ANXIETY AND THE OPTOMETRIC PATIENT

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Summary

Although patient anxiety is known to be a problematic feature within many areas of healthcare, the subject has been largely neglected within optometry. Therefore, this thesis addresses the issue of patient anxiety within optometric practice.

The initial study reported in Chapter 3 is a comparative study of patient anxiety. Results show that there is a distribution of anxiety levels within optometric practice which overlap with dental and general medical practice. A significant association between patient anxiety with patient satisfaction (r_s=-0.19; p<0.001) and compliance (r_s=-0.19; p<0.001) is reported. Furthermore, an ordinal regression analysis identifies the predictors of patient anxiety as trait anxiety, expectancy of bad news and non-spectacle wear.

The development of a new 10-item questionnaire to identify anxious patients in optometric practice is reported in Chapter 4 (the OPAS). A 4-item contact lens anxiety subscale is also described.

The most anxiety-provoking parts of a contact lens fitting examination are reported in Chapter 5, in a study which measured patient anxiety with both questionnaires and physiological methods (skin conductance and pulse rate). Heightened anxiety was identified during periods of communicative interaction and contact lens insertion and removal.

The ability of interventions to reduce anxiety is the focus of the final study reported in Chapter 6. There was no significant reduction in OPAS scores between patients who received an information leaflet, listened to music or received neither intervention prior to their eye examination. However, there was a significant association between OPAS scores and post-examination patient satisfaction (r_s = -0.32; p<0.001) and compliance (r_s = -0.47; p<0.001).

The results from these studies increase our understanding about the presence, causes and effects of patient anxiety within optometric practice. This thesis shows, for the first time, that heightened patient anxiety is associated with decreased satisfaction, compliance and is likely to be a contributing factor in determining healthcare outcomes.

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Chapter 1: Introducing anxiety

"Things don't look as clear as they used to. It never used to be a struggle to sit down and read the newspaper. I never had a problem driving before; it was easy to read road signs. Recognising a friendly face was never a problem. Things have changed. I don't want to get old, I hope nothing is wrong.

It's time to stop delaying making an appointment. Maybe the optician will say new glasses is all that is needed to make things clear again. That would be good. But what if the optician says that nothing can be done? What if the news is bad? What if this is the start of going blind? What happens then? Not being able to read or drive a car is unthinkable. Living independently would be impossible without being able to see. That prospect is awful.

It would almost be easier to not know the truth. But the truth cannot be delayed forever and there is only one way to find it out, whatever the consequences may be."

1.0 Why study patient anxiety?

Heightened patient anxiety is a detrimental factor to healthcare outcomes. Anxiety has been associated with poor attention (Taylor 1986) and can be a barrier to effective patient-practitioner communication (Lang et al. 2000). This in turn leads to reduced satisfaction, an increase in the number of patient complaints and poorer disease resolution (Lang et al. 2000; Richards 1990). All these factors are detrimental to the accomplishment of optimal patient healthcare results (Stewart 1995). Patient anxiety also contributes to wasted healthcare resources, due to patient non-compliance (Corah 1988), non-attendance of appointments (Skaret et al. 2003; Taani 2002) and in other cases excessive utilization of healthcare services (Connelly et al. 1989; Frostholm et al. 2005).

The prevalence and effect of anxiety has been studied in many health related populations; including the patients of general practitioners

(Conroy et al. 1999; Southgate and Bass 1983), patients with diabetes (Lloyd et al. 2000), patients awaiting dental treatment (Corah 1988; Griffiths et al. 1998) and surgical patients (Salmon 1993) including cataract surgery (Foggitt 2001; Nijkamp et al. 2004). Methods adopted to reduce anxiety include playing music (Chan et al. 2003), hand massage (Kim et al. 2001) and practitioner communication technique (Floyd et al. 2005; Lang et al. 2000). Training practitioners to adopt communication styles such as patient-centred consultations (Little et al. 2001; Takayama et al. 2001) and the use of 'active listening' (Floyd et al. 2005; Lang et al. 2000) have been used within medical practice to reduce anxiety and improve both satisfaction and healthcare outcomes (Jackson 2005). These techniques demonstrate the influence of practitioner behaviour in moderating patient anxiety, a conclusion supported by dental research (Corah et al. 1988).

Considering that anxiety has been identified as a barrier to successful healthcare outcomes, it is surprising that the subject has received minimal attention within optometric practice. Subjective patient reports indicate that up to 25% of patients attending optometric practice are anxious (Fylan and Grunfeld 2005). However, there appears to be only one previously published paper directly addressing the presence of anxiety in optometric patients (Margrain et al. 2003). This study evaluated anxiety and arousal in a small group of patients and reported that anxiety levels are unique for each individual. In light of the known detrimental effects of anxiety and the minimal attention which anxiety has received in optometry, the purpose of this thesis is to address this potentially important, but largely ignored, area of optometric research.

Chapter 1 is the first of two literature reviews (the second is contained in Chapter 2) which will identify why the study of patient anxiety within optometry is worthy of research. The literature reviewed in this chapter relates to the theoretical construct of anxiety, including a review of previous literature about patient anxiety in healthcare.

1.1 Defining anxiety

Prior to investigating and discussing the effects of patient anxiety within optometry, it is useful to define a clear theoretical framework for the definition of anxiety. There have been many debates about the nature of emotion over the last 100 years and these ideas have shaped much of the theoretical considerations about anxiety today. As such, it is beneficial to understand the relevant literature on emotion in order to define anxiety. The following is a summary of the key arguments within the emotion literature.

1.1.1 Anxiety as an emotion: the history of emotion research

Emotional theory broadly fits into one of three categories; peripheral, central and cognitive theory (Frijda 1986). Each of these will be described:

1.1.1.1 Peripheral: The James-Lange Theory

James and Lange independently presented the idea that emotions are differentiated by distinct physiological responses (James 1884; Lange 1885). An emotion-evoking stimulus initiates a physiological change i.e. an autonomic response such as sweating and increased heart rate and skeletal muscle changes. The subjective experience is a direct result of these changes. In other words, the emotional experience is inseparable from the physiological changes, because it is these changes that define it. So "*we do not therefore stammer and tremble because we are anxious, but are anxious because we stammer and tremble*" (Edelmann 1992). Therefore, there is no conscious cognitive role in the emotional experience in this model. For example, upon entering the eye clinic a patient's heart rate increases. The James-Lange theory would posit that this physiological response directly causes the experience of anxiety. A schematic of this model is presented in fig. 1.1.

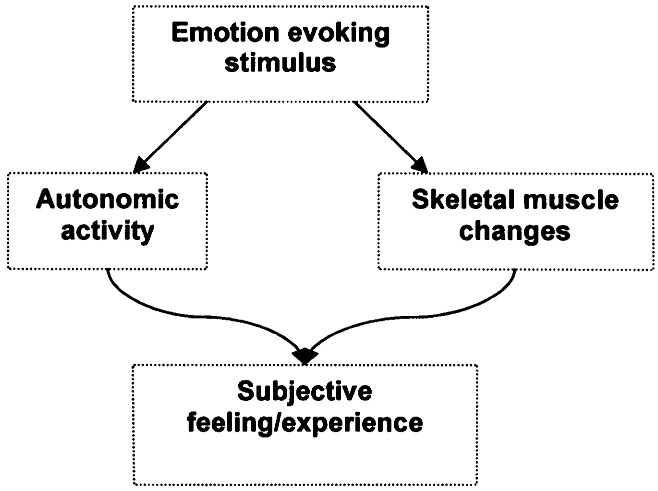

Fig. 1.1: Schematic of the James-Lange theory.

1.1.1.2 Central: Cannon's theory

At the turn of the century an alternative theory to the James-Lange model of emotion was presented by Cannon which became very popular (Cannon 1927). Cannon challenged the James-Lange model. Among his criticisms were that many of the physiological changes occurring in different emotional experiences are very similar to each other. According to the James-Lange model it is the bodily sensations which define each emotion. However, if different emotions have similar physiological manifestations, then it would appear that emotions are differentiated by more than the physiological change itself. Cannon also noted that these same physiological changes could be experienced when a subject is not emotionally aroused, such as when a person is cold or hungry.

Furthermore, considerations of the speed of the emotion process posed a concern for Cannon. If, as the James-Lange theory suggested, the subjective experience was a direct result of feedback from bodily sensations, then it would follow that if there was a disruption in the central nervous system then these individuals would no longer experience emotion or have impaired emotion. However, subsequent studies have shown that this is not the case. For example, a study which investigated the speed of emotional processing in spinal cord injured patients showed that there was no decline following injury (Lowe and Carroll 1985).

Cannon proposed a neurophysiological theory. In his model sub-cortical structures in the brain (especially the thalamus) are responsible for transmitting stimuli to the cortex. At this point in the processing, if the stimulus is emotional, then there is feedback to the peripheral body resulting in physiological responses. In other words, it is the neurological changes which moderate both the emotional experience and the physiological activity. A schematic of this central neural system approach is presented in fig. 1.2.

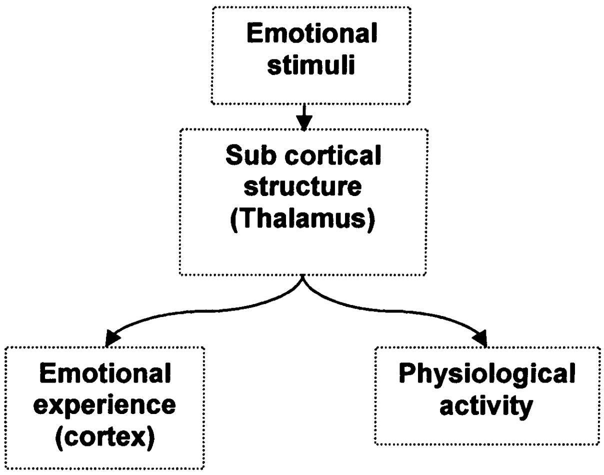

Fig. 1.2: Schematic of Cannon's theory.

1.1.1.3 Cognitive theories

The previous two theories do not acknowledge any conscious cognitive role in the emotional experience. However, an anxious optometric patient waiting for their appointment will probably be experiencing thoughts. As such, it is difficult to argue that thoughts do not have a role in the emotional experience. In fact, more recently the role of cognitions has entered into the emotion theory debate.

The concept that cognitions are an essential element of the emotional experience was outlined by Schachter (Schachter and Singer 1962). Schachter's theory states that emotion is determined by the cognitive labelling of a physiological arousal response (fig. 1.3). For example, the optometric patient, who has sweaty hands and a fast pulse, attributes these physiological changes to the fact they are anxious about having the eye test. An extension to the theory suggests that an arousal response can also be misattributed to a non-emotional stimuli resulting in no emotional response, i.e. if a person has an explanation for arousal that is non-emotional then they may not subsequently become emotional (Schachter 1964). For example, the patient who has sweaty hands and a fast pulse may have just had a large mug of coffee and also noted a pretty receptionist behind the desk. The patient now misattributes these physiological changes to effects from the coffee and an attraction to the receptionist, rather than anxiety about the impending appointment.

The theory of misattribution has been widely supported (Dutton and Aron 1974; Foster et al. 1998; Savitsky et al. 1998). These reports highlight the weakness in such theories as the James-Lange theory which posits that physiological arousal constitutes and defines the emotional experience, and provides support to the role of cognitions in emotion. In other words, emotion results from an interaction of physiological changes and cognitive processes.

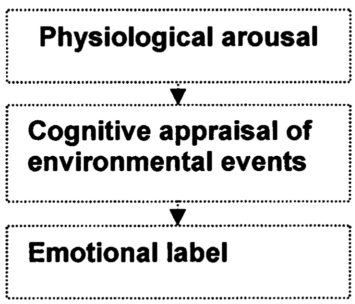

Fig. 1.3: Schematic of Schachter's theory of emotion.

1.1.1.4 Cognitive Expectancy Theory

Cognitive Expectancy theories align themselves with the concept of cognitions as central to the production of emotions. These theories posit that an initial stimulus is subject to a cognitive mediating process and a resultant response ensues (Edelmann 1992). The cognitive expectancy of social or physical danger within an impending situation results in anxiety. Bandura labelled the cognitive appraisal of imagining the potential outcomes resulting from a particular behaviour as 'outcome expectancies', and believed this cognitive process was instrumental in the genesis of anxiety (Bandura 1977). Furthermore, this anxiety is modulated by an individual's judgment of their ability to cope with the threatening situation (self-efficacy) (Bandura 1977).

The framework of cognitive appraisals for the generation and maintenance of emotion and anxiety is well established. Lazarus coined the term 'primary' and 'secondary' appraisals (Lazarus 1966). 'Primary appraisal' concerns the judgement whether an event has relevance to a person's well-being; and 'secondary appraisal' is the evaluation as to whether the person can do anything to divert the treat. Anxiety results if a threat is identified (primary appraisal) which cannot be averted (secondary appraisal). The contribution by Lazarus regarding the role of cognitive appraisals continues to be integral to the understanding of anxiety as an emotion (Lazarus 1982, 1991, 1999, 2000, 2006). Therefore, this will be reflected in this thesis.

1.1.1.5 The Role of Cognitions in Emotion

Contemporary studies on emotion recognise that cognitions are central to the generation of the emotional response. However, it is important to identify the nature of cognition in different aspects of emotion. Theories such as the Cognitive Expectancy theory identify cognition as a conscious process. However, there is also support for the involvement of cognitions in the generation of emotion at the pre-conscious level.

Watts (1983) believed that cognitions in the emotion process can be pre-conscious. He argued that the process of pre-cognitions would mean that "*an absence of awareness of cognitive processes associated with affective reactions cannot be used as evidence for the absence of any involvement of cognition in affective reaction*" (Watts 1983). Therefore this argument acknowledges the presence of cognitions in a process in which the subject is consciously unaware of the cognitive process.

The Emotional Stroop test provides evidence for the presence of pre-conscious processing. This test involves showing a subject a number of emotional and non-emotional words which are different colours. The subject is told to ignore the valence of the words and report only the colours. Experiments show that subjects are slower to report the colour of emotional words, compared to non-emotional ones (Pratto and John 1991; White 1996). It is believed that unpleasant or undesirable words initiate strong associative priming effects, which then grab the attention of the subject, which then delays the subject from naming the colour of the word (White 1996). Therefore these studies strengthen the evidence for a pre-conscious emotional cognitive effect, which unconsciously effects behaviour.

The concept of early pre-conscious emotional reactions has also been investigated by Murphy and Zajonc (1993). A theoretical model was proposed which took into account the presence of these reactions, but that they could then be either sustained or diluted by further cognitive processes. In other words, there is a 'continuum of consciousness', whereby, it is possible that subsequent information processed in the information processing chain can dilute an initial emotional reaction if it appears to be inconsistent with the initial reaction (Murphy and Zajonc 1993). For example, a person has an initial alarm response if they think they see a spider. However, the person relaxes when they look again and realise it is a piece of cotton i.e. there is an emotional adjustment.

In summary, from the theories considered it would appear that emotion is a multi-component phenomenon, in which cognition, emotional reaction and physiological changes all contribute to the genesis and maintenance of emotion. Therefore, since anxiety is considered as an emotion, it is necessary to discuss it within a similar framework. Prior to presenting a framework and construct of anxiety which will be used within this thesis, it is useful to be aware of the past theories and contributions to anxiety research which have led to modern day theory.

1.1.2 History of anxiety research

1.1.2.1 Classical conditioning

The original model for classical conditioning was presented by Watson and Morgan (1917). The basic theory is that when an initial neutral and non-anxiety provoking event (unconditioned stimulus) is paired with an aversive experience then an anxiety response ensues (unconditioned response). Subsequently, this anxiety response becomes associated with the aversive experience, and the unconditioned stimulus then is able to produce the anxiety reaction. For example, a person may have spent a long unpleasant stay in hospital when they were a child. Now they are older the smell of a hospital ward makes the person feel anxious.

In addition to classical conditioning, Rachman suggested that anxiety can be acquired by a 'modelling' pathway (Rachman 1977) i.e. watching another person's reaction to a stimulus subsequently becomes your response. For example, a child may see their parent being fearful of dogs, which consequently becomes the child's response.

1.1.2.2 Trait and State Anxiety

Anxiety theories which relate the acquisition of anxiety to conditioning processes omit any explanation as to why some individuals seem more prone to anxiety than others. This issue was considered by Spielberger (1966) who presented a popular conceptual framework of anxiety in which he differentiated the concept of 'trait' anxiety which refers to a person's 'proneness' to anxiety, and 'state' anxiety which is a transient experience of anxiety. Trait anxiety is therefore a personality trait, and a subject high in trait anxiety will be more prone to experiencing higher levels of anxiety. He states that

> *"anxiety as a personality trait (A-trait) would seem to imply a motive or acquired behavioural disposition that predisposes an*

individual to perceive a wide range of objectively non dangerous circumstances as threatening, and to respond to these with A-state reactions disproportionate in intensity to the magnitude of the objective danger" (Spielberger 1966).

As can be seen from the schematic model of Spielberger's framework for anxiety (fig. 1.4), cognitive appraisal constitutes a central role of the anxiety process. It is a more complicated model than simple conditioning; rather it involves integration between anxiety proneness (trait anxiety), past learning and memory, sensory and cognitive feedback. This model therefore fits in well with the multi-component models of emotion. This is a widely accepted theory forming the basis of many studies measuring anxiety (Spielberger 1983).

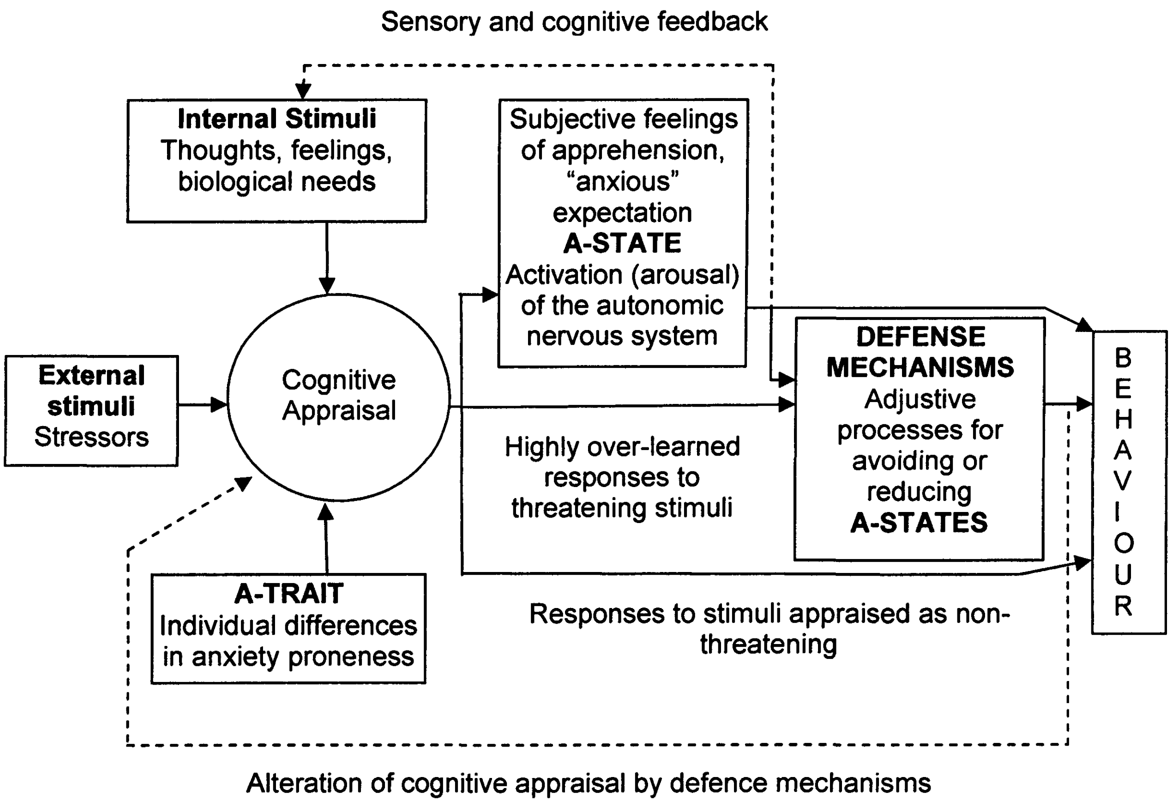

Fig. 1.4: Spielberger's trait-state conceptual framework of anxiety. From Spielberger (1966)

Theories have been suggested to explain why individuals have different levels of trait anxiety. Eysenck (1967) considered that anxiety proneness was heavily dependant on heredity via the physiological system. The functioning of the visceral brain (neural structures involved in emotional processing), which consists of the hippocampus, amygdala, cingulum, septum and hypothalamus, were considered to be the cause for different levels in trait anxiety (Eysenck 1967). This part of the brain was considered to be more active in trait anxiety. A similar neuropsychological concept was offered by Gray (1982), who referred to the 'behavioural inhibition system' as the determinant of trait anxiety level. This system includes the septohippocampal system, its neocortical projection in the front lobe and its monoaminergic afferents from the brain stem (Gray 1982).

These explanations of the causes for different levels of trait anxiety appear rather one dimensional. They negate any other possible systems that may contribute to anxiety and suggest it is only physiological functioning which determines level of anxiety. As with emotion, it would appear that when considering anxiety a multidimensional approach may be more appropriate. For example, a tripartite three system model of anxiety has been proposed, incorporating behavioural, physiological and verbal (cognitive) aspects (Lang 1971; Lang 1985). This three component notion of anxiety has been widely adopted in the last twenty years and shares a lot in common with views surrounding emotions in general. The physiological response to anxiety will be explained in Chapter 2.

1.1.3 Identifying a theoretical construct for optometric anxiety

From the literature discussed, it is clear that cognitions are integral to the generation and maintenance of the emotion anxiety (Bandura 1977; Edelmann 1992; Lang 1985; Lazarus 1982, 1991, 1999, 2000, 2006). Patient cognitive appraisal of both the social and physical elements of the optometric encounter could generate anxiety. For example, four types of social situation have been identified as causing anxiety (Holt et al. 1992). These include; formal speaking and interaction, informal speaking and interaction, assertive interaction and observation of behaviour. Therefore, such processes as talking to the optometrist, communicating reason for visit, communicating concerns are all potentially anxiety creating situations. Furthermore, cognitive appraisal of the possible threats and physical dangers such as pain, discomfort, receiving bad news and spending money are all possible expectancies that may be anxiety provoking.

Due to the potentially diverse nature of anxiety causing factors within the optometric context, it is difficult to label optometric anxiety as either state or trait anxiety. A patient may have a tendency to be anxious (trait), however, the anxiety experienced by that patient will be determined largely by the context of the examination (state). For example, considering the patient reflection at the start of this chapter, the current status of reduced vision may increase patient anxiety about seeing the optician independently of whether they are normally anxious in that situation. Therefore, it is not helpful to discuss optometric anxiety as state or trait. Rather, it is more helpful to identify optometric anxiety within a framework which recognises the role of cognitions as central, but also acknowledges that previous experiences and current level of emotional arousal will also contribute to the generation and maintenance of anxiety.

1.2 Patient anxiety and healthcare

The theories of emotion and anxiety have been discussed and a theoretical construct of optometric anxiety has been identified. The final part of this chapter will expand upon what is currently understood about patient anxiety within the healthcare environment. Currently there is little research pertaining to optometric practice, therefore, the majority of the literature discussed emanates from other areas of healthcare.

1.2.1 Distinction between patient anxiety and anxiety disorders

The aspect of anxiety which this thesis addresses is that which occurs as a consequence of the optometric experience. The anxiety generated by cognitive expectancies specific to the optometric context. In other words, that element of anxiety which is the universal and general adaptive response to threat, a transient state of anxiety (House and Stark 2002). However, it is important to differentiate this form of anxiety from anxiety disorders.

The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) is a handbook used by mental health professionals. In the DSM-IV, twelve types of anxiety disorder are defined which can be grouped under seven headings: panic disorders with or without agoraphobia, phobias, obsessive-compulsive disorder (OCD), stress disorders, generalized anxiety disorder (GAD), anxiety disorders due to known physical causes and anxiety disorder not otherwise specified. These are generally chronic disorders which are graded as mild, moderate or severe. In other words, they are distinctive from the transient experience of anxiety experienced due to a response to a threat.

Anxiety disorders are not the focus of this research and therefore, the following literature only pertains to that element of anxiety that is due to the healthcare experience i.e. not part of a psychological disorder.

1.2.2 Causes of patient anxiety

Anxiety generated within a social situation is known as social anxiety (Jefferson 2001). Alongside physiological arousal and behavioural factors, social anxiety is heavily determined by cognitive appraisals about an encounter (Beidel et al. 1985). Social anxiety is sometimes manifested in healthcare as patient embarrassment (Leary and Kowalski 1995). Embarrassment is the reactive aspect of social anxiety occurring within the patient-practitioner relationship (Leary and Kowalski 1995). It is generated when an individual wants to make a particular impression, but feels that this is not occurring.

The causes of embarrassment within medical examinations are well documented. Some particular types of examination are known to cause embarrassment when 'private' parts of the body are being examined. For example, a telephone questionnaire of 910 women aged 50 and over in the USA, was conducted to ascertain the barriers to having a mammogram (Lerman et al. 1990). The results identified that the significant barriers to having a mammogram in the last twelve months was anxiety, embarrassment and concern of radiation (Lerman et al. 1990). Also, when individuals have particular types of medical problems, such as sexual or alcohol problems, anxiety can be generated (Leary and Kowalski 1995). Finally, the thought of sharing personal information within the patient-practitioner relationship can generate patient anxiety. This sometimes results in patients not disclosing important personal information (Floyd et al. 2005; Lazare 1987).

Dentistry is one area of primary healthcare which has thoroughly investigated patient anxiety. Perhaps this is unsurprising considering the estimation that over 1 in 10 of the British population suffer with 'dental anxiety' (McGrath and Bedi 2004). Therefore, the causes of dental anxiety are well understood. Women report higher dental anxiety than men (Hakeberg et al. 1992; Mellor 1992). Furthermore, negative conditioning, whether by a personal traumatic previous experience or witnessing negative reactions from other people, are most likely the cause of dental anxiety which starts in childhood (Berggren and Meynert 1984; Weiner and Sheehan 1990). Dental anxiety which manifests in adult life is also thought to be influenced by psychological and personality factors (Hagglin et al. 2001; Weiner and Sheehan 1990). Abrahamsson generated a grounded theory model to identify the main anxiety provoking threats for dental patients, based upon 18 in depth interviews (Abrahamsson et al. 2002). The interviews focused on the patients own description of their dental anxiety, dental experiences, thoughts, feelings, coping strategies and consequences of their anxiety. Each interview lasted between 50 minutes to 1.5 hours. Threat of violation and loss of patient autonomy were denoted as the principal causes of anxiety. The concept of violation included the fear of pain and concern regarding the skills of the dentist. This is well supported by other dental research, which shows that the thought of pain is particularly anxiety provoking (Abrahamsson et al. 2002; Arntz et al. 1990; Corah 1969; Kent 1985; McNeil and Berryman 1989). Other dental research has also shown that loss of autonomy and lack of control within the patient-practitioner relationship causes patient anxiety (Corah et al. 1988). However, this is not a problem unique to dental practice, medical research has reported that when practitioners communicate in a way which encourages patient involvement and control, patient anxiety is reduced (Little et al. 2001).

Within healthcare, surgery is also well recognised as an anxiety causing situation (Johnston 1988). The causes of anxiety include anaesthesia, pain, life threatening operations, the outcome success of surgery and issues concerning home (e.g. how the family will cope) (Johnston 1986, 1988). Within ophthalmology, there has been a growing interest in anxiety associated with cataract surgery (Kim et al. 2001). A study including 128 cataract patients attending for a routine cataract extraction was conducted at two hospitals in the Netherlands (Nijkamp et al. 2004). Patients were asked to complete a questionnaire including measures of anxiety, outcome expectancies and coping methods, at four different time points during the patient journey. Multiple linear regression analysis identified that high trait anxiety, low outcome expectancy, poor social support and gender (female) correlated significantly with high state anxiety just before the operation (Nijkamp et al. 2004). This study did not find any association of anxiety with age, educational status or provision of pre-surgical patient information, although the latter was reported by patients to be reassuring. Furthermore, patients undergoing their second cataract operation did not report lower anxiety, although the mean anxiety of those undergoing their first-eye surgery was higher. This result is in agreement with a study by Habib, who showed that there was no significant difference in mean self-report anxiety levels between patients having first-eye surgery, and those undergoing second-eye surgery (Habib et al. 2004).

The expectancy of receiving bad news as causative to anxiety has been documented within healthcare (Brett and Austoker 2001). A questionnaire study which sought to ascertain why 436 women failed to attend a free mammography showed anxiety about receiving bad news (Aro et al. 2001) as a commonly cited reason, along with the anxiety of receiving news that an operation would be required. The expectation of pain during medical procedures also generates patient anxiety (Aro et al. 2001; House and Stark 2002). Considering that anxiety is the adaptive response to a threat it is perhaps unsurprising that if an individual perceives that there is a threat to their personal wellbeing, anxiety will be generated.

1.2.3 Patient anxiety and healthcare outcomes

Perhaps the most problematic aspect of patient anxiety is that it can be detrimental to healthcare outcomes. Research has shown that anxiety can result in either the excessive utilization of healthcare (Connelly et al. 1989; Frostholm et al. 2005) or to patient avoidance of appointments due to potential embarrassment (Lerman et al. 1990) or concern about receiving bad news (Aro et al. 2001; Brett and Austoker 2001). One dental study, which gathered data via questionnaires, reported that over

10% of young adults delayed attendance of dental appointments due to anxiety (Taani 2002). Another dental study reported that those patients with high anxiety had a significantly higher frequency of missed appointments (Skaret et al. 2003). Irregularity of appointments results in poor dental health (Cohen et al. 2000; Forslund et al. 2002). Therefore, it is clear that avoiding appointments due to anxiety will ultimately result in detrimental effects upon patient health.

Within the patient-practitioner relationship anxiety can also be a barrier to optimal healthcare results. As previously discussed, anxiety can prevent patients from voicing important personal information, due to potential embarrassment (Floyd et al. 2005; Lazare 1987). Acknowledgment of this problem in medical practice has resulted in the development of communication training to aid practitioners in eliciting all patient anxieties (Lang et al. 2000). Moreover, patients who are anxious during the consultation are likely to lack concentration. Primarily this is also problematic to the communicative process between the patient and the practitioner. Poor communication results in reduced patient satisfaction, compliance and recall of information (Harrington et al. 2004; Stewart 1995). Dental studies have also identified a relationship between high patient anxiety with reduced satisfaction (Corah et al. 1985). In other words, anxiety has detrimental effects upon healthcare outcomes.

1.2.4 Intervention methods to reduce patient anxiety

As a result of the problematic effects of patient anxiety within healthcare, many anxiety-reducing interventions have been developed. The following paragraphs describe these interventions.

1.2.4.1 Patient information (cognitive)

The provision of patient information has been reported as an effective intervention to reduce anxiety. Dental research has shown that pre-operative anxiety was significantly reduced for patients who read an information leaflet (Ng et al. 2004). This reduction in anxiety was explained on the basis that the information supplied created more positive cognitive appraisals and thereby reduced anxiety. Similar reductions in anxiety using patient information has also been reported in general medical surgery (Sjoling et al. 2003), including cataract surgery (Pager 2005). A study which involved exposing patients to a video about cataract surgery prior to treatment, showed significantly less anxiety levels compared to the control group (Pager 2005). Therefore, this study suggested that patients with a realistic understanding of the procedure (i.e. positive outcome expectancies) were more likely to be less anxious.

1.2.4.2 Music (physiological)

There are studies which report that music successfully reduces patient anxiety (Cooke et al. 2005; Evans 2002). These include a study of 220 women undergoing a colposcopy examination in which the subjects had control over the music which they listened to (Chan et al. 2003). A significant reduction in anxiety was reported. Furthermore, similar results of the positive effect of music were also reported by Allen, who showed that patient chosen music reduced blood pressure compared to those without music (Allen et al. 2001).

1.2.4.3 Communication style (social)

As previously discussed, patient anxiety is potentially disruptive to optimal patient-practitioner communication. However, the communication style adopted by the practitioner can moderate patient anxiety levels (Takayama et al. 2001). This includes the type of language used by the practitioner when communicating with the patient (Bourhis et al. 1989). Interaction skills training has been developed to help practitioners manage patient anxiety (Kern et al. 2005). In addition practitioner communication can modulate patient satisfaction and recall. For example, in a review of medical communication studies, Ong et al. (1995) showed that the amount of information given to the patient, and the affective and behavioural style in which that information is given, moderates patient satisfaction (Ong et al. 1995). Furthermore, the way in which the practitioner presents information (Kupst et al. 1975; Ley

1979), practitioner affect (Shapiro et al. 1992) and interpersonal skills (Bartlett et al. 1984), will contribute to the final recall of the patient.

1.2.4.4 Other interventions

Apart from the interventions already mentioned, other inventions adopted to reduce patient anxiety have included behavioural therapy (Liddell et al. 1994), aromatherapy (Lehrner et al. 2000) and hand massage (Astbury 2004; Kim et al. 2001). All of these interventions have resulted in a significant reduction in patient anxiety.

1.2.5 Why study anxiety in optometry?

The literature reviewed shows that patient anxiety can have a detrimental effect within primary healthcare. However, to date there is almost no research within optometry. Although there have been substantial technological advances in terms of disease detection and management, translating these advances into improved healthcare outcomes can be problematic. This is because the ability of these developments to preserve vision is largely determined by the patient i.e. by their willingness to comply with treatment or advice. For example, non-attendance, inadequate patient-practitioner communication, poor recall, lack of understanding and non-compliance can compromise final clinical outcomes. Consequently, a better understanding of patient anxiety and its role in optometric practice may lead to improved healthcare outcomes.

Although there is evidence of the detrimental effects of high patient anxiety within healthcare, the question may still be raised regarding the validity of the assumption that optometric patients will be anxious. Considering that eyesight is the most valued sense (De Leo et al. 1999), any perceived threat is likely to result in anxiety. Discomfort of clinical procedures, detection of eye disease and adapting to spectacles have all been identified as patient concerns (DOCET; Ettinger 1994; Fylan and Grunfeld 2005; Shute 1986). Furthermore, possible changes to personal appearance and financial cost have also been reported as patient “barriers” (DOCET; Fylan and Grunfeld 2005; Pesudovs et al. 2006; Shute 1986). The “threats” perceived by patients may vary between individuals, but all will result in anxiety.

One area of optometry which has previously recognised the potential problems associated with patient anxiety is contact lens fitting. Both practitioner experience and qualitative reports indicate that patient anxiety is a potential barrier to contact lens wear (Hewett 1984b; Hutchison 2001). There is an increasing awareness that the success of contact lens wear is not simply determined by the ‘mechanics’ of lens fitting, but by patient psychological factors (Hewett 1984a). For example, a large mail survey assessing the attitudes and expectations of regular contact lens wearers compared to occasional and former wearers, showed that the latter group harboured higher anxieties about; their eyes when wearing contact lenses, problems with cleaning lenses, inserting lenses and general discomfort (Hewett 1984b). In other words, a fuller understanding of what causes patient anxiety and how to reduce it can potentially improve contact lens patient outcomes.

1.3 Summary

The theories relating to emotion and anxiety have been discussed in this chapter. Within these theories, the centrality of cognitions has been recognised as providing a helpful theoretical framework for optometric anxiety. Healthcare literature has been drawn upon to identify the causes and effects of patient anxiety. However, this literature is almost devoid of reference to the optometric encounter. Therefore, in light of the potentially detrimental effects of anxiety, the importance of pursuing this area of research rests upon the possible impact it will have upon improving optometric healthcare results.

Chapter 2: The measurement of anxiety

2.0 Measuring anxiety

The theories of emotion and anxiety were discussed in the previous chapter, alongside a review of the literature regarding patient anxiety in healthcare. The methods to measure patient anxiety include self-report, physiological, observational and neurological methods.

Observational methods include the use of facial action coding systems (FACS), via manual (Ekman and Friesen 1978) or automated approaches (Bartlett et al. 1999), in which emotions are interpreted via facial expression. Neurological methods include the use of EEG to identify brain activity in the areas of the brain associated with negative emotions (Isotani et al. 2001). However, perhaps the more commonly used methods are the self-report and physiological measures. These latter two methods are those which are employed within this thesis. Therefore, this chapter provides background theory and describes the application of both these methods. However, greater emphasis is placed upon the self-report measurement of anxiety.

2.1 Self-report methods of measuring anxiety

The well established self-report method of measuring anxiety is with the use of questionnaires. Questionnaires or 'instruments' generally consist of a number of questions or 'items'. The participant's response to each item is typically quantified using response categories. A measurement value is obtained by applying numbers to the item response categories.

One of the most popular and frequently used questionnaires for the measurement of anxiety within healthcare is the Spielberger State-Trait Anxiety Inventory (Spielberger 1983). This instrument has been widely used to measure anxiety across many disciplines including medical, dental, surgical and psychiatric patients (Abe 2004; Dey et al. 2002; Gardner et al. 2005; Jenkins et al. 1996; Locker et al. 1997; Novak et al.

2003). By 1983 over 2,000 studies had used the scale (Spielberger 1983). Questionnaires to measure patient anxiety specific to a particular healthcare domains have also been developed, for example the Corah dental anxiety scale (Corah 1969).

The rising popularity of evaluating clinical success based upon variables such as patient anxiety, satisfaction and quality-of-life, has lead to a substantial increase in the number of questionnaires available to measure patient-centred variables (Pesudovs 2006). However, the theory and methods upon which these questionnaires have been developed and by which they are interpreted are not consistent. In fact, there are two distinctive theoretical frameworks, namely Classical Test Theory (CTT) and Item Response Theory (IRT). Although CTT is still the framework of choice within the Social Sciences, in the area of medicine, including ophthalmology, IRT is gaining increasing popularity (Garamendi et al. 2006; Hart et al. 2005; Kopec et al. 2006; Massof 2002; Pesudovs 2006; Pesudovs et al. 2003; Ryan et al. 2007; Schoor et al. 2006; Wolfe 2003). A fundamental tension exists between these two methods which is rooted in the definition of 'measurement'. The definition of 'measurement' in the social sciences and the physical sciences is distinct (Michell 1997). This poses a potential challenge to the theoretical framework of this thesis. Therefore, the following pages have a number of aims. Firstly, the definition of 'measurement' will be explored within these two disciplines. Secondly, the mode of scoring questionnaires and the different frameworks within which these scores are interpreted will be explained. Thirdly, the measurement paradigm to be adopted in this thesis will be explained. Finally, attention will be drawn to the pragmatic aspects of questionnaire research.

2.1.1 Defining measurement

Measurement requires evaluating the number of units which are needed to achieve equivalence with the object of measurement (Massof 2002). For example, this concept is easily understood in the measurement of weight. An object to be weighed is placed in a weighing pan, and then standard weights are placed into the other pan until the two pans 'balance'. This type of measurement can be seen, and as such is termed a 'manifest variable'. However, the measurement of a psychological trait, such as anxiety, is not publicly seen i.e. it is not a 'manifest variable'. Rather, it is called a 'latent variable'. To measure a 'latent variable' there needs to be a unit of equivalence with which to measure it.

Michell (1994) defines 'measurement' within the physical sciences as "*the estimation or discovery of the ratio of some magnitude of a quantitative attribute to a unit of the same attribute*". This has also been defined as 'fundamental measurement', e.g. measurement of the kind that characterises length and weight (Wright 1983). It produces a measurement that is on a continuous, interval scale. However, the widespread social science definition of 'measurement' as proposed by Stevens (1946) is the "*assignment of numerals to objects or events according to some rule*". Although the 'rule' is often not defined, higher numerical values are often given to responses that are judged to represent higher amounts of the latent variable. This results in an ordinal scale rather than an interval one.

Questionnaires used within healthcare often measure latent variables that reflect the success of a treatment, such as 'quality-of–life' (Jackson et al. 2006; Pesudovs et al. 2006; Stelmack 2001). Although these questionnaires could be scored to obtain an ordinal scale it is desirable that the same rigors of measurement which are accepted in all other areas of medical measurement are applied i.e. interval scale measurement. Wright (1983) argues that few social scientists attempt to construct fundamental measures, not because there is disapproval of fundamental measurement, but rather because they *"despair of attaining it"*. Therefore, the traditional stance in the social sciences is still to treat raw scores, "*assignment of numerals to objects or events according to some rule*" (Stevens 1946), as measures. In light of this, there is a clear conflict between disciplinarily approaches which may occur within this thesis. It is important to realise this at the outset of this research in which we attempt to measure the psychological trait of anxiety in an optometric framework.

2.1.2 Obtaining scores from questionnaires

In order to obtain a quantitative measure of a latent variable from a questionnaire, direct estimation methods are most frequently used (Streiner and Norman 1995). The two most commonly used methods are the Visual Analogue Scale (VAS) and the Likert scale.

2.1.2.1 Visual Analogue Scales

Visual analogue scales provide a quick and easy way to assess subjective internal states such as pain and anxiety. Visual analogue scales (VAS) consist of a line, typically 100mm in length, with opposing verbal descriptors of the subjective state at either end (Cline et al. 1992). The individual rates their current state by making a mark on the line. The distance at which the mark is made is interpreted as the measure of the latent trait.

The simplicity of the VAS may account for its popularity within healthcare. The VAS has been used within ophthalmology to assess both anxiety and pain during cataract extractions (Bellan et al. 2002; Foggitt 2001; Kim et al. 2001; Moon and Cho 2001). However, care must be taken in interpreting the results. The conventional analysis of the score obtained with the VAS effectively treats this as a 101 category rating scale which is already linear. This pre-supposes that an individual has the ability to discriminate between 101 categories. However, evidence suggests that an individual can discriminate well only between five and nine categories (Streiner and Norman 1995), and 10 categories at most (Straube and Campbell 2003). Therefore, Straube and Campbell (2003) argue that a conceptual leap is made in assuming that the VAS provides an interval-level measurement. In other words, the VAS should not be interpreted as a linear scale, a conclusion also reported by other statistical researchers (Svensson 2000a, b).

Although the linearity of the VAS is questionable, it still provides a quick method of obtaining a quantitative estimate of a latent trait from an individual. In fact, it has been reported that these scales are perhaps of most value when assessing an individuals change over time (Crichton 2001). Therefore, in order to avoid interpreting individual VAS results as scores on an interval linear scale, the safest way to analyse the scores are with a statistical method based on rank ordering, as suggested by Crichton (2001).

2.1.2.2 Likert scales

As an alternative to the VAS, another popular method used to scale questionnaire responses in order to obtain the measurement of a latent variable is the Likert scale. This is a direct estimation method which allows the production of a quantitative estimate from the subject (Streiner and Norman 1995). A Likert scale is one in which a subject responds to a number of statements, usually on an agree-disagree continuum (Streiner and Norman 1995) (see fig.2.1). In other words, each item is itself a scale. Each response category is then assigned a number.

I feel happy (please tick one box)

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

Fig. 2.1: Example of a Likert scale.

Likert made a number of assumptions in the development of his scale (Likert 1932). These included that the trait being measured was normally distributed among the population, the response scores are on an interval scale, that the response categories are ordered and that all the items had the same level of difficulty (Massof 2002). However, these assumptions are often violated in test design, for example, items are not the same difficulty and the response scale does not yield an interval measurement. Therefore, Likert scales can provide, at best, an ordinal measurement.

There is a choice with regard to the framework in which Likert scores are interpreted, namely Classical Test Theory (CTT) or Item Response Theory (IRT).

2.1.3 Classical Test Theory

CTT can be used to develop and score questionnaires. Development of questionnaires and identification of useful items includes the use of statistical tests such as 'internal consistency' and 'factor analysis'. Internal consistency is a statistic based upon the correlations between the items. Factor analysis is a data reduction technique, allowing identification of closely related items or 'factors', based upon identification of underlying patterns of correlations between items. However, there have been drawbacks identified with these methods. It has been suggested that item selection based on internal consistency results in redundant items (i.e. items which are very similar to each other), thus reducing breadth of the measurement scale (Prieto et al. 2003). A problem associated with factor analysis is the lack of a single method to determine the number of meaningful factors in an analysis, potentially resulting in an inadequate choice of items (Prieto et al. 2003; Wright 1996).

In CTT the total score for a questionnaire is obtained by summing the numbers assigned to categories, this is then interpreted as a measure of the construct (Pesudovs 2006). In other words, raw scores are treated as measures. There is no consideration of item difficulty.

Within the CTT framework, an individual's ability level (or anxiety level) can only be interpreted based upon the population which undertook the test. For example, a questionnaire (total possible score 30) may be given to two groups of students, an anxious group and a non-anxious group. An individual scoring 15 out of 30 in the first group (anxious group) may place them in the bottom 10% of scores, thus suggesting that a score of 15 indicates a low level of anxiety. However, a score of 15 in the non-anxious group may place them in the top 10% of scores, suggesting a score of 15 represents high anxiety. In other words, a score of 15 out of 30 could be interpreted as either high or low anxiety dependent upon the population which was used to calibrate the questionnaire. Therefore, CTT does not allow interpretation of ability (e.g. anxiety) level which is independent from the characteristics of the people used for the calibration (Wright 1967).

2.1.4 Item Response Theory

The other theoretical framework within which questionnaires can be analysed and developed is Item Response Theory (IRT). IRT adheres more closely to the physical sciences definition of measurement. IRT does not interpret the raw scores from the item responses as a measurement. Rather, to obtain a measurement both the items and the people are scaled based upon responses to the items (Pesudovs 2006). IRT takes account of the fact that people can have different levels of ability and items have different levels of difficulty, both of which can be measured (Pesudovs 2006).

Mathematically, IRT models the probability of a particular response based upon person ability and one or more item parameters. In the 'three parameter IRT model', the item parameters include item difficulty, a discrimination factor (i.e. the discriminative ability of the item to discriminate between people on the measurement scale) and a parameter which accounts for the possibility of item responses that are guessed.

However, despite the advantages of IRT, there is still an argument that it cannot be considered a measurement model. The underlying premise of IRT is that item difficulty and person ability are independent variables. This means that item difficulty does not change when undertaken by people of different abilities. However, because IRT models include a discrimination parameter, there is an interaction between the person and item parameters in the determination of the latent variable. This problem was overcome by a Danish mathematician called Georg Rasch (Wright and Stone 1979). He developed a type of IRT model which did not include a discrimination parameter (the Rasch Model), which he claimed could produce a truly objective measurement (Wright and Stone 1979).

2.1.5 The Rasch Model

Georg Rasch proposed that two premises are required to obtain objective measurement. Firstly, calibration of the measure should be independent from the people which were used to calibrate it, a premise violated by CTT (Wright 1967). Secondly, that the measurement should be independent of the measure used i.e. the measurement should not be bound to the measurement device. This can be thought of in terms of measuring the length of an object i.e. the measured length of the object is the same even when different rulers are used. Measurements based on these premises, means that one can generalise beyond the instrument used (Wright and Stone 1979). This is in line with the concept of measurement in the physical sciences. The Rasch model meets these criteria of measurement because the model allows the algebraic separation of item and the person parameters.

The Rasch model is distinct from most statistical modelling, because the aim is not to describe a set of data, rather it is an 'ideal' which the data should meet in order to provide successful measurement. Application of the Rasch model facilitates the development and scoring of items that are independent of the original group tested. Rasch analysis makes no assumptions about the difficulty of items or the size of the interval between individual response categories. Rather, it estimates item difficulties and determines threshold values for each response category for the items. In this way Rasch analysis can provide questionnaire scores which are on a true interval scale. The following section describes the Rasch model.

The dichotomous Rasch model

According to the Rasch model the probability of a correct response for a dichotomous variable (X_{ni}=1) is determined by the difference of item difficulty (D_i) and person ability (B_n). The probability of a correct response is (Bond and Fox 2001):

$$\Pr\{Xni=1\} = \frac{e^{(B_n - D_i)}}{[1+e^{(B_n - D_i)}]} \qquad (1)$$

This is the dichotomous Rasch model. It is a logistic function and is graphically represented in Fig.2.2. B_n and D_i are expressed in logits (log odds ratios). Logits are a log transformation of the odds of success, for items and people, allowing linear rather than ratio measurement. The graph shows that when the person ability is the same as the item difficulty (i.e. B_n- D_i = 0) the probability of Pr{X_{ni}=1} is 0.5 (fig.2.2). Furthermore, as person ability exceeds item difficulty, the probability of a correct response increases.

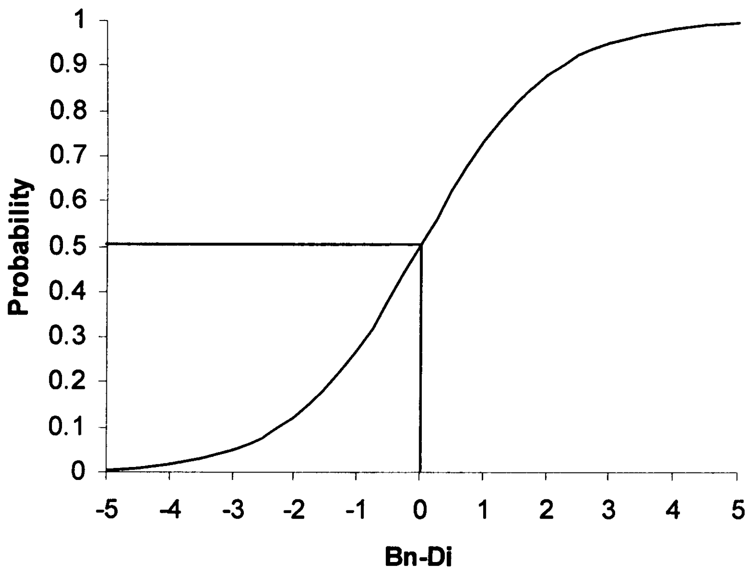

Fig. 2.2: The course of the logistic Rasch model (Bn-Di denotes the difference between person ability and item difficulty).

For example, an individual has ability (B_n) of 2, and attempts an item of difficulty (D_i) of 1.

$$\Pr\{X_{ni}=1\} = \frac{e^{(2-1)}}{[1+e^{(2-1)}]}$$

$$= 0.73$$

Therefore, the probability of a correct response is 73%.

Suppose a questionnaire (with binary choices, i.e. right/wrong) has a total of 5 items and an individual scores 3 out of 5. To achieve a score of 3, there are a total of (2x2x2x2x2) 32 possible response patterns. However, there will be one response pattern that has the highest probability. This is when the items are ordered from least to most difficult, this is also known as a Guttman pattern (Andrich 1985). The Rasch model assumes the data to have a probabilistic Guttman pattern.

Based upon the raw scores for items (the number of people who succeeded on an item) and the total person scores, estimation of the item (D_i) and person (B_n) parameters can be made. This is achieved by using Maximum Likelihood Estimation (MLE), which produces estimates for the unknown parameters that are most likely, given the response patterns in the data. Joint Maximum Likelihood (JMLE) is one type of MLE. The probability of a particular response pattern is given by the log-likelihood function (log Λ) (Wright and Stone 1979):

$$\log \wedge = \sum_{n}^{N} B_n r_n - \sum_{i}^{I} D_i s_i - \sum_{n}^{N}\sum_{i}^{I} \log(1+e^{(B_n - D_i)}) \qquad (2)$$

where r_n is the total raw score for person n, and s_i is the total raw score for item i, N is the number of people and I is the number of items.

Estimates of D_i and B_n are obtained iteratively by applying JMLE. Estimation of parameter estimates ceases (converges) when there is no improvement in estimates (Linacre 2005).

Fit statistics

Once the item and person parameters have been estimated, the fit of the items can be estimated. This refers to how well the predicted responses from the Rasch model (based upon the person and item estimates) match up to the actual responses in the data. This is calculated by determining the residuals; the difference between the Rasch model's prediction for item performance and the actual item performance. Using the person and item estimates, the Rasch model can be used to predict the probability (0-1) of any person succeeding on any item. This probability can then be compared to the actual response from an individual (i.e. 0 or 1). The difference between the observed score and the expected response is then calculated. If the expected response according to the Rasch model is 0.95, and the actual response was 1, then the residual value is +0.05. Low residual values indicate that the actual response was close to the prediction of the Rasch model. Conversely, large residuals indicate that the actual response was not close to the Rasch model prediction.

In practice, fit statistics (outfit and infit) are used to describe how well a set of data fits the predictions of the Rasch model. These can be calculated for both persons and items, based on the residuals. For these calculations the raw residuals are standardised using the variance of the residual. Outfit is calculated from the sum of squared standardised residuals. If X is an observation, E is the expected estimate based on the Rasch model and σ^2 is the variance of the residuals, then the squared standardized residual is (Bond and Fox 2001):

$$Z^2 = \frac{(X - E)^2}{\sigma^2} \qquad (3)$$

Outfit is the mean of the summed squared standardized residuals, i.e (Bond and Fox 2001).

$$Outfit = \frac{\sum Z^2}{N} \qquad (4)$$

Infit is an information-weighted statistic. It gives more weight to people who are close to the difficulty of the item. It is thought that people with ability near to the difficulty of the item will give more insight into the operation of the item (Bond and Fox 2001). This is achieved by weighting the items encountered by each person by its variance, and then summing that value. Infit is calculated by dividing that value by the total sum of the variances (Bond and Fox 2001):

$$Infit = \frac{\sum (Z^2\sigma^2)}{\sum \sigma^2} \qquad (5)$$

Infit and outfit have expected values of 1, with a possible range of 0 to positive infinity. An outfit or infit value of 1.3 would indicate that there is 30% more variation in the observed data compared to the predictions of the Rasch model. In this way, fit statistics provide a means of identifying items which do not appear to 'fit' with the rest of the items and hence are not measuring the same underlying variable. Fit statistics are also sometimes presented in a standardised format, whereby the mean square of the residuals is transformed to a t statistic.

Reliability and errors

Both person ability and item difficulty estimates have associated amounts of error. Standard error measurements for item estimates are usually much smaller than those for person ability estimates. This is because there is usually more data for each item in comparison to the amount of data for each person.

Reliability statistics are also calculated for the person and item estimates. Both item and person separation reliability is reported on a 0 to 1 scale, similar to Cronbach alpha, high values representing higher reliability of the estimates. Reliability can also be described by the separation ratio, which is calculated as the number of standard errors of spread across the items/people (Bond and Fox 2001), reported in standard error units. These values indicate the reliability of the position of the people and items on the scale, or 'ruler'. Root mean square error (RMSE) is also commonly reported, which is the average standard error of all the items/people, indicating the accuracy of the position of the items/people on the 'ruler'.

Polytomous Rasch model

The polytomous model, or rating scale model, is an extension of the basic dichotomous model which can be applied to items which have a rating scale response, such as Likert scales. An item with five response categories is modelled as having four thresholds. Each threshold (K) has an estimated difficulty value (F). The threshold value is the point at which there is a 50% probability of an individual choosing between two adjacent categories. The probability of choosing category k (P_{nik}) is modelled by the Rasch model as (Bond and Fox 2001):

$$P_{nik} = \frac{e^{(B-[D_i+F_k])}}{1+e^{(B-[D_i+F_k])}} \qquad (6)$$

Where F_k is the difficulty of threshold k and D_i+F_k is the item difficulty added to the threshold difficulty, indicating the effect of threshold difficulty on item i.

Inherent within the model is that the thresholds are ordered, thus, higher thresholds measure increasing levels of the variable. In other words, responding to increasing higher categories indicates increasing levels of ability. Disordered thresholds indicate that the higher scores on the item do not equate to increasing levels of the variable. Probability curves provide a visual way to assess the ordering of categories (fig.2.3).

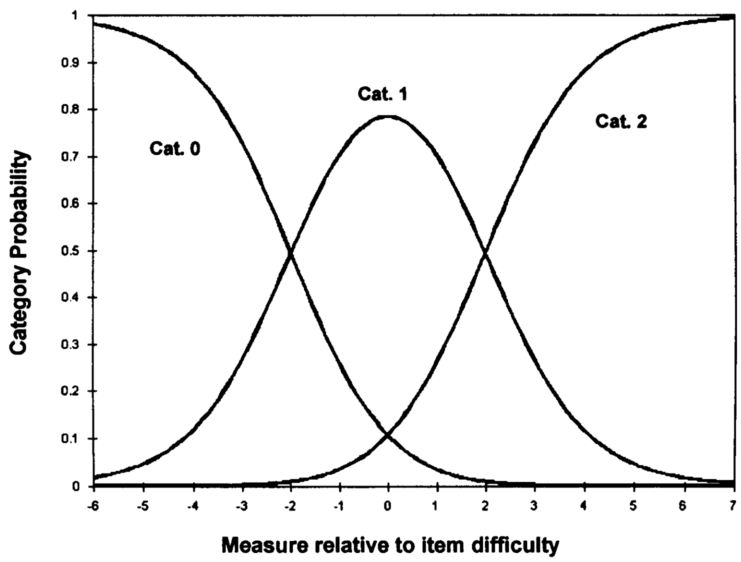

Fig. 2.3: Rasch probability curve for an item with three ordered categories (example taken from Chapter 4).

Threshold estimates are obtained simultaneously with the person and item estimates using Maximum Likelihood Estimation (MLE). One set of threshold estimates are obtained which are then applied to all the items.

2.1.6 The optometric framework of measurement and questionnaire analysis

The differences between the social and physical sciences regarding measurement have been discussed. The social sciences adhere to the Classical Test theory position in which raw scores are interpreted as measures. However, the physical sciences place a greater emphasis upon attaining measurement on a linear interval scale. Within this thesis the physical science paradigm of measurement will be subscribed to. In other words, raw scores from questionnaires will not be treated as continuous interval level measures. Rasch analysis is a useful tool to facilitate the construction of questionnaires which will yield data on a linear interval scale. However, many of the questionnaires used in this thesis were developed within a classical test theory construct. In light of this, two different strategies will be used to analyse questionnaire data. When dealing with raw scores from questionnaires non-parametric statistics will be used thus avoiding the assumptions of a continuous interval measurement, whereas Rasch analysis will be used for the construction of new measures, in order to obtain measurements on a true interval scale.

2.1.7 Utilising questionnaires in research

In this thesis, questionnaires will be used to measure anxiety alongside some other patient variables, including satisfaction and compliance. Therefore, some of the pragmatic aspects of the use of questionnaires in research will be outlined. It has been suggested that due to the ease of using questionnaires in research, the method has been abused (Gillham 2000). Therefore, it is important to establish a clear framework for the use of questionnaires.

2.1.7.1 Selecting questionnaires

Once a research hypothesis is developed, then appropriate questionnaires should be selected to measure the variables of interest. The primary step is to search the existing literature to identify any instruments that already exist (Streiner and Norman 1995). Within this thesis, the resources used were primarily Pubmed and Web of Knowledge. Once questionnaires have been identified, then they should be critically reviewed to establish their validity and reliability.

'Validity' assesses whether a questionnaire is measuring what it is supposed to. Face validity refers to the subjective judgement as to whether the instrument measures what it claims to. The empirical forms of validity include criterion and construct validity. Criterion validity can be sub-categorised into concurrent and predictive validity. Concurrent validity is determined by correlating scores from the scale under investigation and a previously validated 'criterion' scale. For example, a newly developed questionnaire designed to measure patient satisfaction would be expected to give similar results to a previously validated questionnaire measuring the same construct. Predictive validity is a similar correlation, the differing factor is that the 'criterion' scores are collected some time after the scores collected for the investigated scale.

For example, job employees may be asked to complete an aptitude test at the start of a new job. This is then correlated to their job performance scores for the first year of work. Construct validity tests whether the scale has relationships with other variables in an expected way (Bland and Altman 2002). This normally requires testing a hypothesis. For example, does an anxiety scale differentiate between anxiety before and after surgery?

'Reliability' assesses the consistency of the measures attained with the questionnaire. Internal consistency (e.g. Cronbach's alpha) and test-retest reliability (the ability of the questionnaire to produce the same measurement at different time points) are commonly reported. Cronbach's alpha is a statistic which describes how well the items in a scale correlate with one another, this is assumed to indicate how well the items measure the underlying construct. It is based upon comparing the variance of the items in a test, with the variance for each item (Bland and Altman 1997). If k is the number of items, s_i^2 is the variance of the nth item and s^2_T is the variance of the total score, then Cronbach's alpha is: $\alpha = k/k\text{-}1\ (1\text{-}\sum s_n^2/\ s^2_T)$. Cronbach's alpha can have a value between 0 and 1. It is commonly agreed that a value of greater than 0.7 is satisfactory for a scale (Bland and Altman 1997). Questionnaires designed with Rasch analysis may also report extra reliability indices including item/person separation index and root mean square error (described in section 2.1.5).

2.1.7.2 Designing a questionnaire

In the absence of a pre-existing questionnaire to measure the desired variable, a questionnaire will need to be developed. Development of questionnaires is a complex process. However, perhaps the most important aspect is ensuring that the initial pilot questionnaire includes all plausible items relating to the construct to be measured (Streiner and Norman 1995). To ensure that the questionnaire has content validity (i.e. represents all aspects of the measured trait) this information can be obtained in a variety of ways. This should include searching the relevant literature, holding focus groups and conducting interviews (Streiner and Norman 1995). For example, alongside reviewing the literature, designing a questionnaire to measure patient satisfaction when visiting the doctor would include interviewing patients about their experiences and talking to doctors about their perceptions. Once this process has been completed, all the information can then be pooled and initial items constructed based upon the themes obtained. Care should be taken to construct items in which the wording is not ambiguous e.g. avoiding items which ask two questions. The questionnaire should then be piloted and the results assessed to identify items which are not contributing well to the overall score. Validity and reliability testing must also accompany this process, thus allowing a gradual refinement of the questionnaire.

2.1.7.3 Selecting a rating scale

If a Likert scale is used as a response scale in a questionnaire, then an important consideration is the number of categories e.g. should there be an even or odd number of categories. An odd number of categories will allow the respondent a neutral position i.e. allowing a 'undecided' or 'uncertain' position. A decision is also required regarding the labelling of the categories. Research suggests that there is no difference between scales which have each category labelled and those that only have end-anchored scales (Streiner and Norman 1995). When developing a response scale it is useful to evaluate the ways in which participants use the categories. Rasch analysis allows easy inspection of category usage and provides information regarding the ability of participants to discriminate between categories.

2.1.7.4 Respondent biases

When interpreting questionnaire scores it is important to be aware of various biases that can occur. Biases can jeopardize the validity of the scale. Social desirability responding is one type of bias when an individual responds to questions to present themselves in the most socially desirable light (Streiner and Norman 1995). For example, an individual may respond untruthfully to a question such as 'how many hours per day do you wear your contact lenses', in order to create the best impression to the optometrist. One way to minimise this effect is to ensure that participants know that their answers are confidential and to give careful consideration to how the question is asked.

Other types of bias in questionnaire responding include the halo effect and end-aversion bias. The halo effect occurs when an individual simply rates all the items based on a general impression, rather than studying the individual categories (Streiner and Norman 1995). One way to help increase respondent attention to the scale is to include items with both positive and negative content. End-aversion bias occurs when subjects avoid the use of extreme categories (Streiner and Norman 1995). For this reason, when developing a questionnaire, it is important to analyse the way in which the categories are used.

2.2 Physiological measurement of anxiety

Using self-report questionnaires as a method to measure anxiety has been discussed in the first section of this chapter. However, as suggested, there are potential biases which can occur. For example, two types of participant response which can introduce error into the measurement are 'impression management' and 'self-deceptive positivity' (both forms of social desirability responding) (Paulhus 1991). Firstly, 'impression management' refers to when a questionnaire is completed purposefully to create the most positive social image i.e. social desirability responding. Alternatively, 'self-deceptive positivity' describes an honest response; however this is an overly positive self-presentation. Both types of responding will result in skewed results. Therefore, rather than solely rely upon self-report as a measurement of anxiety, physiological methods were also used within this study.

2.2.1 The arousal response

Within the multi-component nature of anxiety, as described in Chapter 1, anxiety is accompanied by physiological changes i.e. arousal. Arousal is not anxiety per se, but is the physiological component, alongside cognition and affect, of the emotional response (Lang 1985).

The body responds to a threat in a number of different ways. A stressful situation results in stimulation of the sympathetic nervous system, producing an immediate "fight or flight" response. Epinephrine, norepinephrine and corticosteroids are secreted from the adrenal gland. These are transported in the bloodstream to act on various targets around the body. For example, the output of the heart is increased resulting in increased blood flow to the muscles. The activity of the sympathetic nervous system also alters the tension of muscles. The bodily responses include an increased heart rate, an increase in cardiac output, pupil dilation, constriction of peripheral blood vessels and piloerection (Toates 1998; Tortora and Grabowski 2000). Measuring any of these bodily responses provides a measure of arousal.

Increased arousal is also related to increased attention to threatening stimuli, fear and motivation (Fimm et al. 2006; Williams et al. 2005). Therefore, this must be taken into consideration when interpreting results from arousal measures.

2.2.2 Measures of arousal and anxiety

There have been a range of arousal measures used in studies to measure anxiety. These include peripheral vasoconstriction (Thyer et al. 1984), heart rate (McLeod et al. 1986; Noteboom et al. 2001; Thyer et al. 1984), skin conductance (McLeod et al. 1986; Noteboom et al. 2001), electromyographic activity (McLeod et al. 1986; Shostak and Peterson 1990), blood pressure (McLeod et al. 1986; Noteboom et al. 2001; Shostak and Peterson 1990) and saliva monitoring (Takagi et al. 2005). The majority of these studies used physiological measures alongside self-report questionnaires, reporting the relationship between the two types of measure; however none of these studies were done in optometric practice. For example, 20 participants were recruited for a study which sought to determine the extent of the relationship between two arousal measures and a self-report measure (Thyer et al. 1984). Participants (in a laboratory environment) watched a mildly stressful film depicting a minor surgical procedure, during which peripheral vasoconstriction and heart rate were continually measured and self-reported anxiety was recorded at various intervals. Physiological electrodes were attached to the participants' fingers to record arousal. Measurements were initially made during a ten minute baseline period before the video started and then throughout the film. Significant correlations between the self-report measure and both measures of arousal were reported (Thyer et al. 1984). The relationship between physiological and self-report anxiety measures have been supported by other studies (McLeod et al. 1986; Noteboom et al. 2001).

One drawback of some of the physiological methods is their invasive nature. For example, a laboratory based study which measured heart rate, skin conductance, electromyographic activity and blood pressure required placing sensors on the participants' arms, fingers and chest (McLeod et al. 1986). However, this thesis is concerned with patient experience of anxiety within the clinical environment; thereby placing some restrictions upon what equipment can be used i.e. there is a need to select techniques which are minimally invasive.

2.2.3 Methodological considerations

When comparing physiological responses between individuals, it is important to account for the influence of pre-stimulus activity (Guglielmi 1999). Levels of pre-stimulus physiological activity vary between individuals e.g. varying levels of resting heart rate. Therefore, the influence of anxiety upon physiological responses cannot be compared across participants unless the influence of the pre-stimulus physiological activity is accounted for. Guglielmi (1999) suggests that one method to account for these variations is to decide upon a baseline value which is subtracted from the post-stimulus response. This will be the approach taken in this thesis.

2.2.4 Physiological measures used in this study

Within the study, bodily arousal is measured with skin conductance and pulse rate. The use of multiple measures is recommended to increase the validity of the results (Blascovich and Kelsey 1990). Both of these measures have received strong support for the measure of arousal in psychophysiological research (Blascovich and Kelsey 1990; Guglielmi 1999). Furthermore, the physiological equipment used to measure skin conductance and pulse rate is minimally invasive, which lends itself well to the clinical context.

Skin conductance is a measurement technique developed in the early 1900's (Dawson et al. 2000) and has been reported as displaying high correspondence to stressful events (Malmstrom et al. 1965). The physiological basis of skin conductance is that eccrine sweat glands are mediated by the sympathetic nervous system. Therefore, upon increasing bodily arousal, the sweat ducts fill, rendering a more conductive path through the skin. Eccrine sweat glands are distinctive to other types of sweat glands because they predominately respond to 'physic' situations, rather than temperature (Stern et al. 2001).

There are two main types of skin conductance responses, non-specific and specific. Non-specific responses are those which are not associated with an external stimuli (Dawson et al. 2000). Studies suggest that non-specific responses correlate to negative emotion, current concern and inner speech (thoughts) (Nikula 1991). It is typical to measure 1-3 non-specific responses per minute in a subject who is resting. Alternatively, specific responses are those that are associated with an external stimuli, which are generally novel or unexpected (Dawson et al. 2000). In order to ascertain that a response is a "specific" elicited response it is useful to consider the latency. The latency of the autonomic response is in the range of 1-3 seconds (Dawson et al. 2000).

Skin conductance is measured in microsiemens (μS). A skin conductance response has a number of components (see fig.2.4). Typically, the latency of a response (i.e. the time between stimulus onset and bodily response; 1-3 seconds) is followed by a rise time of 1-3 seconds for the maximum peak response. The amplitude of the response typically measures between 0.2-1.0 μS. The time taken for 50% recovery of the skin conductance response amplitude is usually in the range of 2-10 seconds.

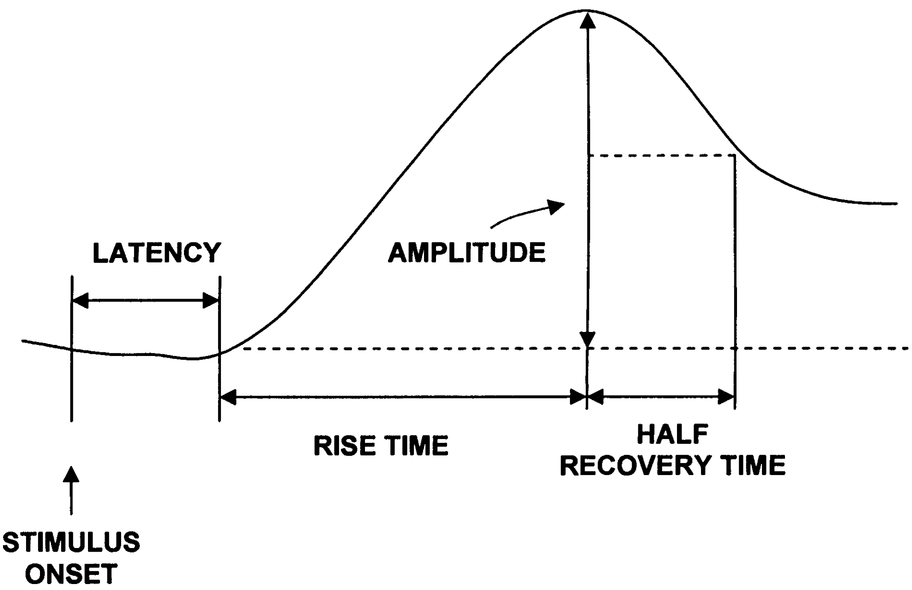

Fig. 2.4: Graphical representation of a skin conductance response (Dawson et al. 2000).

Pulse rate may also be used to measure arousal. Resting pulse rate for an adult is ranges from 60-100 beats per minute. This can increase as a result of exercise, infection or a stressful event. Heart rate is mediated by the autonomic nervous system. Activation of the sympathetic nervous system during a stressful event results in increased heart rate, stronger contractions and results in increased pulse rate. Conversely, the parasympathetic nervous system causes a decrease in heart rate and hence reduction in pulse rate. These two systems have a continual interplay to retain homeostatic equilibrium. This makes the interpretation of pulse rate changes relatively complex (Blascovich and Kelsey 1990).

2.3 Summary

Self-report and physiological methods of measuring anxiety and arousal have been described in this chapter. These methods measure two of the response channels identified in Lang's tripartite model of anxiety (Lang 1985). Where possible, both these methods will be employed allowing a triangulation approach, i.e. using different methods to measure the same variable to increase confidence in the result.

When using questionnaires to measure anxiety, the physical sciences paradigm of measurement will be used as a framework to analyse the results. Therefore, Rasch analysis will be used when developing new measures, thus allowing analysis to include parametric statistics. However, non-parametric statistics will be used when data is gathered using questionnaires which have been developed within a Classical Test theory framework.

Skin conductance and pulse rate will be used to measure the physiological response to anxiety. Analysis of the results will include establishing a baseline value which will then be subtracted from the stimulus responses. This will allow comparison of different participant physiological responses.

Chapter 3: Comparing patient anxiety across primary healthcare domains

3.0 Introduction

To evaluate the significance of patient anxiety in optometric practice, it is helpful to contextualise it within the wider primary healthcare field where patient anxiety is known to be problematic. Many of these problems, which were described in Chapter 1, have been identified in dental and general medical practice. These include; compromised communication between patient and practitioner (Lang et al. 2000; Taylor 1986), non-attendance of appointments (Aro et al. 2001; Brett and Austoker 2001; Skaret et al. 2003; Taani 2002), wastage of healthcare resources due to the excessive utilisation of services (Connelly et al. 1989; Frostholm et al. 2005) and increased medicine use (Bush and Osterweis 1978). If anxiety is a feature of optometric practice we may expect that some of these problems will also be encountered by optometrists. Therefore, this chapter reports a comparative study of patient anxiety levels in optometric practice compared with dental and general medical practice. In this chapter, the relationship between patient anxiety and satisfaction, compliance and recall will also be investigated in all three domains.

To enable a comparison of anxiety across all three healthcare domains, a generic self-report measure is required. The Spielberger state-trait inventory (STAI) is commonly used to measure state anxiety. It has been used to measure anxiety in dental (Dailey et al. 2002; Griffiths et al. 1998) and medical patients (Coudeyre et al. 2002; Skinner et al. 2005), including individuals undergoing cataract surgery (Habib et al. 2004; Mokashi et al. 2004; Nijkamp et al. 2004). However, the ability to compare levels of state anxiety across healthcare domains is complicated by the use of different versions of the STAI and the varying ways in which the scores are calculated. A measurement of state anxiety across healthcare domains using the same version of the STAI would facilitate a comparison.

Perhaps one of the most problematic consequences of anxiety is that it has been identified as a barrier to effective communication (Taylor 1986). This is highly relevant because poor communication is associated with decreased satisfaction (Ley 1982a; Richards 1990), recall (Bartlett et al. 1984; Ley and Spelman 1967) and patient compliance (Bartlett et al. 1984; Edmunds et al. 1997; Ley 1982a). This would suggest that patient anxiety may also have a detrimental effect on these outcome variables, all of which are fundamental to successful patient outcomes. However, the nature of the relationship between patient anxiety and these variables has not been established within the literature.

One dental study has sought to identify the relationship between patient anxiety and satisfaction (Corah et al. 1985). Patient anxiety was measured before and during the consultation, and satisfaction was measured after the consultation. The results showed that anxiety during the appointment was significantly related to final satisfaction (Corah et al. 1985). However, there are no other studies within the literature which confirm these results. Establishing the influence of anxiety upon satisfaction is important because dissatisfied patients are less likely to comply with advice (Claydon et al. 1998; Ley 1982a) and are more likely to make complaints (Richards 1990).

The problem of poor recall in medical settings, including ophthalmology, is well reported (Deokule et al. 2004; Edmunds et al. 1997; Harrington et al. 2004; Parkin and Skinner 2003). Poor recall of information heightens the risk of patient non-compliance, increasing the probability of further health problems (Shapiro et al. 1992). For example, poor recall may partly explain why approximately fifty percent of contact lens wearers are non-compliant with practitioner advice (Claydon and Efron 1994). Due to the problematic nature of poor recall and compliance upon clinical outcomes, it would be beneficial to evaluate the relationship between patient anxiety and these variables. There is some disagreement in the literature regarding the relationship between anxiety and recall (Ley

1982b). Ley (1979) reports the finding of a Yerkes-Dodson type curvilinear relationship, in which recall is degraded by high or low anxiety but is optimal for average levels of anxiety (Ley 1979). However, it has also been reported that higher levels of anxiety can improve recall of medical information (Leeb et al. 1976). These reports contradict results reported in an oncology study, which showed that there was an association between high state anxiety and poor recall of information (Shapiro et al. 1992).

It has been suggested that the variability of results in recall studies is due to the wide variety of methods used to assess recall (McClement and Hack 1999). For example, Ley (1979) assessed recall by recording how many practitioner-statements the patient could remember, whereas, Shapiro (1992) used a multiple choice recall questionnaire. Other methods have included; recording the percentage of facts recalled post-consultation (Reynolds et al. 1981), use of open ended questions (Dunn et al. 1993), comparison between patient versus practitioner-identified key points (Tattersall et al. 1994) and comparison of patient recall with a video-recording of the consultation (Parkin and Skinner 2003). There is also great variability in the time post-consultation at which recall is measured (McClement and Hack 1999). The inconsistency between measures makes meaningful comparisons between studies difficult. In view of the disagreement between studies relating anxiety and recall, alongside the variability of recall measures used, the study described in this chapter will employ a single uniform method to assess the association of anxiety with recall.

The generation of anxiety via 'outcome expectancies' was discussed in Chapter 1 (see 1.1.1.4) i.e. anxiety resulting from the cognitive appraisal of the outcomes of a situation. Ophthalmic research has shown that patient expectancies are a predictor of pre-cataract surgery anxiety (Nijkamp et al. 2004; Nijkamp et al. 2002). Outcome expectancies identified as causing anxiety in dentistry include the prospect of pain and possible loss of autonomy within the patient-practitioner relationship

(Abrahamsson et al. 2002; Spielberger 1983). Currently there is no research which identifies the outcome expectancies that provoke anxiety in optometric practice. However, it would be useful to determine if these are similar to those reported in medical and dental practice, as that would imply that the same anxiety-reducing interventions may be effective in optometric practice. Furthermore, apart from identifying anxiety provoking patient expectancies, it would be useful to identify predictors of patient state anxiety within optometric practice.

The study reported in this chapter will allow a comparison of patient anxiety and outcome expectancies between healthcare domains, as well as identifying the association of anxiety with patient satisfaction, compliance and recall. The design of this study was such that state anxiety, trait anxiety and outcome expectancies were measured prior to the consultation. Participant satisfaction, intended compliance and recall were measured post consultation. All of the data were collected via self-report questionnaires. The same design was used for optometric, dental and general medical practice.

The three main hypotheses which will be tested in this study are:

1) patient state anxiety within optometric practice is comparable to that reported in dental and general medical practice.
2) high pre-consultation state anxiety is significantly associated with lower post-consultation satisfaction, intended compliance and recall.
3) Outcome expectancies which relate to state anxiety in optometric practice are comparable to those in dental and general medical practice.

The final and integral aim of this study was to identify the factors which predict state anxiety in optometric practice.

3.1 Methods

Two patient questionnaires were assembled for this study. The pre-consultation questionnaire incorporated measures of patient anxiety (state and trait) and patient outcome expectancies about the consultation. The post-consultation questionnaire included measures of patient satisfaction, intended compliance and level of recall about the consultation. To enable a measurement of patient recall, the practitioner also completed a short questionnaire at the close of the consultation regarding what had been said to the patient. The results from the practitioner questionnaire were then compared to the patient responses to evaluate recall.

3.1.1 Questionnaires

Existing medical and healthcare literature was searched using PUBMED and Web of Science to identify instruments which measured state and trait anxiety, outcome expectancies, satisfaction, intended compliance and recall. A number of questionnaires measuring anxiety and satisfaction were identified (Baker 1990; Beck et al. 1988; Boynton 2004; Boynton and Greenhalgh 2004; Corah 1969; Corah et al. 1984; Grogan et al. 1995; Hakeberg et al. 2000; Hinshaw and Atwood 1982; Howie et al. 1998; Laerum et al. 1998; Lucock and Morley 1996; Marteau and Bekker 1992; Meakin and Weinman 2002; Ruggeri and Dallagnola 1993; Skinner et al. 2005; Streiner and Norman 1995; Van Knippenberg et al. 1990; Wolf et al. 1978; Zigmond and Snaith 1983). However, there were no questionnaires specifically measuring outcome expectancies, compliance or recall.

Questionnaires were inspected to determine how applicable they would be to all three healthcare domains. In the interests of minimising respondent burden the length of questionnaires was also considered (Streiner and Norman 1995). The reported reliabilities of the questionnaires were also inspected. The final questionnaires which were selected will now be described in detail.

3.1.1.1 Pre-consultation questionnaire

Apart from the measures of anxiety and outcome expectancies, data concerning patient date of birth, gender, first language, educational status, last appointment, reason for appointment and refractive status were also collected via the pre-consultation questionnaire. All materials were reproduced in large font (Arial 16) for those people with low levels of vision.

State anxiety measure

The Spielberger State-Trait Inventory (STAI) (Spielberger 1983) is a widely used instrument within healthcare (Chan et al. 2003; Cruise et al. 1997; Farmer et al. 2003; Kiyohara et al. 2004; Millar et al. 1995; Qureshi et al. 2001; Sari et al. 2005; Yusa et al. 2004), which incorporates two 20-item subscales measuring state and trait anxiety. The items are generic, and as such can be used across all three primary healthcare domains e.g. "right now I feel calm". Therefore, this scale was chosen to measure state anxiety in this study. In an attempt to reduce the length of the pre-consultation questionnaire and reduce respondent burden, a shortened 6-item version of the scale (Marteau and Bekker 1992), which has been previously used in healthcare studies (Maissi et al. 2004; McManus et al. 2005; Robb et al. 2006; Skinner et al. 2005), was used. The scale has good internal reliability (Cronbach alpha 0.82) and correlation with the full STAI is high (r=0.95) (Marteau and Bekker 1992). Each item has four response categories ('not at all', 'somewhat', 'moderately' and 'very much') and higher scores indicate higher anxiety. Therefore, the shortened 6-item Spielberger State Anxiety Scale was used to measure state anxiety (Appendix I).

Trait anxiety measure

A shortened version of the Spielberger trait scale (Spielberger 1983) was also identified (Van Knippenberg et al. 1990). However, this was a Dutch version and therefore, unsuitable. According to the STAI manual a short form of the trait anxiety scale may be constructed based upon item-remainder correlations (Spielberger 1983). Therefore, the 20-item scale was shortened to six items (the same length as the shortened state anxiety scale) (Marteau and Bekker 1992) (Appendix I).

Outcome expectancy measures

In order to identify outcome expectancies which relate to anxiety in primary healthcare, medical, dental and ophthalmic literature was searched and repeated ideas were grouped into key themes (Abrahamsson et al. 2002; Arntz et al. 1990; Brett and Austoker 2001; Corah 1969; De Leo et al. 1999; Fylan and Grunfeld 2005; House and Stark 2002; Kim et al. 2001; Little et al. 2001; McNeil and Berryman 1989; Moore et al. 2004; Nijkamp et al. 2002; Roybyrne et al. 1994; Takayama et al. 2001). Additional information regarding what patients might expect within optometric practice was gathered from interviews and focus group discussions which were principally conducted to help design the Optometric Patient Anxiety Scale (OPAS) (Court et al. 2007). The main generic outcome expectancy themes which were identified as anxiety provoking were; 1) The patient/practitioner relationship (including; i: embarrassment and ii: loss of autonomy), 2) physical discomfort to the patient, 3) expecting bad news, 4) personal cost (in terms of money) and 5) skill of the practitioner. For each theme two items were created (Appendix I). Each item had a four response option ('not at all likely', 'somewhat likely', 'moderately likely' and 'very likely'). The total score of each of the themes was calculated by adding the two item scores together. Low scores indicate low outcome expectancies and high scores indicate high outcome expectancies.

3.1.1.2 Post-consultation questionnaire

The post-consultation questionnaire also recorded the date of the consultation, date of birth and gender. This information was required to enable the pre- and post-questionnaires to be matched.

Satisfaction

The Medical Interview Satisfaction Scale (MISS-21) (Meakin and Weinman 2002) is a patient satisfaction questionnaire which has been developed specifically for use in British general medical practice and is specific to the patient-practitioner encounter. The questionnaire has four subscales, namely, Communication Comfort, Distress Relief, Compliance Intent and Rapport. This study seeks to determine the effect of pre-consultation anxiety upon patient satisfaction with the consultation encounter. The eight items in the Rapport subscale are very specific about the patient-practitioner encounter and were therefore deemed appropriate to measure this element of satisfaction, for example *"I really felt understood by my doctor".* Furthermore, the items were assessed to be equally applicable to all three of the primary care domains. Therefore, this subscale was used as a measure of satisfaction in this study (the word "doctor" was replaced with "dentist" or "optometrist" dependent on domain). The Rapport subscale has good published internal reliability of 0.90 (Meakin and Weinman 2002) and each item has seven response categories (very strongly agree-very strongly disagree) (Appendix II). Higher scores indicate higher satisfaction levels.

Intended compliance

The 3-item 'Compliance Intent' subscale incorporated in the MISS-21 (Meakin and Weinman 2002) was assessed to be applicable across all domains, for example *"I expect that it will be easy for me to follow the doctor's advice".* Therefore, this subscale was used to measure intended compliance in the study (the word "doctor" was replaced with "dentist" or "optometrist" dependent on domain). The published internal reliability of the subscale (Cronbach alpha 0.67) (Meakin and Weinman 2002) is only slightly less than the recommended value of 0.70 (Nunnally 1978). Similarly to the Rapport subscale, each item has seven response categories (very strongly agree-very strongly disagree) (Appendix II). Again, higher scores indicate higher levels of intended compliance.

Recall

The comparison of patient and practitioner memories of consultations has been used to measure recall (Parkin and Skinner 2003). Therefore, patient recall was measured by comparing the patient and practitioner recollection of the consultation on a number of variables. Both the patient and practitioner independently recorded; i) if the time until the next consultation was specified, ii) the main piece of advice given and iii) identified which statements the practitioner had made from a pre-determined list.

The lists of statements included those commonly made by optometrists, dentists and general practitioners (GP's). These statements were gathered by asking nine local optometrists, dentists and GP's to think of statements they made regularly to patients. Items were chosen that had a relatively diverse content. Furthermore, when deciding which items to choose, effort was made to ensure that the items between the three domains were relatively similar, e.g. each domain had a statement about health *"your eyes are healthy/ your teeth are healthy/you don't need medication".* A total of five statements were selected for each domain (Appendix III).

The practitioner had a separate sheet on which to record the recall data, namely; if the time until the next consultation was specified, the main piece of advice given and which statements had been made from the pre-determined list (the same five statements in the patient questionnaire). This information was required from the practitioner in order to gauge the accuracy of patient recall. The practitioner also recorded the patient date of birth and gender so that this information could be matched up with the patient questionnaire.

3.1.1.3 Summary of the questionnaires

In summary, the pre-consultation patient questionnaire contained 24 items designed to measure state anxiety, trait anxiety and outcome expectancies (a copy of the questionnaire may be found in Appendix I). The post-consultation patient questionnaire incorporated 14 items which measured satisfaction, compliance and recall (a copy of the questionnaire may be found in Appendix II). The two questionnaires took approximately 5-10 minutes to complete. The practitioner also recorded information about the content of the consultation on a separate pro forma.

3.1.2 Study design and practice recruitment

Optometric, dental and general practices that took part in the study were matched for catchment area. These were selected from three areas in South Wales; a busy city centre, a town and a more rural location. Sixty seven practices were identified within each of these locations and were sent an initial letter outlining the nature of the study. This was complemented by a follow-up call to the practice about two weeks later to discuss whether the practice were interested in finding out more about the research. If the practices were interested, they were sent a study protocol and a visit to the practice was arranged. Fourteen practice visits were undertaken to provide an opportunity for the practice staff to raise any questions and to decide upon a start date for the study. All fourteen practices agreed to participate, four city centre practices, six town practices and four rural practices.

During the first day of the study a practice visit was undertaken in order to help familiarise staff with the protocol. Each member of staff was given a verbal briefing in order to ensure they fully understood the procedure. A written copy of the protocol was also placed in a visible location for staff near to the reception desk and a practitioner protocol was also provided.

All procedures adhered to the tenets of the Declaration of Helsinki and ethical approval was obtained from the South East Wales Research Ethical Committee (REC reference: 04/WSE02/75).

3.1.3 Protocol

Practice receptionists were instructed to give every patient aged 16 and over a questionnaire pack. This included an information sheet, consent form, the pre-consultation questionnaire and an envelope. Once the participant had completed the paperwork, they took it with them into the consultation. At the close of the consultation the participant was given the post-consultation questionnaire to complete before leaving the practice. Once completed, the patient put both questionnaires into the envelope and posted it into a wooden box in reception. The patient was instructed to post the consent form separately for confidentiality reasons (i.e. their signature was on the consent form). The practitioner was also provided with a form to complete for each patient at the end of the consultation and instructed to place their form in the box at the close of each day.

In order to record the number of patients declining to participate in the study, there was an appropriate box on the consent form for these patients to mark.

3.1.4 Statistical analysis

All of the questionnaire data were entered into SPSS Ver. 12 for analysis. Items from the shortened 6-item Spielberger State-Trait Anxiety Scale (Marteau and Bekker 1992), the shortened trait anxiety measure (Spielberger 1983), the expectancy measure and the 'rapport' and 'intended compliance' subscales of the MISS-21 (Meakin and Weinman 2002) were recoded such that all items had the same valence (i.e. all positive or negative content). Scores for each measure were calculated according to established protocols (Marteau and Bekker 1992; Meakin and Weinman 2002; Spielberger 1983), and the scores for each outcome expectancy theme were calculated (the sum of the two items for each theme).

To analyse the recall data on the post-consultation questionnaire, pertaining to the main piece of advice given by the practitioner, a qualitative analysis was used. For each questionnaire, the main piece of advice from the practitioner and the participant was compared. Participants were classified as being in complete agreement, some agreement or complete disagreement. This was done masked. However, due to the content of the advice there was often an awareness of which healthcare domain was being analysed, increasing the risk of bias.

The sample size (n=167 per domain) was determined to detect a difference of 1.2 in state anxiety (a difference of "clinical importance" (Dailey et al. 2002)) between two healthcare domains (with α set at 0.05 and power at 80%) (Altman 1991; Lehmann and D'Abrera 2006).

The majority of the statistical analysis was conducted using SPSS Ver 12. All statistical tests were two tailed. The initial analysis was an inspection of the amount of missing data. Analyses were conducted to assess the influence of missing data on the validity of the analysis. Non-parametric statistical tests were used because all of the scales were developed within traditional test design parameters (see Chapter 2 for further explanation) i.e. data were treated as interval level data. In accordance with established guidelines (Perneger 1998) the Bonferroni correction for multiple comparisons (Bland and Altman 1995) was also used when there was no a priori hypothesis being tested.

3.2 Results

A total of 941 participants took part in the study across the three primary healthcare domains. Initial screening of the data showed that four questionnaires had been completed by participants under sixteen years old. Since the study was approved for patients of sixteen and over, these questionnaires were not included in the analysis. A further four questionnaires with missing date of birth were also removed because the pre- and post-consultation questionnaires could not be matched. No consent forms indicated that anyone declined to take part in the study.

Further inspection of the data showed that five questionnaires had missing gender, 39 questionnaires had missing education and 35 had missing first language. However, it was decided to retain all these questionnaires in the analysis. Therefore, there were a total of 933 questionnaires for further analyses.

The total number of pre-consultation questionnaires collected from the optometric, dental and general practice domains were 366, 225 and 342 respectively.

3.2.1 Missing data analysis

Prior to the main analysis, it was important to assess the influence of missing data. Patterns in missing data are more important than the amount missing, because they have the potential to affect the generalizability of the results (Tabachnick and Fidell 1989). The analysis included an inspection of incomplete pre-consultation questionnaires and analysis of post-consultation questionnaire returns.

3.2.1.1 Analysis of incomplete pre-consultation questionnaires

Data were screened to identify participants who had not fully completed the pre-consultation questionnaire. Reasons for incomplete questionnaires may have included time pressures or participants missing the first and last pages. If this was the case, it would not be expected to find differences between participants who did and did not complete the pre-consultation questionnaire. This hypothesis was tested by comparing the two groups for age, gender, last examination, reason for examination and educational status within each of the three separate healthcare domains. Inspection of the histograms and Q-Q plots showed that the distribution of age within the general practice domain was not normally distributed. Therefore, Mann Whitney U and chi square were used to compare groups as appropriate (see table 3.1).

One hundred and fifty six participants did not fully complete the pre-consultation questionnaire. The results in table 3.1 demonstrate that older people were significantly less likely to complete the first questionnaire in all three domains. Also, in both dental and optometric practice there was a significant difference between the two groups with regard to educational status. Participants with no qualifications were least likely to return complete questionnaires in both practice domains.

Variable	Domain	Completed pre-consultation questionnaire	Incomplete pre-consultation questionnaire	Statistical comparison
Age:				
	Optometrist	median=53 (n=307)	median=70 (n=59)	z=-5.86, p<0.001**
	Dentist	median=43 (n=189)	median=58.5 (n=36)	z=-3.39, p<0.001**
	Doctor	median=42 (n=281)	median=65 (n=61)	z=-4.78, p<0.001**
Gender:				
	Optometrist	Female; n=197 (64.2%) Male; n=110 (35.8%)	Female; n=42 (71.2%) Male; n=17 (28.8%)	$\chi^2(1)=0.79$; p=0.38
	Dentist	Female; n=110 (58.5%) Male; n=78 (41.5%)	Female; n=22 (62.9%) Male; n=13 (37.1%)	$\chi^2(1)=0.09$; p=0.77
	Doctor	Female; n=184 (65.7%) Male; n=96 (34.3%)	Female; n=41 (69.5%) Male; n=18 (30.5%)	$\chi^2(1)=0.17$; p=0.68
Last examination:				
	Optometrist	<6 months; n=27 (8.9%) 6-12 months; n=94 (31.0%) 1-2 years; n=125 (41.3%) >2 years; n=55 (18.2%) Never; n=2 (0.7%)	<6 months; n=4 (7.0%) 6-12 months; n=21 (36.8%) 1-2 years; n=20 (35.1%) >2 year; n=11 (19.3%) Never; n=1 (1.8%)	$\chi^2(4)=1.89$; p=0.76
	Dentist	<6 months; n=94 (49.7%) 6-12 months; n=55 (29.1%) 1-2 years; n=12 (6.3%) >2 years; n=27 (14.3%) Never; n=1 (0.5%)	<6 months; n=19 (57.6%) 6-12 months; n=5 (15.2%) 1-2 years; n=3 (9.1%) >2 years; n=6 (18.2%) Never; n=0 (0%)	$\chi^2(4)=3.14$; p=0.54
	Doctor	<6 months; n=219 (78.2%) 6-12 months; n=40 (14.3%) 1-2 years; n=16 (5.7%) >2 years; n=5 (1.8%) Never; n=0 (0%)	<6 months; n=38 (77.6%) 6-12 months; n=6 (12.2%) 1-2 years; n=5 (10.2%) >2 years; n=0 (0%) Never; n=0 (0%)	$\chi^2(3)=2.32$; p=0.51
Reason for examination:				
	Optometrist	Routine n=221 (74.7%) Problem n=67 (22.6%) Emergency n=8 (2.7%)	Routine n=19 (61.3%) Problem n=10 (32.3%) Emergency n=2 (6.5%)	$\chi^2(2)=3.08$; p=0.22
	Dentist	Routine n=81 (43.3%) Problem n=32 (17.1%) Treatment n=60 (32.1%) Emergency n=14 (7.5%)	Routine n=7 (41.2%) Problem n=6 (35.3%) Treatment n=4 (23.5%) Emergency n=0 (0%)	$\chi^2(3)=4.42$; p=0.22
	Doctor	Routine n=53 (19.2%) Problem n=136 (49.3%) Treatment n=28 (10.1%) Emergency n=59 (21.4%)	Routine n=4 (19.0%) Problem n=13 (61.9%) Treatment n=3 (14.3%) Emergency n=1 (4.8%)	$\chi^2(3)=3.61$; p=0.31
Education:				
	Optometrist	No Qualifications; n=92 (30.7%) GCSE /equivalent; n=94 (31.3%) A levels/equivalent; n=54 (18%) Degree; n=60 (20%)	No Qualifications; n=25 (51.0%) GCSE/equivalent; n=10(20.4%) A levels/equivalent; n=4 (8.2%) Degree; n=10 (20.4%)	$\chi^2(3)=9.35$; p=0.025*
	Dentist	No Qualifications; n=62 (33.0%) GCSE/equivalent; n=73 (38.8%) A levels/equivalent; n=35 (18.6%) Degree; n=18 (9.6%)	No Qualifications; n=20 (62.5%) GCSE/equivalent; n=5 (15.6%) A levels/equivalent; n=1 (3.1%) Degree; n=6 (18.8%)	$\chi^2(3)=16.67$; p=0.010**
	Doctor	No Qualifications; n=67 (24.1%) GCSE/equivalent; n=92 (33.1%) A levels/equivalent; n=68 (24.5%) Degree; n=51 (18.3%)	No Qualifications; n=17 (36.2%) GCSE/equivalent; n=11(23.4%) A levels/equivalent; n=8 (17%) Degree; n=11 (23.4%)	$\chi^2(3)=4.50$; p=0.18

Table 3.1: Comparison between participants who did and did not fully complete questionnaire 1 (*significant at p=0.05 level, **significant at p=0.01 level).

3.2.1.2 Analysis of post-consultation questionnaire return

The data were also screened to identify participants who did not return the post-consultation questionnaire. The main reason for non-returned questionnaires could have been because the practitioner failed to give the participant a questionnaire. Upon this basis, it would not be expected to find differences between participants who did and did not return a post-consultation questionnaire. This hypothesis was tested by comparing groups for age, gender, last examination, reason for examination and educational status within each of the three separate healthcare domains (see table 3.2).

One hundred and twenty one participants only completed the pre-consultation questionnaire. Table 3.2 shows that a higher percentage of males did not return the post-consultation questionnaire compared to the group who did return the questionnaire. However, this was only identified in the general practice domain.

3.2.1.3 Summary of missing data

In summary, the only consistent pattern across all domains was that there were more missing data in the pre-consultation questionnaire from older participants. However, removing these questionnaires from the data set would potentially result in an under-representation of the older age range. Therefore, none of the participant data were removed from the analysis due to missing data, to guard against biasing the sample. Table 3.1 also showed that participants with lower educational status were less likely to fully complete the pre-consultation questionnaire in the dental and optometric domains. It was decided to retain these questionnaires, as removal would have resulted in an under-representation of the lower educational group. However, when interpreting the results of the analysis there must be regard for the potential influences of missing data.

Variable	Domain	Post-consultation questionnaire returned	Post-consultation questionnaire not returned	Statistical comparison
Age:				
	Optometrist	median=58 (n=346)	median=48.5 (n=20)	z=-0.63, p=0.53
	Dentist	median=46 (n=183)	median=39.5 (n=42)	z=-1.13, p=0.26
	Doctor	median=46 (n=283)	median=42 (n=59)	z=-1.08, p0.28
Gender:				
	Optometrist	Female; n=227 (65.6%) Male; n=119 (34.4%)	Female; n=12 (60%) Male; n=8 (40%)	$\chi^2(1)=0.07$; p=0.79
	Dentist	Female; n=106 (58.6%) Male; n=75 (41.4%)	Female; n=26 (61.9%) Male; n=16 (38.1%)	$\chi^2(1)=0.05$; p=0.82
	Doctor	Female; n=194 (69%) Male; n=87 (31%)	Female; n=31 (53.4%) Male; n=27 (46.6%)	$\chi^2(1)=4.56$; p=0.033*
Last examination:				
	Optometrist	<6 months; n=27 (7.9%) 6-12 months; n=110 (32.4%) 1-2 years; n=140 (41.2%) >2 years; n=60 (17.6%) Never; n=3 (0.9%)	<6 months; n=4 (20.0%) 6-12 months; n=5 (25.0%) 1-2 years; n=5 (25.0%) >2 year; n=6 (30.0%) Never; n=0 (0%)	$\chi^2(4)=6.49$; p=0.17
	Dentist	<6 months; n=93 (51.7%) 6-12 months; n=52 (28.9%) 1-2 years; n=12 (6.7%) >2 years; n=22 (12.2%) Never; n=1 (0.6%)	<6 months; n=20 (47.6%) 6-12 months; n=8 (19.0%) 1-2 years; n=3 (7.1%) >2 years; n=11 (26.2%) Never; n=0 (0%)	$\chi^2(4)=6.05$; p=0.20
	Doctor	<6 months; n=208 (77.0%) 6-12 months; n=40 (14.8%) 1-2 years; n=17 (6.3%) >2 years; n=5 (1.9%) Never; n=0 (0%)	<6 months; n=49 (83.1%) 6-12 months; n=6 (10.2%) 1-2 years; n=4 (6.8%) >2 years; n=0 (0%) Never; n=0 (0%)	$\chi^2(3)=2.08$; p=0.56
Reason for examination:				
	Optometrist	Routine n=229 (73.6%) Problem n=74 (23.8%) Emergency n=8 (2.6%)	Routine n=11 (68.8%) Problem n=3 (18.8%) Emergency n=2 (12.5%)	$\chi^2(2)=5.12$; p=0.08
	Dentist	Routine n=73 (44.2%) Problem n=32 (19.4%) Treatment n=49 (29.7%) Emergency n=11 (6.7%)	Routine n=15 (38.5%) Problem n=6 (15.4%) Treatment n=15 (38.5%) Emergency n=3 (7.7%)	$\chi^2(3)=1.34$; p=0.72
	Doctor	Routine n=45 (18.6%) Problem n=124 (51.2%) Treatment n=25 (10.3%) Emergency n=48 (19.8%)	Routine n=12 (21.8%) Problem n=25 (45.5%) Treatment n=6 (10.9%) Emergency n=12 (21.8%)	$\chi^2(3)=0.64$; p=0.89
Education:				
	Optometrist	No Qualifications; n=112 (33.9%) GCSE/equivalent; n=101(30.6%) A level/equivalent; n=52 (15.8%) Degree; n=65 (19.7%)	No Qualifications;n=5(26.3%) GCSE/equivalent;n=3(15.8%) A level/equivalent;n=6(31.6%) Degree; n=5 (23.6%)	$\chi^2(3)=4.73$; p=0.19
	Dentist	No Qualifications; n=70 (39.3%) GCSE/equivalent; n=61(34.3%) A level/equivalent; n=29 (16.3%) Degree; n=18 (10.1%)	No Qualifications;n=12(28.6%) GCSE/equivalent;n=17(40.5%) A level/equivalent;n=7(16.7%) Degree; n=6 (14.3%)	$\chi^2(3)=1.97$; p=0.58
	Doctor	No Qualifications; n=68 (25.6%) GCSE/equivalent; n=81 (30.5%) A level/equivalent; n=61 (22.9%) Degree; n=56 (21.1%)	No Qualifications;n=16(27.1%) GCSE/equivalent;n=22(37.3%) A level/equivalent;n=15(25.4%) Degree; n=6 (10.2%)	$\chi^2(3)=3.88$; p=0.27

Table 3.2: Comparison between participants who did and did not return questionnaire 2 (* significant at p=0.05).

3.2.2 Comparison of primary healthcare domains

Before testing the primary hypothesis (that state anxiety is comparable in optometric practice to other primary healthcare domains) it was necessary to assess the comparability of the participants within each healthcare domain. This is important because differences between groups may influence the comparison of state anxiety levels. Therefore, age, gender, educational status, last test, reason for examination and trait anxiety were compared across the three domains (see Table 3.3).

Kruskal Wallis and Chi square tests were used, incorporating Bonferroni correction for multiple tests (Bland and Altman 1995). Table 3.3 shows that there was a significant difference between groups for all the variables apart from gender.

	Entire sample	Optometrist	Dentist	Doctor	Statistical comparison
N	933	366	225	342	
Age (median; Interquartile range)					
	50 (34-65)	57.5 (40-69)	45 (33-58)	44.5 (30-63)	$\chi^2(2)=44.62$; $p<0.001^*$
Gender					
Female	596 (63.9%)	239 (65.3%)	132 (58.7%)	225 (65.8%)	$\chi^2(2)=3.28$; $p=0.19$
Male	332 (35.6%)	127 (34.7%)	91 (40.4%)	114 (33.3%)	
Missing	5 (0.5%)	0	2 (0.9%)	3 (0.9%)	
Education					
No qualifications	283 (30.3%)	117 (32%)	82 (36.4%)	84 (24.6%)	$\chi^2(6)=19.78$; $p=0.003^*$
GCSE or equivalent	285 (30.5%)	104 (28.4%)	78 (34.7%)	103 (30.1%)	
A levels or equivalent	170 (18.2%)	58 (15.8%)	36 (16%)	76 (22.2%)	
Degree	156 (16.7%)	70 (19.1%)	24 (10.7%)	62 (18.1%)	
Missing	39 (4.2%)	17 (4.6%)	5 (2.2%)	17 (5%)	
Reason for examination					
Routine	385 (41.3%)	240 (65.6%)	88 (39.1%)	57 (16.7%)	$\chi^2(6)=304.68$; $p<0.001^*$
Problem	264 (28.3%)	77 (21%)	38 (16.9%)	149 (43.6%)	
Treatment	95 (10.2%)	0	64 (28.4%)	31 (9.1%)	
Emergency	84 (9%)	10 (2.7%)	14 (6.2%)	60 (17.5%)	
Missing	105 (11.3%)	39 (10.7%)	21 (9.3%)	45 (13.2%)	
Last examination					
<6 months	401 (43%)	31 (8.5%)	113 (50.2%)	257 (75.1%)	$\chi^2(8)=388.75$; $p<0.001^*$
6-12 months	221 (23.7%)	115 (31.4%)	60 (26.7%)	46 (13.5%)	
1-2 year	181 (19.4%)	145 (39.6%)	15 (6.7%)	21 (6.1%)	
>2 year	104 (11.1%)	66 (18%)	33 (14.7%)	5 (1.5%)	
never	4 (0.4%)	3 (0.8%)	1 (0.4%)	0	
Missing	22 (2.4%)	6 (1.6%)	3 (1.3%)	13 (3.8%)	
Trait anxiety (median; Interquartile range)					
	10 (8-13)	9 (7-12)	10 (8-13)	11 (8-14)	$\chi^2(2)=19.10$; $p<0.001^*$

Table 3.3: Demographics of the entire sample (* significant at p=0.05 level)

Table 3.3 shows that there is a significant difference in age, education, reason for examination, last examination and trait anxiety across domains. These differences may potentially affect the comparison of state anxiety between domains. Therefore, these differences will be investigated further in the following analyses.

3.2.3 Questionnaire analysis

The internal reliability of the separate instruments was assessed with Cronbach alpha. The Cronbach alpha values for this analysis were: state anxiety $\alpha=0.88$, trait anxiety $\alpha=0.86$, satisfaction $\alpha=0.96$ and intended compliance $\alpha=0.61$. The Cronbach alpha value for the intended compliance subscale is slightly lower than the published value of 0.67 (Meakin and Weinman 2002).

3.2.3.1 Comparison of participant state anxiety across primary healthcare domains

The primary hypothesis of this study was that state anxiety reported by participants attending optometric practice would be comparable to that reported by participants in the other healthcare domains.

To determine if there were any differences in state anxiety between domains, the Kruskal-Wallis test was used with post-hoc Mann-Whitney U incorporating Bonferroni correction (Bland and Altman 1995) to identify differences between groups. The median values of state anxiety for the optometric, dental and general practice groups were 8, 10 and 11 respectively (fig.3.1). The initial comparison of state anxiety between groups detected a significant difference {$\chi^2(2)=89.77$; $p<0.001$} and post hoc analysis showed that state anxiety was significantly less within the optometric domain compared to the dental {$z=-6.04$; $p<0.001$} and general practitioner domains { $z=-9.20$; $p<0.001$} (see fig.3.1). This finding is inconsistent with the primary hypothesis of the study. However, as already noted that are some other differences between the samples, therefore, a secondary analysis will be conducted in order to detect the influence of other variables upon this comparison.

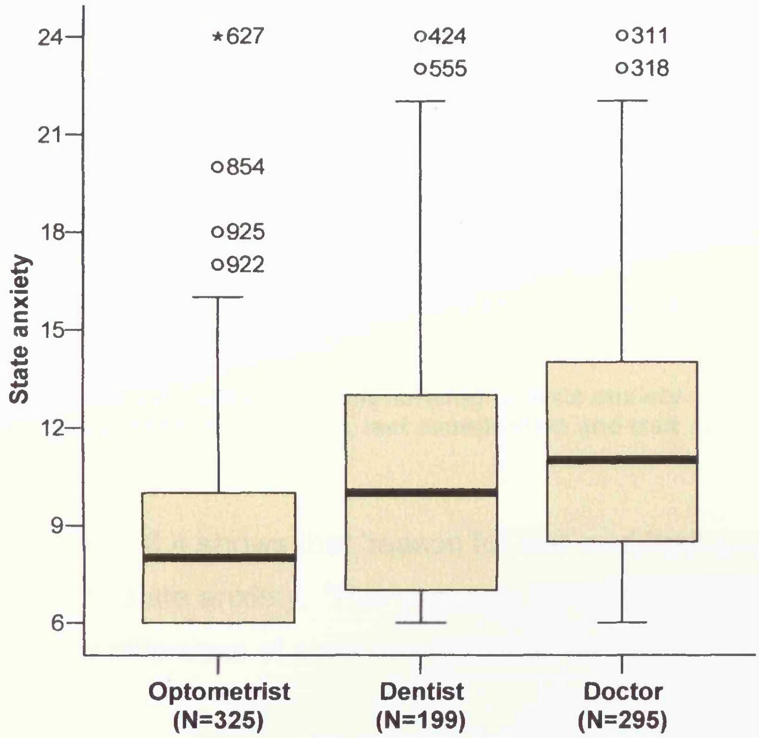

Fig. 3.1: Box and whisker plot comparing state anxiety scores across three primary healthcare domains (° = outlier, * = extreme score) End of whisker identifies largest value which is not an outlier.

Secondary analysis

Table 3.3 showed that there were significant differences between the three healthcare domains for age, educational status, reason for examination, last examination and trait anxiety. As previously suggested, these differences may have an influence upon the comparison of state anxiety between the domains. Therefore, a secondary analysis was undertaken to determine if any of these differences might contribute to the difference in state anxiety i.e. to determine if age, educational status, reason for examination, last examination and trait anxiety were associated with state anxiety. Variables which are associated with state anxiety may have an effect upon the comparison of state anxiety between domains. Association between state anxiety and the patient variables were evaluated using Spearman's rho correlation and Kruskal-Wallis tests incorporating Bonferroni correction (Bland and Altman 1995).

Variable	Optometrist	Dentist	Doctor
Age	r_s=-0.03; p=0.57	r_s=-0.09; p=0.23	r_s=-0.07; p=0.27
Educational status	χ^2(3)=2.69; p=0.44	χ^2(3)=4.42; p=0.22	χ^2(3)=0.23; p=0.97
Reason for examination	χ^2(2)=14.46; p=0.001*	χ^2(3)=18.63; p<0.001*	χ^2(3)=15.61; p=0.001*
Last examination	χ^2(4)=7.05; p=0.13	χ^2(4)=4.26; p=0.37	χ^2(3)=1.02; p=0.80
Trait anxiety	r_s=0.53; p<0.001*	r_s=0.32; p<0.001*	r_s=0.56; p<0.001*

Table 3.4: Testing the relationship of state anxiety with age, educational status, reason for examination, last examination and trait anxiety (* significant at p=0.05 level).

Table 3.4 shows that 'reason for test' and 'trait anxiety' were associated with state anxiety. This suggests that these variables could contribute to the difference of state anxiety between domains.

Variables which intervene between an independent variable (i.e. healthcare domain) and a dependent variable (i.e. state anxiety) are referred to as 'mediator' variables (Baron and Kenny 1986). The possible roles of each of the mediator variables in this analysis (i.e. 'trait anxiety' and 'reason for test') are visually depicted via a path diagram in (fig 3.2 and fig 3.3).

In fig 3.2, arrow 'a' represents the relationship between healthcare domain and state anxiety i.e. the significant difference in state anxiety between domains. Arrow 'b' represents the relationship between each domain with trait anxiety i.e. there is a significant difference in trait anxiety between domains. Arrow 'c' represents the relationship between trait anxiety and state anxiety i.e. trait anxiety is associated with state anxiety. In other words, the difference in state anxiety between domains (arrow 'a') may be moderated by the difference in trait anxiety between domains (arrows 'b' and 'c'). In a similar way, fig 3.2 shows that the difference in state anxiety (arrow 'a') may be moderated by the difference in 'reason for test' between domains (arrows 'b' and 'c'). This may explain why state anxiety was significantly lower in the optometric domain.

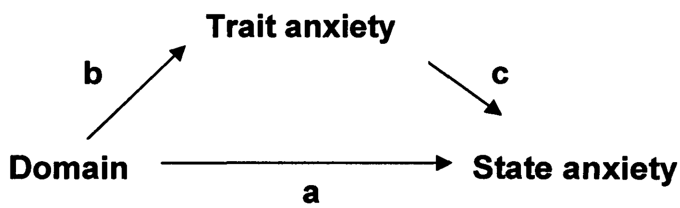

Fig 3.2: Path diagram to depict the mediating effect of trait anxiety upon the comparison of state anxiety between healthcare domains.

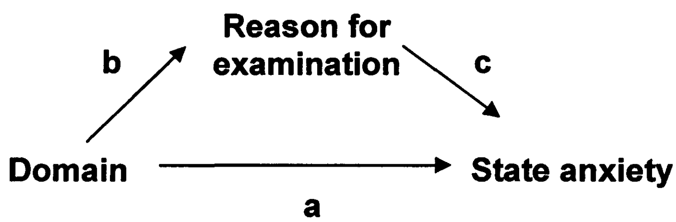

Fig 3.3: Path diagram to depict the mediating effect of reason for examination upon the comparison of state anxiety between healthcare domains.

Regarding trait anxiety, table 3.4 identifies that there is a significant correlation between trait anxiety and state anxiety in every domain i.e. participants with higher trait anxiety will report higher levels of state anxiety. Table 3.3 also shows that trait anxiety was highest at the doctor and lowest at the optometrist. Therefore, the finding that state anxiety is highest at the doctor and lowest at the optometrist could be partly explained on the basis of differing levels of trait anxiety between patient groups i.e. trait anxiety is mediating the comparison of state anxiety.

Regarding reason for examination, inspection of table 3.3 shows that the number of people attending for a routine examination is much greater at the optometrist compared to those at the doctor and dentist. It could be hypothesised that participants attending routine appointments are generally going to be less anxious than those attending for treatment, problems or emergency appointments. If this is the case, it could help to explain why overall state anxiety is lowest at the optometrists.

These results do not support the primary hypothesis (state anxiety is comparable in optometric practice to dental and general practice). The secondary analysis has shown that the initial comparison of state anxiety may have been influenced by other mediating variables. However, without the use of a parametric technique it is difficult to determine the magnitude of the mediator influence upon state anxiety.

3.2.3.2 Correlating state anxiety with satisfaction, intended compliance and participant recall

The second hypothesis of this study was that there would be a significant correlation between pre-consultation state anxiety and post-consultation satisfaction, compliance and recall for all primary healthcare consultations put together.

A significant negative correlation between state anxiety and satisfaction was identified (r_s=-0.19; $p<0.001$) i.e. high participant state anxiety is associated with lower post-consultation satisfaction.

A significant negative correlation between state anxiety and intended compliance was identified (r_s=-0.19; $p<0.001$) i.e. high pre-consultation state anxiety is associated with lower post-consultation compliance.

Finally, state anxiety and participant recall were analysed. Recall was measured at three levels: if the time until the next consultation was specified during the consultation, the main piece of advice given by the practitioner and what specific statements the practitioner had made. Each of these were examined separately.

Of the questionnaires with completed recall information, 504 correctly remembered that the time of the next visit had been specified during the consultation. 144 did not remember if the time until the next visit was specified. There was no significant difference in state anxiety between those who did, and those who did not, recall the information about the next visit correctly (Mann-Whitney U z=-1.44; p=0.15).

Regarding the agreement between participant and practitioner about the main piece of advice given during the consultation; 184 had 'complete agreement', 93 had 'some agreement' and 151 had 'complete disagreement'. There was no significant difference in state anxiety between these groups (Kruskal-Wallis χ^2 (2)=5.31; p=0.07).

State anxiety was correlated with the number of correct statements which the participant remembered the practitioner stating. Again, there was no significant correlation (r_s= -0.05 p=0.26).

Therefore, these results suggest that there is no association of pre-consultation anxiety and post-consultation recall of the examination.

3.2.3.3 Comparing the association of state anxiety and outcome expectancies between primary healthcare domains

The third hypothesis of this study was that outcome expectancies which generated state anxiety in optometric practice would be comparable to those in dental and general medical practice.

This hypothesis was tested by correlating each outcome expectancy theme with state anxiety within each healthcare domain (table 3.5).

OUTCOME EXPECTANCY THEME	Optometrist	Dentist	GP
Patient/practitioner relationship: embarrassment (items 2&7)	r_s=-0.38 p<0.001*	r_s =-0.39 p<0.001*	r_s =-0.42 p<0.001*
Patient/practitioner relationship: loss of autonomy (items 8&9)	r_s=-0.32 p<0.001*	r_s=-0.35 p<0.001*	r_s=-0.29 p<0.001*
Physical discomfort (items 6&11)	r_s=-0.14 p=0.011*	r_s =-0.45 p<0.001*	r_s =-0.28 p<0.001*
Expecting bad news (items 1&4)	r_s =-0.32 p<0.001*	r_s=-0.41 p<0.001*	r_s =-0.41 p<0.001*
Personal cost-money (items 3&10)	r_s=0.01 p=0.86	r_s=-0.16 p=0.03*	r_s=-0.18 p=0.002*
Practitioner skill (items 5&12)	r_s=-0.21 p<0.001*	r_s=-0.06 p=0.38	r_s=-0.12 p=0.05*

Table 3.5: Correlation of state anxiety and outcome expectancy themes in each healthcare domain (* significant at p=0.05; no Bonferroni correction)

Table 3.5 shows that outcome expectancies which are associated with anxiety in the optometric domain are largely comparable to those in the dental and general practice domains, apart from the theme about money. The significant negative correlations suggest that participants with negative outcome expectancies have high state anxiety. Although these themes are not exhaustive, these results suggest that the same aspects of primary healthcare consultations make patients anxious, independent of the specific healthcare domain they attend.

3.2.3.4 Determining the main predictors of state anxiety in optometric practice

The fourth aim of this study was to identify the factors which predict state anxiety in optometric practice.

A regression analysis was used in order to ascertain the strength of the predictors upon state anxiety in optometric practice. Ordinary linear regression involves model assumptions, including continuity and normality of distribution (Hannah and Quigley 1996). However, these assumptions are not appropriate for questionnaire data which ideally should not be treated as continuous linear measures i.e. it is more appropriate to treat questionnaire data as an ordinal measure (see Chapter 2). Therefore an ordinal regression analysis was used to model the predictors of state anxiety for optometric participants.

Univariate analysis of optometric variables

The previous analyses have already demonstrated a significant association of state anxiety with trait anxiety and reason for examination (see Table 3.4). Furthermore, there was also a significant correlation between state anxiety and all outcome expectancies, bar 'personal cost-money' (see Table 3.5).

All the other demographic variables were tested to see if they demonstrated a significant relationship with state anxiety. Age {r_s=-0.03; p=0.57}, gender {z=-1.73; p=0.08}, education {χ^2 (3)=2.69; p=0.44} last test {χ^2 (4)=7.05; p=0.13}, contact lens wear {z=-0.28; p=0.78} and refractive surgery {z=-1.26; p=0.21} did not show any relationship with state anxiety. However, state anxiety was significantly higher for non-spectacle wearers compared to spectacle wearers {z=-2.16; p=0.03}.

Therefore, the predictors entered into the ordinal regression model were all those that were significantly associated with state anxiety i.e. trait anxiety, reason for examination, all outcome expectancies (except 'personal cost-money) and spectacle wear.

Ordinal regression

State anxiety, trait anxiety and outcome expectancy scores were grouped into categories for the analysis. Quintile splits of state and trait anxiety scores were made so that there were comparable numbers of participants in each category. This resulted in the following categories for state anxiety: 6 = very low, 7 = low, 8-9 = medium, 10-11 = high and >11 = very high. The categories for trait anxiety were: 6-7 = very low, 8 = low, 9-10 = medium, 11-13 = high and >13 = very high. Half split of outcome expectancies resulted in the following groupings; Patient/practitioner relationship: embarrassment (1-6 = low, 7-8 = high), Patient/practitioner relationship: loss of autonomy (1-6 = low, 7-8 = high), Physical discomfort (1-6 = low, 7-8 = high), for outcome news (1-5 = low, 6-8 = high) and practitioner skill (1-6 = low, 7-8 = high).

Inspection of Table 3.6 shows that heightened trait anxiety, expecting 'bad news' and being a non-spectacle wearer are predictors of increased state anxiety. For example, participants with very low trait anxiety are 2.18 times more likely to report low levels of state anxiety compared to those participants with very high trait anxiety (see Appendix IV for a further description of ordinal regression).

Nagelkerke's R^2 identifies the strength of the association between the dependent and independent variables (Norušis 2005). In other words, it provides an indication of how successful the model is at explaining the variations in the dependent variable, namely state anxiety. Nagelkerke's

R^2 can vary between 0 and 1 (Nagelkerke 1991) and is 0.35 for this model i.e. the model explains 35% of the variance.

The model fitting statistic, the Pearson's chi-square (X^2 (476) =512.00, p=0.12) indicated that the model fits well, in other words, the observed values were consistent with those estimated by the model.

	Regression Coefficient (ß)	**Std. Error**	**Wald**	**p**	**odds ratio ($e^{-ß}$)**
Very low trait anxiety	-2.180	.428	25.978	.000*	8.85
Low trait anxiety	-2.127	.460	21.422	.000*	8.39
Medium trait anxiety	-0.986	.398	6.147	.013*	2.68
High trait anxiety	-.317	.374	.718	.397	1.37
Very high trait anxiety	0	.	.	.	.
Low outcome expectancy Patient/practitioner relationship: embarrassment	.570	.301	3.593	.058	0.57
High outcome expectancy Patient/practitioner relationship: embarrassment	0	.	.	.	
Low outcome expectancy Possible outcomes (bad news)	.706	.248	8.093	.004*	0.49
High outcome expectancy Possible outcomes (bad news)	0	.	.	.	.
Low outcome expectancy Patient/practitioner relationship: autonomy	.301	.305	.977	.323	0.74
High outcome expectancy Patient/practitioner relationship: autonomy	0	.	.	.	.
Low outcome expectancy Physical discomfort	.132	.325	.166	.684	0.88
High outcome expectancy Physical discomfort	0	.	.		.
Low outcome expectancy Practitioner skills	-.100	.410	.059.	.807	1.11
High outcome expectancy Practitioner skills	0				
Spectacle wearer	-.726	.302	5.765	.016*	2.01
Non-spectacle wearer	0				
Routine appointment	-.843	.693	1.480	.224	2.32
Problem appointment	-.614	.713	.742	.389	2.04
Emergency appointment	0				

Table 3.6: Ordinal regression results for the predictors of state anxiety in optometric practice (* significant at p=0.05).

In summary, the ordinal regression model indicates that heightened trait anxiety, anticipating 'bad news' about the consultation and being a non-spectacle wearer are independent predictors of heightened state anxiety levels in optometric patients.

3.3 Discussion

This was a comparative study to help contextualise patient anxiety in optometric practice within the wider healthcare field. This study indicates that i) state anxiety is lower in optometric patients than in dental and general practitioner patients (although there is an overlap i.e. some optometric patients are very anxious), ii) there is a significant negative correlation between patient state anxiety and post-consultation satisfaction and intended compliance, iii) anxiety related outcome expectancies within optometric practice are comparable to those in dental and general medical practice and iv) within the optometric domain, patient state anxiety can be predicted by trait anxiety level, anticipating 'bad news' and spectacle status.

State anxiety levels were compared across primary healthcare domains. Previous studies which have measured state anxiety with the shortened version of the STAI have reported mean anxiety levels for dental patients attending for treatment of 14.5 (Dailey et al. 2002) and mean anxiety levels for pre-cataract surgery patients of 9.8, 10.0 and 10.3 (Mokashi et al. 2004). The median value of state anxiety for optometric patients in this study was 8.0. However, evaluation of 'mean' and 'median' data overlooks the range i.e. some patients are anxious whilst others are not. Although median state anxiety was lowest at the optometrist compared to medical and dental practice in this study, it is notable that there is a distribution of anxiety levels within optometric practice and that these overlap with dental and general medical practice (fig 3.1).

Examination of the relationships between state anxiety and other variables suggests that the differences between practices could be partly explained by trait anxiety and reason for examination. It is possible that if these differences were accounted for, optometric state anxiety would be more comparable to anxiety levels within dental and general practice.

That trait anxiety scores were highest within general practice and lowest in optometric practice is unremarkable because approximately 20% of people attending general medical practice have an anxiety disorder (Zung 1986) and high trait anxiety is associated with anxiety disorders (Watson and Clark 1984). Given that state anxiety was positively correlated with trait anxiety it is therefore not surprising that state anxiety was highest within general medical practice. The association between state and trait anxiety has been previously reported in medical (Nijkamp et al. 2004) and dental studies (Eli et al. 1997; Locker et al. 1999).

The comparison of state anxiety across domains is also confounded by the differing proportions of examination types within each healthcare group. Table 3.4 shows that there was a significant difference in state anxiety level between 'reason for examination' within each domain. Previous medical research supports this finding, suggesting that patients report higher levels of anxiety when they are attending an appointment knowing that they might have a problem (Brett and Austoker 2001). Furthermore, there is evidence that patient anxiety is elevated when there is the expectation of impending dental treatment (Abrahamsson et al. 2002; McNeil and Berryman 1989). Within the general practice group, the majority of patients were attending due to a problem (43.6%), compared to only 21% for the equivalent optometric group. Over a quarter of the dental group were attending for treatment, whereas there was no 'treatment' equivalent in optometric practice. Moreover, the majority of the optometric group were attending for a routine appointment (65.6%). In other words, there were proportionally higher levels of anxiety provoking appointment types within dental and general medical practice.

In summary, the results show a range of overlapping anxiety levels in each domain. However, median state anxiety reported within optometric practice was significantly lower compared to dental and medical practice.

The data support the hypothesis that there is a significant association between pre-consultation state anxiety and post-consultation satisfaction and intended compliance. Associations between state anxiety during the appointment and post-consultation satisfaction have been previously reported in dental research (Corah et al. 1985). Corah (1985) also presented a conceptual framework which suggested that compliance could be improved by reducing anxiety. However, this is the first time that a clear correlation between pre-consultation state anxiety and post-consultation satisfaction and compliance has been documented.

The association between pre-consultation anxiety and post-consultation satisfaction and compliance may be a result of disrupted communication due to poor patient concentration (Rachman 1998). Anxiety can cause a selective bias to threatening stimuli which diverts attention away from other stimuli, resulting in poor concentration (Rachman 1998). Poor communication is known to result in decreased satisfaction and compliance (Harrington et al. 2004; Richards 1990; Stewart 1995).

The study found no relationship between anxiety and recall. In fact, there is little agreement in the literature regarding the relationship of anxiety with recall. It should also be noted that there is no agreed 'gold standard' method of measuring recall in the literature, perhaps reflecting the difficulty of measuring patient recall. However, it is recognised that recall can be moderated by the way in which the practitioner presents the information (Kupst et al. 1975; Ley 1979; Shapiro et al. 1992) and practitioner interpersonal skills (Bartlett et al. 1984). Furthermore, patients who attend more regularly for appointments have been shown to report more accurate levels of recall (Ley 1982b). The absence of a relationship in this study may suggest that these variables are more influential upon recall. Therefore, to assess the influence of anxiety upon recall it may be necessary to control for communication style and patient previous knowledge in future research.

Anxiety related outcome expectancies within the optometric group were comparable to those in other domains. That similar outcome expectancies operate in optometric practice suggests that anxiety reducing interventions used in other areas of primary healthcare may also be effective within optometric practice.

Unlike dental and general medical practice, the only outcome expectancy which was not significantly associated with anxiety in the optometric domain was the theme of money. This finding may signify the role of patient autonomy in the generation of anxiety. Within both dental and general practice, the patient has little control over the decision to spend money, e.g. paying for prescriptions and for dental treatment. However, optometric patients have more choice over where and whether they choose to buy new spectacles. Furthermore, they can choose to delay making a purchase, removing any immediate 'threat'. In other words, spending money in optometric practice may not represent the same 'threat' as it does in other primary healthcare situations.

Finally, the culmination of this study was to determine the significant predictors of state anxiety in optometric practice using ordinal regression. These were identified as trait anxiety, anticipating 'bad news' and non-spectacle wear. Trait anxiety and outcome expectancies have been reported as predictive of state anxiety in ophthalmic research (Nijkamp et al. 2004). When patients are anxious about their health, they are less likely to articulate their concerns with the practitioner (Lang et al. 2000). Furthermore, it has been reported that the expectation of 'bad news' can stop patients attending practice (Aro et al. 2001). For this reason, attention must be given to equipping optometrists with communicative skills to ensure patient concerns are elicited.

Although the univariate analysis showed that all the outcome expectancies correlated to state anxiety (bar money), only 'expecting bad news' reached statistical significance in the ordinal regression model. This could be explained due to the significance of trait anxiety as a state anxiety predictor. Trait anxiety is mediated by cognitive appraisal (Spielberger 1966), which may indicate that trait anxiety also had a significant correlation with the other outcome expectancies, reducing the independent effect of those expectancies upon state anxiety.

The pseudo- R^2 (Nagelkerke's R^2) was 0.35 for the ordinal regression model. This indicates that although trait anxiety, anticipating 'bad news' and refractive status are predictors of state anxiety; they are not the only parameters which influence state anxiety. This can be explained in part as a result of the generic nature of state anxiety i.e. it is not an exclusive measure of anxiety due to the optometric visit. Therefore, a range of non-optometric factors will also potentially influence state anxiety, e.g. the stress of the journey to the consultation.

In order to measure that component of anxiety caused by the optometric visit, a scale specifically designed to measure optometric anxiety would be required. Prior to this research, there was no such published measure. Considering the results of this study, it would appear that such a scale would benefit greatly from a design that was based upon patient expectancies of the optometric experience. The development of an optometric anxiety scale would facilitate further research of patient anxiety within optometry.

The main limitation of this study was the confounding factors between domains which may have influenced the comparison of state anxiety i.e. the differences in trait anxiety and 'reason for examination'. Although these confounding factors were identified, the degree of influence upon the comparison of state anxiety was difficult to determine within the realm of non-parametric techniques (which are required when analysing ordinal-type questionnaire measures).

Another limitation is the potential of response bias. The study was designed so that refusal rate would be determined by counting the number of consent forms on which patients indicated that they did not wish to participate. However, there were no forms indicating that any person refused to take part. Whilst there is the possibility that no patient declined to take part in the study, there is the potential that patients who refused did not complete the form. Therefore the true response rate is unknown. A further consideration is that the study relied upon the receptionists handing out the questionnaires. There is the possibility that questionnaires were not handed out to every patient.

The causes of missing data (i.e. those people who do not take part) should always be considered (Rubin 1976). If there was a group of people who declined to complete a questionnaire, this may have biased the results e.g. more anxious people may not have completed a questionnaire.

Summary

In summary, this study showed that anxiety in optometric patients is less on average compared to medical and dental practice, but it covers the full range i.e. anxiety is a feature of optometric practice. State anxiety within optometric practice is predicted by trait anxiety, anticipating 'bad news' and spectacle status. Furthermore, by reducing pre-consultation anxiety it may be possible to improve patient satisfaction and intention to comply.

Chapter 4: Development of the Optometric Patient Anxiety Scale

4.0 Introduction

In Chapter 3 patient anxiety was measured with a shortened version of the Spielberger state anxiety scale (Marteau and Bekker 1992), a generic self-report measure of anxiety. This chapter will describe the development of a self-report questionnaire which will measure patient anxiety specific to the optometric encounter.

Subjective patient reports indicate that up to 25% of patients are anxious about attending optometric practice (Fylan and Grunfeld 2005). However, identification of these patients is problematic because anxiety can manifest in a diversity of behaviours. For example, anxiety may cause some patients to talk excessively, whilst others will be silent (Ettinger 1994). For this reason it would be helpful to have a more reliable method for the identification of anxious optometric patients.

The importance of identifying anxious patients has already been highlighted in the previous study (Chapter 3). For example, there is a significant correlation between state anxiety prior to primary healthcare appointments with post-consultation patient satisfaction and intended compliance. Previous reports also suggest that anxiety can have a detrimental effect upon attention (Rachman 1998; Taylor 1986). Although there was no significant correlation between anxiety and recall in the previous study, the potential disruption of attention remains a notable problem. Therefore, clinical outcomes may be improved if anxious patients can be identified and steps taken to reduce that anxiety.

Over the last decade patient-report measures have been used increasingly to evaluate healthcare outcomes (Garratt et al. 2002). Anxiety scales are used within medical and dental practice to identify patients who have heightened anxiety (Corah 1969; Zigmond and Snaith

1983). In the previous chapter state anxiety was measured across primary healthcare domains. However, state anxiety is not specific to a particular context (Spielberger 1966). When researching patient anxiety within the optometric context it is useful to establish the level of anxiety which is driven by the optometric encounter. However, there is currently no tool developed specifically for the optometric context. Therefore, the purpose of this study was to develop a short questionnaire to measure optometric related patient anxiety. Such a tool would have both clinical and research applications, i.e. it would allow identification of anxious patients and may be used to establish the effectiveness of various interventions on anxiety.

As described in Chapter 1, psychologists use the term 'outcome expectancies' when describing the generation of anxiety resulting from the expectancy of social or physical danger (Edelmann 1992). In other words, anxiety is determined by what a patient imagines will happen to them both socially and physically in a particular situation. The role of outcome expectancies as a moderator of anxiety in optometric patients was confirmed in chapter 3. As such, determination of patient expectancies will be integral to developing an optometric patient anxiety scale.

This chapter is divided into three main sections. Each section reports a different aspect of development. In the first section (section 4.1) the initial content development of the Optometric Patient Anxiety Scale is described. The analysis of the data set presented includes the use of Rasch analysis.

The second section (section 4.2) presents a re-evaluation study of the Optometric Patient Anxiety Scale. A second, separate data set is presented and analysed with Rasch analysis.

In the third section (section 4.3) the data set presented in section 4.1 is returned to. The Rasch analysis in section 4.1 suggested that the contact lens items did not fit into the underlying construct of optometric patient anxiety. Therefore, section 4.3 returns to this analysis to look at the contact lens items in more detail.

4.1 Content development of the Optometric Patient Anxiety Scale (OPAS)

4.1.1 Introduction

The first section of this chapter (section 4.1) describes the initial content development of the Optometric Patient Anxiety Scale (OPAS). Development of a questionnaire initially requires the development of a large number of items to ensure content validity (Streiner and Norman 1995). These items are then piloted and subsequent statistical analyses are used to select the best items from the initial pool.

The first developmental stage of OPAS was the generation of an initial pool of items pertaining to patient anxiety. Creation of the initial items was principally driven by patient responses, ensuring content validity of the scale. These items were then reviewed and an initial questionnaire was piloted upon patients attending for an optometric appointment. Subsequently, the questionnaire was reduced in length using Rasch analysis. The stability of the shortened questionnaire was then assessed with test-retest reliability.

4.1.2 Methods

4.1.2.1 Initial item selection

In order to ensure content validity, eighty three items were initially identified on the basis of patient interviews, a literature review and focus group discussions. Twenty four optometric patients (mean age, 37.6 ± 22.1 years) took part in semi-structured interviews to ascertain expectations and potentially anxiety provoking aspects of the eye examination. Ophthalmic, dental and medical literature was reviewed to identify sources of patient anxiety within the practitioner-patient encounter (Abrahamsson et al. 2002; Corah 1969; Corah et al. 1985; De Leo et al. 1999; Ettinger 1994; Fylan and Grunfeld 2005; House and Stark 2002; Kent 1984a; Kim et al. 2001; Little et al. 2001; Moore et al. 2004; Nijkamp et al. 2004; Nijkamp et al. 2002; Takayama et al. 2001;

Terry and Zimmerman 1970). Also, a small focus group made up of two healthy patients and two optometrists (three pre-presbyopes and one presbyope) extensively discussed possible causes of anxiety. The ideas discussed were subsequently grouped into main themes. Additionally, the results in Chapter 3 suggested that the outcome expectancy about the examination outcome i.e. expecting bad news, was associated with anxiety. The main themes contained in the initial item pool were summarised as 'tests and performance', 'trust in optometrist', 'eye health', 'personal interaction with optometrist', 'eyes touched', 'contact lenses', 'financial cost' and 'general comfort'.

Subsequently, the eighty three items generated were reviewed to look for repeated ideas which represented item redundancy. Many of the items had the same face validity, but the adjectives were different. For example, "I know that my eyes are healthy", "I am content that my eyes are healthy", "I am sure that I don't have an eye disease". A large group of items repeating the same idea lengthens the questionnaire increasing respondent burden and reducing the likelihood that the questionnaire will be completed fully and truthfully (Streiner and Norman 1995). Furthermore, in order to avoid disrupting the normal operation of busy optometric practices in which the questionnaire was to be administered, it was recognised at the outset that it needed to be relatively short. Therefore, redundant items were removed. Furthermore, it was ensured that a wide range of adjectives describing anxiety were present in the final list of items. Having excluded redundant items a 30 item, 5 response option pilot questionnaire (strongly agree, agree, uncertain, disagree, strongly disagree) was established (Table 4.1).

It was important that the scale incorporated both positive and negatively valanced items to encourage participants to read every item and so guard against the temptation for participants to tick the same box for every item (halo effect). The thirty items had a good split of positive and negative items (14 positive items, 16 negative items). Furthermore, all

30 items mapped onto the original themes which were identified in the initial item pool.

Item number	Item description
1	I am anxious about each answer I give during the eye test
2	I feel relaxed during the eye test*
3	I am afraid I will find the tests hard
4	I am confident that I will give the right answer during the eye test*
5	Talking to the Optician makes me feel tense
6	I feel comfortable with the Optician*
7	I feel nervous talking to the Optician
8	Speaking to the Optician makes me feel relaxed*
9	I feel on edge during the examination in case something goes into my eye
10	I feel calm about having my eyes touched*
11	I am anxious something unpleasant will happen to my eyes
12	I feel relaxed about having things put into my eye*
13	I am anxious because there might be a problem with my eyes
14	I am content that my eyes are healthy*
15	I am scared that my vision is getting worse
16	I am worried that I may lose my sight
17	The thought of putting a contact lens in my eye makes me feel tense
18	The idea of wearing contact lenses makes me feel anxious
19	I feel relaxed at the thought of having a contact lens in my eye*
20	I feel confident that a contact lens would be comfortable in my eye*
21	Having an eye examination makes me feel uneasy
22	I feel relaxed when I have an eye check*
23	I worry about going to have my eyes checked
24	I feel comfortable at the Optician's*
25	When the Optician is close to me I feel tense
26	The cost of glasses doesn't worry me*
27	The environment at the Optician's makes me feel uneasy
28	I trust the Optician*
29	I am anxious that I will have to purchase a new pair of spectacles
30	I am satisfied in the ability of the Optician*

Table 4.1: Description of the 30 items for the initial pilot; each item had a 5-response category option (Strongly Agree, Agree, Uncertain, Disagree, Strongly Disagree). Items of positive valance are identified by *.

4.1.2.2 Study design and population

For the main questionnaire analysis, the sample was drawn from adults who attended for an eye examination. Four optometric practices agreed to distribute questionnaires. Two were based in city centres and two were located in smaller rural environments. Practices were asked to ensure that every adult patient (18 years and over) was given an information sheet to read and a questionnaire to complete before they had their eye examination. Patients were reassured that their responses were confidential and the optometrist would not see their completed questionnaire. Reception staff were asked to keep a note of the number of patients refusing to complete the questionnaire.

All procedures adhered to the tenets of the Declaration of Helsinki and ethical approval was obtained from the Cardiff School of Optometry and Vision Science Ethical Committee.

4.1.2.3 Statistical analysis

The statistical analysis of the questionnaire data incorporated the following: 1) Response scale analysis, 2) Estimation of item and person estimates, 3) item reduction, and 4) test-retest analysis. Rasch analysis was undertaken according to the Andrich Rating Scale model (Andrich 1978) using Winsteps ver. 3.58.1 (Linacre 2005).

Response scale analysis was performed to determine the optimum number of response categories which people could discriminate reliably between. Rasch analysis fit statistics were then used to identify how well each item contributed to the underlying unidimensional measure (Bond and Fox 2001).

Fit statistics describe how both items and person responses fit the predicted responses of the Rasch model. Rasch analysis provides two chi-square statistics, infit and outfit, which are calculated from the mean square of the residuals. These range from zero to infinity. Items fitting perfectly to the unidimensional scale have an expected infit and outfit statistic of 1. Values less than 1 indicate that the item over-fits the model. Substantially over fitting items add little extra information to the scale and as such they are redundant. Values higher than 1 suggest misfit to the model. These items may be measuring something different to the rest of the scale. Infit statistics are weighted to give more importance to those people who are closer to the item mean. Outfit statistics are not weighted and so, are more sensitive to outlying scores. Therefore, items with poor fit statistics compromise the validity of the measurement.

Removal of items was principally driven by infit and outfit statistics. However, in order to facilitate identification of items for removal, the quality of the data were also assessed using traditional statistical tests. This included measuring skew and kurtosis, calculating the percentage of missing data and assessing ceiling effect (percentage of responses in the end-response category) (Garamendi et al. 2006; Pesudovs et al. 2004).

The reliability of the final questionnaire was measured using person and item reliability estimates. Unrotated factor analysis was also used to additionally test scale validity.

Finally, the stability of the measure was evaluated by assessing its test-retest reliability. This was measured using a group of 59 young adults (test-retest time, 2 weeks), with the intraclass correlation (ICC) (Shrout and Fleiss 1979). ICC is a correlation coefficient; therefore it does not describe reliability in terms of the measurement difference between scores but rather as a value from 0 and 1.

4.1.3 Results

Questionnaire responses were received from 148 adult patients. Two patients with missing demographic data (age, gender, language etc) were excluded from the dataset. In accordance with the approach adopted by others, an additional four questionnaires were excluded because more than 33% of the questionnaire was incomplete and therefore deemed unreliable (Pesudovs et al. 2004). The number of people who declined to complete a questionnaire is unknown.

Person fit statistics provide information about how closely people are responding according to the prediction of the Rasch model. Poor fit statistics highlight people who may not be responding in a consistent way, in other words, rogue responders. Of the 27 people identified as misfitting the model (outfit and infit mean square >1.40), the individual questionnaire responses were examined. The questionnaires were analysed to identify any pages in which the respondent had used the same response category for every item. Many of the items had reversed scales, making it easy to identify responses which were completely contradictory. One questionnaire (patient 103) was identified as providing inconsistent responses and so this person's questionnaire was also excluded from the data set.

Therefore, there were 141 questionnaires in the final sample (50 male, 91 female; mean age 43.21 ± 17.44 years; first eye exam, 2%; requiring spectacle prescription, 81%).

4.1.3.1 Response scale analysis

The first part of the analysis was to evaluate the response scale. Winsteps provides category diagnostic statistics which describe how well the response categories operate. Ordered values indicate that every category has a distinct probability of being selected more than any other category for a particular person difficulty (i.e. anxiety level). The initial structure calibration thresholds are shown in fig.4.1. Category 2 does not have a distinct peak on the curve which indicates that it is never the most probable choice. Such a category is problematic as it will potentially add noise to the questionnaire results (Bond and Fox 2001). Therefore, in line with established guidelines (Bond and Fox 2001), consideration was given to merging this category with an adjacent category to improve the diagnostics of the rating scale.

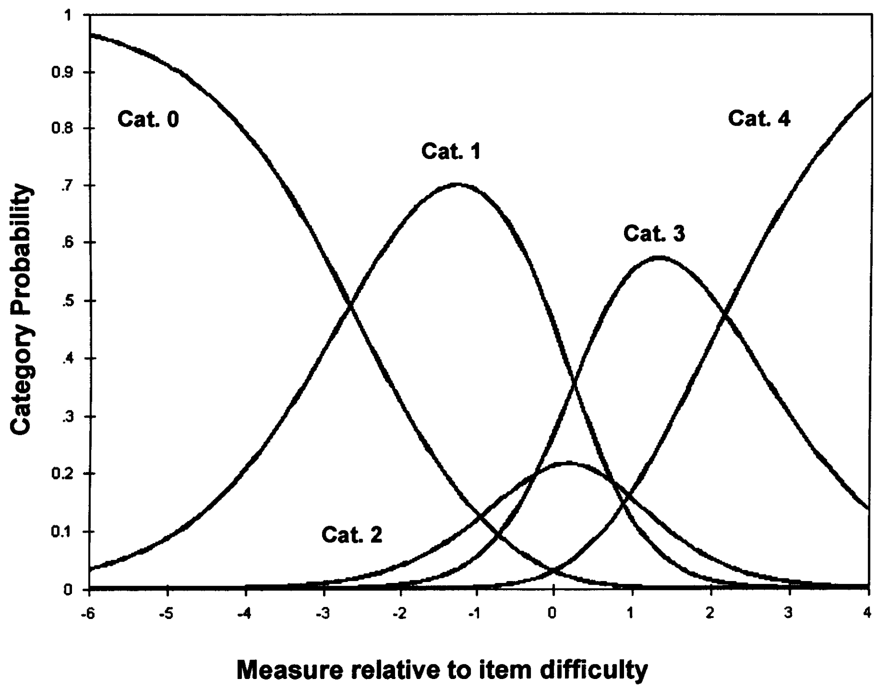

Fig. 4.1: Probability curve to show the operation of 5 response categories.

The descriptor of category 2 was "uncertain" and the categories either side were 'agree' and 'disagree'. One approach would be to merge this category with either category 1 or category 3. However, when merging categories the combination should also "make sense" (Bond and Fox 2001); posing the question of whether 'uncertain' is closer to 'agree' or 'disagree'. In order to overcome this problem, it was assumed that if forced, there is a 50% chance that each person would have either ticked 'agree' or 'disagree'. Therefore, on a random basis, half of the category 2 responses were merged with category 1 and the other half with category 3. Additionally, inspection of the end category (category 4) indicated a proportional underutilization by participants, 0-9%. Underutilized categories compromise the precision of thresholds estimates. Therefore, in accordance with the work of others (Pesudovs et al. 2004), and standard practice (Bond and Fox 2001; Linacre 1999), category 4 and category 3 were merged.

Reanalyzing the diagnostic statistics of the three category solution showed an improved structure calibration and category utilization (Fig. 4.2). Therefore, the results from the rating scale analysis suggested that a three category solution would be optimal for the questionnaire.

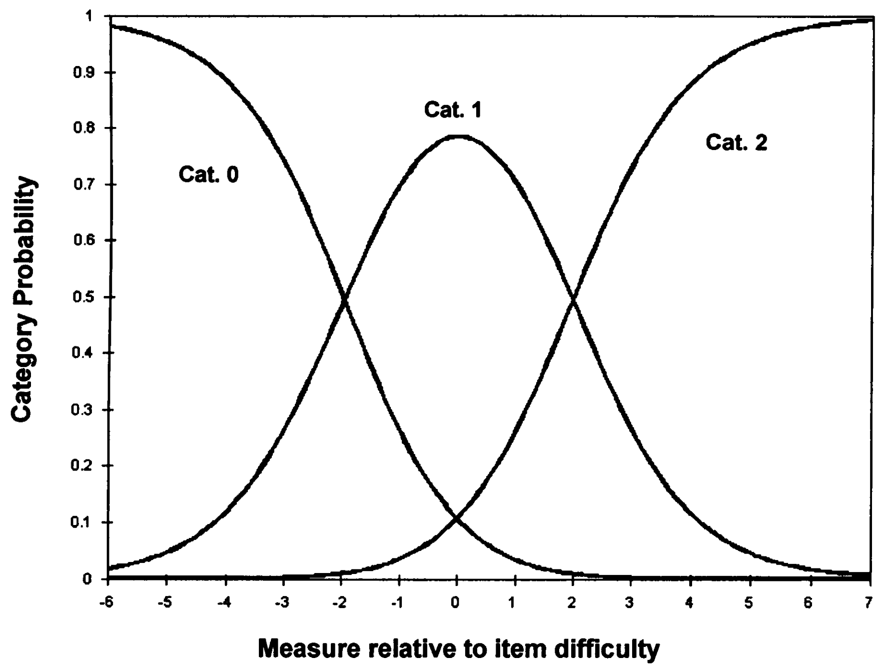

Fig. 4.2: Probability curves showing the chance with which each category is selected (after category 2 was merged with adjacent categories and category 3 merged with category 4).

4.1.3.2 Person and item estimates

The second part of the analysis was to inspect the person and item estimates.

In Fig. 4.3 the spread of each item calibration is visualized compared with the range of person ability (anxiety level) estimates on a person-item map (like a linear ruler). The range of the items are -1.74 to 1.49 Logits; item 4 and item 16 have the mean item difficulty and are therefore located at 0 Logits (SD ±0.90). Items located at the bottom of the map, e.g. Item 26 *"the cost of glasses doesn't worry me"*, discriminate between those people with lower anxiety. Conversely, items located at the top of the map, e.g. Item 28: "*I trust the Optometrist*", are high level anxiety discriminating items. Winsteps provides statistics to describe the precision of these estimates. The root mean square error (RMSE) describes the average standard error of all the items, indicating the accuracy of the position of the items on the 'ruler'. For this analysis RMSE was 0.19. The item separation reliability coefficient describes the reliability of item ordering. It varies between 0 and 1. For this analysis item separation reliability was high (0.96), indicating high stability of the item estimates.

Inspection of the person-item map indicates that the items are marginally targeted toward the lower end of anxiety. The mean of the person estimates is 0.42 Logits (SD±1.44), with a range from -4.15 to 4.93 Logits. The RMSE is 0.43. The person separation reliability coefficient (similar to the item separation reliability coefficient) describes the reliability of person ordering and is similar to the conventional Cronbach alpha coefficient. It is high for this sample (0.91). The person separation ratio expresses the reliability of the scale to discriminate between people of different abilities. It is defined as the ratio of the adjusted person standard deviation to the standard error of the measurement (i.e. the variance not accounted for by the Rasch model), measured in standard error units (Bond and Fox 2001). Recommendation is that the separation ratio should exceed 2 (Pesudovs et al. 2003). It was 3.17 for this sample.

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PERSONS MAP OF ITEMS
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 3               XXX +
                   X |
                  XX |
                  XX |
                   X |
                   X |
 2                 X +
                   X S|T
               XXXXX |
               XXXXX |  ITEM30
          XXXXXXXXXX |
                 XXX |  ITEM28
 1         XXXXXXXXX +  ITEM3    ITEM5    ITEM6    ITEM9
               XXXXX |S ITEM27   ITEM7
             XXXXXXX |  ITEM21   ITEM24
           XXXXXXXXX M|  ITEM23
        XXXXXXXXXXXX |  ITEM11   ITEM2
             XXXXXXX |  ITEM14   ITEM22   ITEM25
 0          XXXXXXXX +M ITEM16   ITEM4
             XXXXXXX |  ITEM8
                XXXX |  ITEM1
             XXXXXXX |  ITEM15
                 XXX |  ITEM29
               XXXXX |S ITEM13
-1                 X S+ ITEM10   ITEM18
                  XX |  ITEM17   ITEM20
                  XX |  ITEM19
                 XXX |
                   X |  ITEM12   ITEM26
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Fig. 4.3: Patient anxiety/item difficulty map for the 30-item Optometric Anxiety Scale. The patients are represented on the left of the dashed line: 'X' is equal to 1 person. The items are represented on the right of the dashed line. The items at the top of the map discriminate between those people with higher anxiety. The items at the bottom of the map discriminate between those people with lower anxiety. M=mean, S=1 standard deviation from the mean, T=2 standard deviations from the mean.

4.1.3.3 Item reduction

Having inspected the item and person estimates, the third part of the analysis was to identify items which misfit the Rasch model. Pesudovs (2003) presented a framework in order to facilitate refining an instrument by item reduction which was adopted in this study (Pesudovs et al. 2003). Items were considered for removal from the scale which fulfilled the highest number of candidate criteria in order of priority; 1: infit mean square outside 0.80 to 1.20, 2: outfit mean square outside 0.70 to 1.30, 3: item with mean furthest from the subject mean, 4: high proportion of missing data (>50%), 5: ceiling effect (>50% in end category) and 6: skew and kurtosis outside –2.00 to +2.00. The statistical data for all 30 items are in appendix V.

Items were removed on an iterative basis until all items provided good infit and outfit values, with no significant missing data or ceiling effect and with good person separation of 2.26 (>2). This was achieved when the scale had been reduced to 10 items (Table 4.2). Interestingly, the four contact lens items (one of the original themes in the initial item pool) showed substantial misfit and were consecutively removed as the second to fifth items. A closer inspection of the contact lens items will be reported in section 4.3.

The final 10-item scale had good measurement precision expressed by the high person and item separation reliability coefficients, 0.84 and 0.88 respectively. The validity of the unidimentional nature of the 10 items was additionally explored with unrotated factor analysis. A principal factor was found with strong loadings from 0.49-0.78 which confirms that the scale measures a unitary concept.

Item	Skew	Kurtosis	Missing data (%)	Ceiling Effect† (%)	Mean square Infit (0.80-1.20)	Mean square Outfit (0.70-1.30)	Item calibration (SE)	Factor loading
2: I feel relaxed during the eye test	0.01	0.50	0	15	0.87	0.80	-0.49 (0.21)	0.72
3: I am afraid I will find the tests hard	0.07	-0.33	0	12	0.96	0.86	0.45 (0.21)	0.78
5: Talking to the Optician makes me feel tense	-0.02	0.01	0.7	10	0.85	0.73	0.41 (0.21)	0.76
9: I feel on edge during the examination in case something goes into my eye	0.10	-0.48	0.7	14	1.12	1.13	0.32 (0.21)	0.75
11: I am anxious something unpleasant will happen to my eyes	0.01	0.26	0	16	1.05	0.92	-0.53 (0.21)	0.68
14: I am content that my eyes are healthy	0.13	1.48	0	13	1.14	1.20	-0.71 (0.21)	0.49
23: I worry about going to have my eyes checked	-0.01	0.26	0	15	0.85	0.74	-0.35 (0.21)	0.76
25: When the Optician is close to me I feel tense	0.02	0.25	0	18	1.08	0.92	-0.80 (0.21)	0.67
28: I trust the Optician	-0.58	0.70	0.7	4	0.85	0.77	0.62 (0.21)	0.62
30: I am satisfied in the ability of the Optician	-0.32	-0.23	1.4	4	1.10	1.02	1.10 (0.21)	0.54

Table 4.2: Descriptive statistics, Rasch fit statistics and factor loadings for the 10-item, 3 -response category questionnaire († % of responses in the end-response category).

Reducing the scale to 10 items marginally changed the targeting of the items to people (Fig.4.4a). The items are targeted slightly more towards the higher levels of anxiety with a discrepancy between the means of 0.44 Logits. Fig. 4.4a shows the mean anxiety level which each item measures. When the influences of the categories are accounted for, the items measure over a larger range (Fig.4.4b) i.e. the items span virtually the complete range of person anxiety levels.

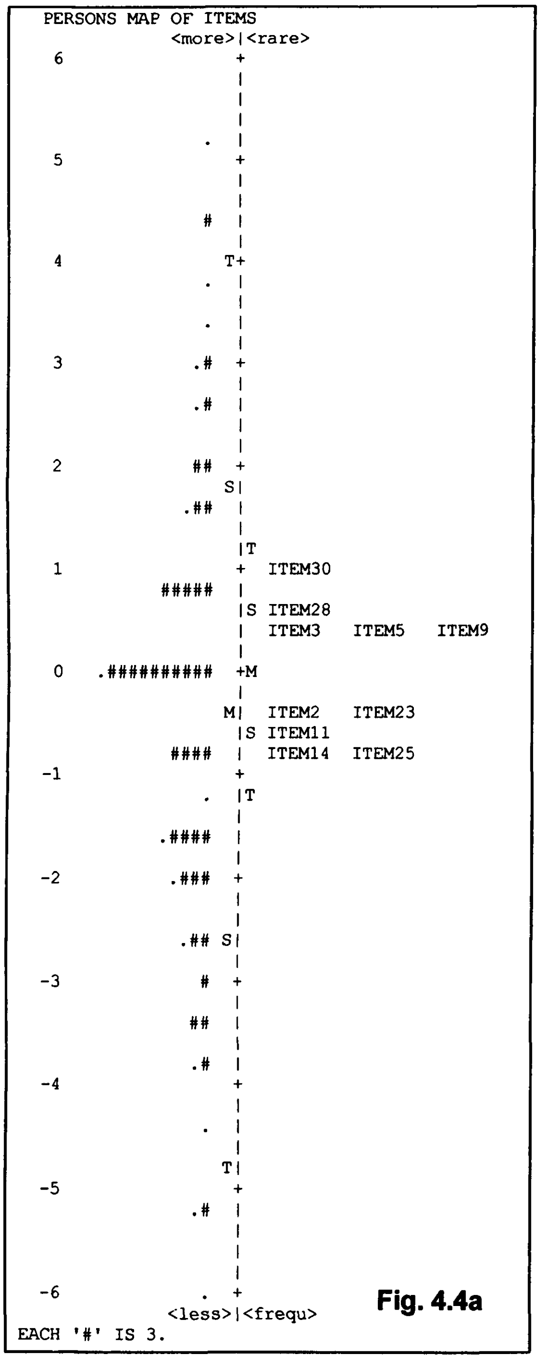

Fig. 4.4a

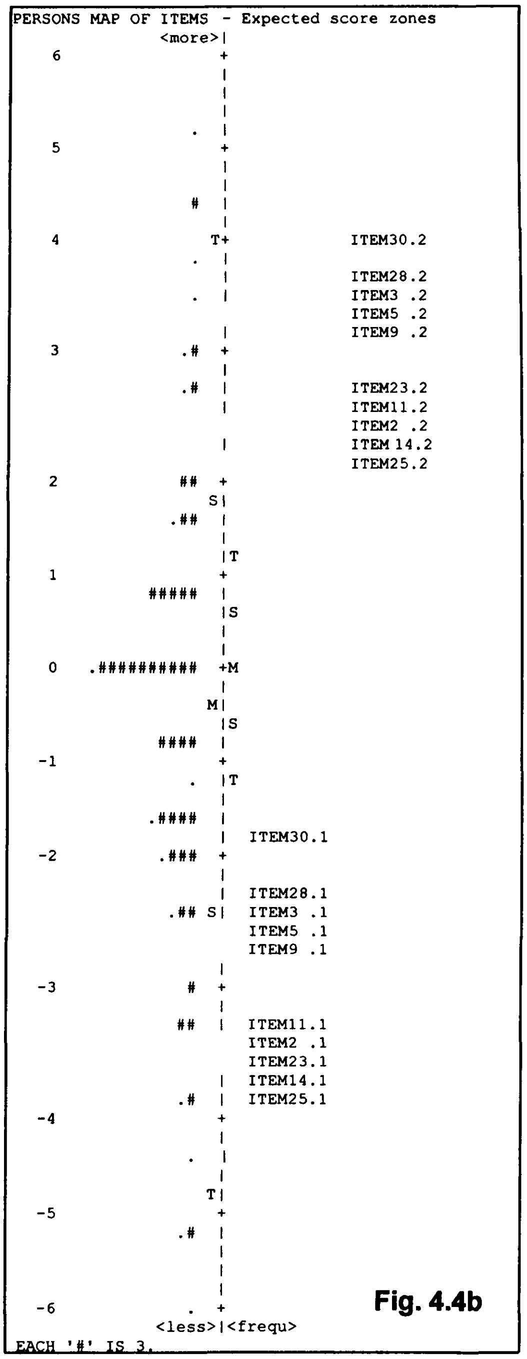

Fig. 4.4b

Fig. 4.4a: Patient anxiety/mean item difficulty map for the 10-item Optometric Anxiety Scale. The patients are represented on the left of the dashed line: '#' is equal to 3 people and '.' is equal to 1 person. M=mean, S=1 standard deviation from the mean, T=2 standard deviations from the mean.

Fig. 4.4b: Patient anxiety/item difficulty map for the 10-item Optometric Anxiety Scale with 50% probability thresholds denoted. The probability thresholds describe when there is equal chance of a person ticking either category 0 or 1 (when item number is followed with .1), or when there is equal chance that a person will tick either category 1 or 2 (when the item number is followed with .2).

The final ten items are representative of the original thirty item measure. The ten items map onto all of the original themes that were identified in the initial item pool, apart from items pertaining to 'contact lenses' and 'financial cost'. Furthermore, there are still items of both positive and negative valance (four positively worded items and six negatively worded items).

4.1.3.4 Test-retest reliability

The fourth part of the analysis was to assess the test-retest reliability of the newly developed ten item measure. The 10-item questionnaire was completed by 59 undergraduates (29 male, 30 female; mean age 18.64 ± 0.804 years) on two occasions, separated by a two week period. Test-retest reliability was good (ICC = 0.85). ICC is defined as the ratio of the variability of scores for each subject to the total variance of all subjects and ratings (Shrout and Fleiss 1979), therefore it will approach 1 when there is no variance within subjects.

4.1.4 Discussion

The results suggest that the Optometric Patient Anxiety Scale (OPAS) is a measurement tool with which to quantify anxiety in optometric practice. The questions on this scale work together to form a valid unidimensional interval scale, i.e. it measures a single underlying latent trait, 'optometric anxiety'.

The principal aim of this chapter section was the content development of OPAS. In other words, to ensure that OPAS represents a valid measure of the underlying construct 'optometric anxiety'. Content validity of the final questionnaire is reflected by all of the original themes in the initial item pool appearing in the final ten items, apart from the themes 'contact lenses' and 'financial cost'. Development of the scale was based upon the concept of cognitive expectancies. Inspection of the final 10 items shows that the scale reflects both social and physical elements, which are both recognised components of anxiety generated by cognitive expectancies (Edelmann 1992). For example, one recognised cause of social anxiety relates to interaction with an authority figure (Holt et al. 1992). The importance of this relationship is reflected in the questionnaire, as four out of the final ten items concern aspects of the patient-optometrist relationship. The physical dimension of cognitive expectancies is also represented by two of the items in the scale.

It is interesting to note that the themes of 'contact lenses' and 'financial cost' were not represented in the final 10-item scale. The analysis showed that all of the contact lens items grossly misfitted the Rasch model. As such, they were among the first items removed from the scale during item reduction. This suggests that the contact lens items did not measure the same underlying trait i.e. anxiety about wearing contact lenses is distinct from 'optometric anxiety'. Therefore optometrists should not make assumptions about a patient's anxiety about trying contact lenses based upon a patient's general optometric anxiety level.

Similarly, items pertaining to the theme of 'financial cost' were also absent from the final 10-item questionnaire. This finding is supported by the results in chapter 3, which showed that there was no correlation between outcome expectancies about spending money and state anxiety. Within the construct of cognitive expectancies, anxiety is fuelled by what an individual imagines will happen to them (Edelmann 1992). This inherently implies a lack of control over the situation. However, individuals fundamentally do have control over whether they choose to buy a new pair of spectacles and the amount of money to spend. This is different to all the other themes contained in the questionnaire. For example, individuals do not possess that same level of autonomy over their ocular health, personal interaction with the optometrist or whether their eyes are touched. Therefore, control over the cost of spectacles may explain why this theme does not map onto the underlying construct of optometric patient anxiety.

Although it is crucial to develop a scale with good content validity, it is important to recognise that this scale was developed to identify anxious patients, not to determine the causes of that anxiety. A scale including items relating to every area of patient expectancy would be very long. Rather, the requirement of the items on the final scale was that they were all sensitive to the underlying latent trait. Rasch analysis is a powerful tool allowing identification of those items. Item fit statistics provide evidence for construct validity. Massof (2002) commented that if any confounding constructs such as ambiguous wording or inappropriate content (items not relating to the underlying trait) influences a person response to an item, then that item will be identified as misfitting the model. In this way, removal of misfitting items improves the measurement accuracy of the scale, reducing the level of noise within the measure (Stelmack et al. 2004). The final 10 items of the scale all provided good fit statistics. The unidimensionality of the scale was further supported by unrotated factor analysis.

When reducing the number of items on a scale it is essential that the reliability does not fall to an unacceptable level. Inspection of the separation ratio is a useful statistic to help maintain test quality when reducing items (Mallinson et al. 2004; Velozo et al. 2000). For this reason, when removing items, the separation ratio was carefully inspected, and removal of items was stopped once this value became unacceptable (i.e. <2). It will be noted on the final person-item map (Fig.4.4a) that there are a few items which measure similar levels of patient anxiety (e.g. item 3, 5 and 9). However, removal of these items would have reduced the person separation to an unacceptable level and compromised the quality of the final scale. Rasch analysis also provides coefficients describing the reliability of the person estimates and the item estimates. The final scale had high reliability estimates, 0.84 and 0.88 respectively. Further evidence of the stability of the measurement over time is reflected by the good test-retest statistic.

Inspection of the final person-item map (Fig.4.4a) reveals that although the items are targeted well to the mean patient anxiety, the range of mean item difficulty estimates is modest in comparison. However, when the category structure of each item is considered, the items measure almost the complete range of patient anxiety for this sample (Fig.4.4b). The central clustering of the items indicates that there will be good measurement precision over the majority of people in practice, indicated by the separation ratio (2.26). However, the floor and ceiling effect of the items does mean that this precision may be compromised at the extremes. Inclusion of additional items that target those with extreme levels of anxiety would have been advantageous since it would have facilitated more reliable estimates of patient anxiety at the extremes. However, the benefit of including more items must be balanced with the possible results of introducing noise into the measure by increasing respondent burden (Streiner and Norman 1995).

Theoretically, the Rasch model is a continuous scale allowing measurement to infinity (Wright and Stone 1979). However, in reality questionnaires have a finite number of items and respondents with extreme abilities may respond by ticking the maximum category for every item. In such a case, another item must be included at the extreme end of the scale in order to accurately measure the individual's ability. This would result in an ever expanding number of items. In fact, failure to accurately measure those at the extreme is a problematic feature of many questionnaires (Pesudovs et al. 2003; Stelmack et al. 2004). To identify items which covered a fuller range we would have had to speak to people who were *very* or, *not at all anxious* about optometry, i.e. to find out what "items" they suggest. However, we had no tool to identify such patients. Therefore, we selected items that came up repeatedly with patients, i.e. those that were the most common reasons for anxiety. As a result, there was a reduced likelihood that the extremes for very high or low anxiety would be ascertained. Furthermore, following the framework to reduce the items described by Pesudovs 2003, items were considered for removal that were furthest from the subject mean (Pesudovs et al. 2003). Although this improved the targeting of the questionnaire, it also contributed to removal of items from the 30-item scale that measured the more extreme levels of anxiety. However, despite this limitation, the questionnaire maintains good psychometric properties and will reliably identify those patients attending practice who have high levels of anxiety, i.e. optometrists will be able to recognize patients with high levels of anxiety. Furthermore, as a tool to assess the ability of interventions to reduce anxiety, failure to differentiate the level of 'extreme' anxiety is not problematic. Interventions which can significantly reduce anxiety are those which cause a significant decrease in mean anxiety. Therefore, whilst it is important that the questionnaire can reliably measure the majority of people close to the mean, it is less important that it measures those who are at the extremes, i.e. who are in the tails of the normal distribution.

One limitation of the study was that receptionists were not consistent in recording the number of people who refused to complete the questionnaire. Although every practice commented that the majority of people accepted a questionnaire, the response rate was unknown. However, this does not compromise the calibration of the questionnaire. Unlike the calibration of questionnaires in traditional test design which are dependant upon the sample, Rasch analysis allows sample-free test calibration (Wright and Stone 1979). The Rasch model simply seeks to describe what happens when any person encounters any item, therefore removing the interaction between person ability and item difficulty (Wright and Stone 1979). In other words, the calibration of the test is not bound by the ability (anxiety) distribution of the sample.

Further evaluation

Primarily, a further revalidation study of the category structure of the shortened 10-item questionnaire was indicated. This study will be reported in the next section of this chapter (section 4.2).

Secondly, identification that the four contact lens items were grossly misfitting to the Rasch model suggests they measure a distinct aspect of anxiety. For this reason, it would be beneficial to reanalyse these four items to assess their validity as a contact lens anxiety subscale (section 4.3).

4.2 Revalidation of the Optometric Patient Anxiety Scale (OPAS)

4.2.1 Introduction

This section describes a re-evaluation study of the Optometric Patient Anxiety Scale (OPAS) with a separate data set. The purpose of the revalidation study was firstly to test the validity of merging the categories, secondly to check item fit and finally to obtain item and category threshold measures which could be applied to the questionnaire for all future analyses.

4.2.2 Methods

4.2.2.1 Study design and sample

The 10-item questionnaire (which was described in section 4.1) was distributed to consecutive patients who were booked to see one of three optometrists for an eye examination at Cardiff University Eye Clinic during autumn 2006 (this was also the 'control group' data described in Chapter 6). Every adult patient (18 years and over) was given a questionnaire to complete before they had their eye examination.

A total of 87 questionnaires were completed. Person fit statistics showed that there were 26 people who misfit the Rasch model (outfit and infit mean square >1.40). Each of the individual questionnaires was examined to identify any pages in which the respondent had used the same response category for every item. This was not evident in any of the questionnaires. Therefore, all 87 questionnaires were retained for the analysis (37 male, 50 female; mean age 58.2 ±18.4years; first eye exam, 1%; requiring spectacle prescription, 90%). Reception staff reported that one person declined to complete the questionnaire.

All procedures adhered to the tenets of the Declaration of Helsinki and ethical approval was obtained from the Cardiff School of Optometry and Vision Science Ethical Committee.

4.2.2.2 Statistical analysis

As in the original analysis, the data were entered into SPSS and analysed according to the Andrich Rating Scale model (Andrich 1978) using Winsteps ver. 3.58.1. The original 30-item piloted questionnaire had a five category response construct. Analysis of the categories suggested that a three category solution was optimal. However, the visual representation on the questionnaire of three categories may cause increased respondent burden, since the verbal descriptors of the categories would be different dependent on the valence of the item, i.e. either: strongly agree, agree, disagree OR agree, disagree, strongly disagree. Therefore, to reduce respondent burden, an alternative method would be to use a four response category representation on the questionnaire and then merge the categories post hoc (i.e. the verbal descriptors of the categories would be same for every item). However, presenting four categories on the questionnaire rather than five changes the cognitive task for the individual. Therefore, it is important to revaluate the questionnaire in terms of category structure and item fit.

4.2.3 Results

4.2.3.1 Response scale analysis

The first aim of this analysis was to test the validity of presenting the participant with four response options and then merging to three categories post hoc. Therefore, the primary part of the analysis was a response scale analysis.

Initially the category diagnostic statistics were inspected for the four category solution (the visual presentation of the questionnaire given to participants). The initial structure calibration thresholds are visually identified in the probability curve (Fig. 4.5). This indicated that each of the response categories has a distinct probability of being selected for a particular person difficulty. However, inspection of the category usage indicates a low response to category 3 (<1% of responses). This was comparable to the result obtained in the original 30-item questionnaire response scale analysis. Therefore, it would appear that the visual presentation of four categories to the participant rather than five has no effect upon the usage of the highest end category. For this reason, the two end categories (category 2 and 3) were merged as they were in the original 30-item response scale analysis.

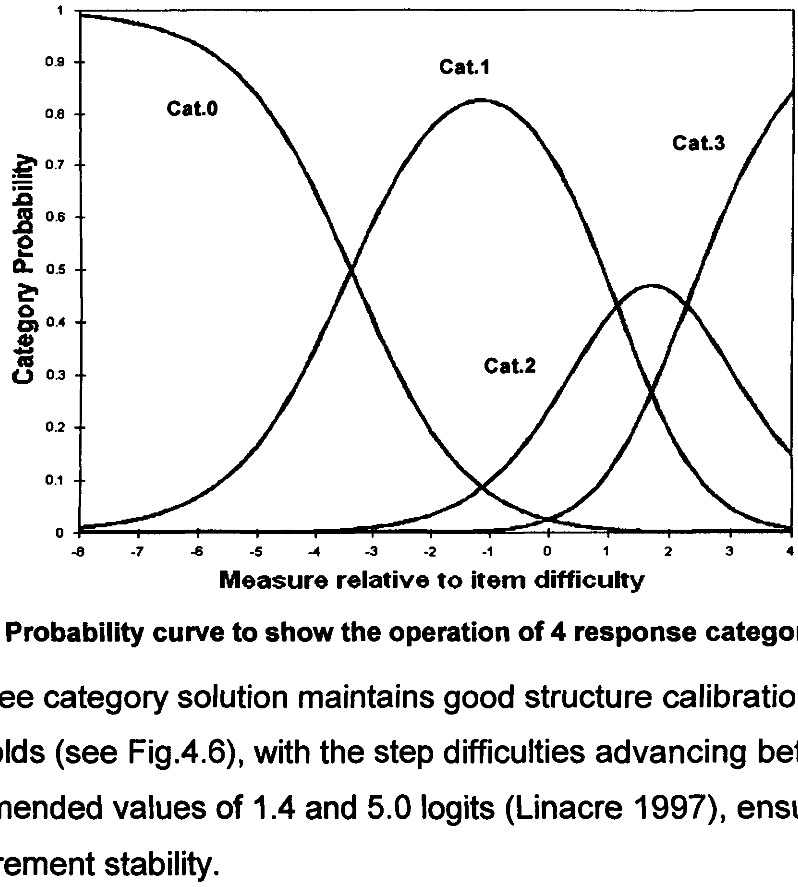

Fig. 4.5: Probability curve to show the operation of 4 response categories.

The three category solution maintains good structure calibration thresholds (see Fig.4.6), with the step difficulties advancing between the recommended values of 1.4 and 5.0 logits (Linacre 1997), ensuring measurement stability.

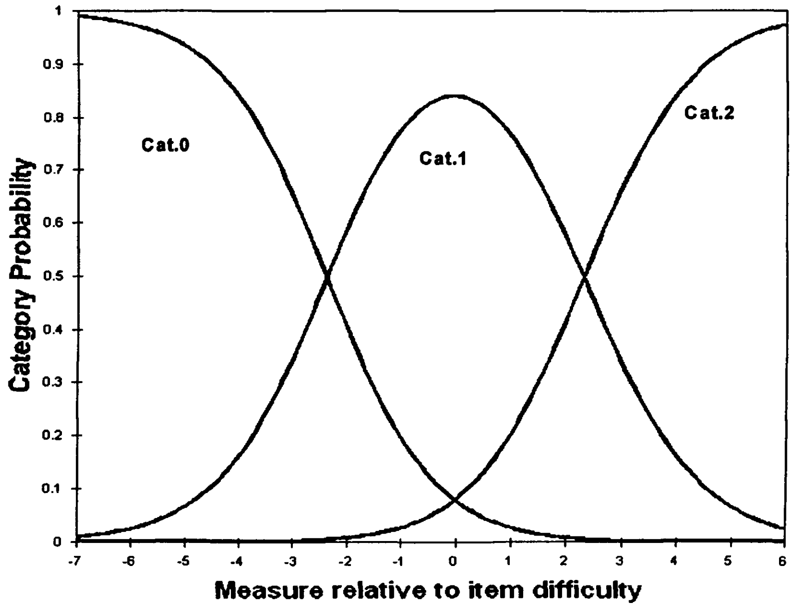

Fig.4.6: Probability curve to show the operation of 3 response categories.

Therefore, this analysis indicates the validity of presenting the 10-item OPAS as a four-category questionnaire and then merging categories 3 and 4 post hoc.

4.2.3.2 Person and item estimates

The second part of the analysis was to inspect the item and person estimates of the 10-item questionnaire. The high item separation reliability coefficient (0.93) of the items indicates the stability of the item estimates. This provides confidence in the item measure estimates that have been generated by the analysis. The root mean square error (RMSE) over all the items is 0.27.

The person separation reliability coefficient (which describes the reliability of person ordering) was 0.77 for this sample. The person separation ratio (signal-to-noise ratio) was 1.85, which is only slightly lower than the recommended value of 2 (Pesudovs et al. 2003).

4.2.3.3 Assessment of item fit

The third part of the analysis was to reassess the fit of the items in light of the newly presented four category response option. The mean square infit and outfit values of the items are identified in table 4.3.

Item	Mean square		Item calibration (SE)
	Infit	Outfit	
1. I feel relaxed during the eye test	0.61	0.56	0.07 (0.26)
2. I am afraid I will find the tests hard	1.37	1.42	0.23 (0.26)
3. Talking to the optician makes me feel tense	0.94	0.80	0.80 (0.25)
4. I am content that my eyes are healthy	1.54	1.91	-2.56 (0.23)
5. I feel on edge during the examination in case something goes into my eye	1.03	1.01	-0.17 (0.25)
6. I am satisfied in the ability of the optician	0.91	0.82	1.35 (0.25)
7. I worry about going to have my eyes checked	1.12	1.00	-0.04 (0.25)
8. I trust the optician	0.81	0.68	0.95 (0.25)
9. I am anxious something unpleasant will happen to my eyes	0.88	0.79	-0.38 (0.26)
10. When the optician is close I feel tense	0.62	0.56	-0.24 (0.25)

Table 4.3: Fit statistics and item calibration measures for the 10-item Optometric Patient Anxiety Scale (OPAS).

Item 2 and item 4 were flagged as misfitting the model according to the limits which were employed for item reduction in section 4.1 of this chapter (Court et al. 2007), suggested by Pesudovs 2003 (Pesudovs et al. 2003). However, the infit and outfit for item 2 are still less than 1.5, which, according to established guidelines (Linacre 2005), indicates that the item is still productive for measurement. Therefore, there is no indication that this item should be removed from the scale.

Item 1 and item 10 were identified as over fitting the model (i.e. low infit and outfit values) according to the limits which were employed for item reduction in section 4.1 of this chapter (Court et al. 2007). However, the values are still above 0.5, and as such are recognised as being productive for measurement (Linacre 2005). As such, they are valuable items in the scale.

The item measures (Table 4.3) and category threshold measures from this analysis were written into a Winsteps anchor control file which will be used in all future analyses using OPAS (Appendix VIa).

4.2.4 Discussion

The results confirmed the validity of presenting the 10-item OPAS with four categories and merging these post hoc. This was the principal aim of the revalidation study. Secondly, the fit statistics were checked in the reanalysis. The Rasch analysis described in Section 4.1 of this chapter confirmed that the ten items measured a unidimensional construct. For this data set item 4 was flagged as misfitting, the infit of item 4 was on the borderline of 1.5. Linacre (2005) suggests that infit and outfit values which are between 1.5 and 2.0 incorporate off-variable noise. The content of item 4 is "*I am content that my eyes are healthy*". One explanation for the off-variable noise for this item could be the nature of the sample. The patients in the sample were all attending a University Eye Clinic. The patient base incorporates many patients with eye problems, who are regular attendees and whose eye problems are managed by the clinic. Therefore, within this sample there may be patients who are aware that their eyes are not healthy, but they were not anxious about this due to the level of understanding they had about the problem. This is not necessarily representative of patients who are attending a high street optometrist, who may be less aware of their eye health.

Importantly, in the original development of the scale (reported in section 4.1), item 4 did maintain good infit and outfit values and loaded onto a single factor. The crucial point regarding the decision to retain this item on the scale is whether it will degrade the measurement ability of the scale. Linacre reports that only mean square values above 2.0 will "*degrade the measurement system*" (Linacre 2005). The infit and outfit values for item 4 are both below 2. Furthermore, since item 4 had shown good item fit in the previous analysis, it was decided to retain this item on the scale. However, this does indicate that there is the potential for future work investigating the operation of this item in different populations of patients.

The final aim of the revalidation study was to obtain item measures for OPAS which could be applied to subsequent analyses. The item reliability for the sample was high (0.93) which indicated that this sample provided stable item estimates. Therefore, the item estimates were used to write a Winsteps anchor file which can be used to analyse all consequent results obtained from studies which use OPAS.

4.3 Assessment of the contact lens items

4.3.1 Introduction

The initial content development of the Optometric Patient Anxiety Scale (OPAS) and a re-evaluation study of the OPAS have been described in section 4.1 and section 4.2 of this chapter. As demonstrated in section 4.1, the contact lens items did not fit onto the underlying construct of optometric patient anxiety. Therefore, the original data set, described in section 4.1, is re-visited in this final section of the chapter to further analyse the contact lens items.

The four contact lens items in the original 30-item piloted questionnaire showed substantial misfit to the Rasch model. This suggests that anxiety about wearing contact lenses is distinct from optometric patient anxiety. Therefore, rather than disregarding these items, it would be beneficial to reanalyse these items to assess their validity as a 4-item contact lens anxiety subscale.

The aim of this final analysis was to revisit the original data gathered from the 30-item pilot questionnaire (described in section 4.1) and to test the validity of a 4-item contact lens anxiety subscale. The purpose of the analysis was to reassess the optimal number of response categories for the four items, to find out if the items measure a unidimensional construct and to test the construct validity. Construct validity will be checked by testing the hypothesis that contact lens wearers will have significantly less contact lens related anxiety compared to non-contact lens wearers.

4.3.2 Methods

4.3.2.1 Study design and sample

The data for the four contact lens items were extracted from the raw data obtained from the 30-item, 5-response category pilot questionnaire described in section 4.1. Therefore, the same 141 questionnaires were revisited (50 male, 91 female; mean age 43.21 ± 17.44 years; first eye exam, 2%; requiring spectacle prescription, 81%).

4.3.2.2 Statistical analysis

Rasch analysis was used for the analysis of the response scale and item functioning (in terms of estimates and fit values) to assess the presence of a unidimensional construct. Using the item measures from the analysis, a parametric independent t-test was used to test the difference in mean contact lens anxiety between non-contact lens wearers and contact lens wearers.

4.3.3 Results

4.3.3.1 Response scale analysis

Firstly, the category structure was evaluated. The initial structure calibration thresholds are shown in Fig.4.7. The curves indicate that each of the five categories have a distinct probability of being selected for a particular person ability. Also, the categories contains at least 10 observations, ensuring stable estimations of the category difficulties (Bond and Fox 2001). Therefore, this indicates that the contact lens items have a well-functioning five-category rating scale. This is different to the category function of OPAS, which favoured a three category solution.

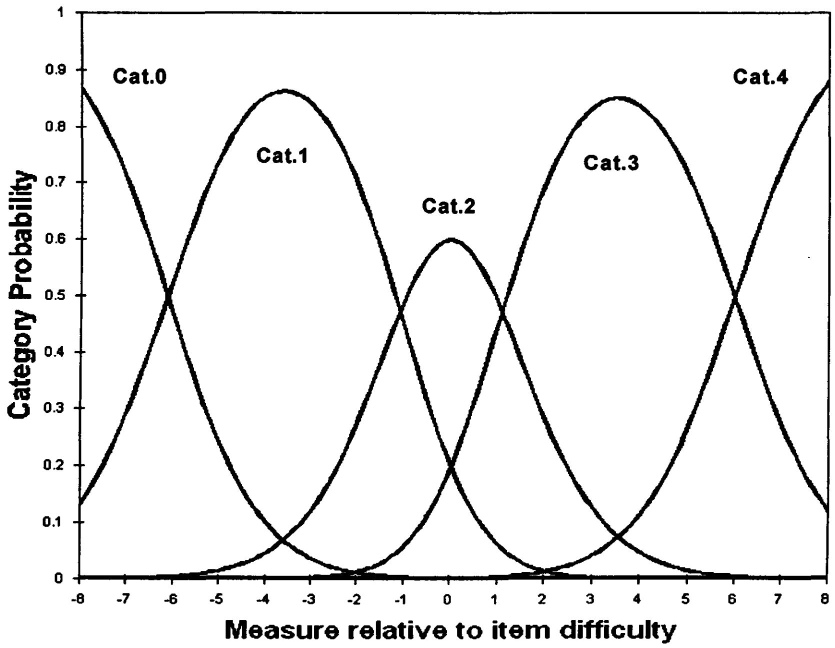

Fig. 4.7: Probability curve to show the operation of 5 response categories for the four contact lens items.

4.3.3.2 Person and item estimates

Secondly, the person and item estimates were inspected. Fig.4.8 shows the person-item map. The range of item difficulties (-0.43 to 0.20 Logits) is very narrow compared to the range of person abilities (-8.60 to 8.55 Logits). However, the effect of the categories results in the majority of person abilities covered by the items (see Fig. 4.8).

For this sample there is almost perfect targeting of the items to the people; the mean of the item estimates is 0 Logits (SD±0.25) and the mean of the people estimates is 0.12 Logits (SD±3.57). The root mean square error (RMSE) over all the items is 0.19, indicating the precision of the position of the items on the 'ruler'. Item separation reliability is an indicator of how well the item measures can be separated from each other (Bond and Fox 2001). For items with a small difficulty range, this is usually a low value (Linacre 2005). For this sample the item separation reliability is 0.42.

The person separation reliability coefficient (reliability of person ordering) was 0.86 for this sample. The person separation ratio (signal to noise ratio) was 2.49, and thus above the recommended value of 2 (Pesudovs et al. 2003).

```
PERSONS MAP OF ITEMS - Expected score zones
              <more>|
    8            .#  +
                     |
                    T|
    7             .  +
                     |
                     |                                 ITEM17.4
                                                       ITEM18.4
    6            ##  +                                 ITEM20.4
                     |                                 ITEM19.4
                     |
    5            .#  +
                     |
                     |
    4                +
          ######### S|
                     |
    3                +
                     |
              .###   |
    2                +
                     |                      ITEM17.3
                     |                      ITEM18.3
                 .#  |                      ITEM20.3
    1                +                      ITEM19.3
                 ##  |T
                  .  |S
    0        ###### M+M
                     |S
                  #  |T
   -1                +           ITEM17.2
                     |           ITEM18.2
                .##  |           ITEM20.2
                     |           ITEM19.2
   -2            ##  +
                     |
                     |
   -3                +
                    S|
          .######    |
   -4                +
                     |
                     |
   -5            .#  +
                     |
                     |
   -6            ##  +  ITEM17.1
                     |  ITEM18.1
                     |  ITEM20.1
                     |  ITEM19.1
   -7               T+
                 .#  |
                     |
   -8           ###  +
              <less>|<frequ>
 EACH '#' IS 3.
```

Fig. 4.8: Person/item difficulty map for the 4-item Contact Lens Anxiety Subscale with 50% probability thresholds denoted. The probability thresholds describe when there is equal chance of a person ticking either category 0 or 1 (when item number is followed with .1), when there is equal chance that a person will tick either category 1 or 2 (when the item number is followed with .2), when there is equal chance that a person will tick either category 2 or 3 (when the item number is followed with .3) or when there is equal chance that a person will tick either category 3 or 4 (when the item number is followed with .4).

4.3.3.3 Assessment of item fit

Thirdly, the fit statistics were analysed to determine if the four items measure a unidimensional construct. The mean square infit and outfit statistics are presented in Table 4.4.

Item	Mean Square		Item calibration (SE)	Factor loading
	Infit	Outfit		
17 The thought of putting a contact lens in my eye makes me feel tense	1.19	1.31	0.16 (0.18)	0.90
18 The idea of wearing contact lenses makes me feel anxious	0.72	0.69	0.20 (0.18)	0.95
19 I feel relaxed at the thought of having a contact lens in my eye	0.77	0.70	-0.43 (0.18)	0.94
20 I feel confident that a contact lens would be comfortable in my eye	1.29	1.50	0.07 (0.18)	0.89

Table 4.4: Fit statistics, item calibration measures and factor loadings for the 4-item Contact Lens Anxiety Subscale.

Inspection of the fit statistics shows that they are on the boundaries of the ranges employed for reducing OPAS, as suggested by Pesudovs 2003 (Pesudovs et al. 2003). However, the fit statistics for all the items are within the range of 0.5 to 1.5 which are 'productive for measurement' (Linacre 2005). Furthermore, a principal factor was found with unrotated factor analysis, with strong loadings from 0.89-0.95 (table 4.4), suggesting that the four items measure a unitary concept. Therefore, the evidence suggests that the four contact lens items do measure an underlying unidimensional construct.

4.3.3.4 Construct validity

Finally, the construct validity of the items was tested. The hypothesis to be tested was that contact lens wearers would have significantly less contact lens anxiety compared to non-contact lens wearers. A total of five participants did not specify if they were contact lens wearers, therefore N=136 for this analysis.

Prior to testing this hypothesis, the item measures (Table 4.4) and category structure measures were used to write an anchor control file in

Winsteps (Appendix VIb). Then, using these item measures, an independent t-test was used to compare contact lens anxiety between the two groups (contact lens wearers n=29; non-contact lens wearers n=107).

Contact lens wearers and non-contact lens wearers had mean scores of -4.52 logit and 1.05 logits respectively. Comparison of the two groups showed that non-contact lens wearers were significantly more anxious than contact lens wearers {$t(134)=-7.35$; $p<0.001$}. This result supports the final hypothesis of this study and supports the construct validity of the contact lens anxiety subscale.

4.3.4 Discussion

The results indicate that the four contact lens items form a valid, unidimensional, linear subscale which measures anxiety about wearing contact lenses. The short length of the questionnaire ensures low respondent burden (Streiner and Norman 1995) and therefore provides an efficient clinical measure.

The item reliability value for the scale was low, 0.42. In other words, there is some uncertainty regarding the position of the items with respect to each other on the scale. However, this was not a surprising result since item reliability is dependent upon the range of the item measures (Linacre 2005). The range of item measures was narrow compared to the person measures. In fact, the person-item map shows that all the items are estimated to measure about the same level of anxiety. This mainly results from the way in which these items were extracted from a longer scale. If this subscale had been developed primarily as a contact lens anxiety scale, more items would have been initially included. This would have probably resulted in items which measured a wider range of anxiety levels. However, although the four items measure similar levels of anxiety, this is not problematic for the scale. In fact, when the effects of the category thresholds are considered, the items measure the majority of the participants in this sample. Therefore, the contact lens anxiety subscale (CLAS) will serve as a useful tool to measure a range of contact lens anxiety. Moreover, the almost perfect targeting of the mean of the item difficulties to the mean of the person abilities, suggests that it will be a useful measure to assess the ability of interventions to reduce anxiety.

In summary, this is a unique tool which allows the measurement of patient contact lens related anxiety. The four items work together as an independent subscale. The testing of construct validity also additionally confirms that the items measure anxiety about wearing contact lenses.

4.4 Discussion

This chapter has primarily detailed the development of the Optometric Patient Anxiety Scale (OPAS). The Contact Lens Anxiety Scale (CLAS) has also been described, which was an unexpected addition, emerging from the development of OPAS.

The OPAS is the first scale designed to measure patient optometric anxiety, allowing the identification of anxious patients within optometric practice. Identification of patients with high anxiety will enable optometrists to decide how best to communicate with their patient for optimum clinical success. Further, OPAS can be used to evaluate the ability of various interventions, such as patient information or music, to alter patient anxiety in optometric practice. By reducing patient anxiety we may expect an improvement in patient variables pertaining to successful optometric outcomes including: improved satisfaction, greater compliance and better patient-optometrist communication.

The short length of the scale (10 items) lends itself to busy clinical practice, ensuring low respondent burden and increasing the likelihood of the questionnaire being completed fully and truthfully. The design of the questionnaire has been strengthened with Rasch analysis which has established that the scale is unidimensional. There is now the potential for further assessment of construct validity by measuring the anxiety levels in various groups, such as comparing anxiety between patients with and without eye problems. Construct validity will be tested in Chapter 6.

During the development of the OPAS, Rasch analysis suggested that items pertaining to contact lenses did not map onto a unidimensional construct of optometric patient anxiety. This suggested that anxiety about contact lenses is distinct from general optometric patient anxiety. This prompted further inspection of the contact lens items. Subsequent analysis showed that the four contact lens items constitute a unidimensional, linear measure of contact lens anxiety.

There is no other published scale which measures patient anxiety about wearing contact lenses. Therefore, the 4-item contact lens anxiety subscale (CLAS) is a unique tool. Previous report suggests that many patients decline wearing contact lenses due to anxiety (Hutchison 2001). Therefore, prior knowledge about a patient's level of anxiety could inform the optometrists' communication style. The influence of optometrist communication style when discussing contact lenses is known to affect the ultimate clinical success of contact lens wear (Thompson et al. 1990). Therefore, the CLAS may assist optometrists in attaining more positive clinical outcomes with patients.

In summary, the OPAS and CLAS provide linear measurements of anxiety in optometric practice. They will assist further research regarding patient anxiety and are tools which can be utilised by optometrists in practice to help improve clinical outcomes.

Chapter 5: Measuring patient anxiety during an optometric consultation

5.0 Introduction

The previous chapter has detailed the development of two self-report questionnaires, the OPAS and the CLAS, to allow the identification of anxious patients in optometric practice. This chapter will report a study in which patient anxiety is monitored throughout a contact lens fitting examination.

Contact lens fitting is perhaps one of the most invasive routinely performed procedures carried out by optometrists. In fact, reports suggest that many patients avoid trying contact lenses because they dislike the idea of having them placed into their eyes (Hutchison 2001). Unfortunately, this obstacle prevents many patients from experiencing the potential visual and cosmetic benefits of contact lenses.

However, it is encouraging to realise that optometrists, via their communication with patients, play a pivotal role in determining patient motivation (Thompson et al. 1990). This requires optometrists to have a thorough understanding of potential patient attitudes, expectations, experiences (Ettinger 1994; Fylan and Grunfeld 2005) and the role of patient anxiety. This study will specifically focus upon the experience of patient anxiety during contact lens fitting.

Thus far in this thesis, anxiety has been quantified with the use of questionnaires. However, there are other methods of evaluating anxiety (see Chapter 2), i.e. via the arousal response. The arousal response is triggered by a stressful event and mediated by the sympathetic nervous system which causes a number of bodily changes (Tortora and Grabowski 2000). Therefore, measurement of any of the bodily responses can provide a physiological correlate to anxiety.

Margrain et al (2003) reports the only previous study which has attempted to establish if there is any repeatable pattern of patient anxiety experienced during an optometric consultation. This study measured skin conductance to evaluate arousal throughout the examination. Skin conductance is an established method by which to measure arousal (Blascovich and Kelsey 1990). Although skin conductance is frequently used to measure the effect of a discrete event, it has been applied to social interaction research (Maio et al. 2001), including the dental context (Caprara et al. 2003).

Pulse rate can also be used as a measure of arousal. Pulse measurements are often conducted alongside other physiological measures, such as skin conductance (Carrillo et al. 2001) and have recently been applied to measurement of anxiety during cataract surgery (Kim et al. 2001; Moon and Cho 2001).

Questionnaires are a well established psychological method of measuring anxiety (House and Stark 2002; Spielberger 1983). The previously cited study which measured arousal during an optometric consultation, also measured state anxiety prior to the consultation with the Spielberger state anxiety scale (Margrain et al. 2003). This is a measure of current anxiety. However, there was no attempt to gauge the subjective experience of anxiety throughout the consultation, nor a measure taken of state anxiety post-consultation. A subjective measure of anxiety during the consultation would help establish if arousal and the subjective experience of anxiety were similar. The quickest and easiest way to make such measurements is with a visual analogue scale (VAS).

Apart from not measuring subjective anxiety throughout the consultation, a further drawback of the study conducted by Margrain et al (2003), was the very small sample size. Their results indicated that arousal varied throughout the consultation, but no effort was made to combine the results to determine if there were any specific anxiety provoking points.

Apart from the afore mentioned study, there is no research pertaining to patient anxiety during the optometric consultation, including contact lens fitting, which is likely to provoke anxiety. Therefore, in response to this current lack of understanding, this study sought to determine if there was any repeatable pattern of patient anxiety during the contact lens consultation.

This was a study of patient anxiety and arousal in patients who had not previously worn contact lenses. Participants recruited in the study underwent a routine contact lens fitting appointment. Participant anxiety was measured prior, during and after the appointment using questionnaires. Throughout the duration of the consultation participant physiological arousal was also measured, via skin conductance and pulse rate. The specific hypotheses tested were:

1) Anxiety, measured with physiological measures and a VAS, would not remain at a constant level throughout the contact lens fitting routine.
2) Anxiety about wearing contact lenses would be significantly reduced after the appointment, because patient anxiety would be moderated by the fitting experience.

Additionally, the study was used as an opportunity to further test the validity of the newly developed Optometric Patient Anxiety Scale (OPAS), described in the previous chapter. If OPAS measures an aspect of anxiety, then it would be expected to correlate well with an established anxiety scale. Therefore, the final hypothesis, to test for concurrent validity, was:

3) Optometric anxiety measured with OPAS would correlate with state anxiety.

5.1 Methods

5.1.1 Sample

Forty participants (15 male, 25 female; mean age 28.3 SD±9.5), recruited via posters located around Cardiff University, visits to lectures and word of mouth, took part in the study. The inclusion criteria of patients were as follows: non contact lens wearers (with no previous experience of trying contact lenses), an interest in trying contact lenses, unknown to the optometrist, 18 years of age or more and ability to read N24 at near without spectacles.

All the consultations were conducted at Cardiff University Eye Clinic, from November 2005 until July 2006. Ethical approval was obtained from the Cardiff School of Optometry and Vision Sciences Ethical Committee and all procedures adhered to the tenets of the Declaration of Helsinki.

5.1.2 Arousal and anxiety measures

Arousal was measured throughout the contact lens fitting procedure. Subjective anxiety was measured prior, during and post consultation. The arousal measures and questionnaires will now be described in detail.

5.1.2.1 Arousal measures

Skin conductance and pulse rate were used to measure participant arousal throughout the duration of the contact lens fitting procedure. Skin conductance was measured by placing two silver-silver chloride cup electrodes coated with electrode gel onto the distal phalanges of the middle finger and ring finger of the left hand. Pulse was measured using a photoelectric transducer attached to the index finger of the left hand (see fig.5.1). Based on pilot work, the photoelectric transducer was placed near to the knuckle to help reduce noise in the pulse rate trace due to movement. Participants washed their hands in warm water with a nonabrasive soap prior to electrode attachment (Dawson et al. 2000).

Once seated in the consulting room, the participant was instructed to rest their arm on the arm rest in a comfortable position. Following previous precedent (Margrain et al. 2003), a piece of crepe paper was loosely tied around the participants arm and the arm of the chair. This was to remind the participant to not move their arm excessively during the consultation, which could introduce movement artefacts into the recording.

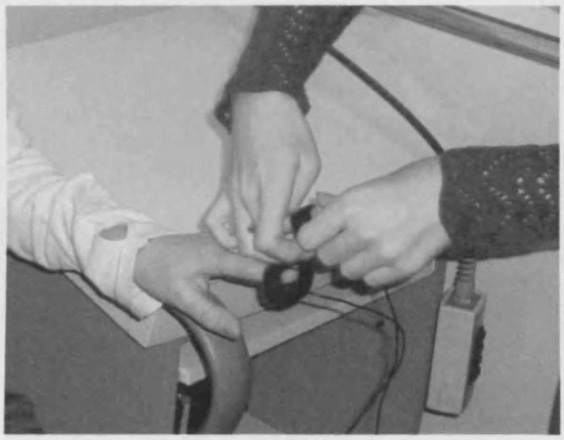

Fig. 5.1. Application of the physiological electrodes.

A physiological amplifier (Biopac MP30) was used to amplify (x2000) and low pass filter (0-35Hz) the skin conductance signals from the electrodes. The pulse signals were amplified (x5000) and low pass filtered (0.5-35Hz) by the same equipment. The amplifier was connected to a laptop PC (Toshiba pro 4200 series) running Biopac Student Lab Pro Version 3.6.5 software (see Fig.5.2).

Fig. 5.2. The physiological amplifier (Biopac MP30) and laptop PC (Toshiba pro 4200 series).

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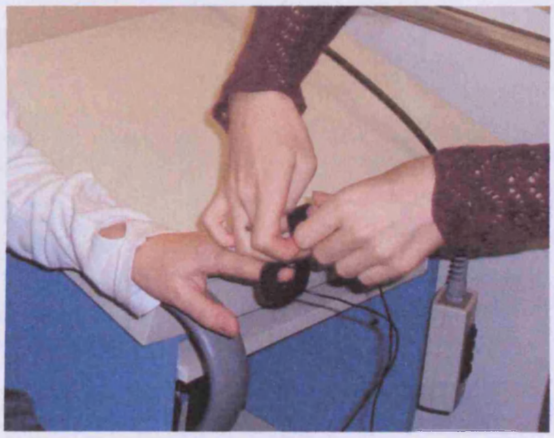

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Fig. 5.2. The physiological amplifier (Biopac MP30) and laptop PC (Toshiba pro 4200 series).

The wires connected to the participant's fingers were routed from the consulting room to an adjacent room. The wires were placed in such a way that the optometrist would not stand on them when moving around the participant and inserting contact lenses. During the consultation a research assistant who could overhear the consultation sat in the adjacent room and marked the output trace at pre-determined points.

5.1.2.2 Anxiety measures

Participant anxiety was measured before, during and after the consultation with self-report questionnaires.

Pre-consultation questionnaire

In addition to collecting information about date of birth, gender, first language and time since the last eye examination, the pre-consultation questionnaire included items measuring state, trait and optometric anxiety.

State anxiety was measured using a shortened version of the Spielberger state anxiety scale (Marteau and Bekker 1992) to reduce the final length of the questionnaires. This is a scale incorporating six items from the original 20-item scale (Spielberger 1983), with four response categories per item. Trait anxiety was measured only in the pre-consultation questionnaire using six items from the Spielberger trait anxiety scale (Spielberger 1983). These two questionnaires had been used in a previous study described in Chapter 3 and demonstrated good internal reliability.

The pre-consultation questionnaire also incorporated the Optometric Patient Anxiety Scale (OPAS) (Court et al. 2007) to measure patient anxiety associated with visiting the opticians. The contact lens anxiety subscale (CLAS) was also incorporated into the pre-consultation questionnaire. This is a four item subscale measuring anxiety about wearing contact lenses, which originated from the development of the

OPAS. The psychometric properties of this subscale are described fully in chapter 4. These four items had a five response category scale.

Finally, a VAS was also incorporated into the pre-consultation questionnaire. This was primarily to familiarise the participant with the use of the scale prior to the consultation (appendix VII). The VAS was constructed according to established guidelines (Cline et al. 1992), a 100mm vertical line with verbal descriptors "extremely anxious" and "not at all anxious" at either end. The visual ability required to view the VAS was measured to be an uncorrected near acuity of N24.

During consultation questionnaire: the VAS

Throughout the consultation subjective participant anxiety was measured using the VAS. Each VAS was printed on a separate piece of paper i.e. during the consultation, participants only saw one VAS at a time. Therefore, numerical markers were also positioned to the left side of the vertical line to assist participants deciding how to grade their anxiety in respect to their last response. Measurement was made at six predetermined points during the examination: the start of the examination, after history and symptoms, before and after contact lens insertion and removal.

At each point of measurement, the optometrist was instructed to use predetermined phrases, e.g. "*I am now going to select a contact lens and place it into your eye*". The optometrist then waited for a period of 5-10 seconds before asking the participant to complete the VAS. This was to allow adequate time for cognitive processing of the statement and to assess the physiological response. To ensure that completion of the VAS did not confound skin conductance responses associated with the stimuli (e.g. inserting the contact lens), the optometrist always waited about one minute after completion of the VAS before performing the task. Any skin conductance response generated by completion of the VAS should have diminished after a minute since the 50% recovery time for a response is 2-10 seconds (Dawson et al. 2000).

Post-consultation questionnaire

The post consultation questionnaire measured state anxiety and contact lens anxiety. The six item Spielberger state anxiety scale and CLAS were used to measure these variables i.e. the same questionnaires which were incorporated into the pre-consultation questionnaire (appendix VIII).

5.1.3 Procedure

Upon entering the clinic each participant was met by a research assistant and provided with an information sheet, consent form and the pre-consultation questionnaire to complete prior to the experiment. The participant was then escorted to the consulting room and the physiological electrodes were attached. A clipboard containing a number of VAS scales were placed on the participants lap. The participant was then asked to relax and wait for the optometrist to arrive; this was always a two minute wait.

Throughout the consultation the research assistant sat in the adjoining cubical (out of sight of the participant) by a laptop computer. A number of predetermined points were marked on the physiological trace, either at the start of an event or when the optometrist made a specific statement. These time points are identified in table 5.1.

Every effort was made to keep each participant experience the same, thereby reducing noise in the results. The same optometrist conducted every examination. It was important to ensure that the optometrist was unknown to the participant. Anxiety can occur in social situations (Jefferson 2001), such as when a person engages in formal speaking and interaction (Holt et al. 1992), for example with an optometrist. Therefore, familiarity with the optometrist could possibly reduce participant anxiety and consequently introduce noise into the results. Thus, the first meeting between the optometrist and the participant was at the start of the consultation. Further controls incorporated into the consultation included the optometrist retaining a set order of examination procedures for every participant. This involved pre-determined phrases to be spoken at key points. Also, the same examination room was used for every participant.

Including lid eversion into the contact lens fitting routine was considered. However, following discussions with 8 optometrists, it was decided not to incorporate lid eversion as it was not considered a regular part of the contact lens fit experience.

Event marker	Event
1	Optometrist enters the room
	VAS 1
2	Start of patient ocular history
3	Optometrist statement: "what I am going to do today is have a look at the suitability of your eyes for contact lenses, then put a contact lens into your eye"
	VAS 2
4	Start of slit lamp examination
5	Holding the right eyelid
6	Holding the left eyelid
10	Start of keratometer examination
11	Extra measurements (e.g. HVID)
12	Optometrist statement: "I am now going to select a contact lens and place it into your eye"
	VAS 3
13	Insertion of contact lens into right eye
14	Insertion of contact lens into left eye
	VAS 4
15	Measurement of visual acuities
16	Start of assessment of fit with slit lamp
17	Push-up test: right eye
18	Push-up test: left eye
19	Optometrist statement: "I am now going to remove the contact lens from your eye"
	VAS 5
20	Removal of right contact lens
21	Removal of left contact lens
	VAS 6
22	Patient told about Fluorescein
23	Fluorescein inserted
24	Start of advice to patient
25	Optometrist leaves participant

Table 5.1: Predetermined events marked on the physiological trace. Each event marker was recorded on the trace.

Upon completion of the consultation the optometrist left the room and let the participant relax for a further two minutes. After this period, the research assistant re-entered the room and removed the sensors. The participant then completed the post-consultation questionnaire. Once completed the participant was thanked for their participation and was offered the opportunity to look at the physiological trace. The participants were then asked if they had any comments about their experience.

5.1.4 Statistical Analysis

Analysis of the physiological data was primarily undertaken with the Biopac Student Lab Pro Version 3.6.5 software. Seven female (mean age 21.4; SD 2.1) participants took part in a pilot study in which full skin conductance and pulse rate data were obtained. On the basis of this pilot work, a 1Hz low pass filter was applied to the physiological trace to remove noise.

Questionnaire data was entered into SPSS® and recoded such that all items had a consistent valance. Scores were calculated for each separate measure within the questionnaires according to standard protocols (Marteau and Bekker 1992; Spielberger 1983).

Non-parametric statistical tests were used when analysing the shortened version of the Spielberger state anxiety scale (Marteau and Bekker 1992) and the six item Spielberger trait anxiety scale (Spielberger 1983).

The OPAS and the CLAS were developed using Rasch analysis and as such can be treated as interval level measures. Threshold values for the categories and item measures were obtained for these items in the development of these questionnaires (see chapter 4). These values were applied to the questionnaires when analysing the results. Parametric statistical tests were used to analyse these questionnaires.

The VAS scores were measured using a ruler (Cline et al. 1992), measuring from the bottom of the line to the bottom of the horizontal mark made by the participant. There is much debate about the nature of the VAS as a non-linear scale (Svensson 2000a, b) and the individual variability in how different people will use it (Straube and Campbell 2003). Therefore, in order to avoid interpreting individual VAS results as scores on a linear scale, the scores were analysed with the ranking method proposed by Crichton (2001).

5.2 Results

Descriptive information of the participants (n=40) is presented in Table 5.2. None of the participants had tried contact lenses before and all were able to read N24 comfortably at reading distance without spectacles. Fifteen of the participants were not current spectacle wearers; however, all were interested in trying contact lenses. The reasons cited by these participants wanting to try contact lenses were dislike of wearing spectacles or desire to try coloured contact lenses.

Age (mean; SD)		28.3 (9.5)
Gender	male	15 (37.5%)
	female	25 (62.5%)
First language	English	26
	Chinese	2
	Hindi	2
	German	2
	Other	8
Spectacles	Yes	25
	No	15
Last eye examination	< 6 months	10 (25%)
	6 month-1 year	11 (27.5%)
	1-2 year	16 (40%)
	> 2 year	3 (7.5%)
Trait anxiety median (Interquartile range)		10 (8-12)

Table 5.2: Descriptive information of the participants.

5.2.1 Assessment of anxiety during the contact lens consultation

The primary hypothesis of this study was that anxiety would not remain at a constant level throughout the contact lens fitting consultation. These data were collected during the consultation by physiological recording and the VAS (measured at six points).

5.2.1.1 Physiological traces

An example of a physiological record is shown in Fig.5.3. Initially all forty traces were inspected on a case-by-case basis. Cases were not accepted for analysis if; i) the trace was incomplete or ii) neither of the contact lenses were inserted (i.e. optometrist unable to insert lenses). Participants in which neither contact lens was inserted did not experience the full fitting routine (e.g. visual acuity check post-insertion) and as such were not representative of a normal contact lens fitting procedure.

One of the traces was incomplete, because the patient felt faint during the routine and the study was stopped. The optometrist failed to insert contact lenses into the eyes of three participants. Therefore, these four cases were also omitted from subsequent analysis. A further case was removed from the analysis because the optometrist knocked the sensors on the participant's hand half way through the routine. This resulted in a degraded trace. Therefore, there were a total of 35 cases in the final analysis (12 male, 23 female; age 27.7±8.8 years).

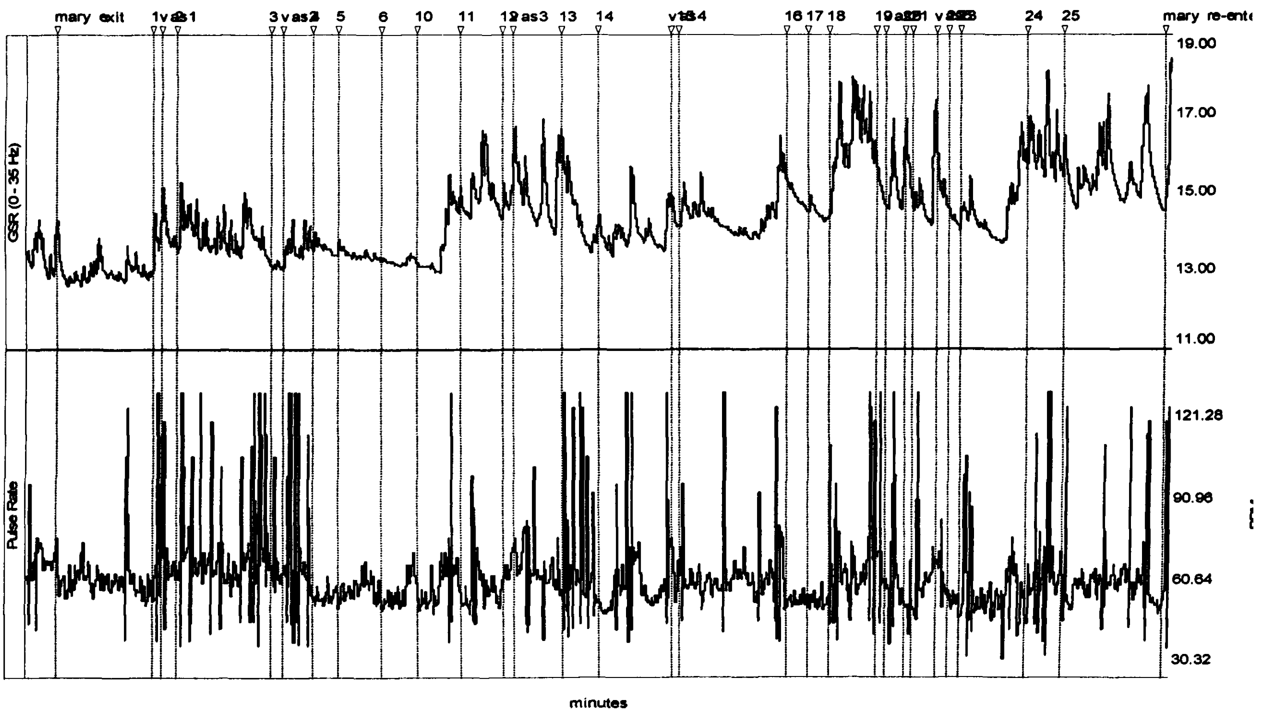

Fig. 5.3: Example of a physiological record showing the markers of key points during the consultation (26 minute period). Upper trace = skin conductance, lower trace = pulse rate.

5.2.1.2 Skin conductance analysis

Physiological recording began 30 seconds prior to optometrist's arrival and continued until 30 seconds after the optometrist left. The participant had already been relaxing for a few minutes before the recording began. For each individual trace, a 'pre-entry' measurement was taken before the optometrist entered the room. This value was the mean skin conductance response (SCR) obtained during a twenty second period, which was taken ten seconds before the optometrist arrived. Also, a final 'post-consultation' measurement was determined at the end of the consultation. This was the mean SCR over twenty seconds; ten seconds after the optometrist had left the participant.

The research assistant entered 'markers' alongside the skin conductance trace at key points during the consultation (see table 5.1). For each of these points a mean SCR value was calculated (based on data from a 5 second period, recorded 1 second after the mark). The rationale for this was to ensure that the peak of the SCR response was captured in the measurement. Latency of the SCR response is 1-3 seconds (Dawson et al. 2000), and time until the peak is 1-3 seconds (Dawson et al. 2000).

Absolute skin conductance values are meaningless. Therefore, to compare skin conductance across participants normalisation was required. The approach taken here was to calculate the mean skin conductance value of the entire trace for each participant, from thirty seconds prior to optometrist entry until thirty seconds after the optometrist left. Subsequently, each of the values calculated for each key point of the consultation was subtracted from this value (i.e. the mean of the trace), thereby normalising the data. This approach was taken as it was deemed to provide an efficient way of interpreting how each individual changed in arousal level throughout the consultation, as a function of their overall arousal.

Once these measurements had been calculated for each trace, all of the traces were grouped together for analysis. The mean SCR values across all traces were calculated for each key point in the consultation. These were then plotted (Fig.5.4).

A visual inspection of Fig.5.4 lends support to the primary hypothesis that participant arousal varies throughout the consultation. Peaks occur at history and symptoms (point 2), contact lens insertion (point 13), contact lens removal (point 20) and patient advice (point 24), suggesting that these were the most anxiety provoking parts of the fitting procedure.

5.2.1.3 Pulse rate analysis

Pulse rate data were collected from all thirty five participants. However, the data were very noisy. Advice was sought from the technical advisor at Biopac. However, even after filtering, the movement artefact was still apparent in the data, making it difficult to interpret. Hence the pulse rate data were not used in this analysis.

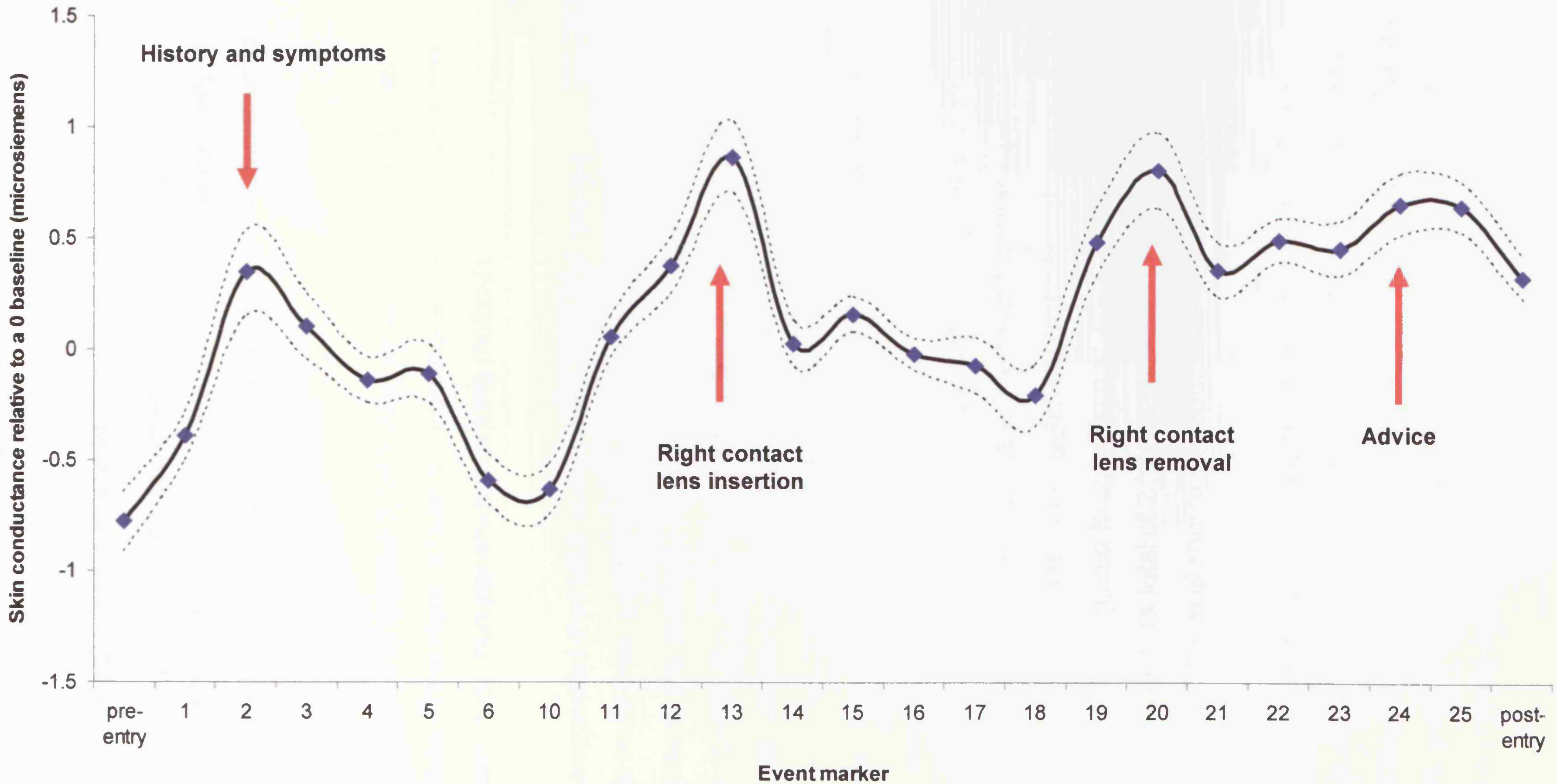

Fig. 5.4: Change in mean skin conductance during an initial contact lens fitting consultation (n=35). Each point is the mean skin conductance level obtained from all subjects at key points during the consultation. The solid line is a smooth line between the points and the dashed lines describe the magnitude of the standard error.

5.2.1.4 Visual analogue scale analysis

In addition to the physiological measurements of arousal, subjective anxiety was also determined using the VAS. VAS scores were analysed for the same 35 participants who were included in the skin conductance analysis.

As already described in chapter 2, VAS data should not be treated as parametric data. Therefore, all statistical methods used to analyse this data are based upon non-parametric ranking methods.

It has been suggested that VAS scales are a valid and reliable alternative to multi-item questionnaires (de Boer et al. 2004). Therefore, in order to assess the validity of the anxiety VAS in this study, the correlation between the state anxiety score and the VAS score prior to the consultation was determined. The correlation was significant (Spearman's rho =0.72 $p<0.001$). This established the monotonic quality of the VAS, i.e. as state anxiety increases, the VAS response increases.

To determine if participant anxiety was significantly higher at any point during the examination, a non-parametric Friedman test was used. A multiple pairwise Wilcoxen test with Bonferroni correction (Bland and Altman 1995) was then applied to determine at which time points anxiety was significantly higher (a total of 21 tests suggests that the p value for significance at the 0.05 level should be reduced to 0.002).

The results of the Friedman test suggested that there are significant differences in anxiety scores across the seven time periods (six points during the consultation and one point prior to the consultation) (Friedman $\chi^2(6) = 33.91$; $p<0.001$). The rankings are shown in fig.5.5. This lends support to the primary hypothesis of the study.

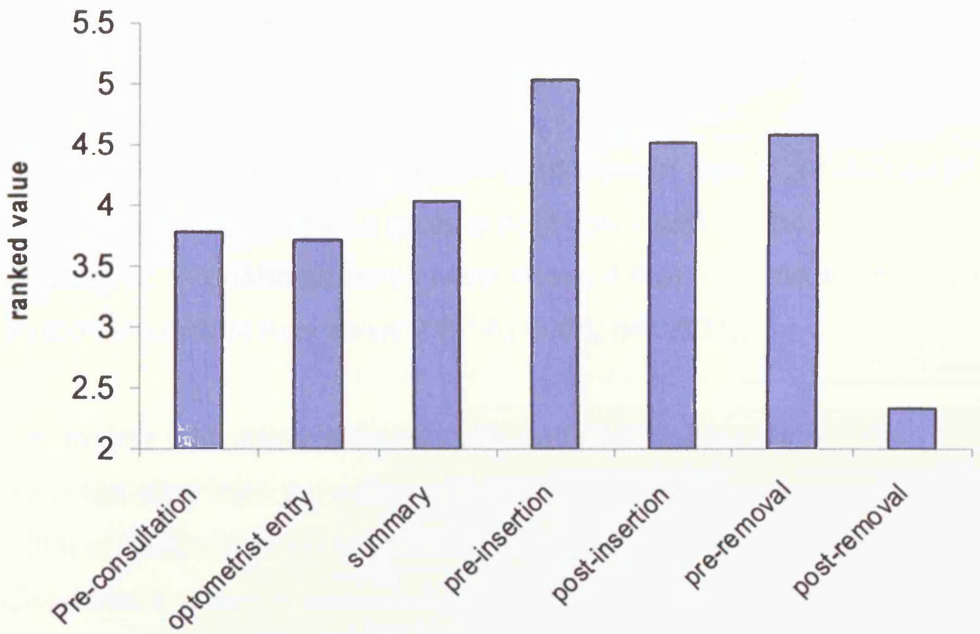

Fig. 5.5: Mean VAS rank values reported throughout the consultation (N=35).

At the p=0.05 level, the multiple pairwise Wilcoxen test showed that subjective anxiety was significantly higher at every point recorded compared to anxiety post-removal of contact lenses. Also, there was significantly higher anxiety measured pre-insertion of contact lenses, compared to the recording at the start of the examination when the optometrist enters.

5.2.2 Assessment of anxiety before and after the contact lens consultation

The secondary aim of this study was to test the hypothesis that participant anxiety would be reduced after the contact lens appointment.

5.2.2.1 Questionnaire analysis

Anxiety was assessed using data from questionnaires given to the same 35 participants before and after the consultation. The reliability of these instruments was measured using Cronbach alpha (State anxiety α=0.70, trait anxiety α=0.63, CLAS α=0.86, OPAS α=0.82).

5.2.2.2 Comparison of anxiety before and after the consultation

In order to test the hypothesis that patient experience of the contact lens examination would reduce anxiety, both anxiety about wearing contact lenses and state anxiety were measured pre- and post- consultation.

Mean contact lens anxiety before the consultation was -1.28 (SD ±3.01) logits and mean contact lens anxiety post consultation was -3.53 (SD ±2.97) logits. A paired samples t-test showed that this was a significant reduction in contact lens anxiety {$t(34)=3.65$; $p=0.001$}.

State anxiety was also measured pre- and post-consultation. State anxiety reduced from a median value of 9 before the consultation to a median of 7 after the consultation. The non-parametric Wilcoxen test showed that the reduction was significant {$z=-3.25$, $p=0.001$}. Furthermore, this is a clinically significant reduction (Dailey et al. 2002). Therefore, these results support the hypothesis that participant anxiety is significantly reduced after the consultation.

5.2.3 Concurrent validity of OPAS

The final aim of the study was to test the concurrent validity of OPAS. Pre-consultation state anxiety and OPAS scores were correlated for the same 35 participants used for the rest of the analyses. A highly significant correlation was identified {$r_s=0.61$, $p<0.001$}, thus supporting the third hypothesis of this study.

5.3 Discussion

This study has uncovered a previously unknown facet of the contact lens fitting consultation. Not only has it been shown that anxiety levels fluctuate throughout the consultation, but more importantly that there are specific points at which patients experience higher levels of anxiety and arousal. This provides insight for optometrists when they are communicating with patients. Furthermore, this study has shown that anxiety post-consultation is significantly less than before the consultation. Thus, both the primary and secondary hypotheses have been supported.

There has only been one previous study which has sought to evaluate anxiety in optometric practice using physiological and psychological measures (Margrain et al. 2003). That study showed that patient arousal varied throughout the eye examination, but did not show that there was any repeatable pattern. This may have been due to the very small sample size and also that there was minimal control during the consultation of the words and phrases used by the optometrist. This current study extends that research by focusing upon a specific appointment type and recruiting a larger cohort, showing that there is a pattern of patient arousal during contact lens fitting. Furthermore, the results clearly show that there are particular points during the consultation which elicit higher levels of anxiety and arousal.

The skin conductance data from all thirty five eligible participants have been presented graphically (see Fig.5.4). Figure 5.4 identifies the points of the consultation which provoked higher levels of arousal. The results suggest that there are two distinct types of event which cause increases in arousal. These events could be labelled as 'communicative interaction' and 'contact lens insertion and removal'.

The first type of event labelled 'communicative interaction' relates to two specific periods during the consultation, both showing heightened levels of arousal. The first of the two periods is at the start of the consultation when the optometrist is asking the participant about their history and symptoms. This is an optometrist led dialogue involving questions about general health, visual problems and daily visual demands. Patient-practitioner dialogue can be an anxiety provoking situation, causing some people to feel embarrassed or silly (Floyd et al. 2005; Lazare 1987). Apart from this, it is recognised within social anxiety research that, within the context of formal encounters people generally do not want to appear foolish. As such, the desire to make a good impression fuels anxiety (Holt et al. 1992; Schlenker and Leary 1982). The second of the two periods of 'communicative interaction' was at the close of the consultation when the optometrist was giving advice to the participant. This chiefly involved advising the participant about the fit of the contact lenses, instruction about lens care and also provided participants with a chance to ask questions. Again, this heightened arousal could be explained within a social anxiety framework.

However, although the explanations for heightened arousal during both these periods of 'communicative interaction' are valid, perhaps this result reveals a more fundamental patient concern. Namely, that patients place substantial value upon good communication with the optometrist. This is a well recognised patient concern within medicine. In that context, when patients do not feel understood by the practitioner, feel out of control or do not have their questions answered, they are less satisfied with the consultation (Harrington et al. 2004; Meryn 1998; Ong et al. 1995; Stewart 1995). The process of communication between patients and practitioners is dynamic and complex (Floyd et al. 2005). Considering this, perhaps it is not surprising that the participants in this study showed heightened states of arousal during these points. Whichever the reason, this unique finding clearly suggests that patients experience higher levels of arousal when talking with the optometrist. The Yerkes-Dobson Law (referred to in Chapter 3) indicates that high levels of arousal are disruptive to task performance (Yerkes and Dodson 1908). Therefore, these findings have great clinical significance, i.e. if anxiety is a factor during these times of discourse, there is an increased risk of poor patient attention and recall of what the optometrist has said (Kent 1984b;Taylor 1986).

The second type of event which showed higher levels of participant arousal was 'contact lens insertion and removal'. The results indicated that arousal increased when the optometrist told the participants "I am now going to select a contact lens and place it into your eye". It is well understood that the cognitive expectation of physical danger (e.g. pain) can evoke an anxiety response (Edelmann 1992). This perhaps explains the increased level of arousal at this point. However, arousal reached a maximal level upon insertion of the right contact lens (first of the two lenses to be inserted). Interestingly, the results suggest that this heightened state of arousal is not maintained upon insertion of the second contact lens, rather, mean arousal dramatically drops. There could be two possible explanations for this. Firstly, it could indicate habituation of the skin conductance response. Habituation results in a decrease in physiological response upon repeated presentation of a stimulus (Dawson et al. 2000). In other words, once the participant has experienced an event once, the second experience will never elicit the same level of response, in spite of their emotional state. However, it could also reflect a true reduction of participant anxiety upon insertion of the second lens. Experiencing the event once may create a more positive outcome expectancy resulting in a reduction of anxiety. Interestingly, the same pattern of arousal also occurs for the removal of the contact lenses. These results can similarly be explained in terms of both cognitive expectancy and habituation.

The uniqueness of this study compared to that previously reported by Margrain et al, 2003, was that subjective anxiety was also measured throughout the consultation. The measurements obtained with the VAS supported the skin conductance results, indicating heightened anxiety prior to contact lens insertion.

The VAS results also showed that subjective anxiety, after removal of the contact lenses, was significantly lower than at any other point measured during the routine (including pre consultation). However, this does not appear comparable to the arousal data. This observation is consistent with previous findings which have shown that cataract patients reported big decreases in anxiety post-surgery (Nijkamp et al. 2004). However, their reported anxiety increased again at follow-up appointments. It was suggested that patients exaggerated their initial post-surgical anxiety response due to the relief that the surgery was over and then reported their anxiety more accurately at consequent appointments (Nijkamp et al. 2004). In other words, the subjective anxiety response given by the participants in this study may not coincide with the bodily arousal measurements as a consequence of an exaggerated relief response.

The secondary aim of the study was to test the hypothesis that participant anxiety would be reduced after the contact lens consultation. The results supported this hypothesis, and both state anxiety and anxiety about wearing contact lenses were significantly reduced post-consultation. The items on the contact lens subscale were originally developed within the concept of cognitive expectancy (Edelmann 1992). Therefore, the significantly reduced score measured with these items suggests that cognitive expectancies may have been altered. Alongside the reduction in state anxiety, these results support the hypothesis that the experience leads to more positive outcome expectancies and thus reduced anxiety.

These results are in line with those of dental research which have investigated the effect of experience on patient expectations (Arntz et al. 1990). Those dental patients who were anxious, overestimated pain (i.e. inaccurate outcome expectancy) and consequently the dental experience reduced anxiety by making their predictions more positive (Arntz et al. 1990). However, when interpreting the results of the current study it is important to recognise that there may be a 'relief' effect operating post-consultation (as discussed above). Thus the reduction in anxiety may not be solely due to altered outcome expectancies. Nevertheless, these results are clinically significant for the optometrist. The findings suggest that if patients who express anxiety about trying contact lenses are motivated to try them, the experience of the contact lens fit will moderate their anxiety.

The final aim of this study, which was not directly related to the first two hypotheses, was to test the concurrent validity of OPAS. The results supported the hypothesis that state anxiety and OPAS scores would significantly correlate. The results identified a medium-strong correlation. This indicates that OPAS measures anxiety, but is also measuring something different to state anxiety.

To ensure the validity of the measurements in this study it was important for the contact lens fitting consultation to be as comparable to professional practice as possible. Clearly the attachment of physiological electrodes and completion of anxiety questionnaires are not normal patient experiences. Therefore, one potential limitation of the study may be that these interventions heightened participant anxiety. However, every effort was made to reduce the impact of these inventions by providing the participant with information (written and verbal) prior to the consultation. Furthermore, research in dentistry has assessed the impact of completing dental anxiety scales upon patient state anxiety. Results confirmed that completion of dental anxiety questionnaires had a non significant effect upon patient state anxiety (Humphris et al. 2006).

Summary

This study has provided previously unknown information about patient arousal and anxiety during an optometric consultation. Significantly, the results suggest that patients experience higher levels of arousal during periods of dialogue with the optometrist. It is clinically valuable information for optometrists to know that patients are potentially more anxious during such discourse, because anxiety can lead to poor attention (Taylor 1986). For example, many optometrists will explain the importance of lens hygiene, expecting the patient to remember what has been said. However, if the patient is anxious, this may not be the case. For this reason, it may be beneficial for optometrists to consider providing written materials and repeating advice to patients, techniques used in medicine to improve clinical success (Kupst et al. 1975; Ley 1979; Ley et al. 1976).

The results also show that patient anxiety is reduced after the consultation, indicating anxiety is moderated by experience and realistic outcome expectancies. If an optometrist communicates information about contact lenses in a clear and realistic way, previous research has already shown that there is an increase in the potential for clinical success (Bennett et al. 1998; Kent 1985), this study also suggests that it will reduce patient anxiety.

Chapter 6: Effectiveness of anxiety-reducing interventions

6.0 Introduction

Optometric research should ultimately translate into improved care and service for the patient. Previous chapters have identified the presence of patient anxiety in optometric practice and shown that it is associated with patient compliance and satisfaction. This suggests that reducing patient anxiety should have direct clinical benefits. Therefore, the principal aim of this final study was to determine if patient anxiety could be reduced by the provision of information leaflets or by listening to music in the waiting room.

Provision of patient information may be one way to ensure that patients have more positive expectancies and hence lower anxiety. This method has been suggested for cataract patients (Nijkamp et al. 2004). The provision of written information has reduced anxiety in patients waiting for surgery (Sheard and Garrud 2006), possibly because of a greater feeling of perceived control. Fylan and Grunfeld (2002) have shown that optometric patients want information and they suggested that this may reduce anxiety; however, this hypothesis has not been formally tested.

Apart from the use of information leaflets, another intervention strategy known to reduce anxiety is listening to music (Chan et al. 2003; Chang and Chen 2005; Cooke et al. 2005). The theoretical basis is that music has a stimulatory action upon the autonomic nervous system promoting relaxation (Cooke et al. 2005). Alternatively, it has been suggested that music has a distracting effect, resulting in reduced anxiety (Chan et al. 2003). In a systematic review of hospital studies, Evans (2002) reported that music significantly reduced anxiety for all patients, apart from those undergoing invasive or unpleasant procedures. In the majority of these studies state anxiety was measured. However, to date, there have been no studies investigating whether listening to music, prior to an optometric appointment, reduces optometric anxiety.

It was established in Chapter 3 that higher levels of patient state anxiety, prior to primary healthcare appointments, were associated with lower levels of patient satisfaction and intended compliance. State anxiety is not specific to a particular situation; rather it is a transient experience of anxiety which can be experienced in any context (Spielberger 1966). A more specific question for optometry is to establish if patients who report higher levels of optometric anxiety (anxiety specifically due to the optometric context) have lower levels of satisfaction and compliance post consultation.

Given that previous research indicates that information and music can reduce anxiety, it was decided to assess the effectiveness of these two interventions on optometric anxiety. Furthermore, the association between patient anxiety with satisfaction and intended compliance required further investigation to establish if it was a replicable association within optometric practice. Therefore, the specific hypotheses tested in this study were:

1) There will be significantly less optometric patient anxiety in patients who listen to music or receive an information leaflet prior to the eye examination compared to controls.
2) There will be a significant correlation between patient optometric anxiety and both patient satisfaction and compliance.

Optometric patient anxiety was measured with the Optometric Patient Anxiety Scale (OPAS) (Court et al. 2007), which has both internal and concurrent validity (see Chapter 4 and 5). This study provided further opportunity to test the construct validity of the OPAS. Hence, the final hypothesis of this study was:

3) Patients attending for a routine appointment will have significantly less optometric anxiety than those who are attending for a “problem”.

This study was a non randomised trial with three experimental conditions; control, eye examination leaflet and music. Optometric patient anxiety was measured pre-eye examination and satisfaction and intended compliance was measured post-eye examination.

6.1 Methods

6.1.1 Sample

The sample consisted of 267 consecutive patients who were booked to see one of three optometrists for an eye examination at Cardiff University Eye Clinic. All these participants were invited to take part in the study, however, a total of six patients (2%) declined to take part in the study and 64 patients (24%) were too late for their appointment to complete the questionnaire. Therefore, the final sample consisted of 197 participants (82 male, 115 female; age 57.1±18.6). Although the optometrists knew the days when the participants were listening to music, they were not aware which patients had seen an information leaflet and which were the controls.

The exclusion criteria were patients less than 18 years old and those attending for a contact lens examination. The information leaflet was about the 'eye examination' rather than a contact lens examination. Therefore, it was not appropriate to include patients attending for contact lens examinations.

6.1.2 The interventions

The leaflet used in this study was produced by The Eyecare Trust, a charity dedicated to raising awareness of all aspects of eye care. The leaflet, entitled "The Eye Examination", explains the importance of the eye examination, encourages the patient to discuss their needs, describes the content of the examination and explains the process of choosing and purchasing spectacles (Appendix IX).

Two other leaflets were also considered for the study (see Appendix X). However, The Eyecare Trust leaflet was chosen upon the basis that it was interesting, concise, clear, included information about when to see the optometrist, described the skills of an optometrist and detailed procedural information about the eye examination. These were identified as key parameters by patient groups (Fylan and Grunfeld 2002).

The majority of medical studies which assess the impact of music upon patient anxiety tended to play music to the patient through headphones (Cooke et al. 2005; Evans 2002). However, this was not possible in this study. There was precedent for assessing anxiety levels in hospital waiting areas while patients listen to relaxing background music (Tansik and Routhieaux 1999). Therefore, for this study a compact disc of music was played as background music in the patient waiting area. There was also variability between medical studies in the type of music played, although classical music is often used. Reports suggest that there is no correlation between the type of music listened to and the reduction in anxiety detected (Winter et al. 1994). Therefore, four CD's of 'Relaxing classical music' were used during this study. The CD's were played on repeat and were regularly changed.

6.1.3 Questionnaires

This study utilised two questionnaires in order to measure optometric patient anxiety, satisfaction and intended compliance. Optometric patient anxiety was measured pre-consultation and satisfaction and compliance were measured post-consultation.

The pre-consultation questionnaire included the 10-item OPAS (Court et al. 2007), described in Chapter 4. The pre-consultation questionnaire also recorded information including age, gender, information about the refractive status of the participant, the time since their previous examination and the reason for the eye examination. The questionnaire took 3-5 minutes to complete (Appendix XI).

The post-consultation question was used to measure patient satisfaction and intended compliance. The Rapport and Compliance Intent subscales were extracted from the Medical Interview Satisfaction Scale (MISS-21) (Meakin and Weinman 2002) to measure these variables (see Chapter 3). The original scale was developed for medical practice; therefore, the word 'doctor' was replaced with 'optician' for this study. Furthermore, the Rapport and Compliance Intent subscales consisted of only eight and three items respectively, reducing respondent burden. This questionnaire also took 2-4 minutes to complete (Appendix XII). Each item has a seven-response option (very strongly agree-very strongly disagree).

All questionnaires were available in large print for patients with low vision.

6.1.4 Procedure

Each of the groups (control, information leaflet and music) were allotted different days upon a random basis.

Upon arrival at the clinic, every suitable patient was invited to complete a pre-consultation questionnaire prior to their appointment and to post it into a sealed box in the waiting area upon completion. After the consultation, participants were given a post-consultation questionnaire to complete before leaving the practice. This questionnaire was also put into the box in the waiting area.

Participants in the eye examination leaflet group were posted a copy of "The Eye Examination" leaflet 3-5 days prior to their appointment. A covering letter accompanied the leaflet explaining that the leaflet would provide them with interesting information prior to the examination. Upon arrival at the clinic, these participants were given a second copy of "The Eye Examination" leaflet with the copy of the pre-consultation questionnaire. There was a question on the pre-consultation questionnaire to confirm that the participant had received the leaflet through the post prior to their examination. Patients had the choice not to participate in the study at this point if they wished.

During the days allotted for the music condition, the CD player was started in the morning and played throughout the day.

All procedures adhered to the tenets of the Declaration of Helsinki and ethical approval was obtained from the Cardiff School of Optometry and Vision Science Ethical Committee.

6.1.5 Statistical Analysis

All data were entered into the statistics package SPSS® and recoded such that all items had a consistent valance.

Data from the OPAS was converted to a linear scale using category values and item measures obtained during its development (see Chapter 4) and evaluated using parametric statistics.

The Rapport and Compliance Intent subscales from the MISS-21 were developed within traditional test design parameters, in which numbers are assigned to each response category and treated in an additive manner. Therefore, these scales were analysed with non-parametric statistics.

6.2 Results

A total of 197 participants took part in the study. The demographic and refractive details are shown in Table 6.1. Chi-square and one way ANOVA were used (incorporating Bonferroni correction) (Bland and Altman 1995) to determine that the groups were comparable. There were no significant differences between groups for this data.

	Control	Leaflet	Music	Comparison of groups
N	87	52	58	
Gender				
Male	37 (43%)	18 (35%)	27 (47%)	$\chi^2(2)= 1.67$;
Female	50 (57%)	34 (65%)	31 (53%)	p=0.44
Age	58.2 ±18.4	55.3±20.2	56.9±17.4	F(2, 194)=0.42; p=0.66
Contact lens wearer				
Yes	7 (8%)	4 (8%)	8 (14%)	$\chi^2(2)= 1.60$;
No	80 (92%)	47 (92%)	50 (86%)	p=0.45
Missing	0	1	0	
Spectacles				
Yes	77 (90%)	47 (90%)	50 (86%)	$\chi^2(2)= 0.57$;
No	9 (10%)	5 (10%)	8 (14%)	p=0.75
Missing	1	0	0	
Refractive surgery				
Yes	1 (1%)	3 (5%)	0 (0%)	$\chi^2(2)= 5.15$;
No	86 (99%)	49 (95%)	57 (100%)	p=0.08
Missing	0	0	1	
Last test				
never	1 (1%)	0 (0%)	0 (0%)	$\chi^2(8)= 11.28$;
<6mths	3 (3%)	6 (12%)	5 (8%)	p=0.19
6mth-1yr	22 (25%)	16 (31%)	8 (14%)	
1-2 yr	34 (39%)	17 (33%)	30 (52%)	
>2yr	27 (31%)	13 (25%)	15 (26%)	
Test				
Routine	62 (72%)	40 (77%)	41 (73%)	$\chi^2(4)= 2.10$;
Problem	21 (24%)	12 (23%)	14 (25%)	p=0.72
Emergency	3 (4%)	0	1 (2%)	
Missing	1	0	2	

Table 6.1: Descriptive statistics of participants and comparison of the groups

6.2.1 Missing data analysis

Of the 197 participants who completed the pre-consultation questionnaire, 58 did not complete a post-consultation questionnaire. It is important to assess the influence of missing data (Altman and Bland 2007; Tabachnick and Fidell 1989), as it can affect the validity of the final results. Differences for age, gender, last test and reason for test were evaluated with the independent t-test and Chi-Square test between these two groups. There were no differences for any of the variables tested {age: t(195)=1.37; p=0.17, gender: χ^2 (1)=1.73 p=0.19, last test: χ^2 (4)=7.40 p=0.12, test type: χ^2 (2)=3.47 p=0.18} between participants who did and did not complete a post-consultation questionnaire.

6.2.2 Questionnaire Analysis

To assess the internal reliabilities of the questionnaires used in this study, Cronbach alpha was calculated. All of the questionnaires had a Cronbach alpha value equal or more than the recommended value of 0.70 (Nunnally 1978) (OPAS: α=0.85, Rapport subscale: α=0.95, Compliance Intent subscale: α=0.70).

6.2.3 Comparison of Optometric Patient Anxiety, satisfaction and intended compliance between control and intervention groups

The primary hypothesis of this study was that there would be significantly less anxiety reported in the intervention groups compared to the control group. The scores of all the measures are presented in Table 6.2. Comparison of pre-consultation OPAS scores between the three groups with one-way ANOVA did not identify any significant differences between groups. The lack of a statistical difference between scores suggests that none of the interventions had a significant effect upon reducing patient optometric anxiety.

	Control	**Eye information leaflet**	**Music**	**Comparison between groups**
OPAS mean (±SE)	-1.03 (±0.20)	-0.82 (±0.11)	-1.31(±0.30)	F(2, 194)=0.75; p=0.48
Satisfaction median (Interquartile range)	48.0 (42.5-55.5)	47.0 (41.0-52.0)	50.0 (46.0-56.0)	Kruskal-Wallis χ2 (2)=3.88 p=0.14
Compliance intent median (Interquartile range)	17.5 (15.0-21.0)	16.0 (15.0-18.0)	18.0 (16.0-21.0)	Kruskal-Wallis χ2 (2)=2.29 p=0.32

Table 6.2: Comparison of questionnaire scores between groups.

6.2.4 Correlation between optometric patient anxiety and satisfaction and compliance

The second hypothesis of the study was that there would be a significant correlation between patient optometric anxiety and both patient satisfaction and intended compliance. The whole sample was used to correlate OPAS with post-consultation measures. The reason for this was that there was no difference in satisfaction or intended compliance scores between the control and the intervention groups (see table 6.2), therefore indicating that noise would not be introduced into the analysis due to the intervention data.

There was a significant correlation between the optometric anxiety and satisfaction measures ($r_s = -0.32$; $p<0.001$). This indicates that participants with higher optometric anxiety prior to the examination had significantly lower satisfaction post examination. This finding supports the hypothesis of the study.

There was also a significant correlation between optometric anxiety and intended compliance ($r_s = -0.47$; $p<0.001$). Again, this indicates that there is a significant association between participants with high optometric patient anxiety and low compliance intent. This finding also supports the hypothesis of this study.

6.2.5 Construct validity of OPAS

The final aim of the study was to test the construct validity of the OPAS. The hypothesis to be tested was that participants attending for a routine appointment would have significantly less optometric anxiety compared to those attending for a problem appointment.

The data from both the control and the intervention groups were used because there was no significant difference in OPAS scores between the three groups. An independent t-test was used to determine if there was a significant difference in OPAS scores between participants attending for a routine or problem appointment.

Participants attending for routine and problem appointments had mean OPAS scores of -1.35 (SD±2.12) logit and -0.32 (SD±1.94) logits respectively. Comparison of the two groups showed that participants who attended for an examination due to a problem were significantly more anxious than those attending for a routine examination {t(188)=-2.94; p=0.004}. This result supports the final hypothesis of this study and indicates the construct validity of the OPAS.

6.3 Discussion

This study set out to determine if patient optometric anxiety could be reduced by the use of interventions. The results suggested that there was no significant reduction in optometric anxiety for either of the intervention groups, namely those receiving the "Eye Examination leaflet" or those listening to music. This result was contrary to expectations. However, a notable result from this study was the finding that there was a significant association between patient optometric anxiety and satisfaction and intended compliance. This is highly significant for optometric practice. Finally, the results of the study provided further construct validity of the OPAS.

Assessing the effect of information leaflets upon patient anxiety extends research conducted by Fylan (2002). That study suggested that providing patients with more information would reduce anxiety by providing the patient with an increased sense of control and confidence. Although the results from the present study do not appear to support this prediction that does not necessarily mean that this is not an effective intervention. In fact, it is very plausible to suggest that the benefit of providing information is not uniform for all people. One differential may be related to the coping style of an individual. When faced with a potentially anxiety provoking situation, 'monitors' seek detailed information in order to reduce their anxiety. This is opposite to 'blunters' who feel overwhelmed and more stressed by possessing more knowledge about the situation (Williams-Piehota et al. 2005). The participants in the Fylan (2002) study were a self selecting sample, which the authors suggested could have resulted in a biased cohort of individuals who were more interested in eye care and desired maximum information from the practitioner. In other words, the conclusion made by Fylan (2002), that the provision of more information would reduce patient anxiety, may be true only for a specific type of patient.

Regarding the provision of patient information leaflets, the results in this study may have been confounded by previous patient experience. The rationale for expecting anxiety reduction was based upon creating more accurate expectancies and increasing patient control. However, nearly all the participants in the groups had had a previous eye examination. Previous experiences can also moderate expectations (Arntz et al. 1990), which may have masked the effect of the leaflet.

Using music as an intervention to reduce anxiety in the optometric waiting room has not been previously studied. However, background music has been shown to significantly reduce anxiety in hospital waiting rooms (Tansik and Routhieaux 1999). The results of this study did not replicate that effect. Perhaps this negative result was partially due to the type of anxiety measurement that was made. Anxiety measured in this study was specifically that element which is related to the optometric experience. However, the more general experience of 'state anxiety' is often the variable measured in medical studies (Cooke et al. 2005; Evans 2002; Tansik and Routhieaux 1999). Music is thought to stimulate the autonomic nervous system promoting relaxation (Cooke et al. 2005). Therefore, it is logical to expect that the general anxiety 'state' may be reduced, whilst this does not necessarily translate to a reduction of anxiety about the specific event to be experienced. This could explain why optometric patient anxiety was not reduced in this study.

The significant association between optometric patient anxiety and both patient satisfaction and intended compliance is an important finding. Previous work in this thesis (Chapter 3) showed a significant correlation of state anxiety with satisfaction and intended compliance in primary healthcare consultations. This study further supports that result. The finding that this correlation is replicable in the optometric setting is of clinical significance. It suggests that optometric patient anxiety is a modulator of patient satisfaction and compliance.

The problem of non-compliance is well documented in both optometry and ophthalmology (Claydon et al. 1998; Edmunds et al. 1997; Taylor et al. 2002). For example, it has been reported that non-compliance in contact lens wear and glaucoma treatment is over 50% (Claydon et al. 1998). Forgetfulness, poor patient-practitioner communication and cost have all been cited as reasons for non-compliance (Claydon et al. 1998; Taylor et al. 2002). However, patient anxiety appears to have been largely ignored. Therefore, the significance of this study is that it indicates that if patient optometric anxiety can be reduced, there may be an improvement in compliance and hence clinical outcomes.

The measure of satisfaction used in this study was the 'Rapport' subscale of the MISS-21(Meakin and Weinman 2002). The items in this subscale are very specific about the perceived relationship between the practitioner and the patient. Therefore, the finding that high optometric patient anxiety significantly correlates with this aspect of anxiety indicates the pivotal role patient anxiety has in the way that a patient views the patient-optometrist relationship. The quality of the patient-optometrist relationship is critical, since optometrists have great potential to determine patient motivation and clinical success (Thompson et al. 1990). Good patient-practitioner relationships result in improved levels of compliance and healthcare outcomes (Fleissig et al. 1999; Harrington et al. 2004; Stewart 1995). This suggests that every effort should be made to ensure that patients are satisfied with the patient-practitioner relationship. In the light of these findings, this may indicate the need for the development of more interventions to reduce patient anxiety.

This study also provided further opportunity to test the construct validation of the OPAS. The results were consistent with the hypothesis, that patients attending for a routine eye examination were significantly less anxious that those attending for an appointment due to a problem with their eyes. This result supports the construct validity of the OPAS.

There were a number of limitations in this study. Every effort was made to ensure participants in the 'leaflet information group' read the leaflet prior to their appointment. That is, they were sent a leaflet prior to the appointment and given another at the appointment. However, ultimately there was no control over whether the patient had actually read the leaflet.

A limitation regarding the music intervention was that there was the possibility that not all the participants could hear the music well. The waiting room in the clinic is a busy area and ambient noise may have disrupted the participant's ability to hear clearly the music. Another limitation of the design was that the participants had no control over the type of music they listened to. It has been suggested that preference type might be important, since variables such as age and culture may influence individual preferences (Lee et al. 2005).

Summary

This final study was an initial attempt at establishing the effect of two interventions to reduce patient anxiety in optometric practice. Whilst neither of the interventions reduced anxiety significantly in this study, it is important that further attention is given to this research area because patient satisfaction and compliance are moderated by patient anxiety.

Chapter 7: Final Conclusions and Future Recommendations

"Things are clearer now. I understand. Doubt has been replaced by truth. The cause of the problem is known. There is a next step – the optician provided a full explanation. This is not the end of the road. Apparently this is completely normal when you get older".

7.0 Conclusions

Patient anxiety is known to have a detrimental effect upon healthcare outcomes. However, until now the subject has received almost no attention in the optometric setting. The results reported in this thesis suggest that patient anxiety is a problematic feature of optometric practice.

The main conclusions which can be drawn from this thesis are as follows:

1. Anxiety is a feature of optometric practice

The study reported in Chapter 3 showed that patients experience a range of anxiety levels within optometric practice which overlap to a large extent with dental and general medical practice. Although the median state anxiety reported within optometric practice was significantly lower compared to dental and medical practice, some optometric patients did report the high levels of state anxiety. State anxiety levels within optometric practice can be partially predicted by heightened patient trait anxiety, anticipation of 'bad news' and non-spectacle wear. Furthermore, outcome expectancies within optometric practice are similar to those within dental and general medical practice, suggesting that similar interventions may be effective at reducing anxiety levels.

2. Optometric patient anxiety and contact lens related anxiety can be measured in clinical practice

The Optometric Patient Anxiety Scale (OPAS) and Contact Lens Anxiety Subscale (CLAS), described in Chapter 4, allow the identification of those patients who are anxious about the optometric consultation generally and those who are anxious about trying contact lenses. These are the first scales developed specifically to measure anxiety within optometric practice. Identifying patients who are anxious, either about the eye exam or wearing contact lenses, prior to the examination could help optometrists consider the most appropriate way to communicate. The development of both scales has been strengthened with Rasch analysis.

3. Anxiety is associated with reduced patient satisfaction and intention to comply

The results from the study reported in Chapter 3 showed that there was a significant association between high levels of pre-consultation state anxiety and low levels of post-consultation satisfaction and intended compliance for healthcare appointments. This may be a result of poor communication due to the disruptive effect of anxiety upon patient concentration (Rachman 1998). Furthermore, the study reported in Chapter 6 showed that this result was replicable for anxiety specific to the optometric context, suggesting that optometric patient anxiety is a mediator for patient satisfaction and compliance.

Non-compliance is a problematic feature of optometric practice which can have detrimental effects upon clinical outcomes. Satisfaction can also influence health outcomes e.g. satisfied patients are more likely to comply with practitioner advice and attend follow-up appointments (Pager 2005). Therefore, the results suggest that if patient optometric anxiety can be reduced, this will translate to improved compliance and clinical outcomes.

4. Patients experience heightened arousal during periods of 'communicative interaction' with the optometrist

Patient arousal levels were heightened during periods of communicative interaction during the contact lens fitting consultation (Chapter 5). Anxiety during these periods may result in disrupted patient recall and attention. This identifies the importance of the practitioner-patient relationship and the need to use other techniques to communicate important information to patients, e.g. providing written materials.

5. Outcome expectancies play a role in patient anxiety experienced within the optometric context

Outcome expectancies relate to what a person imagines will happen to them in a particular situation, in terms of 'threats', which can then generate anxiety (Bandura 1977). The study reported in Chapter 3 showed that patient anxiety was significantly correlated with a range of outcome expectancies within the optometric encounter.

One method within practice of creating more positive patient outcome expectancies may be via the provision of patient information. Indeed, there has been strong support from optometric patient groups for the provision of more information within practice, especially pertaining to causes of eye problems, prognosis and treatment (Fylan and Grunfeld 2002). The results from study described in Chapter 6 did not show any significant reduction in anxiety for those patients who received information leaflets prior to the consultation. However, this method has been demonstrated as successful within other areas of healthcare (Sheard and Garrud 2006). Identification of patient coping styles and issuing written information accordingly is one method which has been applied in medicine to reduce patient anxiety (Williams-Piehota et al. 2005).

7.1 Future Recommendations

Regarding patient anxiety, this thesis has focused upon those patients attending practice. However, we still have little idea of the role of patient anxiety has in determining whether a patient makes an appointment for an eye examination. It has been shown in other areas of healthcare that the expectation of bad news is a barrier to attending for appointments (Aro et al. 2001). This is notable because the study described in Chapter 3 showed that anticipating 'bad news' was a significant predictor of state anxiety within optometric practice. Therefore, it is possible that there are patients who are suffering with eye problems and delaying making appointments because they are anxious about what they will be told. Unfortunately, delaying making an appointment may translate to poorer ocular health outcomes if the patient is suffering with an eye disease. Hence, it would be useful to quantify the extent of this problem.

The interventions evaluated in the thesis (i.e. music and information leaflets) did not show any reduction in patient anxiety. However, it would be useful to evaluate the effect of optometrist 'communicative' and 'behavioural style' upon patient anxiety. This would be an interesting study, in light of the results in Chapter 5, which showed that there are heightened levels of arousal during periods of 'communicative interaction' between patient and optometrist.

The studies within this thesis have established a foundation for the research of patient anxiety within optometry. The results suggest that this is an area of vision science research which deserves further attention i.e. focusing upon patient anxiety may translate to improved optometric outcomes.

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OPTOMETRY AND VISION SCIENCE

ORIGINAL ARTICLE

Content Development of the Optometric Patient Anxiety Scale

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ABSTRACT

Purpose. Patient anxiety has been shown to be detrimental to many aspects of healthcare outcomes. To date, there is no method of evaluating anxiety in optometric practice. Therefore, the purpose of this study was the content development of a questionnaire to measure optometric patient anxiety. Such a tool will have both clinical and research application; allowing the identification of anxious patients in practice and as a method to establish the success of anxiety reducing interventions.

Methods. Selection of initial items was based on patient interviews, literature review, and focus group feedback. The initial 30-item Optometric Patient Anxiety Scale was piloted on 148 patients in optometric practice. Rasch analysis was used to analyze response category operation and to facilitate item removal to ensure a valid and unidimensional scale. Test-retest reliability (test-retest time, 2 weeks) was measured on 59 young adults to test the stability of the measure with time.

Results. Rasch analysis identified disordering of category thresholds and underutilization of the end-response category. Therefore, categories were merged to a three response solution. Item reduction was principally driven by infit and outfit statistics. The items in the final 10-item scale all had good infit and outfit values (infit: 0.80–1.20, outfit: 0.7–1.3), good person separation (>2) and high person and item reliability coefficients, 0.84 and 0.88, respectively. Test-retest reliability also demonstrated good stability of the measure with time (intraclass correlation; ICC = 0.85).

Conclusions. The Optometric Patient Anxiety Scale is the first questionnaire to measure patient anxiety specific to optometric practice. The scale was developed using Rasch analysis to ensure that all the items work together to form a valid unidimensional interval scale.

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Key Words: anxiety, questionnaire, Rasch analysis, patient-optometrist relationship, healthcare outcomes

Heightened patient anxiety is a detrimental factor to healthcare outcomes. Anxiety has been associated with disrupted recall of information,[1] poor attention,[2] and can be a barrier to effective patient-practitioner communication.[3] This in turn leads to reduced satisfaction, an increase in the number of patient complaints, and poorer disease resolution.[3] All these factors are detrimental to the accomplishment of optimal patient healthcare results.[4] Patient anxiety also contributes to wasted healthcare resources because of patient noncompliance,[5] nonattendance of appointments,[6,7] and in other cases, excessive utilization of healthcare services.[8,9]

The prevalence and effect of anxiety has been studied in many health-related populations, including general practitioner patients,[10,11] diabetics,[12] dental patients,[5,13] and surgical patients[14] including cataract surgery.[15,16] Methods adopted to reduce anxiety include playing music,[17] hand massage,[18] and practitioner communication technique.[3,19] Training practitioners to adopt communication styles such as patient-centered consultations[20,21] and use of "active listening"[3,19] have been implemented within medical practice to reduce anxiety and improve both satisfaction and healthcare outcomes.[22] These techniques demonstrate the influence of practitioner behavior in moderating patient anxiety, a conclusion supported by dental research.[23]

Considering that anxiety has been identified as a barrier to successful healthcare outcomes, it is surprising that the subject has received minimal attention within optometric practice. Subjective patient reports indicate that up to 25% of patients attending optometric practice are anxious.[24] However, there appears to be only one previously published paper directly addressing the presence of anxiety in optometric patients.[25] This study evaluated anxiety and arousal in a small group of patients and reported that anxiety levels are unique for each individual.

Anxiety is the adaptive response to a threat.[26] Considering that eyesight is the most valued sense,[27] any perceived threat is likely to result in anxiety. Therefore, there are potentially many reasons for optometric patient anxiety. Discomfort of clinical procedures[28–30], detection of eye disease,[28–30] and adapting to spectacles[24] have all been identified as patient concerns. Furthermore, possible changes to personal appearance[24,29,30]and financial cost[24,29,31] have also been reported as patient "barriers." The "threats" perceived by patients may vary between individuals, but all will result in anxiety.

Although there have been substantial technological advances in terms of disease detection and management within optometry, translating these advances into improved healthcare outcomes is problematic. This is because the ability of these developments to preserve vision is largely determined by the patient. For example, nonattendance, inadequate patient-practitioner communication, poor recall, lack of understanding, and noncompliance all compromise final clinical outcomes.

Identification of patients with heightened anxiety may improve optometric healthcare results. For example, it would allow the optometrist to take steps to ensure that essential information is communicated effectively e.g., in written format. Patient-reported measures have shown an increased popularity to evaluate healthcare within the last decade.[32] Anxiety scales are used within medical and dental practice to identify patients who have heightened anxiety, aiding the practitioner when making decisions about communication technique and patient management.[33,34] However, there is currently no tool developed specifically for the optometric context. Therefore, the purpose of this study was to develop a short questionnaire to measure optometric related patient anxiety. The primary focus of this study was to ensure content validity of the scale and that it measures a unidimensional construct. Such a tool will have both clinical and research applications, i.e., it will allow identification of anxious patients and may be used to establish the effectiveness of various interventions on anxiety.

METHODS

Selection of Items

To ensure content validity, eighty three items were initially identified by the authors on the basis of patient interviews, a literature review, and focus group discussions. Twenty-four optometric patients (mean age, 37.6 ± 22.1 years) took part in semistructured interviews to ascertain expectations and potentially anxiety provoking aspects of the eye examination. Ophthalmologic, dental, and medical literature was reviewed to identify sources of patient anxiety within the practitioner-patient encounter.[16,18,20,21,24,26–28,33,35–40] Additionally, a small focus group made up of four healthy patients (three prepresbyopes and one presbyope) and optometrists extensively discussed possible causes of anxiety. The main themes contained in the initial item pool were "tests and performance," "trust in optometrist," "eye health," "personal interaction with optometrist," "eyes touched," "contact lenses," "financial cost" and "general comfort."

Subsequently, the items generated were reviewed by the authors to look for repeated ideas which represented item redundancy. Many of the items had the same face validity, but the adjectives were different. For example, "I know that my eyes are healthy," "I am content that my eyes are healthy," "I am sure that I don't have an eye disease." A large group of items repeating the same idea lengthens the questionnaire increasing respondent burden and reducing the likelihood that the questionnaire will be completed fully and truthfully.[41] Furthermore, to avoid disrupting the normal operation of busy optometric practices in which the questionnaire was to be administered, it was recognized at the outset that it needed to be relatively short. Therefore, redundant items were removed. Furthermore, we ensured that a wide range of adjectives describing anxiety were present in the final list of items. Having excluded redundant items a 30 item, 5 response option pilot questionnaire (strongly agree, agree, uncertain, disagree, strongly disagree) was established (Table 1) (Appendix, available online at www.optvissci.com).

Study Design and Population

Four optometric practices agreed to distribute questionnaires. Two were based in city centers and two were located in smaller rural environments.

The sample was drawn from adults who attended for an eye examination. Practices were asked to ensure that every adult patient (18 years and over) was given an information sheet to read and a questionnaire to complete before they had their eye examination. Patients were reassured that their responses were confidential and the optometrist would not see their completed questionnaire. Reception staff were asked to keep a note of the number of patients refusing to complete the questionnaire.

All procedures adhered to the tenets of the Declaration of Helsinki and ethical approval was obtained from the Cardiff School of Optometry and Vision Science Ethical Committee.

Statistical Analysis

Rasch analysis was undertaken according to the Andrich Rating Scale model[42] using Winsteps version 3.58.1.[43] Rasch analysis is a probabilistic logistic model, which produces Logit values describing item difficulty and person ability. Firstly, Rasch analysis was performed to determine the optimum number of response categories which people could discriminate reliably between. Secondly, Rasch analysis fit statistics were used to identify how well each item contributed to the underlying unidimensional measure.[44]

Fit statistics describe how both items and person responses fit the predicted responses of the Rasch model. Rasch analysis provides two χ^2 statistics, infit and outfit, which are calculated from the mean square of the residuals. These range from zero to infinity. Items fitting perfectly to the unidimensional scale have an expected infit or outfit statistic of 1.

Values <1 indicate that the item overfits the model. Substantially over fitting items add little extra information to the scale and as such they are redundant; whereas, values higher than 1 suggest misfit to the model, and these items may be measuring something different to the rest of the scale. Infit statistics are weighted to give more importance to those people who are closer to the item mean. Outfit statistics are not weighted and so, are more sensitive to outlying scores. Therefore, items with poor fit statistics compromise the validity of the measurement.

Removal of items was principally driven by infit and outfit statistics. However, to facilitate identification of items for removal, the quality of the data was also assessed using traditional statistical tests. This included measuring skew and kurtosis, calculating the percentage of missing data and assessing ceiling effect (percentage of responses in the end-response category).[45,46]

TABLE 1.
Description of the 30 items for the initial pilot; each item had a 5-response category option (strongly agree, agree, uncertain, disagree, strongly disagree)

Item number	Item description
1	I am anxious about each answer I give during the eye test
2	I feel relaxed during the eye test
3	I am afraid I will find the tests hard
4	I am confident that I will give the right answer during the eye test
5	Talking to the Optometrist[a] makes me feel tense
6	I feel comfortable with the Optometrist[a]
7	I feel nervous talking to the Optometrist[a]
8	Speaking to the Optometrist[a] makes me feel relaxed
9	I feel on edge during the examination in case something goes into my eye
10	I feel calm about having my eyes touched
11	I am anxious something unpleasant will happen to my eyes
12	I feel relaxed about having things put into my eye
13	I am anxious because there might be a problem with my eyes
14	I am content that my eyes are healthy
15	I am scared that my vision is getting worse
16	I am worried that I may lose my sight
17	The thought of putting a contact lens in my eye makes me feel tense
18	The idea of wearing contact lenses makes me feel anxious
19	I feel relaxed at the thought of having a contact lens in my eye
20	I feel confident that a contact lens would be comfortable in my eye
21	Having an eye examination makes me feel uneasy
22	I feel relaxed when I have an eye check
23	I worry about going to have my eyes checked
24	I feel comfortable at the Optometrist's[a]
25	When the Optometrist[a] is close to me I feel tense
26	The cost of glasses doesn't worry me
27	The environment at the Optometrist's[a] makes me feel uneasy
28	I trust the Optometrist[a]
29	I am anxious that I will have to purchase a new pair of spectacles
30	I am satisfied in the ability of the Optometrist[a]

[a]The word "optician" was used in the questionnaire for the UK population because UK patients are more familiar with the word optician to describe an optometrist.

The reliability of the final questionnaire was measured using person and item reliability estimates. Unrotated factor analysis was also used to additionally test scale validity.

The stability of the measure was evaluated by assessing its test-retest reliability. This was measured using a group of 59 young adults (test-retest time, 2 weeks), with the intraclass correlation (ICC).[47] This data was also used to confirm the validity of collapsing categories.

RESULTS

Questionnaire responses were received from 148 adult patients. Two patients with missing demographic data (age, gender, language etc) were excluded from the dataset. In accordance with the approach adopted by others, an additional four questionnaires were excluded because more than 33% of the questionnaire was incomplete and therefore were deemed unreliable.[45]

Person fit statistics provide information about how closely people are responding according to the prediction of the Rasch model. Poor fit statistics highlight people who may not be responding in a consistent way, in other words, rogue responders. Of the 27 people identified as misfitting the model (outfit and infit mean square >1.40), the individual questionnaire responses were examined by the authors. The questionnaires were analyzed to identify any pages in which the respondent had used the same response category for every item. Many of the items had reversed scales, making it easy to identify responses which were completely contradictory. One questionnaire (patient 103) was identified as providing inconsistent responses and so this person's questionnaire was also excluded from the data set.

Therefore, there were 141 questionnaires in the final sample (50 male, 91 female; mean age 43.21 ± 17.44 years; first eye exam, 2%; requiring spectacle prescription, 81%).

Response Scale Analysis

Winsteps provides category diagnostic statistics which describe how well the response categories operate. Ordered values indicate that every category has a distinct probability of being selected more than any other category for a particular person difficulty. The initial structure calibration thresholds are visually identified in a probability curve (Fig. 1). Category 2 does not have a distinct peak on the curve which indicates that it is never the most probable choice. Such a category is problematic as it will potentially add

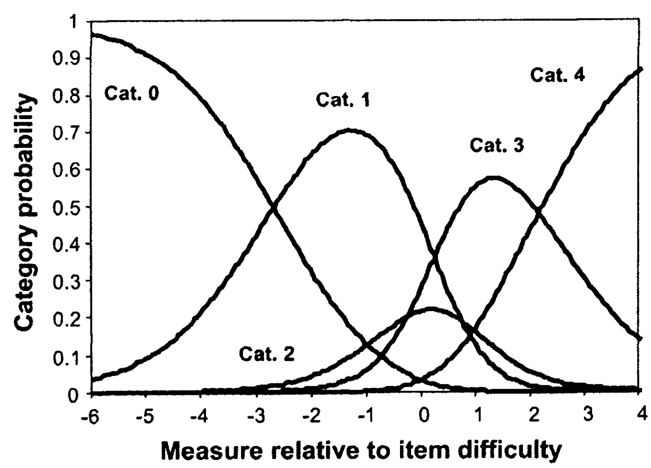

FIGURE 1.
Probability curve to show the operation of 5 response categories.

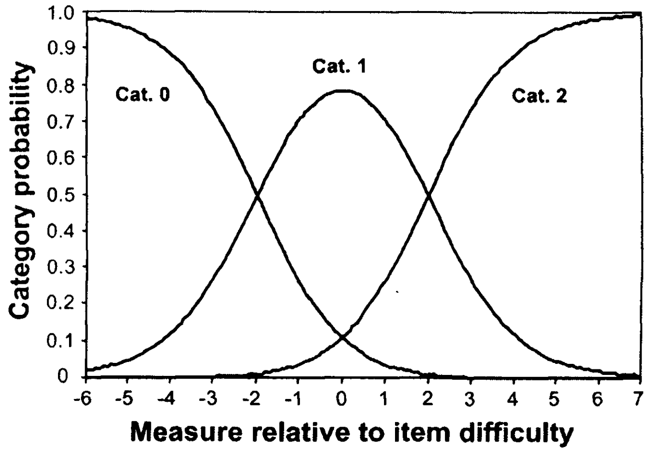

FIGURE 2.

Probability curve to show the operation of categories of the three response option (after category 2 was merged with adjacent categories and category 3 merged with category 4).

noise to the questionnaire results.[44] Therefore, consideration was given to merging this category with an adjacent category to improve the diagnostics of the rating scale.

The descriptor of category 2 was "uncertain" and the categories either side were "agree" and "disagree." One approach would be to merge this category with either category 1 or category 3. However, when merging categories guidelines suggest that the combination should "make sense"[44]; posing the question of whether "uncertain" is closer to "agree" or "disagree." To overcome this problem, we made the assumption that if forced, there is a 50% chance that each person would have either ticked "agree" or "disagree." Therefore, on a random basis, half of the category 2 responses were merged with category 1 and the other half with category 3. Additionally, inspection of the end category (category 4) indicated a proportional underutilization by participants, 0 to 9%. Underutilized categories compromise the precision of thresholds estimates and as such category 4 and category 3 were merged.[44,48]

Reanalyzing the diagnostic statistics of the three category solution showed an improved structure calibration and category utilization (Fig. 2).

Person and Item Estimates

In Fig. 3 the spread of each item calibration is visualized compared with the range of person ability estimates. The range of the items are −1.74 to 1.49 Logits; item 4 and item 16 have the mean item difficulty and are therefore located at 0 Logits (SD ± 0.90). Items located at the bottom of the map, e.g., Item 26 *"the cost of glasses doesn't worry me,"* discriminate between those people with lower anxiety. Conversely, items located at the top of the map, e.g., Item 28: *"I trust the Optometrist,"* are high level anxiety discriminating items. Winsteps provides statistics to describe the precision of these estimates. The root mean square error (RMSE) over all the items is 0.19. The high item separation reliability coefficient (0.96) of the items indicates the stability of the item estimates.

Inspection of the person-item map indicates that the items are marginally targeted toward the lower end of anxiety. The mean of the person estimates is 0.42 Logits (SD ± 1.44), with a range from −4.15 to 4.93 Logits. The RMSE is 0.43. Winsteps provides a statistic called the person separation reliability coefficient which describes the reliability of person ordering and is similar to the

```
PERSONS MAP OF ITEMS
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                    X  |
                       |
                   XX  |
 4                     +
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 3                XXX  +
                    X  |
                   XX  |
                   XX  |
                    X  |
                    X  |
 2                  X  +
                    X S|T
                XXXXX  |
                XXXXX  |  ITEM30
           XXXXXXXXXX  |
                  XXX  |  ITEM28
 1          XXXXXXXXX  +  ITEM3    ITEM5    ITEM6    ITEM9
                XXXXX  |S ITEM27   ITEM7
              XXXXXXX  |  ITEM21   ITEM24
            XXXXXXXXX M|  ITEM23
         XXXXXXXXXXXX  |  ITEM11   ITEM2
              XXXXXXX  |  ITEM14   ITEM22   ITEM25
 0           XXXXXXXX  +M ITEM16   ITEM4
              XXXXXXX  |  ITEM8
                 XXXX  |  ITEM1
              XXXXXXX  |  ITEM15
                  XXX  |  ITEM29
                XXXXX  |S ITEM13
-1                  X S+  ITEM10   ITEM18
                   XX  |  ITEM17   ITEM20
                   XX  |  ITEM19
                  XXX  |
                    X  |  ITEM12   ITEM26
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-2                XXX  +
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FIGURE 3.

Patient anxiety/item difficulty map for the 30-item Optometric Patient Anxiety Scale. The patients are represented on the left of the dashed line: "X" is equal to1 person. The items are represented on the right of the dashed line. The items at the top of the map discriminate between those people with higher anxiety. The items at the bottom of the map discriminate between those people with lower anxiety. M = mean, S = 1 standard deviation from the mean, T = 2 standard deviations from the mean.

TABLE 2.
Descriptive statistics, Rasch fit statistics and factor loadings for the 10-item, 3 -response category questionnaire (% of responses item end-response category)

Item	Skew	Kurtosis	Missing data (%)	Ceiling effect† (%)	Mean square Infit (0.80–1.20)	Mean square Outfit (0.70–1.30)	Item calibration (SE)	Factor loadings
2: I feel relaxed during the eye test	0.006	0.499	0	15	0.87	0.80	−0.49 (0.21)	0.723
3: I am afraid I will find the tests hard	0.071	−0.330	0	12	0.96	0.86	0.45 (0.21)	0.778
5: Talking to the Optometrist[a] makes me feel tense	−0.023	0.004	0.7	10	0.85	0.73	0.41 (0.21)	0.762
9: I feel on edge during the examination in case something goes into my eye	0.096	−0.484	0.7	14	1.12	1.13	0.32 (0.21)	0.753
11: I am anxious something unpleasant will happen to my eyes	0.005	0.256	0	16	1.05	0.92	−0.53 (0.21)	0.678
14: I am content that my eyes are healthy	0.130	1.477	0	13	1.14	1.20	−0.71 (0.21)	0.487
23: I worry about going to have my eyes checked	−0.005	0.256	0	15	0.85	0.74	−0.35 (0.21)	0.763
25: When the Optometrist[a] is close to me I feel tense	0.023	0.251	0	18	1.08	0.92	−0.80 (0.21)	0.667
28: I trust the Optometrist[a]	−0.580	0.700	0.7	4	0.85	0.77	0.62 (0.21)	0.622
30: I am satisfied in the ability of the Optometrist[a]	−0.323	−0.232	1.4	4	1.10	1.02	1.10 (0.21)	0.544

[a]The word "optician" was used in the questionnaire for the UK population because UK patients are more familiar with the word optician to describe an optometrist.

conventional Cronbach alpha coefficient. It is 0.91 for this sample. The person separation ratio expresses the reliability of the scale to discriminate between people of different abilities. It is defined as the ratio of the adjusted person standard deviation to the standard error of the measurement (i.e., the variance not accounted for by the Rasch model), measured in standard error units.[44] Recommendation is that the separation ratio should exceed 2[49]; in other words, the variability in the sample is twice the variability of noise in the test.[50] It was 3.17 for this sample.

Item Reduction

To improve measurement validity, Rasch analysis was used to identify items which misfit the Rasch model. These items were removed from the scale one at a time and then the fit statistics were recalculated. Pesudovs 2003 presented a framework to facilitate refining an instrument by item reduction which was adopted in this study.[49] Items were considered for removal from the scale which fulfilled the highest number of candidate criteria in order of priority; 1: infit mean square outside 0.80 to 1.20, 2: outfit mean square outside 0.70 to 1.30, 3. item with mean furthest from the subject mean, 4: high proportion of missing data (>50%), 5: ceiling effect (>50% in end category) and 6: skew and kurtosis outside −2.00 to + 2.00.

Items were removed until all items provided good infit and outfit values, with no significant missing data or ceiling effect and with good person separation of 2.26 (>2). This was achieved when the scale had been reduced to 10 items (Table 2). The final 10-item scale had good measurement precision expressed by the high person and item separation reliability coefficients, 0.84 and 0.88 respectively. The validity of the unidimentional nature of the 10 items was additionally explored with unrotated factor analysis. A principle factor was found with strong loadings from 0.49 to 0.78 which confirms that the scale measures a unitary concept.

Reducing the scale to 10 items marginally changed the targeting of the items to people (Fig. 4a). The items are targeted slightly more towards the higher levels of anxiety with a discrepancy between the means of 0.44 Logits. Fig. 4a shows the mean anxiety level which each item measures. When the influences of the categories are accounted for, the items measure over a larger range (Fig. 4b), i.e., the items span virtually the complete range of person anxiety levels.

Test-retest reliability was good when tested on 59 young adults (29 male, 30 female; mean age 18.64 ± 0.804 years; ICC = 0.85). ICC is defined as the ratio of the variability of scores for each subject to the total variance of all subjects and ratings,[47] and therefore, it will approach 1 when there is no variance within subjects. This data was also analyzed to further confirm the validity of merging categories. The results confirmed ordered structure threshold calibration and utilization of the three categories. In other words, the three category solution allows reliable discrimination of patient anxiety level.

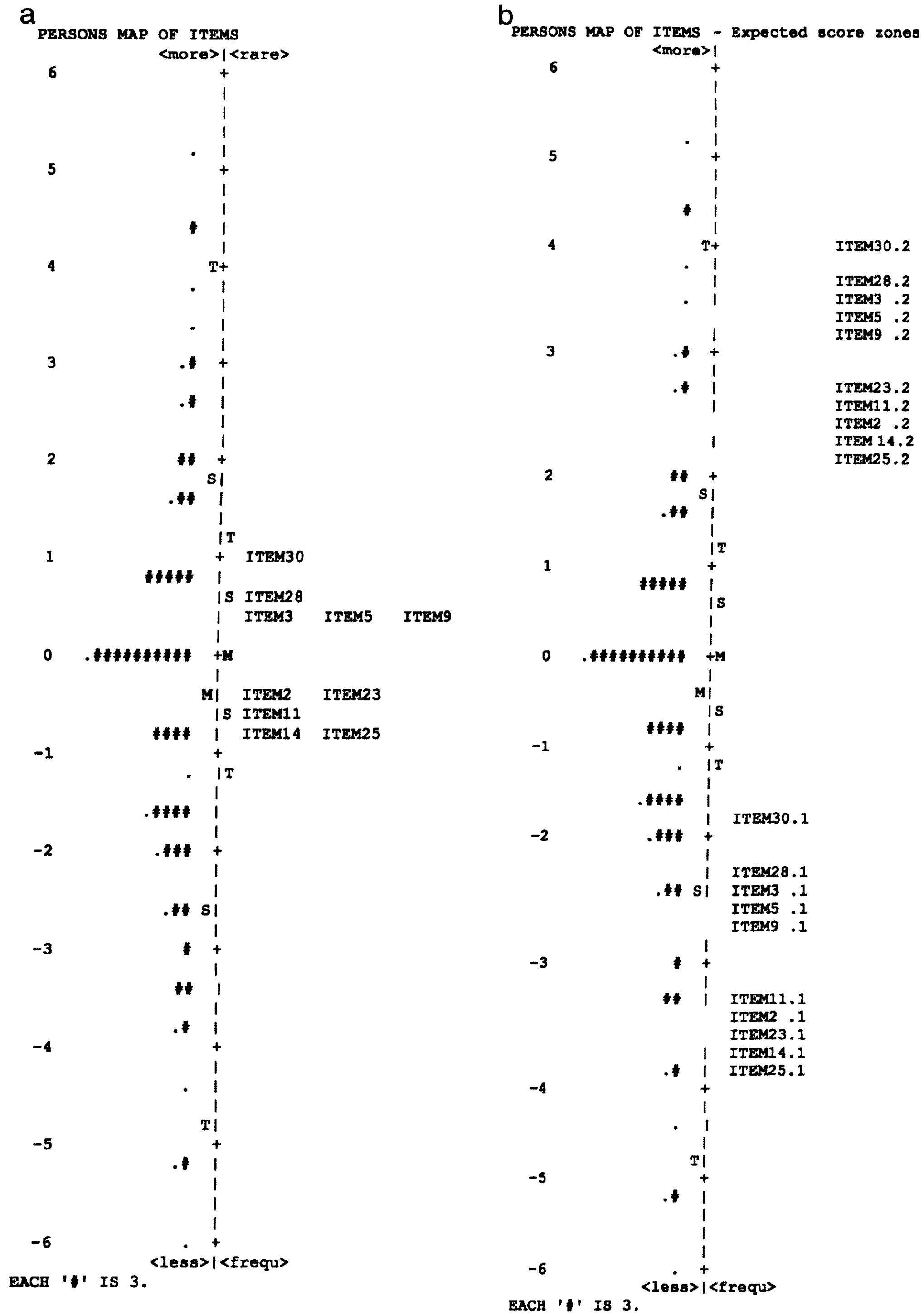

FIGURE 4.

(a) Patient anxiety/mean item difficulty map for the 10-item Optometric Patient Anxiety Scale. The patients are represented on the left of the dashed line: "#" is equal to 3 people and "." is equal to 1 person. M = mean, S = 1 standard deviation from the mean, T = 2 standard deviations from the mean. (b) Patient anxiety/item difficulty map for the 10-item Optometric Patient Anxiety Scale with 50% probability thresholds denoted. The probability thresholds describe when there is equal chance of a person ticking either category 0 or 1 (when item number is followed with 0.1), or when there is equal chance that a person will tick either category 1 or 2 (when the item number is followed with 0.2).

DISCUSSION

The results suggest that the Optometric Patient Anxiety Scale is a measurement tool with which to quantify anxiety in optometric practice.

The questions on this scale work together to form a valid unidimensional interval scale, i.e., it measures a single underlying latent trait, "optometric anxiety."

As highlighted in the introduction, there are many potential "threats" to a patient who is attending an optometric appointment. The standard eye examination format is such that the patient is provided with most information about their eyes and vision at the end of the consultation. If anxiety is a factor during this concluding discourse, there is a risk of poor patient attention and recall of what the optometrist has said.[1,2] Patient disengagement with the practitioner is a further strategy adopted by some patients to manage their anxiety.[51] In other words, the expectation, by the optometrist, that the patient has received and understood all the advice may not coincide with the reality. Understanding patient's attitudes and experience before the eye examination is a key factor in determining the most effective communication strategy with the patient.[24,28] Therefore, identification of anxious patients may indicate that essential information for the patient should be provided in written format.

Creation of the initial items was principally driven by patient responses which ensure content validity of the scale. Psychologists use the term "cognitive expectancy" when describing the generation of anxiety resulting from the expectancy of social or physical danger.[52] In other words, anxiety is determined by what a patient imagines will happen to them both socially and physically in a particular situation. As such, the determination of patient expectancies was integral to developing an anxiety scale. Inspection of the final 10 items reflects both social and physical anxiety generating elements. For example, one recognized cause of social anxiety relates to interaction with an authority figure.[53] The importance of this relationship is reflected in the questionnaire, as four of the final ten items concern aspects of the patient-optometrist relationship. The physical dimension of cognitive expectancies is also represented by items in the scale.

However, it is important to recognize that this scale was developed to identify anxious patients, not to determine the causes of that anxiety. A scale including items relating to every area of patient expectancy would be very long. Rather, the requirement of the items on the final scale was that they were all sensitive to the underlying latent trait. Rasch analysis is a powerful tool allowing identification of those items. Item fit statistics provide evidence for construct validity. Massof, in 2002,[54] commented that if any confounding constructs such as ambiguous wording or inappropriate content (items not relating to the underlying trait) influences a person response to an item, then that item will be identified as misfitting the model. In this way, removal of misfitting items improves the measurement accuracy of the scale, reducing the level of noise within the measure.[55] The final 10 items of the scale all provided good fit statistics. The unidimensionality of the scale was further supported by unrotated factor analysis.

When reducing the number of items on a scale it is essential that the reliability does not fall to an unacceptable level. Inspection of the separation ratio is a useful statistic to help maintain test quality when reducing items.[50,56] For this reason, when removing items we were careful to inspect the separation ratio, and removal of items was stopped once this value became unacceptable (i.e., <2). It will be noted on the final person-item map (Fig. 4) that there are a few items which measure similar levels of patient anxiety (e.g., items 3, 5, and 9). However, removal of these items would have reduced the person separation to an unacceptable level and compromised the quality of the final scale. Rasch analysis also provides coefficients describing the reliability of the person estimates and the item estimates. The final scale had high reliability estimates, 0.84 and 0.88, respectively. Further evidence of the stability of the measurement over time is reflected by the good test-retest statistic.

Inspection of the final person-item map (Fig. 4a) reveals that although the items are targeted well to the mean patient anxiety, the range of mean item difficulty estimates is modest in comparison. However, when the category structure of each item is considered, the items measure almost the complete range of patient anxiety for this sample (Fig. 4b). The central clustering of the items indicates that there will be good measurement precision over the majority of people in practice, indicated by the separation ratio (2.26). The floor and ceiling effect of the items does mean that this precision may be compromised at the extremes. Inclusion of additional items that target those with extreme levels of anxiety would have been advantageous because it would have facilitated more reliable estimates of patient anxiety at the extremes. However, the benefit of including more items must be balanced with the possible results of introducing noise into the measure by increasing respondent burden.[41]

Theoretically, the Rasch model is a continuous scale allowing measurement to infinity.[57] However, in reality questionnaires have a finite number of items and respondents with extreme abilities may respond by ticking the maximum category for every item. In such a case, another item must be included at the extreme end of the scale to accurately measure the individual's ability. This would result in an ever expanding number of items. In fact, failure to accurately measure those at the extreme is a problematic feature of many questionnaires.[49,55] To identify items which covered a fuller range we would have had to speak to people who were *very* or, *not at all anxious* about optometry, i.e., to find out what "items" they suggest. However, we had no tool to identify such patients. Therefore, we selected items that came up repeatedly with patients, i.e., those that were the most common reasons for anxiety. As a result, there was a reduced likelihood that the extremes for very high or low anxiety would be ascertained. Furthermore, following the framework to reduce the items described by Pesudovs 2003, items were considered for removal that were furthest from the subject mean.[49] Although this improved the targeting of the questionnaire, it also contributed to removal of items from the 30-item scale that measured the more extreme levels of anxiety. However, despite this limitation, the questionnaire maintains good psychometric properties and will reliably identify those patients attending practice who have high levels of anxiety, i.e., optometrists will be able to recognize patients with high levels of anxiety. Furthermore, as a tool to assess the ability of interventions to reduce anxiety, failure to differentiate the level of "extreme" anxiety is not problematic. Interventions which can significantly reduce anxiety are those which cause a significant decrease in mean anxiety. Therefore, although it is important that the questionnaire can reliably measure the majority of people close to the mean, it is less important that it measures those who are at the extremes, i.e., who are in the tails of the normal distribution.

One limitation of the study was that receptionists were not consistent in recording the number of people who refused to complete the questionnaire. Although every practice commented that the majority of people accepted a questionnaire, we do not know the response rate. However, this does not compromise the calibration of the questionnaire. Unlike the calibration of questionnaires in traditional test design which are dependant upon the sample, Rasch analysis allows sample-free test calibration.[57] The Rasch model simply seeks to describe what happens when any person encounters any item, therefore removing the interaction between person ability and item difficulty.[57] In other words, the calibration of the test is not bound by the ability (anxiety) distribution of the sample.

In conclusion, the Optometric Patient Anxiety Scale allows measurement and identification of anxious patients within optometric practice. The short length of the scale lends itself to busy clinical practice, ensuring low respondent burden and increasing the likelihood of the questionnaire being completed fully and truthfully. The design of the questionnaire has been strengthened with Rasch analysis, which has established that the scale is unidimensional. There is now the potential for further assessment of construct validity by measuring the anxiety levels in various groups, such as patients with and without eye disease.

Within optometric practice, identification of patients with high anxiety will enable optometrists to decide how best to communicate with the patient for optimum clinical success. Further, the Optometric Patient Anxiety Scale can be used to evaluate the ability of various interventions, such as patient information or music, to alter patient anxiety in optometric practice. By reducing patient anxiety we may expect an improvement in patient variables pertaining to successful optometric outcomes including: improved patient recall, greater compliance, and better patient-optometrist communication.

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APPENDIX

Appendix is available online at www.optvissci.com.

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CARDIFF UNIVERSITY PRIFYSGOL CAERDYD

How do you feel at the Optician's?

Questionnaire – Part 1

Before we start, it would help if you could provide a little background information:

Today's date:.....................................

Date of birth:..

GENDER: Male / Female

First language:..

- **Which of these qualifications do you have? (Please tick one or more of the following)**

☐	☐	☐	☐
GCSE/ O LEVELS or QUALIFICATIONS EQUIVALENT	A LEVELS or EQUIVALENT	DEGREE	NO

- **When did you last have your eyes tested? (Please tick one of the following)**

☐	☐	☐	☐	☐
NEVER	LESS THAN 6 MONTHS	6 MONTHS- 1 YEAR	1 YEAR - 2 YEARS	MORE THAN 2YEARS

Do you wear contact lenses? YES/NO

Do you wear spectacles? YES/NO

Have you had laser eye surgery (e.g. LASIK)? YES/NO

The reason for your visit (Please tick <u>one or more</u> of the following)

"I have come for a routine sight test" ☐

"I have come for a sight test because there is a problem with my eyes" ☐

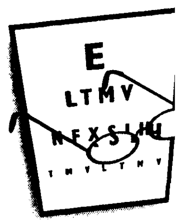
"I have come for a routine contact lens check-up" ☐

"I have come for my first contact lens appointment" ☐

"I have come for an appointment because there is a problem with my contact lenses" ☐

"I have come for an emergency appointment" ☐

For each question please tick one box that best describes how you feel.



There are no right or wrong answers. Do not spend too much time on any one question but give the answer which seems to describe your feelings best. Your immediate answer will usually be more accurate than a long thought out response.

<u>Example:</u>

I feel happy (please tick one box)

Not at all	*Somewhat*	*Moderately*	*Very much*
☐	☐	☑	☐

A number of statements which people have used to describe themselves are given below. Read each statement and then TICK THE BOX of the reply that comes closest to how you <u>FEEL RIGHT NOW</u>, at this moment.

1. Right now I feel calm *(Please tick one box)*

Not at all	Somewhat	Moderately	Very much
☐	☐	☐	☐

2. Right now I am tense

Not at all	Somewhat	Moderately	Very much
☐	☐	☐	☐

3. Right now I feel upset

Not at all	Somewhat	Moderately	Very much
☐	☐	☐	☐

4. Right now I am relaxed

Not at all	Somewhat	Moderately	Very much
☐	☐	☐	☐

5. Right now I feel content

Not at all	Somewhat	Moderately	Very much
☐	☐	☐	☐

6. Right now I am worried

Not at all	Somewhat	Moderately	Very much
☐	☐	☐	☐

Please turn over

For the next questions, please read each item and TICK THE BOX of the reply that comes closest to how you GENERALLY feel.

1. I am generally happy *(Please tick one box)*

Almost never	Sometimes	Often	Almost always
☐	☐	☐	☐

2. I generally feel that difficulties are piling up so that I cannot overcome them

Almost never	Sometimes	Often	Almost always
☐	☐	☐	☐

3. I am generally "calm, cool and collected"

Almost never	Sometimes	Often	Almost always
☐	☐	☐	☐

4. I generally feel like a failure

Almost never	Sometimes	Often	Almost always
☐	☐	☐	☐

5. I generally feel secure

Almost never	Sometimes	Often	Almost always
☐	☐	☐	☐

6. I generally get in a state of tension or turmoil as I think over my recent concerns and interests

Almost never	Sometimes	Often	Almost always
☐	☐	☐	☐

<u>Finally</u>, considering the appointment you are about to have, how likely is it that you think the following will happen?

1. I will get good news

Not at all likely	Somewhat likely	Moderately likely	Very likely
☐	☐	☐	☐

2. I will make a fool of myself

Not at all likely	Somewhat likely	Moderately likely	Very likely
☐	☐	☐	☐

3. I might have to spend more money than I want to

Not at all likely	Somewhat likely	Moderately likely	Very likely
☐	☐	☐	☐

4. I will be told something that upsets me

Not at all likely	Somewhat likely	Moderately likely	Very likely
☐	☐	☐	☐

5. The optician will make the correct diagnosis

Not at all likely	Somewhat likely	Moderately likely	Very likely
☐	☐	☐	☐

6. I am going to experience physical discomfort

Not at all likely	Somewhat likely	Moderately likely	Very likely
☐	☐	☐	☐

7. I will have to tell the optician about something embarrassing

Not at all likely	Somewhat likely	Moderately likely	Very likely
☐	☐	☐	☐

8. I will be taken seriously

Not at all likely	Somewhat likely	Moderately likely	Very likely
☐	☐	☐	☐

9. I will get flustered and forget what I wanted to say

Not at all likely	Somewhat likely	Moderately likely	Very likely
☐	☐	☐	☐

10. I will end up spending a lot of money

Not at all likely	Somewhat likely	Moderately likely	Very likely
☐	☐	☐	☐

11. Something will happen that will be physically unpleasant

Not at all likely	Somewhat likely	Moderately likely	Very likely
☐	☐	☐	☐

12. The optician will do a good job

Not at all likely	Somewhat likely	Moderately likely	Very likely
☐	☐	☐	☐

<u>Thank you</u> for taking the time to fill out this questionnaire.

Please put this questionnaire in the envelope with your consent form.

The optician will give you the second questionnaire at the end of your consultation. It will take only a few minutes to complete.

CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD

How do you feel at the Optician's?

Questionnaire – Part 2

Today's date ....

Date of birth......./......./..........

Gender: male / female

Now we need to ask you your views about the consultation you have just had. Your answers to this questionnaire are very important.

This questionnaire consists of only 14 questions.

Please indicate whether you agree or disagree with each of the following statements, by placing a TICK IN THE BOX.

Example:

I had an enjoyable experience

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☑	☐	☐	☐

When you have finished, please place both questionnaires and consent form in the envelope and place in the box at reception.

Thank you again for helping in this very important research.

Please think about the consultation you have just had and indicate whether you agree or disagree with each of the following statements, by placing a TICK IN THE BOX.

1. The optician seemed interested in me as a person *(Please tick one box)*

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

2. The optician seemed warm and friendly to me

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

3. The optician seemed to take my problems seriously

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

4. I felt free to talk to this optician about private matters relating to my eyes

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

5. The optician gave me a chance to say what was really on my mind

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

6. I really felt understood by my optician

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

7. This is an optician I would trust with my eyes

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

8. The optician seemed to know what (s)he was doing

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

9. I expect that it will be easy for me to follow the optician's advice

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

10. It may be difficult for me to do exactly what the optician has told me to do.

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

11. I'm not sure the optician's treatment will be worth the trouble it will take.

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

These are the final questions:

1. How long has the optician advised before your next visit?

   Please state the length of time below:

   ....days OR ....months OR ....years

   Tick here if your optician did not specify ☐

2. What was the main piece of advice you remember the optician explaining to you? Please state below. (1 sentence only)

....

....

3. Please tick YES if the optician told you any of the following during your consultation:

	YES
Your eyes are healthy	☐
The back of your eyes had been checked	☐
The pressure in your eyes was normal	☐
You need a new pair of spectacles or contact lenses	☐
You need spectacles for driving	☐

PLEASE NOW PUT YOUR CONSENT FORM AND BOTH QUESTIONNAIRES IN THE ENVELOPE PROVIDED AND PLACE THE ENVELOPE IN THE BOX AT RECEPTION.

<u>THANK YOU FOR YOUR VALUABLE HELP</u>

Primary healthcare recall statements

Optometrist

Your eyes are healthy
The back of your eyes had been checked
The pressure in your eyes was normal
You need a new pair of spectacles or contact lenses
You need spectacles for driving

Doctor

You don't need medication
You were given diet advice
You were told how often to take your medication
You need to book another appointment
You need to see a specialist

Dentist

Your teeth are healthy
You need a filling
Your gums are inflamed
You need to see the dental hygienist
You were given brushing advice

The ordinal regression model: further notes

The ordinal regression model is an extension of the binary regression model. The regression coefficients (ß) are estimated to predict an event, considering all the events ordered before it. Negative regression coefficients indicate that lower scores are more likely on the dependent variable and positive regression coefficients indicates that higher scores are more likely. The Wald statistic is the square of the ratio of the regression coefficient and its standard error. A significant p value indicates that the independent variable is a significant predictor of the dependent variable. In other words, the ordinal dependent variable can be thought of as a number of binary variables with a number of internal cut-off points (Norušis 2005). State anxiety has been expressed as a five category scale in the regression, as such this can be thought of as four binary logistic models i.e. the probability of being in category 1 compared to 2,3,4 or 5, the probability of being in category 1 or 2 compared to 3, 4 or 5, etc. Each equation models the odds of being in the first group (e.g. 1) compared to the second (e.g. 2,3,4 or 5). The ß values are assumed to be the same for each model, and so they are pooled to create one ß value for each independent variable. This assumption is confirmed by the test of parallel lines, which is confirmed for this regression (χ^2 (36) = 21.58; p=0.97).

Appendix V: Descriptive and Rasch fit statistics of the 30-item optometric patient anxiety scale

Descriptive statistics and Rasch fit statistics the 30-item, 3 -response category questionnaire († % of responses item end-response category).

Item	Skew	Kurtosis	Missing data (%)	Ceiling Effect (%)	Infit mean square (0.80-1.20)	Outfit mean square (0.70-1.30)
1	-.027	-.196	0	26	1.05	1.02
2	.006	.499	0	15	0.70	0.68
3	.071	-.330	0	12	0.83	0.81
4	-.068	-.386	0	25	1.07	1.07
5	-.023	.004	0.7	10	0.73	0.71
6	-.054	.101	1.4	9	0.78	0.76
7	.001	-.045	0.7	11	0.74	0.72
8	.047	.133	0.7	22	1.15	1.30
9	.096	-.484	0.7	14	0.96	0.95
10	-.356	-.645	0	41	1.10	1.21
11	.005	.256	0	16	0.81	0.76
12	-.337	-1.068	0	50	1.03	1.61
13	-.272	-.614	0	38	1.10	1.07
14	.130	1.477	0	13	0.78	0.79
15	-.087	-.370	0	30	1.18	1.45
16	-.080	-.428	0	26	1.29	1.28
17	-.657	-.818	0.7	50	1.76	1.77
18	-.575	-.938	1.4	47	1.91	1.88
19	-.748	-.543	2.8	53	1.71	1.72
20	-.588	-.666	2.8	47	1.67	1.71
21	-.060	.574	0	11	0.57	0.54
22	.080	.735	0.7	16	0.50	0.47
23	-.005	.256	0	15	0.60	0.56
24	-.109	.968	0	10	0.56	0.53
25	.023	.251	0	18	0.80	0.75
26	-.950	-.199	0.7	59	1.65	1.94
27	-.196	.765	0.7	8	0.72	0.69
28	-.580	.700	0.7	4	0.71	1.33
29	.025	-.301	0.7	30	1.01	1.04
30	-.323	-.232	1.4	4	0.92	0.92

Anchor file for 10-item OPAS

```
IAFILE=*
1 0.07
2 0.23
3 0.80
4 -2.56
5 -0.17
6 1.35
7 -0.04
8 0.95
9 -0.38
10 -0.24
*
LCONV=0.005
SAFILE=*
1 .00
2 -2.36
3 2.36
*
```

Anchor file for 4-item CLAS

```
IAFILE=*
1 0.16
2 0.20
3 -0.43
4 0.07
*
LCONV=0.005
SAFILE=*
0 .00
1 -6.12
2 -1.05
3 1.15
4 6.02
*
```

CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD

Contact Lens Study: Part A

Today you will have a contact lens consultation with a qualified optometrist. Before your consultation we are interested to know how you feel.

Therefore, we would be very grateful if you could spend a few minutes filling out this questionnaire.

Thank you

Before we start, it would help if you could provide a little background information:

Today's date:....................................

Date of birth:..

GENDER: Male/Female

First language:..

When did you last have your eyes tested? (Please tick one of the following)

☐	☐	☐	☐	☐
NEVER	**LESS THAN 6 MONTHS**	**6 MONTHS- 1 YEAR**	**1 YEAR - 2 YEARS**	**MORE THAN 2 YEARS**

SELF-EVALUATION QUESTIONNAIRE: Part 1

DIRECTIONS:

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

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1. Right now I feel calm	1	2	3	4
2. Right now I am tense	1	2	3	4
3. Right now I feel upset	1	2	3	4
4. Right now I am relaxed	1	2	3	4
5. Right now I feel content	1	2	3	4
6. Right now I am worried	1	2	3	4

SELF-EVALUATION QUESTIONNAIRE: Part 2

DIRECTIONS:

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you *generally feel*.

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
7. Generally I feel like a failure	1	2	3	4
8. Generally I am "calm, cool, and collected"	1	2	3	4
9. Generally I feel that difficulties are piling up so that I cannot overcome them	1	2	3	4
10. Generally I am happy	1	2	3	4
11. Generally I feel secure	1	2	3	4
12. I get in a state of tension or turmoil as I think over my recent concerns and interests	1	2	3	4

These are the final few questions about your thoughts and feelings about contact lenses and visiting the optometrist. Think about the consultation you are about to have. For each statement tick the box which comes closest to how you feel. Do not spend too much time on any one question but give the answer which seems to describe your feelings best. Your immediate answer will usually be more accurate than a long thought out response.

1. I feel relaxed at the thought of having a contact lens in my eye

Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
☐	☐	☐	☐	☐

2. The idea of wearing contact lenses makes me feel anxious

Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
☐	☐	☐	☐	☐

3. The thought of putting a contact lens in my eye makes me feel tense

Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
☐	☐	☐	☐	☐

4. I feel confident that a contact lens would be comfortable in my eye

Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
☐	☐	☐	☐	☐

5. The cost of contact lenses doesn't worry me

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

6. I feel relaxed during the eye test

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

7. I am afraid I will find the tests hard

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

8. Talking to the optician makes me feel tense

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

9. I am content that my eyes are healthy

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

10. I feel on edge during the examination in case something goes into my eye

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

11. I am satisfied in the ability of the optician

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

12. I worry about going to have my eyes checked

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

13. I trust the optician

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

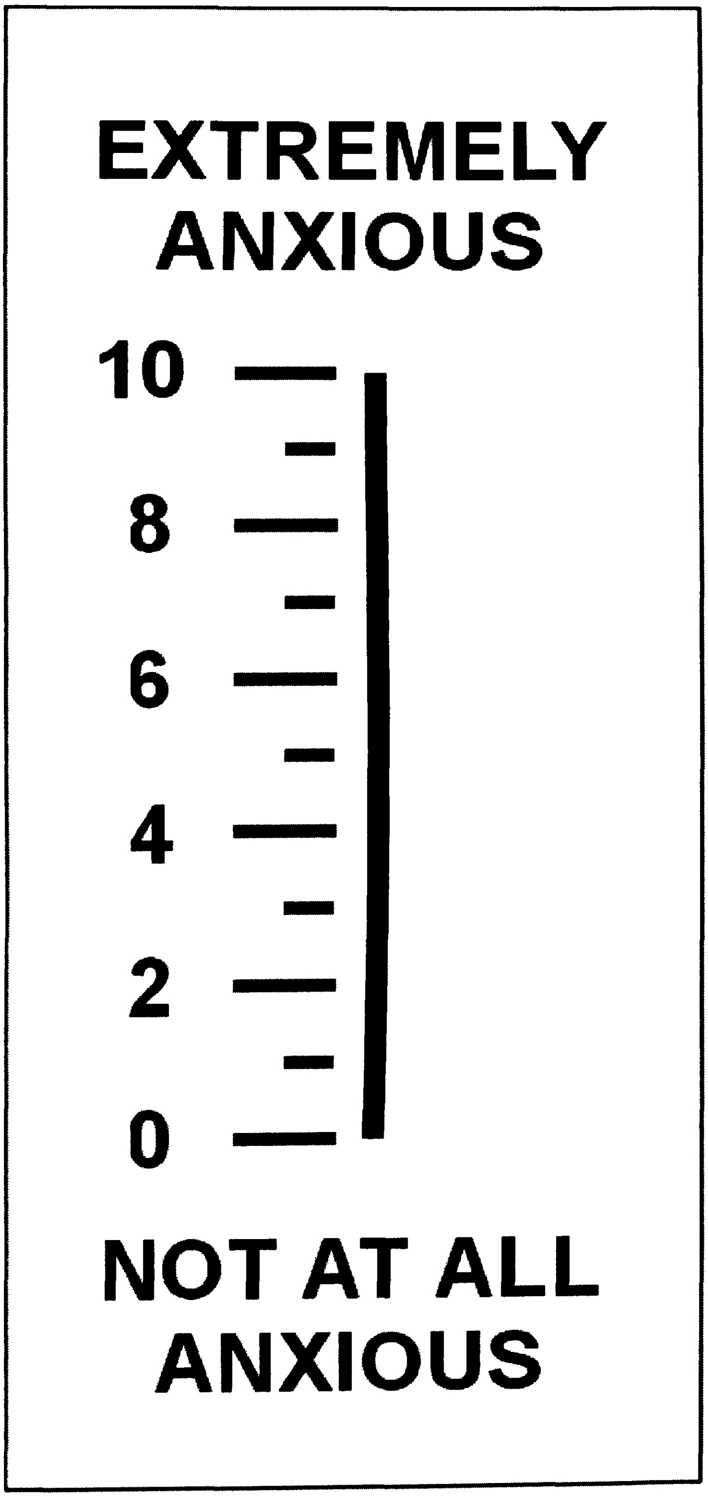
14. I am anxious something unpleasant will happen to my eyes

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

15. When the optician is close to me I feel tense

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

Finally, looking at the vertical line below, please place a horizontal line somewhere on the line to indicate how anxious you feel at this moment.



Thank you

CARDIFF UNIVERSITY
PRIFYSGOL CAERDYD

Contact Lens Study: Part B

Now that you have had your consultation we would like to find out how you feel.

Therefore, we would be very grateful if you could spend a few minutes filling out this questionnaire.

Thank you

Today's date:.....................................

Date of birth:...

GENDER: Male/Female

SELF-EVALUATION QUESTIONNAIRE: Part 1

DIRECTIONS:

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

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1. Right now I feel calm	1	2	3	4
2. Right now I am tense	1	2	3	4
3. Right now I feel upset	1	2	3	4
4. Right now I am relaxed	1	2	3	4
5. Right now I feel content	1	2	3	4
6. Right now I am worried	1	2	3	4

These are the final questions. Please read each one and tick the box which comes closest to how you feel about wearing contact lenses.

1. **After the consultation today, the thought of putting a contact lens in my eye makes me feel tense**

Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
☐	☐	☐	☐	☐

2. **After the consultation today, the idea of wearing contact lenses makes me feel anxious**

Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
☐	☐	☐	☐	☐

3. **After the consultation today, I feel relaxed at the thought of having a contact lens in my eye**

Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
☐	☐	☐	☐	☐

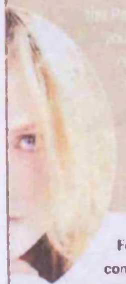
4. **After the consultation today, I feel confident that a contact lens would be comfortable in my eye**

Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
☐	☐	☐	☐	☐

5. **After the consultation I would consider wearing contact lenses in the future**

Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
☐	☐	☐	☐	☐

Meeting expectations



For information about eye-related matters and eye conditions look out for opticians practices showing the Eyecare Information Centre logo in their window or visit the Eyecare Trust website at: www.eyecare-trust.org.uk

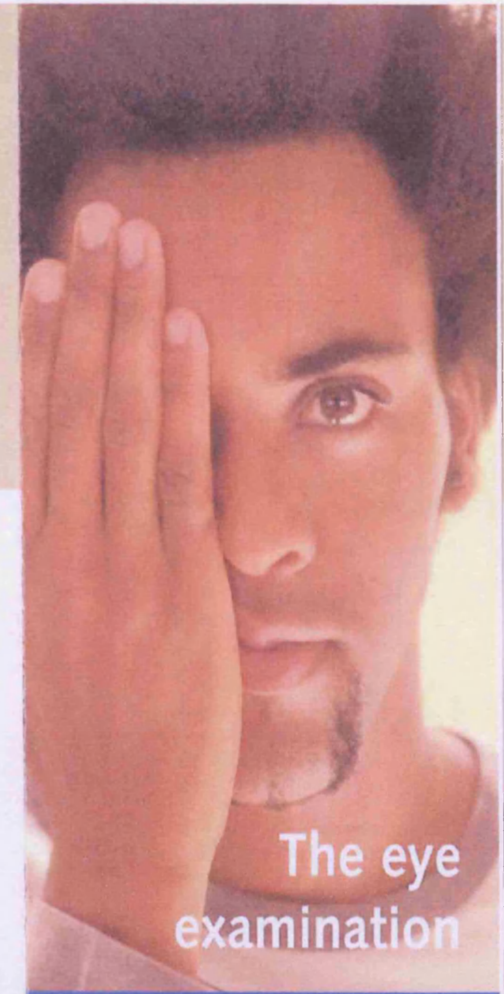
Please affix practice sticker here

This leaflet is sponsored by the

Central (LOC) Fund

The Eyecare Trust
PO Box 131, Market Rasen, Lincs, LN8 5TS
Email: info@eyecare-trust.org.uk
www.eyecare-trust.org.uk.

ET102



The eye examination

The Eyecare Trust

The Eye Examination

no symptoms.

Regular examinations are important, since the sooner a problem is detected, the sooner it can be treated - this is particularly true with young children and the elderly. Most peoples' eyesight tends to be pretty stable in their 20s and 30s. After that, the changes can be so gradual, people don't notice until they need longer arms, or reading glasses!

A major part of the eye examination is to 'look for injury or disease' of the eyes or the rest of the body. It is a vital health check and may well reveal other underlying conditions such as Diabetes or High Blood Pressure.

The person who tests your eyes will be an optometrist (formerly known as an optician) or occasionally, an ophthalmic medical practitioner (a doctor with a special interest in eyes). It is sensible

Discussing your needs

suddenly, or developed over a period of time.

Your medical history

You must also tell your practitioner if you are taking any medication such as tablets or inhalers. He should also be aware of other clinical information, such as if you suffer from headaches, currently wear spectacles or contact lenses, or have had any close relatives with eye problems.

Examining the eye

Your eyes will be examined both internally and externally. This provides an assessment of the general health of your eyes and may identify other underlying medical problems. The inside of your eye is usually examined using an ophthalmoscope, which is an instrument that shines a light through the pupil allowing a detailed examination of the internal structures. It is also normal to measure the intra-ocular pressure (IOP) of people aged over 40. This is one of the tests for glaucoma.

Your vision

Measurements will be taken of your uncorrected vision, ie when you are not wearing spectacles or contact lenses.

If your vision needs to be improved, a series of lenses will be placed in front of your eyes, until the best possible prescription is achieved. This should allow you to see as clearly as possible at all distances, ie: for driving, TV, reading or computer work.

Eye movements & co-ordination

It is important that these are checked to make sure that both eyes are working together effectively and not put under any undue strain. This is particularly important for those who use VDUs.

Lifestyle

It is really helpful to tell your practitioner if you have any hobbies or play sports. You may find that special glasses or contact lenses make things much easier and more enjoyable.

Your practitioner will now have a detailed knowledge of the health of your eyes, how good your vision is, and any special requirements you may need. This information will be explained to you, but remember, if you don't understand anything or if you require more information, please ask your practitioner, who will be delighted to help.

At the end of the eye examination you will be advised when you should return for your next check up and be handed a copy of your spectacle prescription, or a statement confirming that nothing is required. If your practitioner feels there is something wrong with your eyes or your health, he will refer you for a medical or specialist opinion.

If you do need spectacles, the practitioner or one of his colleagues will gladly assist you in choosing ones which are suitable for your lifestyle. You may also opt to take your prescription elsewhere, if you wish.

Frame selection

Fashion and image are important, but you should also choose a frame made from a suitable material and compatible with your prescription. Good optometrists, dispensing opticians and their assistants, can offer skilled advice on the most flattering shapes and colours to suit your face. Don't be afraid to experiment or try on as many pairs as you wish.

Lens selection

Advice will be given on the most suitable lens for your particular needs. They can now be thinner, lighter, better reflection-free, tinted, photochromic (darken in the sun) and are available in glass or plastic. Most lenses are plastic these days, as they are lighter and safer.

When you collect your new spectacles, they will be checked and the fitting adjusted to ensure your comfort and clearest vision. As part of the continuing aftercare your optician will be happy to adjust or make minor repairs to them.

You might like to try contact lenses. These are fitted by most optometrists and some dispensing opticians, after your eye examination.

For people with impaired vision, magnifiers can be found in many optical practices.

NHS entitlements

Those in the following categories are entitled to an NHS sight test and may also be entitled to a voucher towards the cost of any spectacles or contact lenses prescribed.

- *Children under 16, or under 19 and in full-time education
- All those aged 60 and over
- *People receiving Income Support or Family Tax Credit
- *Those receiving a Disabled Persons Tax Credit
- *Those receiving an income-based Job Seekers Allowance (Contributory JSA does not count)
- Diabetics
- Glaucoma sufferers
- Those who are 40 and over and the parent / brother / sister / child of a person with glaucoma
- Those diagnosed by a consultant ophthalmologist as being at risk of developing glaucoma
- The blind and partially sighted
- *People entitled to NHS complex lens voucher
- Those who have a valid HC2 certificate

* Automatically entitled to a voucher.

Confidentiality

The optometrist will:

- protect confidential and personal information against improper disclosure
- keep other practitioners informed only where necessary and only with your consent, when sharing your care with them.

If things go wrong

In the unfortunate event that you have to complain about the care you have received, you are entitled to a prompt and appropriate response. If you do not feel the optometrist has given you a satisfactory reply, you can contact the Optical Consumer Complaints Service (OCCS)[1] or your local health service if you had an NHS eye examination.

Providing information about services

If the optometrist publishes information about the services he or she provides, you can expect the information to be factual and verifiable.

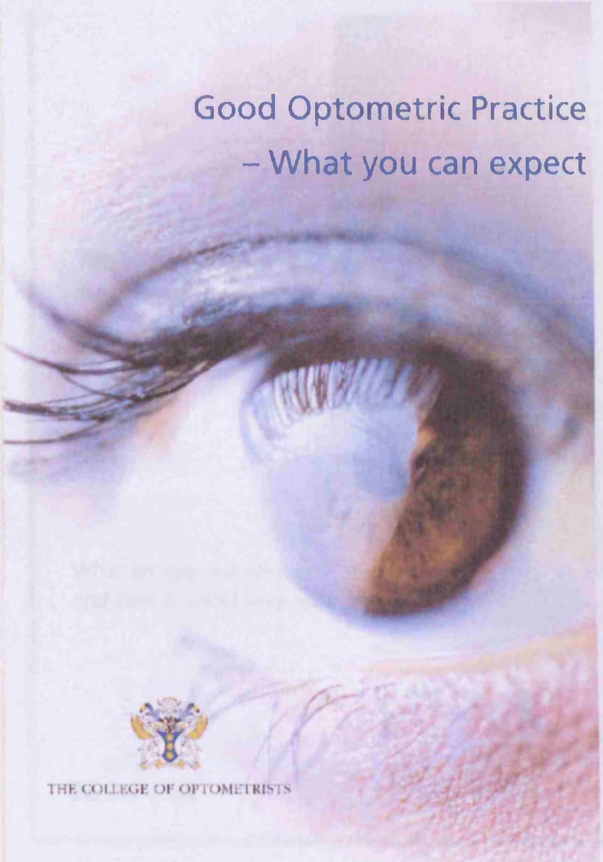
Probity in professional practice

You can expect the optometrist to:

- be honest in financial and commercial matters relating to the optometric care provided
- make sure that you understand the costs of the eye examination and the costs of the different elements involved in the dispensing of any spectacles or contact lenses before you are committed to them.

June 2002

[1] OCCS, PO Box 4685, London SE1 8YH
Tel: 020 7261 1017 Fax: 020 7407 3991
http://www.opticalcomplaints.co.uk



Good Optometric Practice

What you can expect

You are entitled to high standards of care from any optometrist you consult. The essential elements of this are professional competence, good relationships between optometrist and patient, and between optometrist and other clinical colleagues, and a high standard of professional ethics.

Good optometric care

You can expect the optometrist to:

- carry out whatever tests are necessary to determine your needs for vision care
- give you appropriate advice on the basis of the results of those tests
- arrange further investigations where necessary
- refer you to another practitioner when indicated.

In providing your care the optometrist will:

- recognise and work within the limits of his or her professional competence
- be willing to consult colleagues
- be competent when making a diagnosis and when giving treatment
- keep full and clear records about your eye examination and any outcomes
- discuss with you appropriate options for providing your visual correction
- discuss with you appropriate options for the management of any eye condition.

Keeping up to date

The optometrist will keep his/her knowledge and skills up to date and will take part regularly in education and training activities.

The optometrist will keep up to date with the laws and statutory codes of practice affecting his or her work.

Maintaining Trust

Successful relationships between optometrists, patients and the public depend on trust. The optometrist will therefore:

- listen to you and respect your views
- treat you politely and considerately
- give you the information you need about your visual health.
- give information in a way that you can understand. If your child is having an eye examination and is not old enough to understand, the optometrist will give you the relevant information and advice
- respect your right to be fully involved in decisions about your care
- make sure you have understood what is involved in the different tests and obtain your full consent before starting the examination.

The optometrist will not:

- recommend an investigation, treatment or eye care service which he or she knows is not in your best interests
- prescribe spectacles, contact lenses or other optical appliances for which there is no clinical need, unless you request them.

Can I get a free eye test?

If you answer yes to any of these questions, you are entitled to free NHS tests:

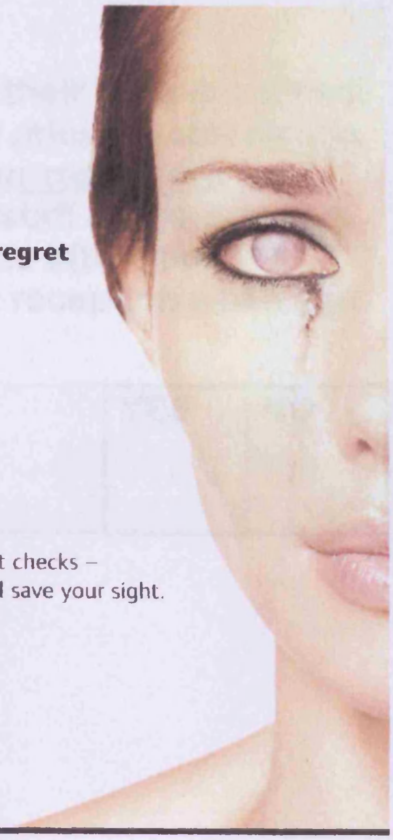
- Are you aged 60 or over?
- Are you under 16, or under 19 and in full-time education?
- Are you or your partner receiving income support, guarantee pension credit, income-based jobseekers allowance, or tax credits – and you have a valid NHS tax credits exemption certificate?
- Are you named on a valid NHS low income scheme HC2 certificate (or a HC3 certificate for partial help with cost of test)?
- Are you resident in Scotland from March 2006?
- Are you entitled to vouchers for complex lenses?
- Do you have diabetes or glaucoma?
- Are you 40 or over and have a close relative with glaucoma?
- Does an ophthalmologist say you are at risk of glaucoma?
- Are you registered blind or partially sighted?

If you use a VDU at work, by law you can ask your employer to provide and pay for an eye test. You are also entitled to further tests at regular intervals. The optometrist who carries out the initial test will be able to advise on timing.

For information about any aspect of eye health or living with sight loss call the **RNIB Helpline: 0845 766 9999**, or visit: **rnib.org.uk**. Further copies of this leaflet are available from RNIB Customer Services by calling **0845 702 3153**.

RNIB is a charity which relies on voluntary donations.

You'll never regret an eye test



What an eye test checks – and how it could save your sight.

RNIB

You should get an eye test at least every two years

Eye tests are much more than checks for whether you need glasses – they can help detect problems like glaucoma or diabetic eye disease before you notice the effect on your sight.

Early treatment can often prevent your sight from getting worse – and may even save your sight.

What happens in an eye test?

An eye test should normally take about 30 minutes. It should check:

- Your eyesight – you will be asked to read letters on a chart.
- Your outer eye – a light will be shone on the front of your eyes to check their health and how well they react to light.
- Your inner eye – a light will be shone into your eyes to check their health and you will be asked to look in different directions.
- Your eye muscles – your optometrist will check that the muscles which control your eye movement are working well.
- If you need glasses to improve your vision – the optometrist will work out exactly what prescription you need. They will first shine a light in your eyes and then ask you to look at letters or colours on a chart through various lenses in a special frame or machine.

> A contact lens check is not the same as a full eye test.
>
> Are you a driver? The eye test will ensure you meet the legal standard.

Checklist of details your optometrist will need to know:

- ☐ glasses you wear
- ☐ tablets or medicine you are taking
- ☐ the name of your doctor
- ☐ information about your health – especially whether you smoke
- ☐ information about eye health problems in your family

> **Other important parts of the eye test**
>
> If you are over 40, have a close relative with glaucoma, are of African/Caribbean origin or have diabetes, you should ensure you have the field of vision test and the eye pressure test as well as the inner and outer eye tests. It is important to ask for all of them as together they detect signs of glaucoma more effectively than only one or two tests.
>
> - The field of vision test checks your all round vision. You will be shown patterns of lights on a screen to test which ones you can see.
> - The eye pressure test checks the pressure in the eyes and can help detect glaucoma.

At the end of the test

You will either be given a statement saying that you do not need glasses, or a prescription for glasses which can be used at any optometrist's practice.

Getting an eye test at home

If you are unable to leave your home due to a disability you are entitled to an eye test at home. Ask your optometrist or contact your local Primary Care Trust for details.

CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD

HOW DO YOU FEEL AT THE OPTICIAN'S? (Part 1)

We are seeking to find out how people feel about having their eyes examined. Therefore, we would be grateful if you could spend a few minutes completing this short questionnaire before you see the optician. Your responses are confidential. You will not be identifiable to the reception staff or the optician. There will also be another short questionnaire to complete after your examination. Please put your questionnaire in the box at reception when you are finished. You do not have to participate.

Did you receive and read an information leaflet through the post called "The Eye Examination" before attending today?	**YES**	**NO**

Today's date:	/ / 2006
Date of birth:	/ /

Your gender:	**Male**	**Female**
Do you wear contact lenses?	**YES**	**NO**
Do you wear spectacles?	**YES**	**NO**
Have you had laser eye surgery (e.g. LASIK)?	**YES**	**NO**

When did you last have your eyes tested? (Please circle one of the following)	**NEVER**	**LESS THAN 6 MONTHS**	**6 MONTHS – 1 YEAR**	**1 YEAR – 2 YEARS**	**MORE THAN 2 YEARS**

The reason for your visit (Please tick one or more of the following)

	YES
"I have come for a routine sight test"	
"I have come for a sight test because there is a problem with my eyes"	
"I have come for a contact lens appointment"	
"I have come for an emergency appointment"	

Please read EACH statement and TICK THE BOX that best describes how you feel. There are no right or wrong answers. Your immediate answer will usually be more accurate than a long thought out response.

1. I feel relaxed during the eye test

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

2. I am afraid I will find the tests hard

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

3. Talking to the optician makes me feel tense

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

4. I am content that my eyes are healthy

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

5. I feel on edge during the examination in case something goes into my eye

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

6. I am satisfied in the ability of the optician

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

7. I worry about going to have my eyes checked

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

8. I trust the optician

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

9. I am anxious something unpleasant will happen to my eyes

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

10. When the optician is close to me I feel tense

Strongly agree	Agree	Disagree	Strongly disagree
☐	☐	☐	☐

Can you currently hear music playing in the waiting area?	YES	NO

Please place the completed questionnaire in the box at reception.

Thank you for completing these questions.

We would like to know your opinions of your visit today. Therefore, your optician will give you another short questionnaire at the end of your consultation. Thank you.

If you have any concerns or questions about this research then please do not hesitate to contact us (telephone: 029 2087 6118 or e-mail; Dr Tom Margrain, Dr Katy Greenland or Mrs Helen Court Researchhelp@Cardiff.ac.uk) and we will do our best to answer them.

CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD

HOW DO YOU FEEL AT THE OPTICIAN'S? (Part 2)

We would value your opinions about your visit today. Please complete this questionnaire and place it in the box at reception when you are finished. Your answers are completely confidential and will not be seen by the optician.

Today's date:	**/ / 2006**	
Date of birth:	**/ /**	
Your gender:	**Male**	**Female**

Please think about the consultation you have just had and indicate whether you agree or disagree with each of the following statements, by placing a TICK IN THE BOX.

1. The optician seemed interested in me as a person

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

2. The optician seemed warm and friendly to me

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

3. The optician seemed to take my problems seriously

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

4. I felt free to talk to this optician about private matters relating to my eyes

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

5. The optician gave me a chance to say what was really on my mind

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

6. I really felt understood by my optician

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

7. This is an optician I would trust with my eyes

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

8. The optician seemed to know what (s)he was doing

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

9. I expect that it will be easy for me to follow the optician's advice

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

10. It may be difficult for me to do exactly what the optician has told me to do

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

11. I'm not sure the optician's treatment will be worth the trouble it will take

Very strongly disagree	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	Very strongly agree
☐	☐	☐	☐	☐	☐	☐

These are the final five questions:

I found booking the appointment: (Please circle <u>one</u> of the following)	**VERY EASY**	**QUITE EASY**	**QUITE HARD**	**VERY HARD**

Were you dealt with promptly when you arrived at the practice?	**YES**	**NO**

Was your appointment with the optometrist (optician): (Please circle <u>one</u> of the following)	**ON TIME**	**MORE THAN 5 MINUTES LATE**	**MORE THAN 10 MINUTES LATE**

Would you recommend a friend to visit?	**YES**	**NO**

How could we make things better for you? (please write any comments in the box)

Please place the completed questionnaire in the box at reception.

Thank you for completing these questions. Your opinions are important to us.