Leicester.

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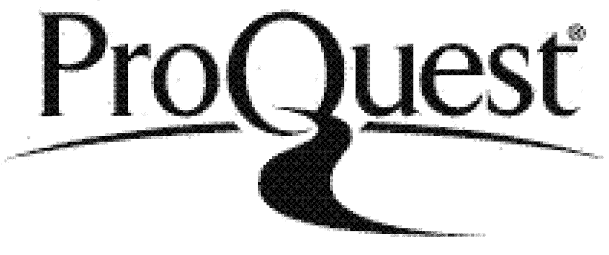

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Abstract of thesis.

The current study examined the dynamics of anxiety in men before and after cardiac surgery using a standard anxiety inventory (the STAI-S) and Shapiro's personal questionnaire (PQ) technique. Fifty-five men were assessed, of whom 29 were tested immediately before surgery, and 51 post-operatively. The first hypothesis, that the PQ would be more sensitive than the STAI-S to the changing context of the subject as they pass through a medical procedure was not supported; when made comparable, both measures were essentially the same in their sensitivity to anxious states. The second hypothesis addressed the internal and external reliabilities and validity of the PQ in relation to the STAI-S, and established that PQ techniques are equivalent in reliability, validity, and consistency to a standard psychometric instruments. The third hypothesis examined the influence of trait neuroticism (N) on the state measures of anxiety; due to doubts about the quality of the N measure, N was replaced by the trait score of the STAI. This found that individuals higher in trait anxiety sustained their higher state anxiety over time, but that trait anxiety was not in interaction with other variables. Trait anxiety was not therefore, a source of complex confounding. The fourth and final hypothesis, that lower verbal ability may confound the more complex PQ measure of anxiety was not supported: there was no significant correlation between PQ and NART scores. However, the reliability of the PQ was negatively related to lower verbal ability and higher trait anxiety, suggesting that low-verbal, high trait anxiety individuals were less consistent in their PQ responses. The study thus concludes that PQ techniques are as psychometrically rigorous as more standard measures, but do not provide a differential advantage in sensitivity to changes in mood.

(292 words in abstract.)

Acknowledgements and Declaration.

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I declare that this thesis is my own composition, and the work presented in it is my own.

Vincent Egan, Ph.D.

29 May, 1996

Contents

CHAPTER 1

1.0 Introduction.

Being admitted into hospital for surgery generates contrasting emotions; on the one hand, discomfort and/or a life-threatening situation may be resolved and enable the individual to live a pain-free (and possibly longer) life. On the other hand, in order to achieve this more satisfactory state, the individual also has to undergo general anaesthesia, major surgery, and, post-operatively, an extended period of recovery marked by possible discomfort and medical complications. Anxiety is the unsurprising consequence of these more threatening aspects of surgery. The current study seeks to separate the state, trait, and personality constructs of anxiety in a context in which individual concern is warranted - open-heart cardiac surgery. By repeated measurement of anxiety at different stages within an anxiety-provoking procedure, the relative influence of personality trait-related anxiety can be removed from the specific effect of state-related anxiety. In addition, by comparing two different ways of measuring anxiety, the differential validity of one form over another can be evaluated within a real-world context.

1.1 Anxiety.

While anxiety is defined as an "..unpleasant emotional state or condition ... characterised by subjective feelings of tension, apprehension, and worry, and by activation or arousal of the autonomic nervous system" (Speilberger, 1972, p. 482), the term is conceptually quite vague, and may refer to an acute response to a perceived (although sometimes unconscious (Macleod, Mathews and Tata, 1986)) threat, an emotional state, or a trait disposition. Anxiety can also be seen as an effect (as in the case of post-traumatic stress disorder, where exposure to a disaster leaves an individual with persistent, vivid recollections and anxieties regarding the event (Jones and Barlow, 1990)) , or an underlying cause (phobias, obsessive-compulsive disorder,

and panic attacks are all more common in individuals diagnosed as having anxious or neurotic problems (Andrews *et al*, 1990, Sturt, 1981)).

1.2 Is anxiety an emotion or a cognition?

Anxiety and the emotions are similarly marked by a (*a*) physiological basis; (*b*) affective experience; (*c*) subsequent cognitive responses such as changes in the appraisal of circumstances; (*d*) changes in physiology predicated on the aforementioned cognitive changes; and (*e*) the production of behaviour which is expressive and goal-directed (Kleinginna and Kleinginna, 1981). The direction of causality between these components varies, and continues to generate heated debate (*e.g.*, Zajonc (1984); Lazarus (1984)). Given that "... the brain systems mediating emotion overlap with those mediating cognition to such a degree that it is difficult to maintain any clear distinction between them" (Gray, 1990, pp. 269), the separating of cognitive and affective experience may be a somewhat artificial exercise, and one should simply accept that anxiety is one of the six universal human emotions (the others being happiness, anger, sadness, disgust, and surprise (Ekman, 1973)) with both physiological and cognitive components.

1.3 Is anxiety a disposition?

Reflecting the conceptual disparity between different meanings of the term "anxiety", the concurrent physiological and psychological characteristics associated with the term often show poor correlation ("discordance") from one another (Rachman and Hodgson, 1974). That the correlation between subjective experience, overt behaviour and psychophysiological indices such as heart-rate or galvanic skin response may often be low means that one cannot make conclusions about one of these categories of reaction based on a score of one of the others. One reason for the discordance between pencil-and paper measures of anxiety and psychophysiological measures may be that the pencil-and-paper measures are actually measuring a disposition. This is explicitly recognised by Speilberger, who notes that "An adequate theory of anxiety

must distinguish conceptually and operationally between anxiety as a transitory state and a relatively stable personality trait " (Speilberger, 1972b, pp. 38). Subjective expressed feelings of tension, apprehension, and variable, negative mood are identified in questionnaires measuring both anxiety and trait neuroticism, and the two variables unsurprisingly correlate at between 0.6 and 0.8 (Edelmann, 1992).

Whether anxiety or neuroticism is the antecedent or latent variable of the other, is like the relationship between cognition, emotion, and physiology, difficult to differentiate. Neuroticism is one of the "Big Five" personality characteristics, readily identified in almost all psychometric studies of personality as a major source of individual difference variance (Deary and Matthews, 1993), and underpinned by putative greater autonomic nervous system activity and slow rates of habituation to stimuli (Eysenck, 1994). However, Gray (1982) argues that neuroticism is better conceived as introverted anxiety, reflecting an over-active Behavioural Inhibition System (which integrates inputs from the septohippocampal and monoamine systems, and sends outputs to the frontal lobes perceived as non-specific arousal). Gray (1982) similarly proposes that impulsivity is underpinned by a Behavioural Activation System concerned with the conditioned increase in the probability of a behavioural response.

While Gray's somewhat physiological theory has plenty of supporting evidence, much of it comes from psychopharmacological and lesion studies of rats; in these cognitive times, it is no longer clear whether one can blithely extrapolate from the fear reactions of rodents - or the cerebral correlates of these events - to similar events in humans. However, studies involving the ratings of human subjects to anxiety, punishment susceptibility, and impulsivity, in conjunction with standard personality scales suggest that anxiety is related to both extroversion and neuroticism - as is impulsivity (Diaz and Pickering, 1993). This suggests that the simple assumption of orthogonal personality dimensions with specific associations may not be warranted,

and that brain systems overlap rather than function discretely - a somewhat more plausible representation of brain -behaviour relationships.

1.4 Difficulties with standardised questionnaires.

The standard psychometric measure of anxiety is the self-report State-Trait Anxiety Inventory (STAI: Speilberger, 1983). Psychometric instruments are characterised by a high degree of psychometric sophistication, validation, and reliability, and given their ease of use and administration, have been widely used in a range of contexts. Instruments such as the STAI involve an individual grading themselves upon a numeric dimension of agreement to a given item statement, these individual items being summed to provide a total or subscale score according to the instrument in question. In cases where large groups of individuals need quick assessment on a concrete and specific issue, and the unit of measurement is commonly understood, such instruments may be ideal. In other cases, their application may be inappropriate.

Mulhall (1976) has argued that standard psychometric scaling is not necessarily more reliable than any other form of measurement, and that numeric scaling is unduly abstract for most subjects. This is not simply a matter of psychologists arguing at one another from their respective and well-defended ivory towers: given the complexities of measuring even psychophysical experience, subjective scaling has become an increasingly important topic. Poulton (1989) has suggested that individuals' judgements of stimulus intensities vary according to the nature of the assessment method, and are particularly biased in circumstances where there is no familiar order of measurement; where effects may be non-linear; and where the construct under question is subjective and abstract. In the case of psychological experience, such concerns are warranted.

One ostensibly face-valid solution to this difficulty of scaling subjective experience is the visual analogue scale (VAS). A VAS typically requests that a subject rate their

feeling to a given stimulus on a 100 mm line, the ends of which being tagged to denote extreme states of the stimulus condition. The subject is requested to mark their position between these two extremes, and thus produces quasi-spatial description of subjective experience - precisely the physical rating of a non-physical phenomena Poulton questions. A further problem with VAS-type measures is that they discourage extreme responses, and lead to a self-explanatory 'central tendency bias'; this is seen when there is a clustering of responses in the centre of the scale (Poulton, 1989). If the extreme categories (or ends) of a possible response are attenuated, the ability of the scale to discriminate between stimuli is reduced.

There are other reasons why established psychometric measures may sometimes be unsuitable for clinical use. Firstly, standard questionnaires (SQs) may over-emphasise test-retest correlations and high reliability, leading to the exclusion of 'unstable' items more sensitive to changes in the observed variable. Secondly, SQs maximise reliability by having numerous items: subjects may get irritated at having to complete the same lengthy questionnaire repeatedly, and so fail to answer items with due consideration to their own mental state. Thirdly, SQs have standardised items: they do not address the different terms by which an individual may define their mood and its magnitude, and may thus fail to measure this state adequately. Fourthly, SQs may require a numeric rather than verbal coding of a response, despite most construct intensifiers being verbal rather than numeric. Lastly, interval measurement assumes that the difference between any two neighbouring points on the scale is identical (*e.g.*, inches, IQ points). This is not the case for most psychological constructs.

1.5 The Personal Questionnaire.

Shapiro (1961, 1966) was aware of these foregoing difficulties. He noted that: "the experimental clinical psychologist at present lacks techniques which will enable him : (i) to measure changes in specific psychological symptoms ... and (ii) to do so in a

manner which makes possible comparisons between different patients and between different aspects of a given patient's illness" (Shapiro, 1961, pp. 151). Shapiro's solution to the problem of measuring a psychological construct with a non-interval measure was to construct an inventory unique to the subject using their own ordinal (*i.e.*, ranked) scaling criteria - a Personal Questionnaire (PQ). The PQ was designed to optimise the validity and reliability of individual responses. Thus he proposed that the PQ used paired presentations of dichotomous nominal stimuli that enabled discrimination across a broad continuum; natural language comparisons (as opposed to forcing the subject to quantify a perhaps subjectively unquantifiable internal state); and the minimising the memory load required for a suitable response. In addition, making a forced choice discrimination also reduced response sets, as a range of comparisons between difficult stimuli encouraged the subject to think about their answer. Shapiro thus provided a formal technique suitable for the single-subject designs of much clinical work.

In his original paper on the PQ Shapiro comments that: "Unlike questionnaires in common use, a different personal questionnaire is constructed for each patient. Construction takes about five hours, and administration and scoring takes about 30 minutes" (Shapiro, 1961, pp. 151). This implies two major difficulties; firstly, in being so ideographic (subject-defined) the PQ precludes the aggregation of comparable data between subjects as well as within subjects; and secondly, each PQ generated is very time-consuming. Thus Shapiro's urging that: "The PQ could be used for 'group-centred' as well as 'individual-centred' research, *i.e.*, it would be possible to make comparisons between individuals, either in respect of similar symptoms or the whole symptomology ... such a method of scoring .. (being) .. analogous, in principle, to the scoring of a subject's responses to an individual vocabulary scale" (Shapiro, 1961, pp. 154 - 155) was perhaps handicapped by his devising of a method unsuitable to larger studies.

With such a laborious original technique, it is unsurprising that the PQ has been under-utilised; 1976 Mulhall (pp. 591) puts it thus: "Despite relatively extensive exploration of the various methods of constructing PQs, none have been produced which are quick and easy to use on a day-to-day basis". In pushing his own individual-oriented scheme (the Personal Questionnaire Rapid Scaling Technique), Mulhall perhaps downplayed improvements in PQ method earlier proposed by Phillips that made for better research opportunities. Phillips (1970a, 1970b) generalised PQ techniques to provide a single partial scaling of statements and levels of a symptom in which any number of statements, scaling, and dimension of scaling could be used, allowing generalisation of measurement over subjects and more formal analysis of assessment validity.

These alternative methods are reviewed and differentiated in his eponymously-titled chapter on generalised PQ techniques (Phillips, 1977). Shapiro's original approach could be described as an **ordered metric** PQ, in which all points on the scale are ordered, as are all pairs of points. Due to the distribution of items, central PQ items would be inevitably examined more than items at the extremes of the range, limiting the quality of measurement at these distal, important points. Phillips (1970a) devised an **interval** PQ, in which the ratio of differences between points and objects is specified according to some standard metric, and an **ordinal** PQ (Phillips, 1970b), in which stimuli are simply ranked according to a given property. The ordinal approach has the advantage of being easier for subjects to do, and far quicker to complete. When subjects are able to respond easily and naturally to a psychologist's questions, they are more likely to provide useful information than if they (often increasingly grudgingly) respond to some spuriously precise testing paradigm.

Two aspects of PQ scaling are particularly important; the level of intensity of the condition represented by the original statements, and the level of that condition over different occasions. The essential process of generating a PQ involves presenting the

subject with a stimulus symptom, having them rate the item ipsatively (*i.e.*, rate the statement according to their own judgement of magnitude), and examine whether this rating changes over time (Phillips, 1970a,b). The ordinal items of PQs are (ideally) straightforward, and due to their basis on natural language intensifiers should generate consistent (and thus reliable) response patterns. Despite their credibility and potential usefulness, PQs have not been well-researched. In 1977 Phillips wrote that: "it is to be regretted that researchers have scarcely begun to take advantage of the of the possibilities of the method: over the fifteen years since it was first published there has been an average of less than two studies per year applying it" (Phillips, 1977, pp.239).

Things have not improved; a search of the PsychLIT CD-ROM database using the search term "Personal Questionnaire" revealed just 11 published papers on the topic from 1977 to 1989, and 10 further papers from 1990 to March, 1996. These papers often assume that the PQ is superior to standard psychometric measurement without demonstrating this objectively (Shapiro, 1975; Mulhall, 1976). Most of the studies involve single-cases (Garety, 1985; Chadwick, 1994) or a sample too small to enable the extrapolation of any useful general point (Shapiro *et al*, 1975; Dagnan *et al*, 1994). There have been two exceptions to this somewhat discouraging, unrigorous, and inconclusive literature. Using a sample of 40 subjects and a repeated subjects design, Barkham *et al* (1989) found that the PQ was sensitive to subjective changes in individuals given prescriptive followed by exploratory psychotherapy; and Honeyman (1990) found that the PQ was sensitive to changes in the intensity of perceptions with potential treatment implications for 24 drug-dependent subjects in a residential community.

The presumptive laudability and rhetoric with which the PQ has been presented has not generally been reflected in the modest literature applying the technique, and it is likely that the lack of research with the PQ is related to the lack of basic research considering the putative differential validity of the technique over other, more

conventional approaches. More rigorous and credible studies have shown the PQ to be sensitive to subtle changes, and suggest that the technique may indeed be useful. However, the most objective test of the PQs' validity, sensitivity, and possible use is by using it in conjunction with more conventional measures in a context where strong effects may be expected, such as that before and after a specific and controlled anxiety-provoking event - for example, surgery.

1.6 Pre-operative anxiety.

Psychological distress is a common adjunct to medical conditions and treatment and is particularly marked following hospitalisation (House, Farthing and Peveler, 1995). These effects are not general to all patients; surgical patients appear significantly more distressed than medical patients by their unfamiliar surroundings, loss of independence, and threat of severe illness; these differences are not attributable to the effects of age or seriousness of illness (Volicer and Bohannon, 1975). It might be added that the dynamics of surgical anxiety are not obvious, and the common sense view that raised anticipatory pre-operative anxiety is followed by a steady post-operative linear decrease, does not seem to occur (Johnston, 1980). It should also be noted that not everyone regards medical anxiety as a problem: Salmon (1993) prefers the term 'preparatory worry', arguing that medicalising pre-operative anxiety pathologises a natural emotional response to an understandable and finite stressor.

While Salmon's view makes common sense, pre-operative anxiety undoubtedly has implications for post-operative outcome. For example, Jenkins *et al* (1994) followed up 463 patients who had experienced cardiac surgery and found that low levels of pre-operative anxiety and depression predicted freedom from cardiac symptoms 6 months after their operation. Similarly, Bunzel and Wollenek (1994) suggest that higher levels of preoperative emotional stability contribute significantly to the likelihood of successful heart transplantation. Lastly, higher levels of pre-operative state anxiety and anger were associated with poorer post-operative outcome in 94 patients

undergoing cardiac surgery (Stengrevics *et al*, 1996). These results were obtained despite adjusting for medical status, surgical procedure, preoperative length of stay, priority of surgery, gender and age. Evidence for the clinical significance of pre-operative anxiety therefore seems quite clear, and continued assessment of it as part of routine audit of clinical procedures seems warranted.

The anticipation of treatments or procedures which are likely to be painful is distressing, and may produce feelings of apprehension, discomfort, or embarrassment. Surgical operations are normally elective (*i.e.*, planned well ahead), and often provide a patient with plenty of time to develop anticipatory anxiety (Edelmann, 1992; Mai, 1993). Underwood, Firmin and Jehu (1993) found that time spent on the waiting list awaiting coronary artery bypass graft (CABG) surgery was positively and significantly associated with impaired performance of work, interpersonal relationships, and leisure activities, and with higher self-rated anxiety and depression scores on the Hospital Anxiety and Depression scale. There was no association between measures of subjective distress and objective levels of clinical cardiac symptoms.

Anticipatory anxiety can be augmented by repeated admission, preparation, then cancellation of the operation as surgeons rearrange their lists to accommodate emergencies or sudden changes . One strategy to reduce anxiety is to administer anxiolytic medication as part of the pre-operative medication. Given the desynchrony of physiological and psychological aspects of anxiety, medication may not reduce cognitive aspects of anxiety, even if autonomic aspects of the condition have been reduced (Wikinski *et al*, 1994; Geddes, Gray and Asbury, 1994). A more effective strategy to manage preoperative distress appears to be to provide patients with information about the procedures and experiences they are about to face, and to increase their sense of control over their recovery (Anderson, 1987).

Cognitions behind an emotional response to surgery are multi-dimensional and subtle, and deserve clarification; Kincey and Saltmore (1988) argue that a taxonomy of surgical operations examining dichotomous implications - reducing or lengthening life, restoring or removing function, increasing or decreasing pain, cause or remove physical stigmata, and improve or impair autonomous self-care - may predict outcome. A further source of variance upon the effects of surgical outcome and adjustment is personality; negative affect saturates health complaints and distress (Ma thews and Ridgeway, 1981; Watson and Pennebaker, 1989). At the same time, state anxiety in a surgical setting is not completely predicted by trait anxiety, as the loss of mental equilibrium in an individual facing unexpected cardiovascular surgery may be severe (Headey and Wearing, 1989; Mumford, Schlesinger and Glass, 1982). An effective way of clarifying these processes may be to measure and examine their effects on anxiety arising from a potentially stressful process: cardiac surgery.

1.7. Cardiac Surgery: a) Coronary Artery Bypass Grafting.

Coronary Artery Bypass Grafting (CABG) is one of three operations used to relieve otherwise intractable myocardial ischaemia. The operation involves taking a vein from the leg or inside of the thorax and bypassing the coronary obstruction by suturing the vein between the aorta and the coronary artery distal to the obstruction. This provides dramatic relief from angina for about 90% of those operated upon, lengthens life span, and improves quality of life (Kumar and Clark, 1987). Meta-analysis of randomised trials comparing CABG with coronary angioplasty (in which the coronary arteries are expanded internally by a balloon-like object) for 3371 patients suggests that CABG patients are less likely to experience post-operation angina or need further surgical intervention (Pocock *et al*, 1995).

1.8 Cardiac Surgery: b) Mitral and Aortal Valve Replacement.

Narrowing of the coronary valves is a common complication of rheumatic fever, and places increased load on the on the remaining mechanism of the heart to keep cardiac

output up. The long term consequences of this are varied, and best summarised in the vague but accurate term "heart failure". Whilst diuretic, anti-coagulant, and vasodilating medication may be sufficient to treat the symptoms of this condition, in other cases surgical intervention is necessary, and the mitral and/or aortal valves are replaced (MVR and AVR, respectively). Whereas individuals undergoing CABG are typically older, the age distribution for MVR/AVR begins with people in their early twenties. In both cases, however, the procedure by which surgical improvement is effected is the same: open-heart surgery under general anaesthesia.

1.9 Personality and Health.

Pre-operative anxiety is related to post-operative distress, and this relationship is mediated by trait anxiety. As discussed above, trait anxiety and trait neuroticism are highly correlated, and are thus arguably measures of the same latent trait of emotional lability (Matthews and Ridgeway, 1981). Roger and Nesshoever (1987) argue that personality has a major role as a moderator variable in the relationship between psychological stress and illness, on the grounds that personality shapes an individual's perception of their own resources and the relative dominance of particular coping strategies.

Trait neuroticism (N) is a major factor of personality and comprises substantial emotional subcomponents: anxiety; depression; low self-esteem; tension; guilt; shyness; moodiness; and irrationality (Eysenck, 1994). Evidence from a longitudinal study of health, personality, and socio-economic factors involving 245 subjects confirms the importance of N's influence; N was a major mediating factor in the stress-illness relationship (Ranchor and Sanderman, 1991). Negative affect, in conjunction with social inhibition, appears to be an independent predictor of long-term mortality in patients with coronary heart disease (Denollet *et al*, 1996). Given that N is a major source of variance in individual difference research, it is likely that N would affect the degree to which individuals endorse anxiety-related items -

especially when confronted with a real anxiety-provoking challenge. It is difficult to reconcile the Protean influences of N with the *ex-cathedra* claim that N is a weak predictor of an individual's response and recovery to surgery (Kincey, 1995). Again, empirical evidence is necessary to guide ones' decisions regarding the matter.

1.10 Practical Implications of the study.

The relative merits of SQ and PQ techniques come into particular focus when one has to evaluate and manage the real anxieties imposed by serious illness. The current study suggests three practical benefits. Firstly, the use of the PQ may provide a quicker, and more sensitive method of evaluating anxiety than an SQ. If this is the case, the use of a PQ would be a more appropriate way of evaluating anxiety or anxiolysis in other medical settings. Secondly, the degree to which anxiety increases and recedes following a stress-inducing medical event can be objectively described, providing guidelines on the degree to which subjective discomfort may be expected to follow a medical intervention. Thirdly, the degree to which individual differences in personality and verbal ability affect measures of anxiety can be quantified, enabling the effect of premorbid characteristics upon a current event to be clarified.

1.11. Aims of the study.

The current study examines an anxiety PQ in a surgical setting where quick, easy, sensitive and repeatable assessment is necessary. The study seeks:

1. To examine the dynamics of anxiety over the pre- and postoperative period for both an SQ and the PQ, the assumption being that the PQ will be more sensitive to the changing context of the subject as they pass through a medical procedure.
2. To examine the internal and external reliabilities of PQ and SQ measures using specialist and standard correlational techniques at separate points across time, and to examine test-retest correlations for the two measures..
3. To examine the correlation between PQ and SQ measures, and trait N at a single point and across time; it is hypothesised that there will be non-trait anxiety variance

attributable to pre-operative anxiety, and that this specific source of variance will reduce once the operation has occurred.

4. To examine whether premorbid verbal ability affects measurement of anxiety.

CHAPTER 2

Some technical matters: exploring the differential validity of similar measurement instruments.

2.0 The reliability and consistency of psychometric measures.

Psychometric assessments are the products of a technology for quantifying individual differences in behaviour and mental processes in a reliable and objective manner (Kline, 1986). Test development ideally involves the identification of a series of items which collectively index a given psychological characteristic in a given (ideally general) population, and thus correlate with the characteristic (*i.e.*, a higher score on the novel test is associated with more or less of the psychological construct, as indexed by independent observations of behaviour, or other measures). Individual items within a new questionnaire are also subject to examination, and it is routine to report the internal reliability (Cronbach's alpha) of the scale, and ideally, to factor-analyse the instrument to identify whether a scale is univariate or has several internal subcomponents. This information is generally provided by the handbooks which come with validated instruments, and ensures a psychometric instrument measures what it claims. Psychology, however, continues to have many unvalidated tests.

2.1 An example.

An example of the psychometric procedure for examining a test is provided by O'Carroll, Egan and Mackenzie (1994), who considered the psychometric properties of a purported measure of impaired frontal lobe function - the Cognitive Estimation Test (CET; Shallice and Evans, 1978). The 10-point scale was found to have a low reliability (0.40), and to have 5 independent factors underlying an ostensibly univariate scale. As such, it was no longer possible to argue that the measure was reliable, or that the questions asked by the CET examined the same quality of 'frontal lobe function'. (Subsequent clinical evidence has been even more damning; while

supposedly an instrument that measures frontal lobe function, the CET fails to discriminate patients with either anterior or posterior lesions to the brain (Taylor and O'Carroll, 1995).)

2.3 The Reliability and consistency of a Personal Questionnaire.

Standard psychometric instruments such as the STAI have very high reliabilities, and factorial and external validity (Speilberger, 1983). This degree of rigour has also been sought for ordinal measures such as the PQ (Phillips, 1970). However, because the PQ considers patterns of response rather than ratings on individual items, measures of internal reliability and consistency are not underpinned by the same correlation-derived methods of analysis. Phillips (1977) presents these methods of analysis in a somewhat dense, opaque, and obscure book chapter, which also fails to provide the reader with quick indices for inferring the consistency and reliability of PQ responses. A busy clinical psychologist, unable to devote much time to understanding such technical (and sometimes laborious) prose may well decide to discard the PQ technique when such an approach may be warranted. For these reasons, I present the methods for analysing one (ordinal) version of a PQ below, hopefully in a more straight-forward way which will be helpful to subsequent readers.

2.4 A PQ example.

Table 2.4a. An example of a personal questionnaire, and possible response patterns.

		Test 1		Test 2		Test 3		Test 4	
A.	I am ANXIOUS to a VERY CONSIDERABLE degree	~~M~~	L	~~M~~	L	M	L	M	L
B.	I am anxious to a CONSIDERABLE degree	~~M~~	L	~~M~~	L	M	L	M	L
C.	I am anxious to a MODERATE degree	~~M~~	L	M	~~L~~	M	L	M	L
D.	I am anxious to a SLIGHT degree	~~M~~	L	~~M~~	L	M	L	M	L
E.	I am anxious to a VERY SLIGHT degree	~~M~~	L	~~M~~	L	M	L	M	L
	Total number of M responses:	5		4					
	Inconsistencies	0		2					

Data for a PQ can be collected on a form similar to the one presented in table 2.1a. A subject is asked to respond whether their feeling is more (M) or less (L) intense than statements A to E. These responses are represented as struck-through Ms or Ls. For test 1, the subject was completely consistent, and endorsed the anxiety items in a logical way. At test 2 they respond in a more inconsistent way, endorsing a more severe M statement after negating a less severe one. While a simple count of M-endorsed statements suggests a decline in our subject's anxiety, what does it say about the reliability of their responding? Is the subject responding so inconsistently as to deem their responses (and the information they contain) worthless?

2.5 The Consistency of a Personal Questionnaire.

The number of inconsistencies in an ordinal series can be represented as the statistic i; a consistent ordinal series would mean $i = 0$; my inconsistent example above would be $i = 2$. When a PQ is given over time, these i values are summed (Σi). Slater (1960) calculated the probabilities for different values of i where one hypothesises that responses are purely random, and has provided the values and variances for given levels of i (table 14.16b of Phillips, 1977). These probabilities can be used to test whether Σi is less than would be expected given random responses by the subject. The study this chapter precedes assumes that subjects will be given a 5-item PQ question on between 1 and 4 occasions. The simulated χ^2-values arising from an exact test to examine random responding under changing levels of occasions and i is presented in table 2.5a on the next page.

Table 2.5a presents χ^2-values. χ^2 is interpreted such that, for given number of degrees of freedom, it is significant (to a given level of significance) if it is equal to, or larger than, a critical value in an appropriate statistical table. In the case of an exact probability test, one is comparing an observed with an expected event, and there is thus only 1 degree of freedom. A significant result on this statistic means that one can reject the null hypothesis (*i.e.*, that subjects are not responding consistently). The

table suggests that if subjects show one inconsistency in their responding over three or four trials, one should reject the information the subject provided. This is surely anomalous, as with increasing numbers of trials, a single inconsistency should reflect a gradually improving consistency of responding. It might be best to disregard data for $i = 1$, and consider those values of i which make more logical sense. These suggest that when the ratio of i to the number of test occasions multiplied by the number of PQ levels in an item goes over 0.4, significant inconsistency is indicated.

Table 2.5a. χ^2-values from an exact test to examine random responding under changing levels of occasions and *i*.

i	Number of test occasions			
	1	2	3	4
1	0.03	1.61	3.88*	6.32*
2	1.58	0.06	1.30	3.23
3	7.26**	0.58	0.10	1.16
4	17.08***	3.16	0.27	0.13
5	-	7.81**	1.82	0.13
6		14.53***	4.75*	1.16
7		23.31***	9.05**	3.23
8		34.16***	14.73***	6.33*
9		47.07***	21.79***	10.46***
10			30.23***	15.62***

* = P<.05; ** = P<.01; *** = P<.001.

2.6 The reliability of the Personal Questionnaire.

The internal consistency of the subject's responses to a PQ can be directly tested by dividing Σi by the product of the number of test occasions times the number of levels in the particular PQ item (Phillips, 1977). In the case of the current study, table 2.6a presents the expected internal consistencies for subjects tested between 1 and 4

times on a 5 point PQ item where $i = 1$ to 5. Taking an arbitrary (and somewhat generous) cutting point of 0.50 as an acceptable level of reliability, it can be seen that increasing the number of test sessions and keeping the number of inconsistencies down optimises the internal consistency of a PQ item.

Table 2.6a. Internal consistencies for subjects with 1 to *i* inconsistencies tested on 1 to 4 occasions

i	Number of test occasions			
	1	2	3	4
1	0.80	0.90	0.93	0.95
2	0.60	0.80	0.87	0.90
3	0.40	0.70	0.80	0.85
4	0.20	0.60	0.73	0.80
5	0.00	0.50	0.67	0.75
6	-	0.40	0.60	0.70
7		0.30	0.53	0.65
8		0.20	0.47	0.60
9		0.10	0.40	0.55
10		-	0.33	0.50

The reporting of these PQ statistics is not common, and is thus unsurprising that the technique has not been enthusiastically adopted by other clinicians or researchers - particularly those of a psychometric bent. Indeed, informal discussions with the creator of the STAI had him claim that PQs were highly unreliable (Speilberger, personal discussion, 1995). The current study seeks to resolve this state of affairs by presenting PQ data with more methodological rigour than before, by reporting internal consistency and reliability scores, reliability over time, and in relation to an established measurement, also over time. This will provide a vigorous testing of the PQ paradigm.

2.7 Objective comparison of the PQ and the STAI-S.

While presenting psychometric validation information may interest those with a particular interest in the credibility (or otherwise) of the PQ, the clinical significance of whether to use one paradigm for measuring anxiety or another may seem arcane and otiose; particularly when an instrument like the STAI is internationally known and a standard tool for both clinical work and research. However, as new instruments are introduced, methods of measurement change. The current study will test whether a PQ or the STAI-S is more responsive to the differential dynamics of anxiety pre- and post-surgery using a related subjects ANOVA, both using the raw scores, and transforming both PQ and STAI-S data into z -scores, so they are on the same scale and have similar variance. The logic for this is that, uncorrected, the range of possible scores for the STAI-S is between 20 and 80, while the range of possible scores for the PQ is 0 to 30. Thus, the means and standard deviations for the two measures would be very different irrespective of objective underlying differences, and actual changes in anxiety dynamics would be exaggerated or concealed by different scaling schemes. Transformation of both measures to the same scale enables objective testing of whether the STAI-S or the PQ is higher pre-operatively and lower post-operatively. This would be shown by an interaction between the test type and the trial, as if the two measures were equivalent, one would expect them to overlap.

Bland and Altman (1995) observe that when one compares a new method of measurement with a standard method, it is helpful to know whether the difference between the measurements using two methods is related to the magnitude of the measurement. While one can plot the difference between the two measures against the standard measure, this may reveal an artefactual association. Bland and Altman suggest that plotting the difference between the two measures against the average of the standard and new measure (r diff/av) is less likely to mislead. More specifically, the mean difference between the two measures would estimate the systematic bias of

the two methods. If the difference between measures increases or reduces in relation to increasing mean difference, the two methods do not agree equally throughout the scoring range. Testing of this matter enables one to better decide whether two methods agree sufficiently for them to be interchangeable. The current study will carry this analysis out for concurrent PQ and SQ measures.

2.8 Sample size and power.

The last part of this somewhat technical chapter addresses sample size and statistical power. While research has long sought to avoid making a *type one* error (finding a difference which is not there), it is only relatively recently that *type two* errors have been considered. A *type two* error involves failing to discover a difference that is actually present. Power statistics are used to estimate the probability of correctly rejecting the null hypothesis (Howell, 1987). In order to ensure a study is sufficiently sensitive to produce credible results, it is thus necessary to calculate appropriate power statistics and to extrapolate from these to an appropriate sample size. Power is a function of the effect size one seeks, an effect-size in turn being substantially related to the reliability of a test instrument (Leon, Marzuk and Portera, 1995).

SQs such as the STAI-S are highly reliable, internally-consistent measures, and as such they are sensitive measures of outcome. For the purposes of the study, we sought a difference of 10 points on the STAI in relation to increasing or decreasing anxiety levels. The STAI-S standard deviation for general medical and surgical patients without psychiatric complications is 13.8 (Speilberger, 1970, table 4). If I observed my hoped-for result, it would produce an effect-size of 0.73 (*i.e.*, the difference divided by the population standard deviation). Seeking a power of 0.80 and a significance (two-tailed) of $P<.01$, I used formulae from Howell (1987, pp. 199) to calculate δ (delta), which is the effect size multiplied by the square root of N. The following program (written in BASIC) was used to calculate this:

```
10 FOR N=1 TO 50
20 ROOTN=SQR(N)
30 DELTA=0.73*ROOTN
40 PRINT N, DELTA
50 NEXT
```

This produced a series of δ values, which compared to critical values on a statistical table, suggested that it would need 24 subjects to have a power of 0.80 at the P<.01 level, 20 subjects to have a power of 0.80 at the P<.02 level, and 15 subjects to have a power of 0.80 at the P<.05 level. However, if I sought a 5-point difference between groups, I would have an effect-size of 0.36, and would need over twice as many subjects in my sample. Figure 2.8a presents these power curves graphically.

Figure 2.8a. δ plotted against sample size for two possible effect-sizes.

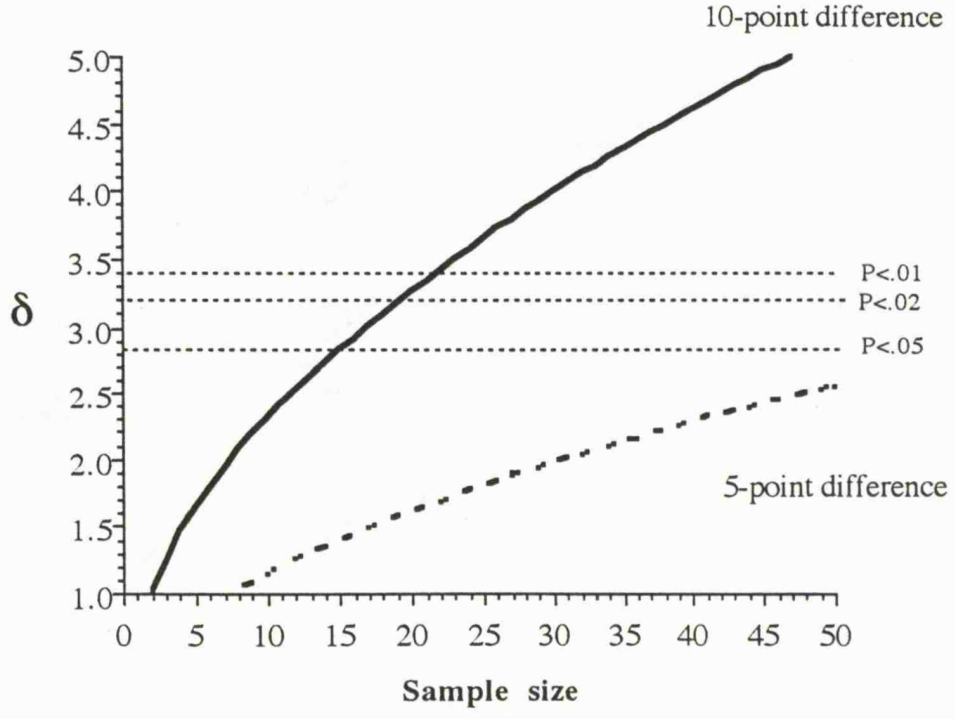


Figure legend: Dotted lines represent significance levels. Where the plotted line crosses the significance level, a line projected to the x-axis indicates the estimated sample-size necessary to have an 80% probability of minimising a type-II error.

Given the difficulty of recruiting between 60 and 90 subjects to seek a possibly modest result, I therefore sought a slightly greater effect from a smaller sample. Given the radical change in expected anxiety from the pre- to post-operative stage, this effect was considered possible. I therefore sought to test at least 24 subjects at each point of my protocol; this sample size would ensure that, if no result was found by the study, it was very unlikely to be due to my restricted sample size, and more likely to reflect that there was no result to be found in the first place.

CHAPTER 3

The experimental Procedure

3.0 Background.

In order for the study to occur, a considerable amount of preparation needed to be done. Firstly, a full research protocol (including copies of any questionnaires used) had to be submitted to the local Ethics Committee. The protocol passed ethical criteria for research with hospital in-patients. The study then had to be approved by the numerous consultant anaesthetists and surgeons concerned with Cardiac Surgery at the Glenfield Hospital, several nurse managers, a research worker, and the nursing staff of Wards 28 and 31, on which the research was to be done. Allowing for the time taken by sitting committees, meeting relevant staff, and allowing the medical staff to discuss the study took 3 months. One surgeon requested that I do not attempt to recruit his patients, on the grounds that he took great efforts to allay their anxieties, and that my involvement with them may bring these emotions back. His wishes were respected, and I recruited patients from the lists of the other four surgeons.

3.1 Subjects.

Fifty-five subjects from the Cardiothoracic Unit of the Glenfield Hospital, Leicester being prepared for a CABG or AVR/MVR were recruited. Because of the low proportion of women passing through the unit compared to men, only male subjects were tested; this also ensured that sex differences associated with women's greater pre-operative anxiety and depression to prospective CABG (Sokol *et al*, 1987) were reduced. The mean age of the sample was 63.5 years (standard deviation = 10.8). All subjects were volunteers, and informed regarding the intentions of the study, their freedom to withdraw from the study at any point, and the confidentiality of any information revealed. They were all recruited on the morning of their hospital admission, while they were awaiting attention by the nursing staff. All patients were

seen on their own. In several circumstances the author complied with the patients' request that questionnaire items be read out and completed by the experimenter.

Subjects completed a consent form noting this information (Appendix A), and were given a patient information sheet summarising the verbal information given to them (Appendix B). This patient information sheet was written to understood by anyone with a reading age of 10 or above (Flesch, 1948). Subjects were not recruited if their medical condition (defined by the medical and nursing staff) was deemed unsuitable, or if they did not have a reasonable grasp of written and spoken English.

3.2 Design.

The study was a repeated measures design, in which each individual acted as their own control subject. Subjects were assessed for self-rated state and trait anxiety using a standardised anxiety measure (the Speilberger State-Trait Anxiety Inventory; STAI-S and STAI-T, respectively: Speilberger, 1983; appendices C and D) and an ordinal PQ (Phillips, 1977; Appendix E). Anxiety was measured 3 times: at baseline before the operation (A1); on the morning of the operation, just before they receive their pre-medication (A2); and several days after the operation (A3). STAI-S and PQs from tests A1 to A3 are denoted by their final digit.

3.3 Method: Instruments.

The study used 4 questionnaires:

1. The Hospital Anxiety and Depression Scale (HAD: Zigmond and Snaith, 1983; Appendix F). The HAD is a brief standardised pencil and paper measure of anxiety and depression. By excluding items with a somatic content, it is appropriate for use in medical settings.
2. The Speilberger State-Trait Anxiety Inventory (STAI: Speilberger, 1983). The It widely used and well-researched STAI measures anxiety as both a contextual reaction (STAI-S), and as an underlying trait of personality (STAI-T). A short-form of this

questionnaire using just 6 (items 1, 3, 6, 15, 16, and 17) of the full 20 items (STAI-SF; Marteau and Bekker, 1992); was also calculated.

3. The revised Eysenck Personality Questionnaire-Abridged (EPQR-A: Eysenck and Eysenck, 1975; Francis *et al*, 1992; Appendix G). The EPQR-A is a brief measure (24 items) of the three major dimensions of personality; extroversion (E), neuroticism (N), and psychoticism (P). It also has a scale which examines the degree to which subjects have been responding truthfully to the questionnaire (L).

4. The National Adult Reading Test (NART: Nelson, 1982; Appendix H). The NART is a brief, well-validated measure of premorbid verbal IQ which examines the subject's ability to pronounce grammatically irregular words (*e.g.*, chord, psalm).

3.4 Method: Measurement of the PQ.

Adjectives for the PQ were selected on the basis of pilot work previously conducted by Professor Edgar Miller. This involved his giving a range of anxiety-related adjectives and synonyms to a separate sample of subjects about to undergo surgery, and taking those items which were most frequently endorsed. The anxiety adjectives were: 'Anxious', 'Apprehensive', 'Nervous', 'Restless', 'Tense', and 'Worried'. These symptoms were coupled with five statements representing increasing levels of severity, these differing levels of intensity being 'very slight', 'slight', 'moderate', 'considerable', and 'very considerable'. These intensifiers are readily understood as representing progressively greater degrees of experience. The original statements followed the form of "The extent to which I am (symptom) is (intensifier)" and "I am (symptom) to a degree that is (intensifier)". The phrasing of these statements does not reflect natural language, and it was thought that some subjects would have difficulty making sense of this slightly convoluted form. The PQ items were therefore simplified to the more straightforward "I am (symptom) to a (intensifier) degree" or "I feel (symptom) to a (intensifier) degree", as appropriate. The stimulus statements are presented at appendix E, on the model record form.

These 30 PQ statements were written individually on 5" x 3 " index cards, the cards being shuffled to randomise statement order. The subject was shown the cards one at a time, and said whether the statement on the card described their present state more or less. If a subject said they felt more than that indicated by the statement, the M corresponding to the statement was circled on the PQ record form, otherwise the L; M responses were quantified as 1, and L as 0. The total scoring range was thus 0 to 30.

3.5 Procedure.

The experiment involved three phases. During phase one, and on the day or evening preceding their operation, the pencil-and-paper questionnaires (STAI-T, STAI-S, HAD, EPQR-A) were completed by the subject: the researcher was at hand to assist the subject regarding any difficulties or uncertainties the subject had regarding the questions asked. The researcher then gave the PQ and the NART to the subject. At this interview, demographic and medical data (*i.e.*, age, sex, occupation, years education) was also collected (appendix I).

Phase two occurred on the morning of their operation, during which subjects completed the PQ and the STAI-S shortly before they received pre-medication; pilot research of the testing procedure indicated that subjects were otherwise asleep shortly afterwards. Phase three of the study occurred five days after their operation (*i.e.*, after they have returned from the intensive care unit and are on the Cardiothoracic Unit pending hospital discharge), where subjects completed the PQ and the STAI-S again, summarising their post-operation state.

3.6. Statistical treatment of the data.

All analysis was made using SPSS 4.0 on a Macintosh Classic II microcomputer fitted with a maths co-processor. Prior to analysis, unreliability of the PQ was calculated by looking up the number of inconsistencies by the number of times the subject had done the task for each of the items, as per table 2.6a above. This allowed

the reliability of the individual items and the total scale to be calculated, along with individual differences in reliability of responding. Individual PQ items were scored according to the number of M's endorsed. Thus individual items ranged from 0 to 5.

Inspection of the raw data revealed normally-distributed data, justifying analysis of the data using parametric statistics. In particular, ANOVA and repeated-measures MANOVA were used to compare means within and between subjects; Pearson's *r* was used to examine correlational relationships. The internal reliability of the PQ and the STAI-S was examined using Cronbach's alpha. To enable comparison of the possible differential sensitivity to changes in anxiety, STAI-S and the PQ values were converted into *z* - scores, which standardised differences in variance and ensured both measures had the same mean and standard deviation.

CHAPTER 4

4.0 Experimental Results

4.1 Sample characteristics.

Of 55 men tested at baseline, 42 (76.4%) were about to undergo a CABG, with the remaining 13 (23.6%) about to have an AVR or MVR. Twenty-nine subjects (52.7%) were tested before given pre-medication (the remaining 26 being first on the surgical list and thus in the operating theatre early in the morning). Out of the 55 men tested at baseline, 51 (92.7%) were followed up for a post-operative assessment. Of the remaining 4 untested men, 1 had died, 1 had their operation cancelled, and 2 were critically ill. Analysis of the anxiety, personality and verbal ability measures found that there were no significant effects of either operation type, surgical consultant, or surgical list position (all F-ratios less than 2.70, 72.7% F-ratios less than 1). This justified combining samples irrespective of type of surgical operation, or different degrees of emotional preparation given by different surgeons.

4.2 Baseline results.

Table 4.2 presents the baseline means, SDs, and intercorrelations between variables. Means were in the normal range for all variables; linear transformation of the NART error score using the equation provided by Nelson and Willison (1991) suggested that the sample had an estimated pre-morbid WAIS-R IQ of 101.2 (SD = 12.8), and thus did not show a notably restricted range of IQ. Using cutting values provided for the HAD Anxiety subscale, 32 subjects (58.2%) had scores of 7 or below , and thus no major difficulties with anxiety. However, a further 14 (25.5%) had HAD Anxiety scores of 8 to 10, suggesting a tendency to anxiety, and 9 (16.4%) had scores of 11 or over, indicating a clinical degree of anxiety. A similar analysis using the Depression subscale of the HAD found 45 (85.5%) had no significant degree of depression, and that just 2 (3.6%) subjects suggested a clinical degree of depression.

Table 4.2: Mean, standard deviation, and correlations (Pearson's *r*) between experimental variables (*n* = 55).

	P	E	N	L	NART	STAI-T	HADA	HADD	PQ	STAI-S	STAI-S SF1	Mean	SD
P	-	08	05	-17	-02	-08	00	06	06	09	06	1.3	1.2
E		-	-49 ***	00	-13	-44 ***	-29 *	-26 *	-32 **	-39 **	-39 **	3.6	1.9
N			-	-16	-03	57 ***	40 ***	12	61 ***	64 ***	58 ***	2.2	1.8
L				-	29 *	-30 *	-17	03	-13	-18	-11	3.7	1.9
NART					-	14	07	13	03	-15	-08	23.7	10.4
STAI-T						-	52 ***	43 ***	50 ***	49 ***	45 ***	38.2	9.0
HADA							-	42 ***	68 ***	62 ***	58 ***	7.1	3.9
HADD								-	16	12	11	4.6	2.8
PQ									-	83 ***	82 ***	10.9	7.2
STAI-S										-	96 ***	37.5	11.7
STAI-SF											-	11.4	4.3

Table legend: One-tailed test; decimal point dropped. Significance: * = P<.05; ** = P<.01; *** = P<.001.

Inspection of the correlation matrix for the baseline measures reveals that both neuroticism and the STAI-T have pervasive positive associations of 0.40 or over, between a self-reported general fearful disposition, and state measures of anxiety. This was expected. However, an association between extroversion and neuroticism was not, as the two traits are ostensibly orthogonal. Given this anomalous result, it was decided that it is possibly more prudent to simply use the STAI-T measure of trait anxiety, and discard information derived from the (possibly) unreliable EPQR-A. Verbal ability was not obviously associated with higher (or lower) state anxiety scores, suggesting that poor or over-sophisticated wording is not an obvious source of confounding in state anxiety measures. It was found that the short, 6-item version of the STAI-S correlated with the full form at 0.96 (P<.0001; see figure 4.2). This is a very high association, and suggests that any additional information provided by the full STAI-S over the short form is essentially redundant. On these grounds, only information from the shorter STAI-S is subsequently reported.

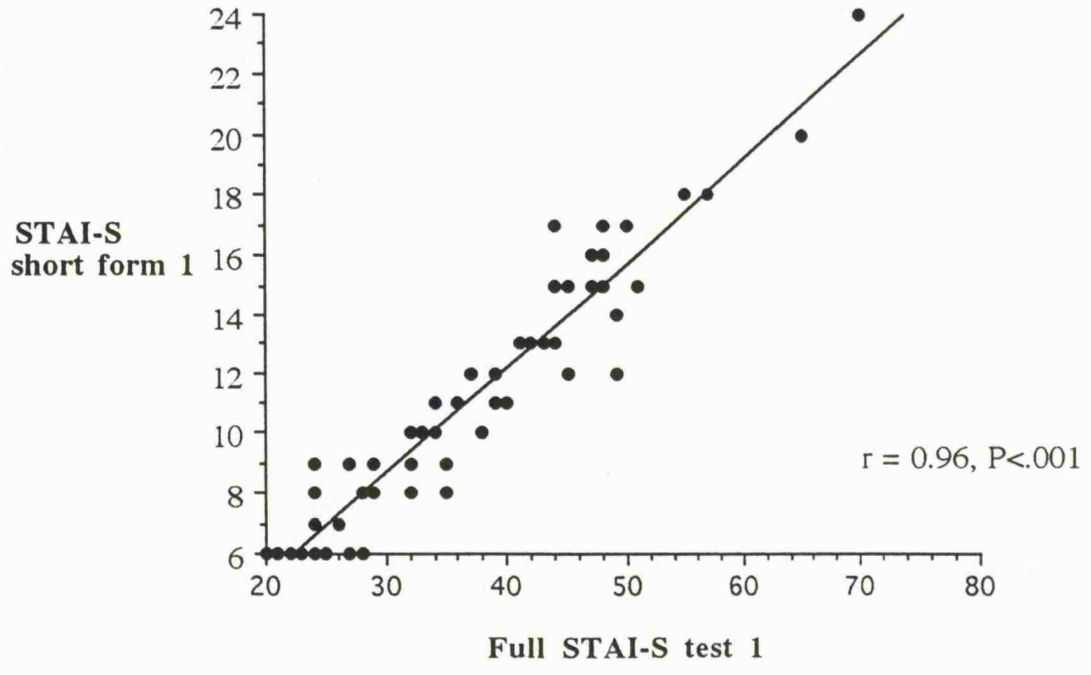


Figure 4.2. Scattergram demonstrating the high positive correlation between the full STAI-S and a 6-item short-form of the same test.

4.3 The reliability of the STAI-S and the PQ.

The reliability and validity of the PQ was approached in several ways. Firstly, the test-retest reliability (*i.e.*, the correlation of the measure with itself at another time) was calculated. Secondly, the validity of the measure (*i.e.*, it s)correlation with another, criterion measure) was calculated. Thirdly, the specific internal reliability of the PQ using Phillips' and Slater's formulae (Phillips, 1977) was calculated. Fourthly, given the comparability of PQ and STAIS-SF distributions, Cronbach's alpha coefficient for the two measures was calculated. Lastly, to examine whether any differences between measurements by the two methods was related to the magnitude of the measurement, correlations between STAI-S and STAI-SF, and PQ score differences and their average was calculated.

Table 4.31: Test-retest reliability of the PQ and the STAI-SF (Pearson's *r*).

	STAI SF1	STAI SF2	STAI SF3	PQ1	PQ2	PQ3
n	*55*	*29*	*51*	*55*	*29*	*51*
STAI-SF1	-	54 ***	43 **	82 ***	55 ***	45 ***
STAI-SF2		-	31 *	64 ***	88 ***	41 **
STAI-SF3			-	47 ***	36 **	80 ***
PQ1				-	76 ***	56 ***
PQ2					-	50 ***
PQ3						-

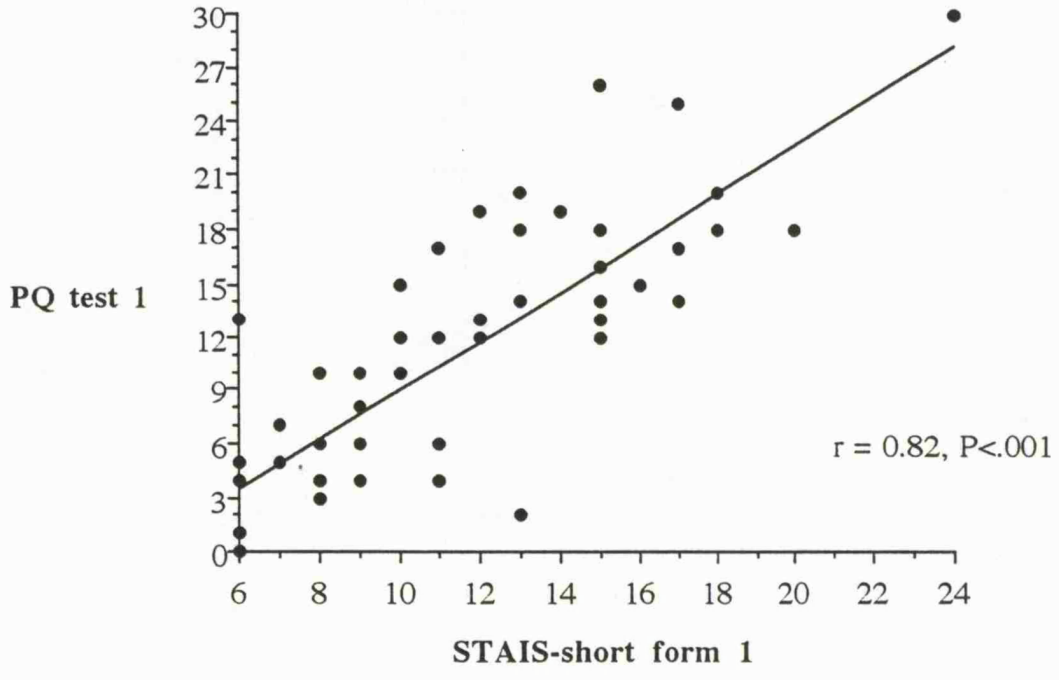
Table notes: One-tailed test, decimal point dropped.

Significance; * = P<.05; ** = P<.01; *** = P<.001.

Table 4.3 indicates that, while all test-retest reliability coefficients were significant, positive, and of moderate size, the test-retest reliability for the PQ was greater than

for the STAI-SF. The external validity coefficients are also presented in table 4.3. These show that the STAI-SF1/PQ1 correlation is 0.82 (P<.001; see figure 4.3), the STAI-SF2/PQ2 correlation is 0.88 (P<.001), and that the STAI-SF3/PQ3 correlation is 0.80 (P<.001). Clearly, both tasks measured some similar attribute.

Figure 4.3. Scattergram showing the correlation between the short-form of the STAI-S and the PQ (data from the first assessment).



Ordinal measures such as the PQ are subject to the variable responses of subjects engaged in ranking their own subjective opinions. Inconsistent responses within the PQ can be converted to internal reliability measures by noting the total number of inconsistencies (i) and calculating the reliability given the number of items in the scale and the number of times the scale was administered. Individual calculation of these internal reliabilities was conducted separately. Summary statistics for the internal reliability of the PQ are presented in table 4.32.

Table 4.32. The internal reliability of the PQ.

Item	Mean	SD
Anxiety	0.98	0.06
Apprehension	0.97	0.07
Nervousness	0.98	0.04
Restlessness	0.96	0.08
Tense	0.97	0.06
Worry	0.96	0.10
Total scale	***0.97***	***0.05***

The internal consistency of the PQ is substantial, with reliabilities for the individual items being upwards of 0.96. This suggests that PQ items are as psychometrically valid as items derived from more conventional questionnaires.

As each 5-component item of the PQ has a separate reliability, it is possible to examine reliability of responding as a difference between individuals. Exploratory analysis of this confirmed a hypothesis generated as the study was being run; that individuals with lower verbal ability were more unreliable in their responses to the PQ. For example, the NART error score correlated with the overall mean reliability score on the PQ at -0.48 ($P<.001$). The same correlation, but with the STAI-T score, was -0.33 ($P<.01$). Multiple regression suggested that these two associations were independently significant, and combined to produce a multiple R of 0.55 ($F(2, 52) = 11.31$, $P<.0001$; $R^2 = 0.30$, Adjusted $R^2 = 0.28$). This result strongly suggests that some 28 to 30% of the variability of responding on the PQ is attributable to lower levels of verbal ability and concurrent higher trait anxiety.

A further test of the equivalence between the STAI-SF and the PQ was an analysis of their alpha-values. This was afforded - although the PQ is ostensibly an ordinal scale rather than an interval one - by the discovery that measures of normal distribution

(*e.g.*, skewness and kurtosis) for both scales over the three testing sessions were similar, thus justifying a more conventional analysis of test reliability.

Table 4.33. Cronbach's alpha for the STAI-SF and the PQ.

	Mean inter-item *r*	Minimum *r*	Maximum *r*	Alpha coefficient	Standardised alpha coefficient
PQ1	.71	.56	.83	.94	.94
PQ2	.73	.50	.85	.94	.94
PQ3	.80	.65	.88	.96	.96
STAI-SF1	.47	.28	.67	.84	.84
STAI-SF2	.60	.38	.78	.90	.90
STAI-SF3	.54	.26	.73	.87	.88

Table 4.33 indicates that the alpha-reliabilities for both the PQ and the STAI-S are very high; in the case of the PQ they are 0.94 and above, whereas for the STAI-S they are a still highly respectable 0.84 to 0.90. Formal psychometric analysis of the PQ in comparison to the well-accepted STAI-S measure of anxiety thus indicates that PQ measures are in every way as reliable, consistent, and valid.

The final examination of the inter-test reliability of the STAI-S and STAI-SF, and the PQ, followed the method of analysis proposed by Bland and Altman (1995) in which one examines whether the difference between the measurements using the two methods is correlated with the magnitude of the measurement. Table 4.34 presents the results of this analysis and shows that even when differences in magnitude of measurement for the two anxiety assessments are controlled for, the two measures continue to be highly correlated. The results show that the difference between PQ and STAI-S or STAI-SF increases, so does the mean of the two measures, and implies

that while the two types of measure are highly correlated and comparably reliable, the two methods do not agree equally throughout the full range of scores. While this appears alarming, it is a consequence of the different mean and standard deviation of the scales; a repeat analysis of the data using this technique, but upon values converted into z -scores found no significant associations whatsoever.

Table 4.34. The correlation between the two STAI-S measures and the PQ controlling for magnitude of measurement.

	raw r	(r diff/av)	95% CI for (r diff/av)	SE (r diff/av)
STAI-S1 / PQ1	0.83	0.67	0.59 to 0.75	0.04
STAI-S2 / PQ2	0.92	0.88	0.81 to 0.93	0.03
STAI-S3 / PQ3	0.79	0.68	0.57 to 0.78	0.05
STAI-SF1/ PQ1	0.82	0.69	0.60 to 0.77	0.04
STAI-SF2/ PQ2	0.88	0.69	0.62 to 0.78	0.04
STAI-SF3/ PQ3	0.80	0.72	0.62 to 0.82	0.05

4.4. Analysis of individual PQ items.

The constructs of the STAI-S items are well-established and investigated. By definition, the PQ is novel, and thus has to show that it's content is valid. Six constructs were evaluated by the anxiety PQ: 'anxiety', 'worry', 'tenseness', 'apprehension', 'restlessness', and 'nervousness'. To examine the changes in these individual constructs across baseline assessment, pre-operatively, and post-operatively, a repeated-measures ANOVA upon the 6 PQ test items and the three testing sessions was run. For the 6-item PQ there was no significant difference between testing sessions ($F(52,2) = 1.61$, n.s.) a significant difference between items (($F(130,5) = 9.98$, $P<.001$), and a significant interaction between testing session and PQ item ($F(260, 10) = 2.94$, $P<.002$). These changes in PQ endorsement across sessions are presented in figure 4.41 below.

Figure 4.41. Mean ratings on individual PQ items across three test sessions.

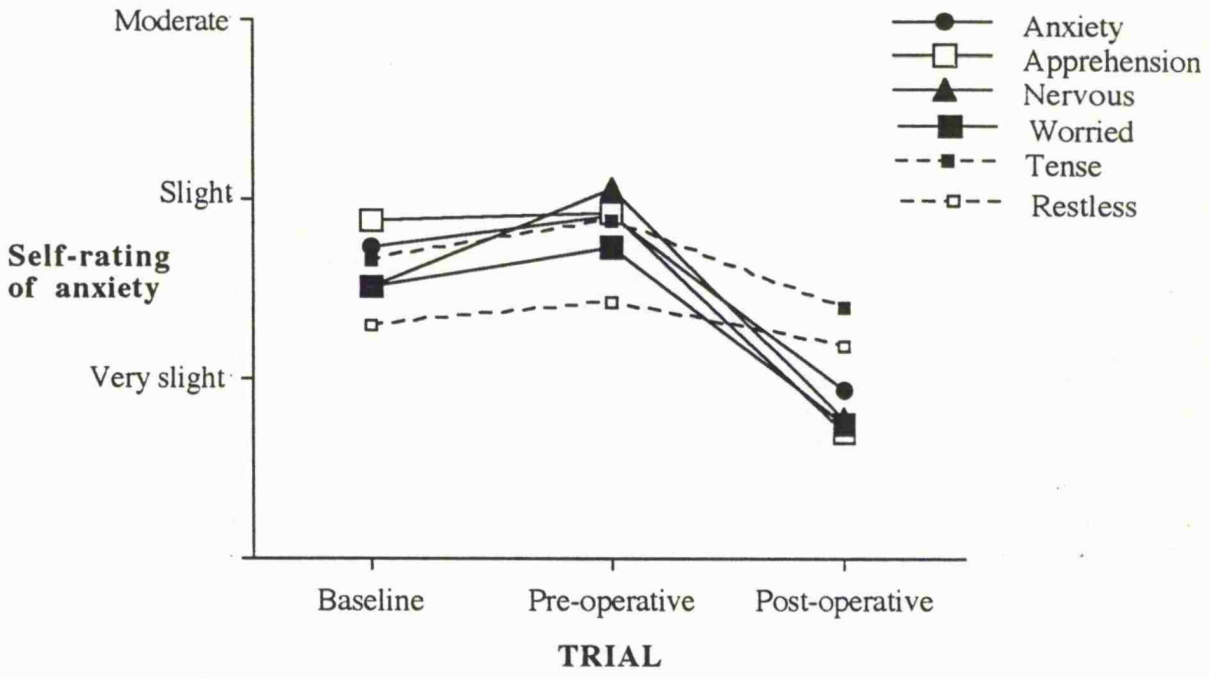


Figure 4.41 indicates that in fact 4 of the PQ items were responsive to post-operative changes, whereas 2 of the items ('tenseness' and 'restless') did not substantially decline. When the ANOVA model was repeated excluding these items, there was a significant difference between testing sessions ($F(52,2) = 9.98$, $P<.001$), no significant difference between test items ($F(130, 5) = 1.69$, n.s.), and a highly significant interaction between testing session and PQ item ($F(260, 10) = 10.67$, $P<.001$). This suggests that perhaps a 4-item PQ is more sensitive and specific to the dynamics of surgical anxiety than a 6-item PQ.

4.5 The effect of trait anxiety upon state anxiety.

The difficulties with the neuroticism measure of the EPQR-A have been described above. As such, it was decided to discard this measure, and simply use the STAI-T trait anxiety measure. This respectively correlated with the STAI-SF1 and the PQ1 at 0.45 and 0.50 (both $P<.001$). However, the associations between the STAI-T and STAI-SF2 and the PQ2 were respectively only 0.18 and 0.29 (both non-significant). At the third test session, the STAI-T and STAI-SF3 and the PQ3 correlations were

both only 0.27, and again non-significant. As the STAI-T was not picking up pervasive variance associated with negative affect over the three testing sessions, it was decided that co-varying out the effects of trait anxiety upon state measures of anxiety was unnecessary. Trait anxiety was, however, retained as a splitting variable within the ANOVA models examining changes in state anxiety over time.

4.6 Changes in anxiety scores across stages of surgery.

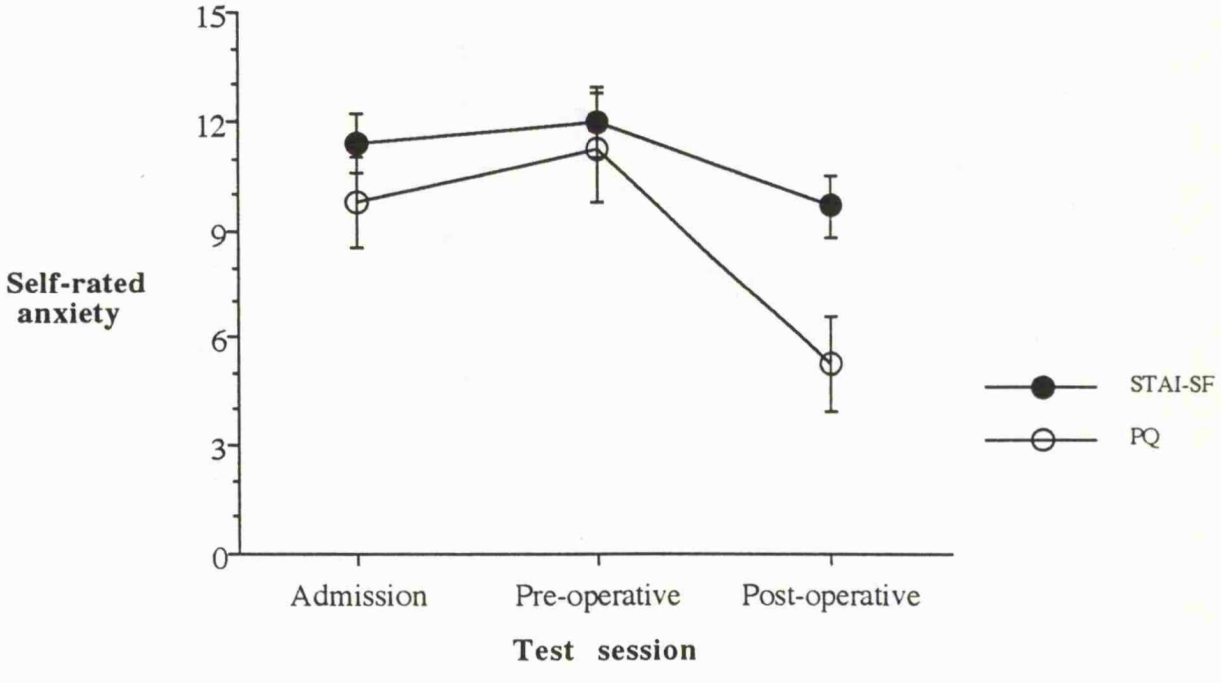
Description of changes in the dynamics of anxiety for the two anxiety assessments is subject to the proviso that only 28 subjects had data for all three testing points at the time of reporting. The analysis is therefore presented initially for the 51 subjects with complete pre-operative and post-operative data, followed by a more detailed (but smaller sample) who were assessed at all three testing points.

A repeated-measures ANOVA with two levels (test before or test after) and two tasks (STAIS1 and STAIS3, and PQ1 and PQ3) examined the independent effects of testing point and test type upon measures of anxiety. Individuals with greater trait anxiety had significantly higher state anxiety scores than subjects with lower trait anxiety scores ($F(49, 1) = 12.17$, $P<.001$). There was a significant reduction in state anxiety from admission before surgery- to post-operation ($F(49,1) = 9.62$, $P<.003$), a significant difference between the two tasks ($F(49,1)=28.39$, $P<.001$), a significant interaction between test stage and task ($F(49,1)=22.80$, $P<.001$), and a trend to a significant interaction between trait anxiety and state anxiety over time ($F(49, 1) = 3.76$, $P <.06$). Interactions between trait anxiety and task, and between trait anxiety, state anxiety over time, and task were both non-significant ($F(49,1) = 1.17$ and 1.64, both n.s.).

While this result suggests that possibly a 6-item PQ measurement is more sensitive to declining levels of anxiety in the post-surgical period, it does not acknowledge the differences in the two scales; in particular, that scores on the PQ range from 0 to 30,

while scores on the STAI-S range from 6 to 24, which inevitably leads to measures with different means and standard deviations. To place the two anxiety measures on an equivalent scale, the raw scores were therefore converted to z - scores, then subjected to the same ANOVA model. This found a significant effect of trait anxiety ($F(49,1) = 12.65$, $P<.001$), but no other individual variable or interaction between variables was significant (All F-ratios less than 1.00 with 49 and 1 d.f.). These results suggest that when scaling is made equivalent, no changes in anxiety pre-or post surgery occur. The results and F-ratios were essentially same when the same analysis was conducted using the refined 4-item PQ described in section 4.4 above.

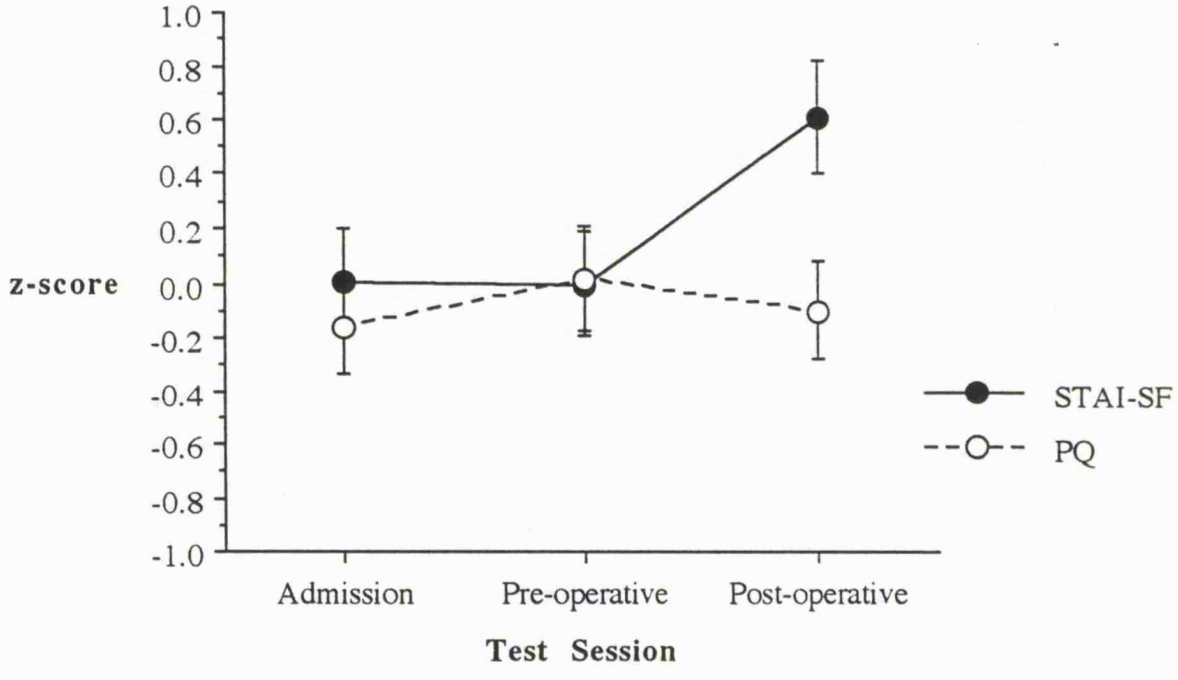
Figure 4.61. Mean (and standard error) of self-rated anxiety at hospital admission, immediately pre-operatively, and post-operatively for men undergoing cardiac surgery.



A similar repeated subjects ANOVA model of analysis was applied to those subjects who had anxiety assessed at admission, pre-operatively, and post-operatively. This found that raw test scores increased between admission and the immediately pre-

operative stage, then declined post-operatively. These results are presented in figure 4.61. There was a significant effect of trait anxiety ($F(26,1) = 5.74$, $P<.025$), testing session ($F(52, 2) = 11.00$, $P<.001$), anxiety measure ($F(26,1) = 32.54$, $P<.001$), and a significant interaction between testing session and anxiety measure ($F(52, 2)=6.75$, $P<.0002$). The remaining interactions were all non-significant.

Figure 4.62. Mean (and standard error) *z* -scores of self-rated anxiety measures at hospital admission, pre-operatively, and post-operatively for men undergoing cardiac surgery.



The same analysis using the raw test values converted into their equivalent *z* -scores found a significant effect of trait anxiety ($F(26,1) = 5.82$, $P<.024$), but no effect of testing session ($F(52, 2) = 0.06$, n.s.), a significant difference between the two anxiety measures ($F(26, 1) = 6.32$, $P<.02$), but no interactions between any of these variables. The *z* -transformed data is presented in figure 4.62, which suggests a divergence between the two measures at the third (post-operative) assessment of anxiety. A *t* -test comparing the two values did not find them significantly different (t =1.63, n.s.).

Again, the results and F-ratios were essentially same when the same analysis was conducted using the refined 4-item PQ described in section 4.4 above. Thus, while at the level of raw scores the two measures of anxiety differ, neither is differentially effective at picking up specific anxiety variance at a particular stage in the surgical process.

CHAPTER 5

5.0 Discussion

5.1. Results of the study.

The current study examined the dynamics of anxiety in a group of men about to undergo cardiac surgery. All men completed the same anxiety assessments, had the same baseline evaluations, and were tested at approximately the same points during their admission to the Cardiothoracic Unit. The first hypothesis, that the PQ would be more sensitive than the STAI-S to the changing context of the subject as they pass through a medical procedure was not supported; when made comparable, both measures were essentially the same in their sensitivity to anxious states. The second hypothesis addressed the internal and external reliabilities and validity of the PQ in relation to the STAI-S, and established that PQ techniques are equivalent in reliability, validity, and consistency to a standard psychometric instruments. The third hypothesis examined the influence of trait neuroticism (N) on the state measures of anxiety; due to doubts about the quality of the N measure, N was replaced by the trait score of the STAI. This found that individuals higher in trait anxiety have higher state anxiety over time, but that trait anxiety is not in interaction with other variables. Trait anxiety was not therefore, a source of complex confounding. The fourth and final hypothesis, was that lower verbal ability may confound the more complex PQ measure of anxiety. This was not supported: there was no significant correlation between PQ and NART scores. However, the reliability of the PQ was negatively related to lower verbal ability and higher trait anxiety, suggesting that low-verbal, high trait anxiety individuals were less consistent in their PQ responses.

5.2. Medication issues.

Surprisingly, anxiolytic and analgesic medication did not appear to confound results. This is because patients were not seen at points when such medication was a significant aspect of their management. At admission, subjects were drug free. Few

required sleeping tablets for the night before their operation, and no subject was interviewed after pre-medication, as a preliminary investigation found that the pre-medication (20 mg *Temazepam*) had the rapid and predictable effect of sending subjects to sleep. Thereafter, standard anaesthesia protocols were applied. Post-operatively, subjects returned to the ward having been given morphine, and were obviously opiated. Unless otherwise indicated, morphine was routinely replaced the next day by *Co-codamol*, a painkiller containing a small amount of codeine. This was given the patient on request. By the time they were assessed for post-operative anxiety (typically 5 days after their operation, and on the day before they were discharged from hospital), they were essentially medication free.

5.3. Problems with personality.

The large and unexpected correlation between N and (supposedly orthogonal) extroversion (E) traits on the EPQR-A was surprising and very unsatisfactory. This led the author to withdraw from systematically investigating personality factors influencing anxiety in men about to undergo surgery, and to be less skeptical about Kincey (1995), himself cautious about the predictive value of N in this context. The trait measure of the STAI (STAI-T) provided a proxy measure of one major correlate of N: anxiety, and in the current study STAI-T and N variables correlated at 0.57 ($P<.001$), suggesting substantial shared variance. Partialling-out the STAI-T from correlations between STAI-S and PQ measures negligibly changed their relationship, and suggested that perhaps the influence of trait anxiety, N, or pervasive negative affect, is not always as major a confound as expected. This was bourne out by the discovery that trait anxiety had significant univariate effects in the various ANOVA analyses, but did not have significant interactions with other variables.

The literature on personality factors underlying heart disease suggests that hostility may be the latent trait underlying the (waning) fortunes of the Type A (supposedly coronary-prone and heart-diseased) personality (Dembroski *et al*, 1989; Steptoe and

Wardle, 1995). The current study measured trait Psychoticism (perhaps better regarded as tough-mindedness; Claridge, 1995), and provided a rough marker of hostility. However, due to the question of the EPQR-A's credibility, it was not used; a casual, *post-hoc* analysis did not reveal any associations or increased presence in more (or less) symptomatic subjects. A future study could explore hostility in CABG patients using more reliable instruments, to see whether greater hostility improves or impairs long-term outcome.

5.4. Other directions for future research.

The current study was very successful in recruiting patients then following them up, and no subject approached refused to participate. In many ways, therefore, the sample was unselected and representative of the cohort attending the hospital unit. All the same, there were a several difficulties with the study. Firstly, no proper baseline measure of anxiety was obtained; rather, anxiety was assessed on the day before surgery occurred. This precluded the opportunity to examine how much anxiety increases whilst waiting for an opportunity to be operated upon. Ideally, anxiety should be routinely and repeatedly evaluated as part of the medical protocol. For the effort of having a subject spend 5-minutes completing a 6-item PQ or STAI-S at multiple points in their treatment, there would be the rapid accumulation of data on the true dynamics of anxiety - rather than the *ad hoc*, opportunist study presented here. A further difficulty with the study was the exclusion of women and ethnic minorities. This was done for pragmatic reasons, but limits the extrapolation of results to the general population undergoing cardiac surgery.

One repeated observation was that patients were less anxious once they were admitted to hospital, settled in, and their families went home; it would be useful to know the dynamics of anxiety in the carers of those about to undergo cardiac surgery, and how they interact with the anxiety of those directly involved in the medical procedures. Carers sometimes saw their partner completing the baseline pencil-and-paper

questionnaires, and suggested that they may have a different view of their mood: a future study could obtain the carer's rating of their partner's anxiety, and see how this correlates with the self-rated anxiety of their partner. A number of the men seen were now widowers, and were returning to home alone, raising concern that they may not have sufficient social and personal support. A search of the literature found that married men undergoing CABG experience greater emotional support post-operatively than unmarried men, and this predicts less post-operative emotional distress, better reported quality of life, and greater compliance to recommended post-operative behaviour such as increasing exercise, improving one's diet, and stopping smoking (Kulik and Mahler, 1993). Would running post-operative support groups for unmarried or windowed men reduce this difference?

Another further direction for research might be flippantly described as 'arid psychometrics' and would not have to address clinical matters at all. Such a study would estimate just how biased numeric estimations of anxiety actually are, relative to ostensibly nominal scales: both of the scales in the current study used nominally labelled intensifiers, and were thus, in hindsight, bound to be similar. However, a visual analogue scale, a generic verbal "how anxious are you out of 10" rating, a Likert-scaled item - or more complicated (and seemingly user-unfriendly) PQ modifications such as ordered-metric or interval PQ techniques might be applied to examine their bias relative to more straightforward assessment instruments.

5.5. Subjective comments: Forces reducing anxiety.

One subject noted that there was a paradox associated with his completion of the anxiety assessments; when he was made to think about his mood, he felt less anxious, because he was more pre-occupied with reflecting upon his mental state. This view was affirmed by other subjects, who noted that seeing a psychologist took their mind off the forthcoming operation. One subject suggested that anxiety was greater at night, when there were less distractions to take one's mind off one's thoughts, greater

time to ruminate, and patients seemed more likely to experience discomfort or disturbed sleep. Other subjects mentioned being less anxious once they were admitted to hospital, finding the uncertainty of being on a waiting list, or being at home and waiting to go into hospital upsetting. The confidence of the surgeons, and the efficiency of the staff and system also helped reduce extremes of anxiety, as did a specific briefing about what the men could expect. Most men benefited from being shown the theatre where they would operated upon, seeing the intensive care unit, and being told what they would feel. This use of combined sensory and procedural information to pre-operatively prepare the men for surgery is well-validated as a technique for reducing anxiety associated with surgery (Anderson and Masur, 1983).

A further factor modulating anxiety was the previous experience the subject had of hospital, surgery, or acquaintances who had also undergone cardiac surgery. In each relevant case, previous (or vicarious) experience appeared to inoculate subjects from greater distress. Patients who observed the rapid recovery of men who were only a few days out of theatre were also desensitised to the otherwise anxiety-provoking situation. These post-operative men often discussed their operation with the pre-operative men, acting as a support group for them. This behaviour can be regarded as coping via modelling. That is to say, subjects acquire new coping responses not previously within their behavioural repertoire; they have previously established coping strategies facilitated and enhanced; they experience inhibition effects where positive coping is encouraged and negative coping discouraged; and have their sense of self-efficacy enhanced (Bandura, 1969, 1977).

Given the age and condition of most subjects, many had already been in hospital for investigation and treatment of previous heart problems, and knew what to expect. Many knew people whose lives had been radically improved by CABG or valve replacement, and notwithstanding the short-term distress and discomfort of surgery, looked forward to being similarly healthy. Cohort effects within the men were also a

factor: many spontaneously described experiences of National Service, making positive comparisons between their current conditions and life in a military barracks (or, sometimes, a military hospital). An institutional and regimented hospital setting is possibly more agreeable to those who have done military service than for younger men. Lastly, a convivial ward atmosphere was encouraged by the simple expedient of providing the men with a can of beer every day before lunch, and by communal viewing of sport on the television. These factors and processes limited the extent to which anxiety coloured the men's experience of cardiac surgery.

5.6. How sensitive was the study for detecting changes in anxiety?

The phenomena of anxiety reducing for some individuals as the operation approaches was reflected in the small mean increase (two test units on the STAI-S and the PQ, and less than 1 on the STAI-SF) from T1 to T2 for those subjects tested immediately before pre-medication. This modest increase was followed by similarly modest decrease for the STAI-S measures in the post-operative phase (6.8 units for the full STAI-S, and 2.3 units for the short-form). The proportional increase on the PQ was similar, but the decrease was much more substantial - some 6 units. Table 5.6 presents these differences between trials for the two types of test into effect sizes (Glass, 1976), and indicates that the largest effect sizes are for the PQ. These true (rather than estimated) effect sizes suggest that the sample size was sufficiently large to confidently accept the negative results for paired comparisons with effect sizes of 0.49, 0.66, and 0.81, which have corresponding powers of 0.74 ($P<.05$), 0.82 ($P<.01$), and 0.96 ($P<.01$) respectively. However, for those comparisons producing an estimated effect size of 0.20 or less, at least 200 subjects would be required to reach comparable levels of power. Clearly the study was not large enough to detect more subtle effects.

Table 5.61. Effect sizes between test conditions (STAI-SF above diagonal, PQ below).

		Test		
		1	2	3
Test	1	-	-0.13	0.49
	2	-0.20	-	0.49
	3	0.66	0.81	-

5.7. Post-operative complications.

The data presented above conceal the differential effects of complications associated with cardiac surgery, which influence post-operative anxiety, and was not considered as a possible confounding factor in the interpretation of the experimental results. Reviewing my records, nine subjects experienced medical difficulties as a consequence of their operation. These included strokes, arhythmias, having to have a pacemaker fitted, having a coronary artery deemed inoperable, and having a painful sectioned sternum which was not healing as quickly as normal.

5.8. Post-operative complications: an alarming case example.

One individual (B) had arhythmia and required further cardiac surgery; because of the concern that too much general anaesthetic would kill someone in an already poor condition, he was given insufficient sedation and awoke, paralysed, in the operating theatre while being re-ventilated. The veracity of this experience was bourne out by his being able to give the forenames of the theatre nurses to the consultant, despite these nurses having nothing to do with normal ward staff. He described literally being unable to move a muscle, feeling pain as they entered a Venflon into his arm, and further pain as they hit his chest trying to get his heart started; he had no sensation of hot or cold. He claimed that after 20 minutes of terrified staring, one of the nurses noticed tiny movements in his toes and eyes, and said "He's bloody awake!" whereafter the consultant immediately increased anaesthesia, and B

thankfully lost consciousness. Such an experience understandably left B quite upset (although he freely admitted the incident would be most impressive when subsequently told to friends in a public house). One hopes that he will not develop PTSD as a result of this alarming experience. Bs' scores on the STAI-SF and the PQ are presented graphically below, and indicate that while his anxiety reduced pre-operatively, it significantly increased in the post-operative phase.

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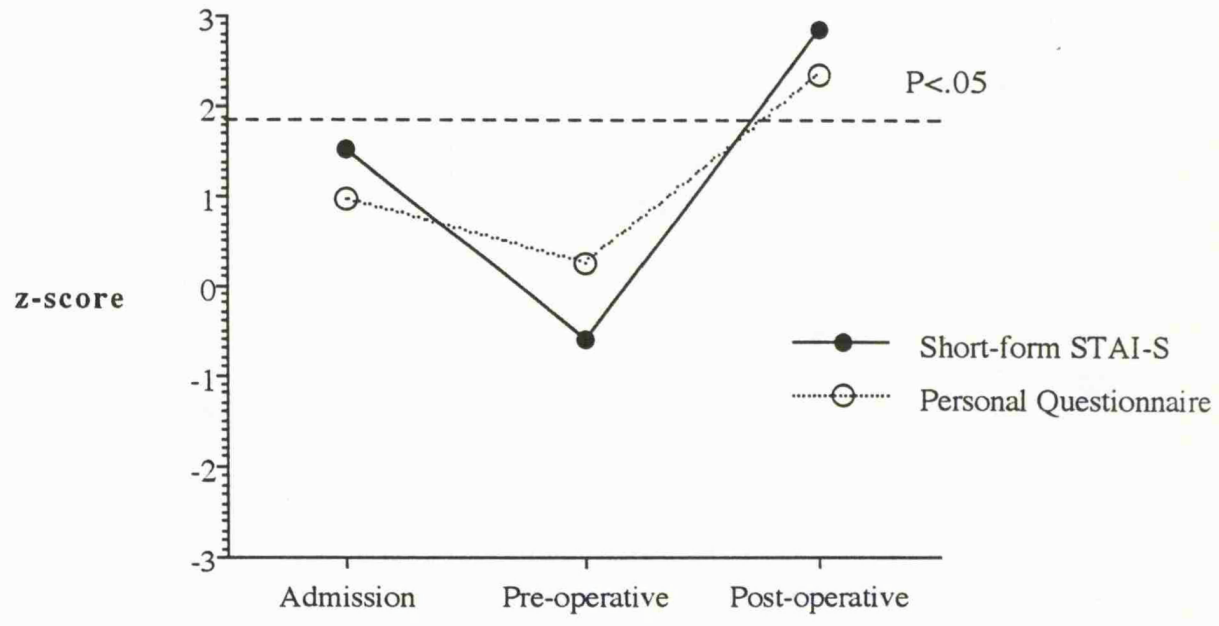
Figure 5.81. Individual anxiety scores for a patient who had a traumatic surgical experience.



5.9. Post-operative complications: an exploratory analysis.

To formally examine the effect of these post-operative complications on the group test results, a *post-hoc* MANOVA looking at the two repeated tests over the three testing sessions, subdivided by whether subjects were above or below the mean STAI-T score, and whether or not they experienced medical complications, was calculated. Both of the high and low trait anxiety subgroups had 4 subjects who had experienced complications. There was a significant effect of trait anxiety ($F(24,1) = 11.06$, $P<.003$) and a trend to significance for subjects who had experienced

complications ($F(24,1) = 3.13$, $P<.1$); there was a strong interaction between these variables ($F(24,1) = 6.99$, $P<.015$), indicating that individuals who are higher in trait anxiety who experience medical complications show differentially greater self-ratings of state anxiety. The analysis also showed a significant effect of the type of measurement ($F(24,1) = 7.85$, $P<.01$), and a 3-way interaction between complication, measurement type, and point of testing. This is readily interpretable as an increase in anxiety (in particular for scores on the STAI-SF) at the third testing point for people who had medical complications.

5.10. Qualitative comparison of the PQ and the STAI-S.

While this study has shown that PQ techniques are in many ways the equivalent of standard questionnaire measures of anxiety, it is doubtful whether PQs will replace more conventional approaches. Using the STAI-S to evaluate state and trait anxiety provides one with a set of norms and a huge research literature, whereas the PQ is an obscure method with little international recognition. Methodologically, the time required to answer the 6 questions of the short-form STAI-S is rather less than the time required to administer the 30 individual PQ items, and does not involve tedious repetition of "More" or "Less" to the same intensifiers of a series of anxiety synonyms. Notwithstanding the apparent reliability of the PQ, this repetitive PQ structure was marked in the current study by a number of subjects commenting "haven't I already answered this?", their being understandably insensitive to the subtle differences involved in deciding whether they were 'worried to a moderate degree' or anxious to a slight degree'.

PQ techniques will not replace the STAI-S as a general measure of anxiety. However, the PQ has a broader range of possible scores (0 to 30) than the STAI-SF (6 to 24). The PQ also has an absolute zero, leading to less confusion about score interpretation, and uses better graded natural language intensifiers than the STAI-S's vague "somewhat" and "moderate" intermediate points, which do not convey a

reliable differential intensity. As the PQ provides 'higher highs', and 'lower lows' than the STAI-SF, it is, in larger studies, possibly more sensitive to changes in the dynamics of anxiety. However, for researchers wanting to do large-scale studies that generate results comparable to results derived from other investigators, the STAI-S or STAI-SF will continue to be the investigative instrument of preference. PQ techniques will continue to be used for individual work in unusual conditions where specific questionnaires may not be available, and single-case methodology is required. This study has shown that PQ techniques have psychometric credibility, and that individual work of the kind which typically employs PQs is warranted.

5.11. Conclusions

Is pre-operative anxiety qualitatively the same as anxiety experienced without an obvious threat? The men undergoing cardiac surgery in the current study had a number of factors that constrained their anxiety, possibly accounting for the modest changes before and after surgery. This does not mean they did not experience anxiety. However, their anxiety was specific to a particular context, and tended to reduce following a specific event. This is qualitatively different from the free-floating apprehension to many potential (but absent) threats seen in clinically anxious patients. The observed surgical situation afforded a proper test of the relative sensitivity of the PQ and the STAI-S to acute changes in anxiety; such an opportunity would not have been so possible among subjects for whom the dynamics of anxiety were more dependent upon internal factors. While the PQ has been shown to be reliable and sensitive, it is not significantly more sensitive than established instrumentation, and is unlikely to supersede standard self-report measures of anxiety.

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Appendix A

Consent Form

I consent to participating in Dr. Vincent Egan's study of emotional feelings among those about to undergo surgery in the Cardiothoracic Unit of the Glenfield Hospital, Leicester. The procedure of the experiment has been explained to me. I understand that all information he collects is confidential, and that I am free to withdraw from the study at any point I chose.

Name _____

Address _____

_____

_____

_____

Telephone _____

Date _____

Appendix B

Patient Information Sheet

Dr. Vincent Egan

Department of Psychology (Clinical Section), The University, Leicester, LE1 7RH.

Emotions associated with surgery.

Waiting for an operation is a worrying experience for some people, and has two major effects. Firstly, worry may make you very concerned or irritated by sensations or situations that didn't previously upset you. Secondly, worrying thoughts may cause physical sensations that are unpleasant, such as a dry mouth, shakiness in the limbs, or a racing heart. To help people who have these experiences I am testing a way of measuring worry which is quick, sensitive, and easy to do. My study looks at two ways of measuring worry in a group of people about to undergo surgery. The study sees how these feelings change over time by testing people before and after the operation, and considers differences people have in their personality and education.

The study has four parts. On the day or night before the operation, you will complete five brief questionnaires. On the day of the operation, you will repeat two of the short questionnaires before you receive your pre-medication. Three to five days *after* the operation, when you are recovering on the ward, you will do the two short questionnaires again. A month after you leave the hospital, you will be contacted by me, where we will arrange to do these short questionnaires for a final time.

All information I collect is confidential, and will help to improve the service for people passing through the Cardiothoracic Unit of the Glenfield Hospital. You may withdraw from the study at any point. Thank you for helping me with this study.

Appendix C

STAI-S (Form 1).

NAME _____ DATE _____

Instructions: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate response on the right of the statement to indicate how you feel ***right now*** (i.e., at this moment). There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	Not at all	Somewhat	Moderately so	Very much so
1. I feel calm.	1	2	3	4
2. I feel secure.	1	2	3	4
3. I am tense.	1	2	3	4
4. I am regretful.	1	2	3	4
5. I feel at ease.	1	2	3	4
6. I feel upset.	1	2	3	4
7. I am presently worrying over possible misfortunes.	1	2	3	4
8. I feel rested.	1	2	3	4
9. I feel anxious.	1	2	3	4
10. I feel comfortable.	1	2	3	4
11. I feel self-confident.	1	2	3	4
12. I feel nervous.	1	2	3	4
13. I am jittery.	1	2	3	4
14. I feel "high strung".	1	2	3	4
15. I am relaxed.	1	2	3	4
16. I feel content.	1	2	3	4
17. I am worried.	1	2	3	4
18. I feel over-excited and "rattled".	1	2	3	4
19. I feel joyful.	1	2	3	4
20. I feel pleasant.	1	2	3	4

Appendix D

STAI-T (Form 2).

NAME _____ DATE _____

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

	Almost never	Sometimes	Often	Almost always
21. I feel pleasant.	1	2	3	4
22. I tire quickly.	1	2	3	4
23. I feel like crying.	1	2	3	4
24. I wish I could be as happy as others seem to be.	1	2	3	4
25. I am losing out on things because I can't make up my mind soon enough.	1	2	3	4
26. I feel rested.	1	2	3	4
27. I am "cool, calm, and collected".	1	2	3	4
28. I feel that difficulties are piling up so that I cannot overcome them.	1	2	3	4
29. I worry too much over something that really doesn't matter.	1	2	3	4
30. I am happy.	1	2	3	4
31. I am inclined to take things hard.	1	2	3	4
32. I lack self-confidence.	1	2	3	4
33. I feel secure.	1	2	3	4
34. I try to avoid facing a crisis or difficulty.	1	2	3	4
35. I feel blue.	1	2	3	4
36. I am content.	1	2	3	4
37. Some unimportant thought runs through my mind and worries me.	1	2	3	4
38. I take disappointments so keenly that I can't put them out of my mind.	1	2	3	4
39. I am a steady person.	1	2	3	4
40. I get in a state of tension or turmoil as I think over my recent concerns and interests.	1	2	3	4

Appendix E

The Personal Questionnaire - Anxiety Version.

Instructions: Randomly allocate statements to subject. Ask them whether the statement presented is more or less than the subjects current level of feeling. Circle response.

	Test 1		Test 2		Test 3		Test 4	
I am ANXIOUS to a VERY CONSIDERABLE degree	M	L	M	L	M	L	M	L
I am anxious to a CONSIDERABLE degree	M	L	M	L	M	L	M	L
I am anxious to a MODERATE degree	M	L	M	L	M	L	M	L
I am anxious to a SLIGHT degree	M	L	M	L	M	L	M	L
I am anxious to a VERY SLIGHT degree	M	L	M	L	M	L	M	L
I am WORRIED to a VERY CONSIDERABLE degree	M	L	M	L	M	L	M	L
I am worried to a CONSIDERABLE degree	M	L	M	L	M	L	M	L
I am worried to a MODERATE degree	M	L	M	L	M	L	M	L
I am worried to a SLIGHT degree	M	L	M	L	M	L	M	L
I am worried to a VERY SLIGHT degree	M	L	M	L	M	L	M	L
I am TENSE to a VERY CONSIDERABLE degree	M	L	M	L	M	L	M	L
I am tense to a CONSIDERABLE degree	M	L	M	L	M	L	M	L
I am tense to a MODERATE degree	M	L	M	L	M	L	M	L
I am tense to a SLIGHT degree	M	L	M	L	M	L	M	L
I am tense to a VERY SLIGHT degree	M	L	M	L	M	L	M	L
I am APPREHENSIVE to a V. CONSIDERABLE degree	M	L	M	L	M	L	M	L
I am apprehensive to a CONSIDERABLE degree	M	L	M	L	M	L	M	L
I am apprehensive to a MODERATE degree	M	L	M	L	M	L	M	L
I am apprehensive to a SLIGHT degree	M	L	M	L	M	L	M	L
I am apprehensive to a VERY SLIGHT degree	M	L	M	L	M	L	M	L
I am RESTLESS to a V. CONSIDERABLE degree	M	L	M	L	M	L	M	L
I am restless to a CONSIDERABLE degree	M	L	M	L	M	L	M	L
I am restless to a MODERATE degree	M	L	M	L	M	L	M	L
I am restless to a SLIGHT degree	M	L	M	L	M	L	M	L
I am restless to a VERY SLIGHT degree	M	L	M	L	M	L	M	L
I am NERVOUS to a V. CONSIDERABLE degree	M	L	M	L	M	L	M	L
I am nervous to a CONSIDERABLE degree	M	L	M	L	M	L	M	L
I am nervous to a MODERATE degree	M	L	M	L	M	L	M	L
I am nervous to a SLIGHT degree	M	L	M	L	M	L	M	L
I am nervous to a VERY SLIGHT degree	M	L	M	L	M	L	M	L

HAD Scale

Name:

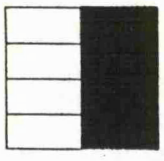
Date:

Doctors are aware that emotions play an important part in most illnesses. If your doctor knows about these feelings he will be able to help you more.
This questionnaire is designed to help your doctor to know how you feel. Read each item and place a firm tick in the box opposite the reply which comes closest to how you have been feeling in the past week.
Don't take too long over your replies: your immediate reaction to each item will probably be more accurate than a long thought-out response.

Tick only one box in each section

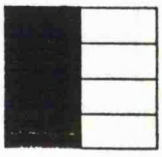
I feel tense or 'wound up':

- Most of the time .....
- A lot of the time .....
- Time to time, Occasionally .....
- Not at all .....



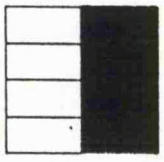
I still enjoy the things I used to enjoy:

- Definitely as much .....
- Not quite so much .....
- Only a little .....
- Hardly at all .....



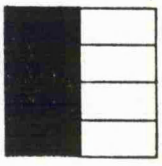
I get a sort of frightened feeling as if something awful is about to happen:

- Very definitely and quite badly .....
- Yes, but not too badly .....
- A little, but it doesn't worry me .....
- Not at all .....



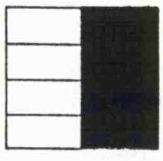
I can laugh and see the funny side of things:

- As much as I always could .....
- Not quite so much now .....
- Definitely not so much now .....
- Not at all .....



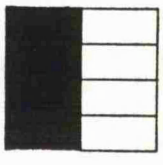
Worrying thoughts go through my mind:

- A great deal of the time .....
- A lot of the time .....
- From time to time but not too often ..
- Only occasionally .....



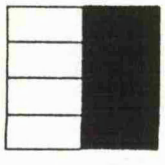
I feel cheerful:

- Not at all .....
- Not often .....
- Sometimes .....
- Most of the time .....



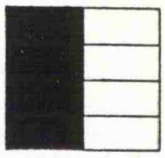
I can sit at ease and feel relaxed:

- Definitely .....
- Usually .....
- Not often .....
- Not at all .....



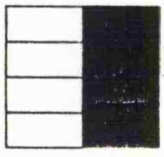
I feel as if I am slowed down:

- Nearly all the time .....
- Very often .....
- Sometimes .....
- Not at all .....



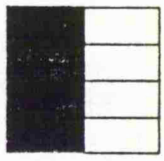
I get a sort of frightened feeling like 'butterflies' in the stomach:

- Not at all .....
- Occasionally .....
- Quite often .....
- Very often .....



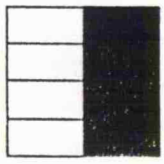
I have lost interest in my appearance:

- Definitely .....
- I don't take so much care as I should.....
- I may not take quite as much care .....
- I take just as much care as ever .....



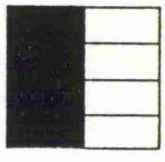
I feel restless as if I have to be on the move:

- Very much indeed .....
- Quite a lot .....
- Not very much .....
- Not at all .....



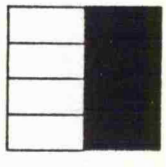
I look forward with enjoyment to things:

- As much as ever I did .....
- Rather less than I used to .....
- Definitely less than I used to .....
- Hardly at all .....



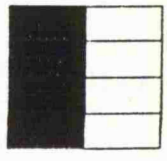
I get sudden feelings of panic:

- Very often indeed .....
- Quite often .....
- Not very often .....
- Not at all .....



I can enjoy a good book or radio or TV programme:

- Often .....
- Sometimes .....
- Not often .....
- Very seldom .....



Do not write below this line

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Appendix G

The EPQR - A.

Name _____ Age _____

Date _____

Instructions: Please read each question carefully, and circle the Y (Yes) or N (No) according to how closely the question fits how you see yourself. Do not take too much time thinking about your answer, as a quick answer is normally more accurate.

1.	Does your mood often go up and down?	Y	N
2.	Are you a talkative person?	Y	N
3.	Would being in debt worry you?	Y	N
4.	Are you rather lively?	Y	N
5.	Were you ever greedy by helping yourself to more than your share of anything?	Y	N
6.	Would you take drugs with strange or dangerous effects?	Y	N
7.	Have you ever blamed someone for something you knew was really your fault?	Y	N
8.	Do you prefer to go your own way than act by the rules?	Y	N
9.	Do you often feel "fed-up"?	Y	N
10.	Have you ever taken anything, however small, that belonged to someone else?	Y	N
11.	Would you call yourself a nervous person?	Y	N
12.	Do you think marriage is old-fashioned and should be done away with?	Y	N
13.	Can you easily get some life into a rather dull party?	Y	N
14.	Are you a worrier?	Y	N
15.	Do you tend to keep in the background on social occasions?	Y	N
16.	Does it worry you if you know there are mistakes in your work?	Y	N
17.	Have you ever cheated at a game?	Y	N
18.	Do you suffer from 'nerves'?	Y	N
19.	Have you ever taken advantage of someone?	Y	N
20.	Are you mostly quiet when you are with other people?	Y	N
21.	Do you often feel lonely?	Y	N
22.	Is it better to follow society's rules than to go your own way?	Y	N
23.	Do other people think of you as being very lively?	Y	N
24.	Do you always practice what you preach?	Y	N

P ____ E ____ N ____ L ____

Appendix H

NART TEST

CHORD	SUPERFLUOUS
ACHE	SIMILE
DEPOT	BANAL
AISLE	QUADRUPED
BOUQUET	CELLIST
PSALM	FACADE
CAPON	ZEALOT
DENY	DRACHM
NAUSEA	AEON
DEBT	PLACEBO
COURTEOUS	ABSTEMIOUS
RAREFY	DETENTE
EQUIVOCAL	IDYLL
NAIVE	PUERPERAL
CATACOMB	AVER
GAOLED	GAUCHE
THYME	TOPIARY
HEIR	LEVIATHAN
RADIX	BEATIFY
ASSIGNATE	PRELATE
HIATUS	SIDEREAL
SUBTLE	DEMESNE
PROCREATE	SYNCOPE
GIST	LABILE
GOUGE	CAMPANILE

Appendix I

Patient background information sheet.

Subject ID _____

Name _____

Address _____

_____

_____

_____ **Telephone** _____

D.o. B _____

Demographics

Age (years) _____

Sex (M:F) _____

Occupation _____

(OPCS Class code) _____

Years education _____

(Highest qualification) _____

Medical information

Previous psychiatric history _____

Previous medical history _____

Surgical Consultant _____

Anaesthetic Consultant _____

Anaesthesia medication _____

Other information: