Coping During Hyperbaric Oxygen Therapy: Predictors and Intervention

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By

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ABSTRACT

The present research sought to understand patient experiences during Hyperbaric Oxygen Therapy (HBOT) by using 24 HBOT patients (17 men, 7 women) to examine the relationship between individual variables and anxiety, and providing One Session Exposure Therapy (OSET; Öst, 1989) if necessary. Pre-HBOT participants completed the following measures: State-Trait Anxiety Inventory (STAI; Spielberger, 1983), Claustrophobia Questionnaire (CLQ; Radomsky, Rachman, Thordarson, McIsaac, & Teachman, 2001), Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky, & McNally, 1986), and Treatment Credibility/Expectancy Questionnaire (CEQ; Devilly & Borkovec, 2000). State Anxiety was assessed pre-HBOT and at the tenth and last sessions. Findings suggest Dispositional Anxiety (STAI-Trait + ASI), Expectancy of symptom improvement (CEQ), and gender were significantly predictive of State Anxiety before and during HBOT. Limitations and directions for future research are discussed.

GLOSSARY OF ABBRIEVIATIONS

ANOVA	Analysis of Variance
APA	American Psychological Association
Ata	Absolute Pressures in Atmospheres
BAI	Behavioural Analysis Interview
BATs	Behavioural Avoidance Tests
BIBs	Built-In-Breathing system
CBT	Cognitive-Behavioural Therapy
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition and Text Revision
EGD	Esophagogastroduodenoscopy
GAD	Generalised Anxiety Disorder
HBOT	Hyperbaric Oxygen Therapy
HMU	Hyperbaric Medicine Unit
kPa	Unit of pressure
MRI	Magnetic Resonance Imaging
OSET	One Session Exposure Therapy
PTCA	Percutaneous Transluminal Coronary Angioplasty
SUDs	Subjective Units of Distress

Variables

ASI	Anxiety Sensitivity Index
CEQ	Treatment Credibility/Expectancy Questionnaire
CEQ-T	CEQ Total Score
CEQ-E	CEQ Expectancy Subset
CEQ-C	CEQ Credibility Subset
CLQ	Claustrophobia Questionnaire
CLQ-T	CLQ Total Score
CLQ-RS	Restriction Subscale
CLQ-SS	Suffocation Subscale
STAI-S	State-Trait Anxiety Inventory-State (Form Y-1)
STAI-T	State-Trait Inventory-Trait (Form Y-2)

CHAPTER ONE

1. INTRODUCTION

Experiencing an intrusive medical intervention is an inevitable event for the majority of the population. Should medical conditions give rise to sometime in life unpleasant medical procedures or hospitalisation, psychological distress and anxiety may be encountered (Sarafino, 1998). Psychological distress in medical settings encompasses the emotional reactions a patient has in response to their interactions and involvement with, for example, medical professionals, locales, procedures and/or surgeries. Recent research suggests 'typical' manifestations of psychological distress in medical studies include symptoms of anxiety and fear (Lowenstein, Deutcsh, Gruberg, Solt, Yagil, Nevo, et al., 2006; Vögele, 2004). For example, reactions to Magnetic Resonance Imaging (MRI) scans range from nervousness to intense fear or terror (Lukins, Davan, & Drummond, 1997). Similarly, even relatively common outpatient procedures, such as cervical smears and dental check-ups, can be anxiety-provoking (Vögele, 2004). This is illustrated by Anderson and Masur's (1983) review which found that patients facing surgical or dental procedures often report high levels of anxiety.

Generally, anxiety and fear as emotions can appear very similar; therefore distinguishing them can be difficult (Lader & Marks, 1971). Both anxiety and fear are characterised by increased arousal and subjective and/or physiological arousal (Rachman, 1998). Anxiety, in this instance, is defined in the Diagnostic and Statistical Manual of Mental Disorders

(DSM-IV) as “apprehensive anticipation of future danger or misfortune accompanied by a feeling of dysphoria or somatic symptoms of tension.” (American Psychiatric Association (APA); 2000, p. 820). People may experience apprehension along with physiological symptoms such as increased heart rate, when contemplating upcoming medical procedures. ‘Fear responses’ however, are said to involve the interaction of two elements: physiological arousal and cognitions that interpret the situation as dangerous and therefore attribute this arousal to fear (Meichenbaum, 1977). This implies that the stressful situation (namely, medical procedures) is largely unrelated to the emotional response of the individual, but rather that it is the individual’s evaluation of the ‘danger’, and how they interpret their body’s responses, which determines the individual’s emotional response to the situation (Davis, Robbins Eshelman, & McKay, 2000). Thus, perception of a situation will control or determine fear, whether the perception is correct or incorrect, whereas anxiety is not so clearly directed or determined (Rachman, 1998). In practice, it is harder to differentiate between anxiety and fear than in theory and the terms are often used interchangeably (Rachman, 1998).

It is important to distinguish between normal anxiety and clinical anxiety. Normal anxiety is widespread, affects most individuals, and depending on individuals, often is related to specific situations (Lader & Marks, 1971). However, clinical anxiety can be defined in the sense that it is “more marked, more frequent or more persistent than the intensity, occurrence or duration which the patient regards as his norm or as the norm for his or her peers” (Lader & Marks, 1971, p. 22). As mentioned, anxiety surrounding

medical procedures is a common reaction (Vögele, 2004), thus this anxiety, while unpleasant, is not an atypical response.

The experience of anxiety and fear when individuals undergo routine medical treatments varies in prevalence between studies and procedures. The literature, depending on study, has described a range of incidence for adult preoperative anxiety from 11% to 80% (Maranets & Kain, 1999). For instance, MRI research has reported that as many as two out of three people who complete an MRI scan experienced anxiety or claustrophobic fear before or during their scan (Quirk, Letendre, Ciottone, & Lingley, 1989a). In addition, an MRI review (Phillips & Deary, 1995) described these common reactions by reporting that 35% of patients experience apprehension and between 5–10% experience extreme panic and/or claustrophobia. For the procedure Hyperbaric Oxygen Therapy (HBOT), research reported 43% of 87 patients who had undergone this experienced anxiety to some degree, with five discontinuing because of their anxiety (Ellis & Mandal, 1983). Therefore, the current rates of prevalence of anxiety in patients before and during medical procedures are varied according to procedure and study, and thus justify further research into investigating this phenomenon.

Unfortunately, the effect of fearful or anxious reactions within a medical setting may be adverse (Luck, Pearson, Maddern, & Hewett, 1999). Psychological distress (e.g. extreme anxiety), lack of ability to comprehend information, fear of the unknown, unfamiliar surroundings and procedures, and cultural and social backgrounds, can all affect a patient's ability to adjust and cope with prescribed medical procedures (Horne,

Vatmanidis, & Careri, 1994). While there are many medical procedures, settings, and types of surgeries that can evoke anxiety and fear in the individual, the purpose of this study is to contribute to the body of knowledge regarding patient psychological distress – particularly anxiety and fear – in the context of contemplating or undergoing the medical procedure of HBOT.

1.1. HYPERBARIC OXYGEN THERAPY

HBOT is a medical procedure involving the administration of 100% oxygen in conjunction with a higher than atmospheric pressure (Feldmeier, 2003). This procedure is used to treat a variety of acute and chronic medical conditions (see next section). Pressure vessels and oxygen therapy has been used for more than 100 years (Sosiak & Evans, 2005) for divers and caisson workers who developed decompression sickness, or "the Bends". Scientific use of HBOT in clinical medicine, however, was introduced in 1955, and became formalised in 1976 by the Undersea Medical Society who formed an ad hoc committee on hyperbaric oxygenation (Kindwall & Whelan, 1999). Hyperbaric centres have since extended across the developed world.

HBOT takes place in a hyperbaric chamber. A hyperbaric chamber is a pressure vessel utilised within medical settings. Hyperbaric chamber types can be monoplace (refer to Image 1[1]) or a multiplace (refer to Images 2 and 3). Monoplace chambers are hollow spheres, approximately 1.4m in diameter, and accommodate one patient, generally placed

[1] Permission for use of photos was granted by Christchurch Hospital's Hyperbaric Medicine Unit, and photos are available for public use via their website http://www.cdhb.govt.nz/hbu/.

in a prone position (Kot, Houman, & Müller, 2006). The multiplace chamber accommodates two or more patients, and medical personnel (Feldmeier, 2003). This type of chamber is large enough to accommodate trolleys, or beds, if necessary. The development of the multiplace chamber provided several benefits over monoplace chambers. The most important justification of multiplace preference is that it provides increased quality of patient care during HBOT sessions (Kindwall & Whelan, 1999). With the larger area clinicians are able to provide necessary direct care to patients who for example, may have multiple intravenous drips and ventilators that need manipulating or monitoring. Additionally, the multiplace chambers are more economically viable, allowing more patients to be treated simultaneously.

Image 1: Monoplace chamber

Image 2: Multiplace chamber – outside

Image 3: Multiplace chamber – inside

1  **2**  **3** 

The process of a patient undergoing a treatment session in the chamber is called a “dive”. A dive generally takes approximately two and a half hours, and involves the incorporation of compression, oxygen intake ‘at depth’, and decompression, in that order. In a multiplace chamber, compression takes between five and ten minutes. Patients then breathe 100% oxygen from a Built-In-Breathing system (BIBs) via a face mask or a head hood for approximately 60–120 minutes. Current practice is to have the patient breathe

100% oxygen at a pressure of 203-284kPa (2–2.8Ata) (normal atmospheric pressure is 101.3kPa) (Hyperbaric Chamber Safety Committee, 1994). Approximately half way through a treatment session patients take an 'air break' of approximately 10 minutes, as this is reported to minimise pulmonary oxygen toxicity (Kindwall & Whelan, 1999). This involves patients removing headgear. Prior to exiting the chamber, patients are subject to a 30 minute period of decompression, essential to prevent the development of "the Bends" (decompression sickness).

HBOT patients typically undergo a series of sessions (usually 20 to 40 sessions, five days a week) in the hyperbaric chamber (with the variation depending on the condition of the patient). Different maximum pressures and durations of treatment are used in varying clinical situations – for example, the emergency treatment of a diver with decompression sickness may start at 405kPa on a helium/oxygen breathing mix and last over seven hours, while a patient with problem wounds will undergo a series of two and a half hour sessions as described.

Who Uses Hyperbaric Oxygen Therapy and Why?

The medical use of HBOT is to treat patients with a variety of medical conditions. Currently, the Undersea and Hyperbaric Medical Society recognises as many as 13 clinical indications for HBOT (Feldmeier, 2003), and classifies the benefits of HBOT into four categories: mechanical effects, bacteriostatic effects, treatment of poisoning, and treatment of hypoxia (Broussard, 2004). Additionally, because of the diversity of

HBOT's uses, and the benefits and side effects, HBOT has attracted attention from various fields of research, including military medicine (Clark, Rock, & Tackett, 1994), aviation and space medicine (Plafki, Peters, Almeling, Welslau, & Busch, 2000), and nursing (Broussard, 2004).

There is much research on the proposed benefits of HBOT on medical conditions, for example, wound healing (Broussard, 2004), musculoskeletal disorders (Wang, Calhoun, & Mader, 2002), tinnitus (Stiegler, Matzi, Lipp, Kontaxis, Klemen, Walch, et al., 2006), and necrotizing fasciitis (Wilkinson & Doolette, 2004), demonstrating the potential importance HBOT can have in many patients' health plans. HBOT is used to treat 'acute' and 'chronic' cases and its rationale is complex and varies according to the pathology of the patient. 'Acute' patients may present with decompression sickness and therefore require immediate and potentially extensive life-saving treatment. Treatment, in this instance, works via the regulation and reduction of nitrogen in the body's tissues, thereby correcting hypoxia (a shortage of oxygen in the body). Some serious infections (gas gangrene) and poisoning (carbon monoxide) are also considered acute and require immediate care. More common today however, is the use of HBOT for chronic conditions that include but are not limited to non-healing wounds, radiation tissue damage, sports injuries, and some infective cases. The therapeutic effect for non-acute cases lies in both the increased achieved oxygen partial pressure at higher than normal atmospheric pressure, as well as the increased oxygen transport capacity of the blood. For example, for non-healing hypoxic wounds, the aim of the procedure is to supply extra oxygen, thus enhancing healing (Broussard, 2004).

Distressing features of Hyperbaric Oxygen Therapy

It is important to delineate how and why the distressing features of HBOT can affect patients requiring this treatment. Invasive medical procedures often are not pleasant procedures, and research suggests that the degree of anxiety during medical procedures is associated with the level of invasiveness associated with that procedure (Weller & Hener, 1993). While HBOT is technically a 'non-invasive' form of treatment – where 'invasive' is defined as "any operative or diagnostic technique, usually involving the use of instruments, that necessitates the penetration of tissue or the invasion of a body orifice." (Anderson & Masur, 1983, p. 2) – it still has the potential to cause varying degrees of discomfort and pain in some patients, despite the fact it does not actually 'invade' the patient's body. Issues reported significant to undergoing HBOT include discomfort of the face mask or head hood, boredom, noise and coldness of the chamber (Chalmers, Mitchell, Rosenthal, & Elliot, 2007), and aural or sinus barotraumas (Wang et al., 2002).

Several situational and mechanical features of HBOT may cause patients to experience psychological distress. Firstly, the chamber is small and restrictive and it is not possible to escape rapidly unless there is an emergency. Secondly, the headgear worn during the procedure can be uncomfortable. Finally, patients are often uncertain about treatment and this can subsequently provoke feelings of anxiety. The restrictive nature of the chamber and its relationship to claustrophobic anxieties will be discussed later in this section, and

research regarding patient uncertainty and discomfort in the HBOT setting will presently be discussed.

Research surrounding the psychological impact of medical procedures and surgery has been published for some time. Reports from medical and dental studies include, among others, at least five frequently occurring themes: fear of complications; fear of pain; fear of the unknown; fear of discomfort; and disruption of life plans (Anderson & Masur, 1983). Firstly, undergoing HBOT, like all medical procedures, increases the risk of potential complications. HBOT complications include trauma to ear drums, sinuses or teeth, mild rise in blood pressure, mild cough and soreness behind the breast bone, mild reduction in quality of distance vision, oxygen convulsion, and an increased fire hazard (due to high oxygen concentrations). While some of these complications however, are mild and/or reversible, they remain factors which patients are made aware of both prior to and during their treatment. Secondly, patients may have the added fear of how HBOT may affect pain, if present. Thirdly, for those who have not experienced HBOT before, despite information given by staff, there is also the fear of the unknown, especially when undertaking the first "dive". As mentioned, the DSM-IV includes anticipatory apprehension in its definition of anxiety (APA, 2000) and patients requiring HBOT may be anxious and/or apprehensive about undertaking a procedure they know little about. Consequently, patients experiencing distress may choose not to undergo their hyperbaric sessions. Where the clinical prognosis indicates that if patients' health care is delayed, the potential for future adverse health complications can become more likely and this may increase future health care needs. A fear or anxiety-based decision to terminate HBOT, or

not to have it at all, may lead to adverse medical outcomes, e.g. loss of limbs, lack of wound healing, potential reduction of intensity and duration of pain, etc. Fourthly, patients may worry about the discomfort of wearing oxygen headgear for a prolonged period. Lastly, because it necessitates repetitive treatments HBOT is a significant disruption to patients' lives, requiring a time commitment of approximately three hours a day, five days a week, for up to two months.

It has been well documented that potential side effects of HBOT include confinement anxiety and/or claustrophobic fear (e.g. Broussard, 2004; Kindwall & Whelan, 1999; Plafki et al., 2000). Kindwall and Whelan (1999) report that approximately one in 50 patients experience some level of confinement anxiety in a multiplace chamber. Furthermore, it has also been reported that some people fail to complete treatment altogether because their reported levels of anxiety are so high (Ellis & Mandal, 1983; Plafki et al., 2000; Weaver, 2006; Weaver, Hopkins, Chan, Churchill, Elliot, Clemmer, et al., 2002). However, while the medical literature surrounding hyperbaric therapy recognises confinement anxiety as an issue, existing research generally affords anxiety and claustrophobic fear no more than a passing reference (e.g. Broussard, 2004; Escobar, Slade, Hunt, & Cianci, 2005; Sosiak & Evans, 2005; Tibbles & Edelsberg, 1996; Wang et al., 2002; Weaver, 2006). Generally, medical literature on HBOT introduces confinement anxiety in the context of outlining potential side effects or adverse consequences (Tibbles & Edelsberg, 1996; Wang et al., 2002) or briefly as a description in their results (Escobar et al., 2005). As a consequence, this lack of examination leaves the full phenomenology,

natural course, and/or predictor of the relationship between HBOT and anxiety in need of further empirical investigation.

Two studies that have attempted to investigate patients' experiences while undergoing HBOT come from a military and a nursing background. These are discussed below.

Clark et al. (1994) sought to determine the magnitude and specific foci of anxiety experienced by a sample of 24 adult patients referred for their initial hyperbaric treatment at an American military centre. Levels of anxiety were assessed at three intervals: before any health care teaching, one hour pre-treatment (and post-health care teaching), and immediately post-treatment. In addition to this, patients participated in a personal interview immediately after their initial HBO treatment regarding concerns and feelings about the session. The pre-teaching State and Trait anxiety levels were found to be low, in comparison to normative data. Further, there was no significant difference between pre-teaching and pre-treatment phases, but there were significant decreases from both pre-teaching to post-treatment, and pre-treatment to post-treatment. Regarding the specific foci of anxiety, 48% confirmed that the orientations helped prepare them for their HBOT while 52% had no concerns regarding their first HBOT. Collectively, 82% expressed positive views about the orientation sessions. The strengths of this study included a specific focus on anxiety levels and an effort to determine patient perspectives. However, the research setting (Veteran's Hospital) could explain why the general levels of anxiety were low. Most of the sample would have experienced some or many intense stress-provoking situations during military service, and may not be typical of other

general hospital patients undergoing HBOT. Additionally, the sample was not randomly selected, was mostly male (only two females), and had a mean age of 55 years (range 27 – 81 years). These factors necessitate caution when interpreting this study, and limit its generalisability to other populations.

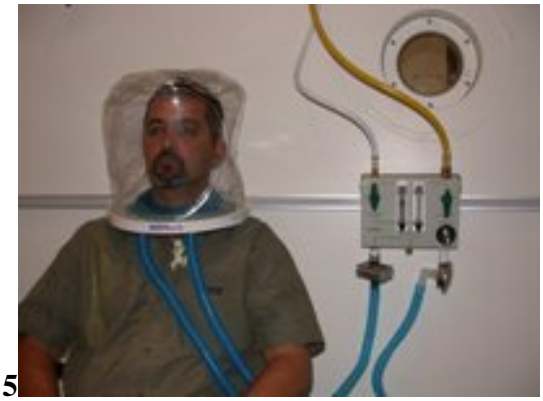
More recently, Chalmers et al., (2007) undertook an exploration of patients' memories and experiences of HBOT in a multiplace chamber in Australia. They used a sample of seven patients at the conclusion of their HBOT sessions, using a semi-structured interview. The qualitative analysis used was Grounded Theory. Categories were not developed prior to data analysis, but became known from the analysis. Four different issues were derived: uncertainty of treatment; discomfort of the face mask or head hood; noise and cold of the chamber; and boredom. Chalmers et al. (2007) reported that even when patients are educated about the process of HBOT via an orientation, they often continue to feel fairly unprepared and uncertain for their actual sessions. Additionally, it was noted, patient apprehension may have some link with past adverse radiotherapy or surgical experiences. Chalmers et al. (2007) also found that the physical discomfort of the face mask or head hood is a real issue for some patients when it comes to continuing their HBO treatment. This is because, on one hand, the face mask (see Image 4) works by the activation of a demand regulator (Christchurch Hospital, 2008), which can make patients with respiratory conditions more vigilant than normal with their breathing. The head hood (see Image 5), on the other hand, has a continuous flow of 100% oxygen in and a mixture of oxygen and CO_2 out (Christchurch Hospital, 2008), which results in intrusive noise directly around the face. While both types of headgear have their own pros and

cons, Chalmers et al. (2007) report that individual preference is the determining factor as to which is less distressing. Chalmers et al., (2007) applied the findings in their research to their future practices to attempt to make patient experiences less stress-invoking. They introduced increased communication with the patients during their orientation, achieved noise reduction during the session, and initiated air-breaks from the face mask or head hood to relieve boredom and discomfort. Anecdotally, subsequent patient reports were positive in regards to these clinical changes (Chalmers et al., 2007). For this study, it is important to be aware when drawing conclusions that this research was an exploratory design and thus only provides an insight into a small group of patients during HBOT. While strengths in this research included the foci on patient experiences and use of the more widespread multiplace chamber, caution needs to be exercised in making definitive conclusions, and further replication research and quantitative data would provide beneficial information.

Image 4: Face Mask

Image 5: Head Hood

4 

5 

As described above, the limited research there is recognises confinement anxiety or claustrophobic fear as a potential anxiety-arousing factor in HBOT (e.g. Broussard, 2004). Consequently, it is beneficial to describe claustrophobia, its characteristics, and how it relates to HBOT.

Claustrophobia is classified as a situational subtype of Specific Phobias in the DSM-IV (APA, 2000), which states that the "essential feature of specific phobia is marked and persistent fear of clearly discernible, circumscribed objects or situations" (APA, 2000, p. 443). Claustrophobic fear is cued by a specific situation such as lifts, small rooms, and enclosed places. The mean age of claustrophobic onset is approximately 20 years and prior to diagnosis has a mean duration of approximately 17 years (Öst, 1987). While severe claustrophobia is estimated to occur in as much as 2-5% of the population (Rachman, 1997), the number of people who seek help for symptoms of claustrophobia is much smaller. Accordingly, the prevalence for mild to moderate claustrophobia in individuals, it would be assumed, may be significantly higher than this, though for many living with claustrophobic fear it may not present itself as a problem in their life. However, for people with claustrophobic tendencies, requiring HBOT may be an issue because of its association with confinement anxiety (Broussard, 2004). This is because the hyperbaric chamber can evoke claustrophobic fear, even potentially in individuals without previous experiences of claustrophobic fear. Therefore, individuals with previous

experiences of fear of enclosed places are likely to experience some degree of anxiety in the HBOT setting, and more so than individuals low on such fear.

Claustrophobia is reported to be made up of two elements – a fear of restriction and a fear of suffocation (Rachman, 1997). This two-factor structure has been well researched and widely supported; Rachman and Taylor (1993) propose that while either of the two elements can sufficiently produce claustrophobic reactions in the individual, when experienced in combination it is far more likely. Subsequent research further supports the restriction and suffocation components of claustrophobic fear. Febbraro and Clum (1995) extend upon these findings by arguing that key claustrophobic cognitions include suffocation, entrapment, and loss of control.

HBOT has features that pertain to both restriction and suffocation elements. Firstly, as discussed, patients are required to wear headgear, which is directly related to one's breathing and air supply and may cause anxiety for patients with fears of suffocation. Patients do receive 100% oxygen through their respective headgear, but it tends to be a physically uncomfortable process for most. While the pressured chamber contains air vents and a carbon dioxide remover, the sealed chamber may also cause anxiety for patients with cognitions about fear of suffocation through a lack of oxygen. Secondly, the chamber can evoke feelings of restriction, even for the most relaxed patient. To allow for the change in pressure, the chamber door is sealed shut, and to return to normal atmospheric pressure takes approximately half an hour, although in an emergency this is achieved in approximately two minutes. This creates a situation where individuals are

unable exit rapidly and may cause people who have existing claustrophobic fears or tendencies to feel frightened and feel an urgent need to escape (Rachman, 1997). Essentially, patients must remain inside the hyperbaric chamber as it is too dangerous, even fatal, to leave without the correct decompression sequence. In addition to both restriction and suffocation elements influencing anxiety, the size of the chamber may be another distressing factor. The multiplace chamber used in the present study measures 2.25m wide by 2.97m long and 2.1m high (Fink Engineering, 2000). With several patients and a nurse inside, this small area may create a cramped and uncomfortable environment for the patient. In summary, HBOT contains characteristics of suffocation and restriction and/or entrapment, and the combination of a perception of physical restriction *and* a perception of threat to one's air supply can be dangerous and provide a foundation for claustrophobic reactions (Rachman, 1993).

While research surrounding HBOT and psychological distress is limited, fear and anxiety surrounding MRI procedures are much better investigated. MRI, like HBOT, is a medical procedure that appears to elicit some distress regarding confinement from patients. It is therefore interesting to briefly consider the relevant literature.

Similar to HBOT, termination of the MRI procedure due to acute anxiety has been observed: McIsaac, Thordarson, Shafran, Rachman, and Poole (1998) found that for a subset of patients, claustrophobic fear can be so intense that it triggers panic during the MRI scan – which in a number of instances leads to termination of the scan. Research also suggests that between five and ten percent of patients report claustrophobic reactions

during an MRI scan (Kilborn & Labbé, 1990), and it is estimated 1% to 10% diagnostic studies have failed because patients refused to complete the procedure (Friday & Kubal, 1990). Research into claustrophobia and MRI scanning proposes that the anxiety induced by MRI scans is primarily claustrophobic in nature (McIsaac et al., 1998). HBOT also appears to be associated with the claustrophobia components and while there are some potential differences with HBOT, it is beneficial to be informed by the larger body of knowledge that MRI research allows.

In summary, while data reporting on the psychological experiences of patients' during HBOT remains limited – especially with regard to multiplace chambers – it certainly is recognised that it can be a distressing procedure.

1.2. REDUCING DISTRESS IN MEDICAL SETTINGS

Why distress in medical settings needs to be reduced

The experience of anxiety and/or fear before surgery or a medical procedure is something that is frequently described by patients (Kendall & Watson, 1981). In fact, as Stoddart, White, Covin, and Strauss (2005) point out, fear and anxiety is reported by more than 80% of adult patients undergoing a medical procedure. While many of these may not require intervention, some do find it extremely anxiety-provoking, thus it is vital to investigate the effect that this type of distress can have on patients, both prior to and immediately following their scheduled medical procedure.

Distress needs to be reduced because much research links the experience of fear and anxiety before medical procedures or surgery with negative post-procedure outcomes (e.g. Horne et al. 1994; Kiecolt-Glaser, Marucha, MacCallum, & Glaser, 1998). Very recently Kagan and Bar-Tal (2008) showed that for patients undergoing elective arthroplasty, post-operative well-being and mental health were negatively affected by preoperative anxiety. Furthermore, reducing distress may benefit diagnostic results. Results may be affected by the level of distress experienced by the individual within the medical setting. The experience of strong fear and anxiety impinging upon a patient's ability to keep still over an extended period of time (for example during the imaging process of an MRI) increases the likelihood that the results of the procedure will be compromised. As two case studies demonstrate (Klonoff, Janata, & Kaufman, 1986; Simon, 1999. Refer to Table 2) the inability to achieve accurate diagnostic results and complete an MRI scan, due to anxiety and a patient's inability to remain still in the scanner, are motivating factors for the implementation of psychological intervention in MRI settings.

Ideally, it is hoped that by reducing distress surrounding HBOT, adjustment and coping to the aforementioned distressing features of HBOT will be less stressful. In turn, this is hoped to increase the likelihood for the patient to commence, and complete, all of their required HBOT sessions, thereby achieving the positive health outcomes from treatment. Reducing distress in patients before and during medical procedures can be advantageous to medical staff and hospitals, be cost-effective, and of benefit to the patient themselves.

Thus, it is important to address psychological preparation before medical procedures, in order for patients to have the best possible outcome.

Review of techniques used for reducing distress in medical settings

Over the past four decades the importance of investigating how the reduction of distress in medical settings can be of benefit to patients has been made evident in a number of studies (Devine, 1992; Vögele, 2004). Psychological preparation before nonsurgical medical procedures has been shown to be of benefit by improving adjustment and recovery both prior and following a medical procedure (Sarafino, 1998). The designs of psychological preparation for medical procedures and surgery have tended to focus primarily on reducing pre-procedural anxiety and concerns. The general rationale for psychological preparation prior to an invasive medical procedure/surgery is that, as previously discussed, a high pre-procedure level of fear can create adverse adjustment problems or negative impacts on well-being subsequent to procedure. A major meta-analysis (Devine, 1992) supports the provision of pre-procedural psychological preparation as having a small to moderate beneficial effect on patient psychological distress.

The above rationale does not specifically pertain to HBOT for a number of reasons. Firstly, the rationale for psychological preparation prior to HBOT should focus on adjustment and exposure to the HBOT sessions themselves, rather than on any post-procedural benefits of psychological preparation, as any post-procedure benefits will

derive from the HBOT treatment itself. Secondly, as described, HBOT is technically not an invasive procedure. Finally, while surgery and invasive procedures like cardiac catheterisation are normally one-off treatments, HBOT is a repetitive medical procedure, not unlike procedures such as burn debridement and renal dialysis.

The next section will briefly review techniques that have been used to reduce distress in medical settings, with a specific focus on MRI and HBOT. Table 1 lists outcome studies that have investigated psychological preparation before general medical procedures or surgery. The type of medical procedure/surgery, type of psychological preparation, sample description and group assignment, design, outcome measures, and results are all specified.

Table 1

Studies Investigating Psychological Preparation before Medical Procedures or Surgery

Author/s	Design	Type of Procedure/Surgery	Type of Assignment (N)	Type of Control Group	Type of Psychological Preparation	Outcome Measures	Results	Strengths/Limitations +/-
Claar, Walker, and Smith, (2002)	Descriptive, correlational	Esophagogastroduodenoscopy (EGD)	Children (8 – 17 years) (100)	No control group	Information appraisal	Endoscopy Knowledge & Patient Preparation EGD Appraisals State Trait Anxiety Inventory (STAI) for Children Scale based on the Observation Scale of Behavioural Distress-Revised Faces Pain Scale Modified version of Post-Endoscopy Patient Questionnaire	Children with less knowledge about the EGD appraised it as more threatening Children with higher threat appraisals reported higher anxiety Children with more knowledge reported lower threat and those with lower threat reported less anxiety Children reporting greater anxiety showed more distress	- Two scales had no reliability or validity information - Sample size lacked power -Lack of ethnic generalisability - Just by being in the study may have produced some changes in anxiety for parents and children
Hackett, Lane, and McCarthy (1998)	Experimental	Gastrointestinal Endoscopy	Random Adults (18 – 65 years) (48)	Attention - control	Group 1: Cognitive Group 2: Behavioural Group 3: Combination Group 4: Attention control	STAI The Positive and Negative Affect Schedule Endoscopy Confidence Questionnaire Credibility Assessment	Groups 1 & 3 experienced significant reduction in anxiety and increase in self-confidence from pre- to post-intervention	- No statistics reported with measures - Unable to rule out age as a confounding variable – was identified and implications discussed - Self reported questionnaires
Kendall, Williams, Pechacek, Graham,	Experimental	Cardiac Catheterisation	Random	Standard Care	Group 1: Control group Group 2: Attentional focus Group 3: Cognitive	STAI Physician and technician ratings	Groups 2, 3 and 4 showed significantly lower state anxiety post-procedure	- Be cautious with physicians and technicians reporting psychological distress

Shisslak, & Herzoff (1979)					Behavioural Therapy (CBT) Group 4: Information provision		During procedure groups 3 and 4 had significantly lower anxiety than groups 1 and 2 CBT participants were rated as best adjusted	- Some patients had undergone this procedure before
Lang, Berbaum, Faintuch, Hatsiopoulou, Halsey, Li et al. (2006)	Experimental	Large core needle breast biopsy	Random Women Adults (18 – 86 years) (236)	Standard Care	Group 1: Standard Care Group 2: Structured empathic attention Group 3: Self-hypnotic relaxation	STAI -Y Verbal pain and anxiety ratings from 0-10	Structured empathy and hypnosis decrease procedural pain and anxiety Hypnosis provided more powerful anxiety relief without undue cost, thus they concluded this to be a better outpatient pain management option	- Clinical team was not blind to group assignments - Unknown whether self-hypnosis provides better anxiety relief than medicated options - Hypnosis offers a drug-free alternative for patients
Lenzen, Gamel, & Immink, (2002)	Cross-sectional, descriptive correlational with a quantitative and qualitative component	Percutaneous Transluminal Coronary Angioplasty (PTCA)	Adults (median 60 years) (86)	No control group	Provision of information First PTCA (1-PTCA) patients versus repeat PTCA (re-PTCA) patients	Hospital Anxiety & Depression Scale (HADS) Heart Patients Psychological Questionnaire (HPPQ) Visual Analogue Scale (VAS)	Re-PTCA patients were more likely to have worse despondency scores on the HPPQ – this difference was more pronounced in males Anxiety and well-being showed a trend – though not statistically different – towards a worse condition for re-PTCA patients.	- Self-report questionnaires - Does not explain rationale behind preparatory information - Discuss trends and non-significant results as important outcomes, citing clinical relevance + They cannot conclude undergoing a repeat PTCA causes more anxiety + Validates anxiety is present prior to medical procedures
Luck et al.	Experimental	Colonoscopy	Random	Routine	Information provision/	STAI	Females and those	+ Manipulation checks

(1999)			Adults (20 – 88 years) (150)	treatment	Modelling – everyone received an information leaflet regarding colonoscopy then were randomly assigned to watch the video (video group) or not (non-video group)	Knowledge Questionnaire (developed for purpose of study)	who had not had previous colonoscopy had higher baseline anxiety The video group had significantly higher knowledge regarding the procedure and a significant decrease in anxiety pre-procedure	performed + Blind assessors used - Not enough information provided discerning the two groups
Mahajan, Wyllie, Steffen, Kay, Kitaoka, Dettorre et al., (1998)	Experimental	Gastrointestinal Endoscopy	Random Children (6 – 19 years) (60)	Routine treatment	Group 1: Control group Group 2: Modelling and information with parent	STAI Heart Rate & Blood Pressure Observational Scale of Behavioural Distress	Group 2 experienced significantly less self-reported anxiety before and during the procedure than Group 1 Group 2 had significantly less autonomic nervous system stimulation before procedure than Group 1	+ Used both self-report and physiological measures - No clearly articulated hypotheses - No manipulation checks - No strong rationale provided for psychological preparation
Stoddart et al., (2005)	Experimental	Day surgery – benign surgeries with favourable outcomes only	Random Adults(22 – 54 years) (98)	Basic background information control group	Group 1: Control Call – basic background information Group 2: Intervention Call – permitted to request as much or as little information as they desired Group 2 would be moderated by "monitors vs. blunters" coping styles	STAI Miller Behavioral Style Scale (MBSS) The Amsterdam Preoperative Anxiety and Information Scale (APAIS)	No significant findings were identified – *preoperative anxiety remained constant over time *monitors and blunters used equal amounts of time on phone call	+ Explanations are discussed for lack of findings + Findings are discussed well in conjunction with past research - Despite random assignment baseline anxiety was greater for Group 2 - No manipulation or integrity checks were performed

Reducing distress within medical settings is not a new initiative and varieties of techniques have been suggested. While medication has been employed as a short-term solution, this would not be a suitable treatment for anxiety in patients undergoing HBOT because it is a repetitive and daily procedure. Additionally, it has been suggested that psychological approaches – such as information provision, modelling, varying procedures of relaxation, cognitive, behavioural, or cognitive and behavioural combined – are more popular alternatives (Phillips & Deary, 1995). The reported success of these techniques, as they pertain to reducing distress in medical settings, is varied. Each has particular strengths that need to be explored.

Information provision is an approach frequently used as a means of psychological preparation prior to a medical procedure (Anderson & Masur, 1983). This technique relates to what has been defined as 'typical' or 'normal' reactions to unknown experiences. Thus, where a normal reaction before undergoing an unknown or atypical experience within medical settings is to seek out information regarding what will arise and how this may impact on oneself, it is believed that patients with insufficient information may experience psychological distress (Horne et al., 1994). As such, the aim of information provision is to provide the patient with enough information to reduce anxiety and allow for accurate cognitions regarding procedures. However, research suggests that there are variations of what the ideal medium for information provision is (Luck et al., 1999), in addition to the varying amount of information desired by or suitable for individuals (Woloshynowych, Oakley, Saunders, & Williams,1996).

Research is inconsistent regarding the benefits and effectiveness of information provision approaches in reducing distress in medical settings. For example, a recent study that looked into the effect of information provision on patient distress, via the use of a phone call from the anaesthesiologist prior to surgery, reported no significant difference in anxiety between control and information groups (Stoddart et al., 2005). Additionally, information provision has not been shown to be particularly successful in studies related to reducing distress during endoscopic treatment (Woloshynowych et al., 1996). At the same time, however, Luck et al. (1999) reported a significant decrease in pre-procedure anxiety for patients undergoing a colonoscopy when they were provided with an informational video. Another study, which looked at the relationship between levels of distress and the technique of information provision, found that, when coupled with 'modelling', patients who receive information provision reported significant decreases in self-reported anxiety and less autonomic nervous system stimulation before their gastrointestinal procedure (Mahajan et al., 1998). Lastly, a study on children undergoing an EGD found those with more knowledge tended to have lower threat appraisals, and those with lower threat appraisals generally exhibited less anxiety. These studies therefore, show that while information provision can reduce distress, this is not always the case. Such findings are therefore inconsistent and create difficulty when generalising between procedures, populations, and settings.

Modelling, or observational learning, happens when an individual witnesses another individual perform a particular behaviour (Bandura, 1977), and is part of Bandura's Social Cognitive Theory. When modelling, as a psychological preparation, has been

demonstrated as an effective tool for the reduction of distress in medical settings (Anderson & Masur, 1983), it is generally used as a component, or in association with another technique, such as information provision (Mahajan et al., 1998; Luck et al., 1999), or cognitive restructuring and relaxation (O'Halloran, 1995). Although a variety of modelling approaches have been used successfully, more research is needed to delineate modelling methods and the populations that benefit most from use of such techniques (Anderson & Masur, 1983).

Relaxation techniques range from hypnosis to relaxation tapes and have frequently been used within the medical settings to assist with patient distress. For example, in a study conducted by Lang et al. (2006), self-hypnotic relaxation, as compared to structured empathic attention, was demonstrated to be a good outpatient pain management option for a particularly anxiety provoking procedure. The authors suggested that self-hypnotic relaxation may provide a powerful, and relatively cheap, anxiety relief to patients undergoing invasive medical procedures such as needle biopsies. However, as with modelling, relaxation techniques tend to be utilised in conjunction with other psychological techniques, thus making it difficult to differentiate the benefits of relaxation as a sole treatment as no manipulation checks have been performed.

Cognitive Behavioural Therapy (CBT) approaches, on the other hand, have shown promising results in the literature to date. For example, Hackett et al. (1998) found patients who receive either cognitive or CBT interventions before undergoing gastrointestinal endoscopy have a significant reduction in anxiety, in comparison to the

attention-control and behavioural-only groups. Additionally, a review on preparing patients for invasive medical procedures and surgical procedures suggests CBT approaches are successful for both adults and children in decreasing anxiety and pain, as well as being a cost-effective method (Horne et al., 1994).

Because of the similarity to HBOT the next section will review techniques that have been used to reduce distress in MRI settings. In the last 20 years there has been an attempt to confront the issue of patient anxiety with regard to MRI scans (refer to Table 2). Using an experimental design, Quirk, Letendre, Ciottone, and Lingley (1989b) investigated how MRI patient anxiety levels varied across a set of groups, when a variety of psychological approaches were manipulated and implemented. The three groups in this study were: information alone, information and counselling, or information and relaxation. The study found that psychological preparation that incorporates relaxation is more effective than information alone. A randomised control trial explored the use of relaxation tapes for diminishing anxiety related to MRI scans (Lukins et al., 1997). This found that the patients who used relaxation tapes before and/or during MRI demonstrated lessened anxiety during their scan. Other instances where methods to reduce anxiety before MRI scans are illustrated through case reports (Klonoff et al., 1986; Simon, 1999). These case reports used systematic desensitisation and hypnosis to enable patients to successfully complete their MRI scans. While their results suggested that the introduction of psychological approaches into medical settings is beneficial, one problem that was identified is that having a technician skilled in a psychological preparation approach onsite may not always be feasible or affordable. Lastly, research has suggested that the

psychological approach was the most popular way to alleviate anxiety during MRI and to take into account cost-effectiveness, individuality, and practicality when choosing the appropriate psychological approach (Phillips & Deary, 1995).

Table 2

Studies Investigating Psychological Preparation before MRI

Author/s	Design	Type of Assignment (N)	Type of Control Group	Type of Psychological Preparation	Outcome Measures	Results	Strengths/Limitations
Klonoff et al., (1986)	Case Report	n/a	n/a	Systematic Desensitisation	MRI completion with minimal movements	MRI was completed successfully Results demonstrate that there are steps that can be taken to allow for completion	+ The success suggests the further interaction between radiology and psychology - One patient only
Lukins et al. (1997)	Experimental	Random	Standard Care	Group 1: Control Group 2: Anxiety reduction tape pre-MRI Group 3: Anxiety reduction tape pre-MRI *and* adapted version of tape during MRI	STAI Y-2 Fear Survey Schedule	Patients who used relaxation before and during scan showed reduced anxiety during the scan	- Bias sample of less fearful individuals because those who considered themselves claustrophobic chose general anaesthetic
Phillips & Deary (1995)	Review	n/a	n/a	Interventions to alleviate anxiety during MRI	Anxiety	Cost-effectiveness, individuality, and practicality need to be accounted for Psychological approach the most popular	+ Covers physical and psychological approaches - Not particularly thorough
Quirk et al. (1989b)	Experimental	Random	Information only	Group 1: Information only Group 2: Information plus counselling Group 3: Information plus relaxation exercise	STAI	Patients in Group 3 showed significant less increase in anxiety compared with those in Groups 1 and 2 Results suggest that to reduce anxiety levels, patient preparation should include more than the provision of information alone	+ Important implication suggesting that information alone is not sufficient - No “standard care” control group
Simon (1999)	Case Report	n/a	n/a	Hypnosis	MRI completion with minimal movements	MRI was completed successfully Results suggested that hypnosis can be a viable option in treating MRI claustrophobia	+ Worked for a patient who previously had failed completion of MRIs twice even with medication - One patient only

Of significance to the present study is the research, albeit limited, regarding the reduction of anxiety and distress in patients requiring HBOT (refer to Table 3). In 1989, one study compared standard care procedures to the supply of an informational video before HBOT, and the use of film distraction during the session (Allen, Danforth, & Drabman, 1989). Although the patients who watched the video and film described themselves as less distressed than control patients, there were no manipulation checks performed and the sample size was particularly low (n = 11). Another case report investigating the benefits of psychological preparation before HBOT focused on a patient's refusal of HBOT sessions due to their experience of claustrophobic fear (Hillard, 1990). The author sought to demonstrate how relaxation, visualisation, and medication enabled this patient to successfully undergo all of their required HBOT sessions. Clearly there is a lack of controlled HBOT research, making it difficult to know what approach/approaches is/are most appropriate for the treatment of distress in patients undergoing HBOT.

Table 3

Studies Investigating Psychological Preparation before HBOT

Author/s	Design	Type of Assignment (N)	Type of Control Group	Type of Psychological Preparation	Outcome Measures	Results	Strengths/Limitations
Allen et al. (1989)	Experimental	Random (11)	Standard Care	Group 1: Control group – standard preparation Group 2: Experimental group – watched an informational video, and had a film to watch during first session for distraction	Subjective Units of Distress (SUDs) Ways-Of-Coping Questionnaire Miller Behavioural Style Scale	Results support the use of modelling and distraction during HBOT to reduce distress and increase compliance	+ Specific to HBOT - No reliability or validity scores reported for scales - No manipulation check between the informational video and distraction film - Very low sample size
Hillard (1990)	Case Report	n/a	n/a	Relaxation, visualisation and medication	HBOT completion	Successfully completed HBOT sessions Author suggested you could conceptualise the first session as flooding then subsequent sessions as reinforcement of this flooding	+ Patient was able to complete HBOT even after initially refusing it - One patient only
Sax (1990) ABSTRACT ONLY	Experimental	Random (40)	Control Condition	Group 1: Intervention – Stress Inoculation tape Group 2: Control – Music tape	Self-report anxiety measures Pulse rates Medical staff ratings of distress and anxiety	Anxiety related to HBOT can be therapeutically impacted by psychological intervention Intervention patients reported lower anxiety pre-HBOT	- Abstract only was available

While the research described suggests that psychological preparation has its merits and prospects within a medical setting, it is essential to interpret the above studies with caution due to widespread methodological limitations and generalisability issues. No research is without unavoidable limitations; however some methodological problems can seriously compromise definitive conclusions. To name a few such issues, studies failed to include: manipulation checks to determine which part of the intervention facilitated change (e.g. Allen et al. 1989; Mahajan et al., 1998; & Stoddart et al., 2005); sufficient statistics regarding outcome measures (e.g. Allen et al. 1989; Claar et al., 2002; & Hackett et al., 1998); sufficient sample size (e.g. Allen et al. 1989; & Claar et al.,, 2002); and control groups (e.g. Claar et al., 2002; Lenzen et al., 2002; & Quirk et al., 1989b). These problems significantly limit the ability to make inferences, and indicate the need for more well-controlled studies. Limitations aside, one evident trend is that CBT approaches may show promise as a means of psychological preparation in a variety of medical settings. As such, the application of CBT to claustrophobia and to HBOT settings will be discussed.

Claustrophobia, Cognitive-Behavioural Therapy, and One-session Exposure Therapy

Current practices of treating claustrophobia have developed from the original theoretical foundation underpinning the treatment of anxiety disorders. The complex history of the current treatments for anxiety disorders includes two pathways from which treatment methods have been developed; behavioural theories and cognitive theories. Both

behavioural and cognitive theories are centrally concerned with the acquisition and maintenance of fear as it relates to phobic stimuli, and in turn the treatment applications.

Behavioural treatments for anxiety disorders originate from a variety of behavioural theories which aim to identify an individual's predisposing vulnerabilities, specific learning experiences, and response deficits in association with specific phobic stimuli (Craske & Rowe, 1997). It is subsequently the unlearning of these associations that is the foci of behavioural treatments. Developed from behaviour therapy is a set of procedures known as exposure therapy. Traditional *in vivo* exposure incorporates both systematic and repetitive exposure to a feared stimulus and the essential component being not to escape the stimuli, thus remaining 'exposed' until anxiety subsides. Treatments associated with exposure treatments that developed included covert conditioning (e.g. for alcohol abusers), flooding, implosive therapy, and gradual exposure methods (Sweet, Giles, & Young, 1987). The goal of exposure therapy is twofold: firstly, to extinguish the arousal of fear in the presence of the phobic stimulus; and secondly, to concurrently initiate approach to the stimulus as a counter to avoidance/escape (Koch, Spates & Himle, 2004). The differing forms of exposure can range from graduated to intense; imaginal or *in vivo*; massed versus spaced; and with or without a therapist. Relevant to this study, is the way exposure theory implies a systematic, gradual, and *in vivo* exposure to the phobic stimulus, the hyperbaric chamber.

Cognitive treatments originate from cognitive theories and are well utilised as a stand-alone treatment for anxiety disorders, or in combination with others (Choy, Fyer, &

Lipsitz, 2007). The underlying theory behind cognitive treatments is the notion that, due to incorrect thinking, an individual has an irrational and maladaptive fear of a phobic stimulus (McGlynn & Lawyer, 2000). Research supports the cognitive element to phobic beliefs, suggesting that the connotation of the phobic stimulus is influenced by a range of beliefs that make up phobic thoughts (Thorpe & Salkovskis, 1995). Maintenance of phobias are closely related to these beliefs, which are thought to be influenced by an individual's perceptions of harm by the stimulus, harm felt by individual, and feelings of helplessness (Thorpe & Salkovskis, 1995). As such, patterns of thinking in anxious patients are seen to reflect perceptions of harm or danger, and their interpretations (conscious and unconscious) are assumed to generate anxiety (Craske & Rowe, 1997). Cognitive therapy posits that emotions based on cognitive processes are amenable to change through conscious reasoning (Craske & Rowe, 1997). It is therefore the reorganisation of incorrect or irrational cognitions regarding the phobic stimulus that is the main foci of cognitive therapy (Choy et al., 2007). Thus, once the phobic stimulus is addressed cognitively, anxiety is intended to decrease. Pertinent to the present study are patients' irrational cognitions regarding the perceived distressing procedure of HBOT. Therefore, in this instance, the focus of the cognitive therapy would be identifying and modifying a person's cognitions regarding HBOT, and thus influencing their levels of anxiety.

The result of the amalgamation of the above two approaches (behavioural and cognitive) has led to the development of CBT. Historically, the objective of CBT has been to change an individual's maladaptive thoughts. However, at the same time, this theory recognises

the importance of implementing behavioural techniques – in this case *in vivo* exposure – to assist with the achievement of the targeted change (Emery & Tracy, 1987). Accordingly, exposure treatments are combined with a cognitive approach, particularly in the treatment of anxiety disorders (Chambless & Gillis, 1993), and behavioural techniques remain ways for cognitions to be tested and modified (Craske & Rowe, 1997).

Behavioural and CBT therapies are often suggested as the treatment of choice for anxiety disorders, including specific phobias, such as claustrophobia (Sweet et al., 1987). For example, a recent review conducted by Choy et al. (2007) suggests cognitive or cognitive with *in vivo* exposure are efficacious therapies for claustrophobia. Specifically, the CBT treatment of an individual's claustrophobic fear is treated via both exposure (behavioural) exercises in combination with cognitive therapy (Choy et al., 2007; Rachman, 1997). Through the development of CBT in the field of specific phobias, *in vivo* exposure has further been refined into a one-session treatment. This refinement, which includes already proven successful forms of treatment for phobias, namely cognitive and behavioural (*in vivo* exposure) components, was done by Öst (1989), whose purpose was to present a rapid and effective method for the treatment of specific phobias. The differences of the One-Session Exposure Therapy (OSET) to traditional *in vivo* exposure was firstly that the patient is presented with all exposure steps at a single session – as opposed to the usual four to eight sessions for specific phobias (Öst, 1989) – and secondly, that modelling is used to help the patient when required (e.g. for spider phobics). Öst (1989; 1997) proposes that the cognitive restructuring inherent in the use of such behavioural tests yields a more rapid shift in avoidance and anxiety, suggesting that this type of treatment

can be completed over a shorter period of time while still remaining efficacious. As with general *in vivo* exposure, OSET principles are similar: the patient makes a commitment to remain in the exposure situation until their anxiety subsides; they are encouraged to approach the stimulus as much as possible; they are to remain in contact with the specific stimuli until their anxiety subsides; and the therapy session does not conclude until the anxiety level of the individual has been reduced by at least 50% or is completely gone. As mentioned, in addition to the cognitive and behavioural components in OSET is modelling; characteristically included as an adjunctive method for behaviour modification interventions (Kazdin, 2001). Modelling enables the therapist to demonstrate the behavioural tasks set for the client and to help make the step to achieving them less stressful.

Subsequent to Öst's (1989) development of OSET, it has demonstrated therapeutic success for individuals with specific phobias. The pioneering study by Öst in 1989 treated 20 patients with specific phobia and found positive results; 90% were much improved or completely recovered after a mean of 2.1 hours of therapy. These results are on a par with regular behavioural treatment with multiple sessions. Hence, with results that are just as effective as a longer treatment method it is logical to conclude that using the one-session method for this particular population was not a disadvantage and had clinical efficacy. These outcomes resulted in subsequent attempts at replication, from which the one-session method was suggested as the treatment of choice for a variety of specific phobias such as spider, blood-injury, injection, claustrophobia, and flying (Öst, 1997). From Öst's (1997) review, it is reported that although there were a small number of studies reviewed,

some suggestions could be made. Across the different specific phobias the one-session treatment method yielded 74-94% clinically improved patients after 2-3 hours of treatment and effects were maintained or somewhat better at the 1-year follow-up. Since Öst's 1997 review, several studies have used OSET within an experimental design on specific phobias. A study on claustrophobia revealed all three experimental groups, five sessions of exposure, five sessions of cognitive therapy, or OSET, to be clinically improved as per Jacobson, Follette, and Revenstorf's (1984) criteria, and there were no significant differences between outcome variables for the three groups (Öst, Alm, Brandberg, & Breitholtz, 2001). Additionally, Koch et al. (2004) found that OSET and behavioural therapy achieved the same cognitive change, but participants rated OSET as less intrusive. Choy et al. (2007) suggest, after reviewing the literature, that *in vivo* exposure is a strong method to use for specific phobias and cognitive therapy has strong evidence as a stand alone therapy, or as an adjunct method, for claustrophobia. In summary, cognitive, behavioural and CBT procedures are efficacious treatments for specific phobias, and OSET has shown to be as effective, and less intrusive, as the longer treatment methods it has been compared to. Additionally, as health care costs are a continuing issue, and feasible brief interventions (like OSET) are preferred by most clients (Lane, 2000), brief and effective treatments like OSET can only be a help to reduce costs, lengthy waiting lists, and benefits the patients.

On the background of this literature, the current study will evaluate the effectiveness of OSET to reduce atypical claustrophobic anxiety in patients undergoing HBOT.

1.3. POTENTIAL PREDICTORS OF STATE ANXIETY

This study aims to examine psychological factors associated with adverse psychological distress in patients undergoing HBOT. This research was intended to enhance the understanding of Hyperbaric Medicine Unit (HMU) staff at Christchurch Hospital regarding patient experiences concerning the process of undergoing HBOT. In this section of the thesis I will provide an overview of these variables – state and trait anxiety, claustrophobic anxieties, anxiety sensitivity, and treatment credibility/expectancy – and how they relate to the research at hand. Additionally, other potential confounding variables of interest to the study will be discussed.

State and Trait Anxiety

Anxiety is a theoretical construct. Freud (1936) viewed anxiety as something people feel, and contemporary psychology generally refers to anxiety as a transitory and clear condition of feelings, for example, subjective feelings of apprehension and tension (Spielberger, 1972). It has been suggested that anxiety be viewed as at least two related, and yet dissimilar constructs (Spielberger, 1966). Anxiety can be expressed as a particular condition of feeling (Spielberger, 1972), or more specifically, as an unpleasant emotional *state*. In this instance, someone's state is defined as one's given condition at a particular moment in time, thus suggesting that a person's state is subject to change as that moment in time passes. That is, an individual's anxiety state, or their anxiety levels, can vary from moment to moment. This amenable component of anxiety is called 'state

anxiety' and is defined as a transitory group of emotions influenced by environmental factors (Spielberger, 1966).

Another expression of anxiety is the way in which it manifests itself as a disposition, or personality trait. From this perspective, anxiety is regarded as a relatively stable individual difference variable in anxiety-proneness and is called 'trait anxiety' (Spielberger, 1983). In contrast to state anxiety, trait anxiety is classified as established and therefore less influenced by environmental factors. Trait anxiety can be viewed as an inclination to anxiety, as well as a tendency to, and a predictability to, perceive particular situations and to react in certain ways (Spielberger, 1983).

Research argues that it is important to recognise the distinction between trait and state anxiety (Gaudry, Vagg, & Spielberger, 1975). However, while state and trait anxiety can be discriminated as two separate constructs, it is important to understand their relationship. Spielberger's (1983) Trait-State Anxiety Theory summarises briefly how trait anxiety influences and impacts on state anxiety. The theory postulates that trait anxiety is the individual differences in the perceptions of stressful situations and the individual's reactions to these situations. Consequently, these perceptions, influenced by one's trait anxiety, dictate the intensity of one's state anxiety. Furthermore, the Trait-State Anxiety Theory describes the ways in which trait anxiety has the ability to reveal differences between individuals in frequency and intensity of past anxiety states, and predicts differences in the future. Accordingly, Spielberger's (1983) Trait-State Theory claims that individuals with higher trait anxiety are more likely to experience higher

intensity anxiety states in anxiety-provoking situations, as well as to perceive a larger number of situations as more dangerous or threatening (Spielberger, 1972). Recent research by Lau, Eley, and Stevenson (2006) supports this theory by demonstrating that while trait anxiety has moderate genetic and large non-environmental effects, state anxiety is to a considerable extent influenced by environmental factors. When relating the Trait-State Theory to the study at hand, it suggests that persons with higher trait anxiety may perceive hyperbaric treatment as a more dangerous or threatening situation than someone with lower trait anxiety. In addition to experiencing higher intensity states of anxiety, people with higher trait anxiety have the potential for more frequent episodes of state anxiety throughout their treatment. Therefore, anxiety is delineated as two connected but differing constructs that attempt to partially explain and predict individuals' behaviours.

Both trait and state anxiety have been used extensively as outcome measures in research and clinical practice. They have been applied to a variety of populations, namely medical samples (e.g. Asmundson & Norton, 1995; Hackett et al., 1998; Luck et al., 1999; Mahajan et al., 1998), and including HBOT research. Clark et al. (1994) were able to measure change in patients' state anxiety levels regarding HBOT before and after the first session, and to measure trait anxiety to observe its relationship with state anxiety. Thus, measuring state and trait anxiety can provide a snapshot of how a patient may feel at a particular moment in time, demonstrate when individual state anxiety may vary, and allow for an understanding of how state and trait anxiety are interrelated.

Accordingly, in the present study, it is hypothesised that as patients continue with their hyperbaric sessions, their perception of the situation as threatening will decrease, and therefore produce a change in state anxiety. Because state anxiety is a transitory set of emotions, it is expected that should one's anxiety regarding HBOT change, the state anxiety score will reflect this. Additional to this, trait anxiety will be measured to examine its association with state anxiety during HBOT.

Claustrophobic Anxieties

As described earlier, claustrophobic fear is cued by specific situations, for example a hyperbaric chamber. Research has recognised the need to focus on how claustrophobia manifests itself, and can be of impact in medical settings. Specifically, MRI studies have investigated claustrophobia because of the potential adverse affects to the MRI procedure (Harris, Robinson, & Menzies, 1999; Harris, Robinson, & Menzies, 2001; McGlynn, Smitherman, Hammel, & Lazarte, 2007; McIsaac et al., 1998). McIsaac et al. (1998), in part, wanted to determine the best predictors of anxiety during MRI scans. They found that claustrophobia scores pre-MRI significantly predicted participants' distress during the scan. They further found that claustrophobia scores were able to differentiate between those who reported panic during the scan, and those who did not.

MRI research also has found support for the two components of claustrophobia, fear of suffocation and fear of restriction (McGlynn et al., 2007). McGlynn et al. (2007) concluded that fear of suffocation, fear of restriction, and sensitivity to symptoms of

suffocation had some influence on participant's fear regarding their mock MRI scan. In 1999, Harris et al. however, claimed that MRI-related fears were based more on fear of restriction, than on suffocation, as while MRIs are restrictive, dark, and the patient must remain still, it is not sealed. However, findings that fear of suffocation doesn't play a role in subjective fear in the MRI context has yet to be definitively confirmed (McGlynn et al., 2007). Unlike MRI scans, HBOT characteristics may evoke both restriction and suffocation fears, and thus a scale measuring claustrophobic fears needs to include both these components. Claustrophobic tendencies have been of interest in medical settings, (e.g. Radomsky, Rachman, Thordarson, McIsaac, & Teachman, 2001) and proved to be a sensitive tool in identifying who may experience high levels of fear for patients undergoing MRI scans (McIsaac et al., 1998). The present study will assess claustrophobic fears for patients undergoing HBOT and observe the associations with state anxiety.

Anxiety Sensitivity

Anxiety sensitivity is the fear of one's own anxiety symptoms, and on occasion may be of more importance to examine than the actual experience of anxiety. A critical finding in the first published article measuring anxiety sensitivity was that it may be more important to understand what an individual may think will happen because of their anxiety, rather than actually how often they experience the anxiety (Reiss, Peterson, Gursky, & McNally, 1986). Specifically, anxiety sensitivity pertains to fears of anxiety symptoms, and the beliefs of negative consequences attached to these symptoms. While trait anxiety

measures anxiety proneness (Spielberger, 1983), anxiety sensitivity measures individual levels of fear of anxiety-related symptoms (Reiss & McNally, 1985). Initially, there was much debate over whether anxiety sensitivity is distinct from trait anxiety; however it has become more accepted that anxiety sensitivity has qualities that go above and beyond trait anxiety, despite being moderately related to anxiety sensitivity (Taylor, 1999). More recently, further support that anxiety sensitivity and trait anxiety are distinct constructs has been demonstrated on a Spanish sample (Sandin, Chorot, & McNally, 2001).

Although anxiety sensitivity has been linked strongly to agoraphobia and generally associated with other anxiety problems (Reiss et al., 1986), there is some evidence that anxiety sensitivity also is elevated in claustrophobia (Booth & Rachman, 1992). A justification for this is that fear based on a particular object is intensified by one's anxiety sensitivity, because fear is being caused by both the object itself and the fear of the consequences of this fear (Reiss, 1991). Additionally, Rachman and Taylor (1993) suggested that anxiety sensitivity may actually intensify the components of claustrophobia – fears of suffocation and restriction– or possibly is a third contributing factor. For the small group of patients requiring HBOT that present with claustrophobic fears and/or high anxiety sensitivity, the anxiety-provoking features of HBOT may trigger higher levels of state anxiety.

Anxiety sensitivity has previously been of interest in medical settings, for example, a study found that chronic back pain patients were more likely to be negatively affected by their pain experiences if they had high anxiety sensitivity (Asmundson & Norton, 1995).

The present study will investigate anxiety sensitivity and HBOT because it is thought that patients with higher anxiety sensitivity will find their experience more stressful and potentially experience higher state anxiety than those with lower anxiety sensitivity.

Treatment Credibility and Expectancy

Belief in the credibility of HBOT as a medical procedure, in addition to an expectancy of symptom improvement, may influence patient anxiety when undergoing HBOT. Credibility is defined as "the quality of meriting belief or confidence" (Colman, 2003, p. 175) and can be viewed in context of patients' interpretations of the quality of HBOT as a medical procedure. Expectancy can be expressed as "improvements that clients believe will be achieved" (Kazdin, 1979, p.82) and, for this study, is the level of improvement of symptoms patients expect to see from undergoing HBOT.

Treatment credibility and expectancy of treatment were originally investigated when comparing therapy rationales (Borkovec & Nau, 1972), and then for evaluating the efficacy of several therapies for non-phobic anxiety disorders (Borkorvec & Mathews, 1988). From further investigations, Devilly and Borkovec (2000) reported that the two constructs, credibility and expectancy, were separate yet related factors, and while research has linked both treatment credibility and expectancy with outcome measures, the results are indicative of different predicting abilities. Credibility of a treatment has shown on occasion to be related to outcome measures (Borkovec & Mathews, 1988; Kirsch & Henry, 1977, 1979) while expectancy of symptom improvement has been linked more

regularly to outcome measures (Devilly & Spence, 1999; Borkovec & Costello, 1993; Chambless, Tran, & Glass, 1997; Collins & Hyer, 1986).

Treatment credibility and expectancy have been investigated as variables that may influence change or have potential impact on outcome measures(Kirsch & Henry, 1977, , 1979). Early findings linked higher credibility of treatments to improvements surrounding subclinical speech anxiety (Kirsch & Henry, 1977, , 1979). Specifically, Kirsch and Henry (1979) considered how the credibility of treatment rationales for programs designed to lessen public speaking anxiety may impact on this fear. They reported that only those who rated the treatment rationale for the speech anxiety program as highly credible demonstrated changes in the physiological appearance of anxiety and reductions in self reported anxiety. Further research explorations suggest that psychiatric inpatients with higher treatment expectancy of symptom improvement tended to have better outcomes for community adjustment and improvement for the original problem three months post-discharge (Collins & Hyer, 1986). Furthermore, research looking at predictors of social phobia treatment found that the participants who reported both a higher expectancy for benefit of treatment, and higher credibility of treatment were more likely to improve (Chambless, Tran, & Glass, 1997). In addition to the above therapy environment, expectancy has been associated with positive outcomes in a medical setting. A study on patients undergoing HBOT due to tinnitus revealed that the success rate of HBOT appeared to be associated with pre-HBOT patient expectations regarding their symptoms (Stiegler et al., 2006). Specifically, positive effects were reported in 60% of

those who believed in the effectiveness of HBOT as compared to just 47% or 19% in those who respectively reported indifferent or negative expectations.

Thus, perception of credibility of treatment and expectancy of symptom improvement appear to be important variables on impacting outcome measures in therapy and medical research. If this rationale is applied to medical procedures that have anxiety-provoking features, it may lead to the question, if one believes their treatment is credible and have a high expectancy of outcome, will they be less anxious about their procedure? Lastly, the current study will examine the relationship between expectancy of symptom improvement and credibility of HBOT with State Anxiety, of which few if any studies have previously investigated.

1.4. POTENTIAL CONFOUNDING VARIABLES OF ANXIETY

Past Exposure

As mentioned previously, hyperbaric treatment is an integral part of patient health plans. For that reason, it is of medical value to observe how psychological distress regarding HBOT may fluctuate. Pertinent questions addressed in previous research regarding the reduction of psychological distress include how patients may become more "experienced" with hyperbaric treatment through exposure (Sandal, Vernes, Bergan, Warncke, & Ursin, 1996). Experience can be interpreted through adaptation and exposure to treatment. For example, Sandal et al. (1996) investigated psychological reactions and

adaptation to long-term isolation in a hyperbaric chamber. While it is unwise to generalise because their objective was focused on a space simulation study, and their sample (professional astronauts and space personnel) and methodology (isolation in the chamber for 4 to 9 weeks) were very different to the current research, the study did indicate a steady increase in coping with isolation, and to fundamental adaptation to the environment.

Investigating whether patient psychological distress may reduce as exposure to HBOT increases may support the importance of preparation for HBOT for those with high anticipatory anxiety. The premise that anxiety about a feared stimulus will reduce derives from *in vivo* exposure rationale, whereby enhancing the reduction of fear occurs by repeated exposure to the stimulus that evokes the anxiety (Craske & Rowe, 1997). Accordingly, the repeat experiences of HBOT theoretically will help reduce some of the anxiety surrounding it. For example, Clark et al. (1994) did find a significant decrease in anxiety from pre- to post-hyperbaric treatment. If the experience of hyperbaric treatment in Clark et al.'s (1994) study did contribute to reductions in anxiety regarding that HBOT, then it would support the fundamentals of exposure theory. Therefore, this study will observe and measure changes in state anxiety over time as patients become more experienced with hyperbaric treatment.

Demographic Variables

Individual variables influence our behaviour and responses to different situations, for example our coping mechanisms with stressful medical situations. Research examining anxiety within the medical context typically entails the need to control for factors similar to age, gender, and medical variables like previous operations and post-operative complications (e.g. Boeke, Stronks, Verhage, & Zwaveling, 1991; de Groot, Boeke, Duivenvoorden, Bonke, & Passichier, 1996; de Groot, Boeke, vanden Berge, Duivnvoorden, Bonke, & Passchier, 1997). Boeke et al. (1991) suggest that although further research is needed, medical-status variables have the potential to be more significant for invasive medical procedures. The present study will include demographic and medical variables to investigate the possible significant correlations they may have with HBOT patients' anxiety before and during their hyperbaric sessions.

While research has demonstrated a relationship between age and state anxiety within the medical setting, outcomes have been inconsistent. de Jong, Erdman, van den Brand, Verhage, Trijsburg, & Passchier (1994) investigated anxiety, heart rate, and skin conductance level before cardiac procedures and if they could be predicted by anxiety-related factors at one's home before the procedure. They found that advanced age predicted low state anxiety in hospital. However, Clark et al. (1994) found a significant positive correlation between age and state anxiety after participants had completed HBOT. MRI research has also taken into account demographic influences, for example Lukins et al. (1997) reported a significant tendency for older patients to report less anxiety both before and during the scan, although this tendency was weak. Furthermore,

patients' age has been found not to be related to precolonoscopy anxiety (Luck et al., 1999). Consequently, the present study will consider age as a potential covariate.

The literature reporting gender influences on anxiety in a variety of medical settings have been more consistent than findings related to age. de Jong et al. (1994) found that being female predicted high state anxiety in hospital prior to invasive cardiac procedures. Within the MRI setting, females have demonstrated higher anxiety before and during an MRI scan than males (Lukins et al., 1997). Furthermore, precolonoscopy anxiety has also been associated with gender; female patients exhibited higher baseline anxiety scores (Luck et al., 1999). One study (Stoddart et al., 2005) which did not find a significant difference between genders for preoperative anxiety had a low number of male participants; they postulated this factor as affecting their power to find any statistical differences should they exist. Accordingly, the present study will consider gender as a potential covariate.

In addition to the aforementioned demographic variables, there is potential for other variables to confound patient anxiety before and during HBOT. This study will take into account several medical variables because it has been suggested that research results may be confounded by medical-status variables (Boeke et al., 1991). It has been previously mentioned in this review that patients undergoing HBOT are required to wear headgear. Thus, whether participants are wearing a face mask or a head hood will be noted. Additionally, the main condition that is prompting the need for HBOT for each

participant will be noted, as well as if participants have undergone a course of HBOT previously.

A further variable that may have confounding impact on patient anxiety during HBOT is the number of other people in the chamber. Research has shown that patients who are waiting to undergo surgery and share a hospital room with other patients who have recently undergone the same surgery, demonstrate less preoperative anxiety and fare better on outcome variables like length of hospital stay (Kulik & Mahler, 1987, as cited in Sarafino, 1998). Thus, this research will report the number of other people, including the nurse attending, in the hyperbaric chamber for each session. Lastly, the total number of sessions participants' complete will be recorded.

There are many potential confounding factors with patient anxiety surrounding medical procedures, and inevitably not all can be accounted for. Influences from patients' illnesses may be related to behaviour, for instance pain has been found to be associated with state anxiety in the older adult population (Feeny, 2004). Strength of familial and social support, and other uncertainties, like worry about future medical procedures/surgery, health concerns, and fear of prognosis, may all influence patient experiences within medical settings.

1.5. THIS STUDY

Hyperbaric medicine began in Christchurch in 1973 using a special hyperbaric single patient bed. In the late 1970s a dual-lock monoplace chamber was donated to the Christchurch Hospital Board and remained in use until 1994. The hyperbaric unit was then moved to its present location at Christchurch Hospital late 1995, and in 2000 the unit was expanded, permanent staff appointed, and the current rectangular, walk-in, multiplace chamber (refer back to Images 2 & 3) was officially opened. Presently, the HMU has permanent staff, improved patient care facilities and offers a full range of hyperbaric medical services.

Rationale

This study has been prompted by the need within the medical field to better understand patient reactions to HBOT and evaluate effective strategies when dealing with them. The clinical need for help with patients undergoing HBOT was the motivating reason for this study. The medical director of the Christchurch Hospital's HMU, Dr Mike Davis, approached the University of Canterbury Psychology Department for assistance with patients who experience such extreme anxiety they are unable to undergo HBOT. Associate Professor Neville M Blampied, Dr Lois Surgenor, and I developed this request into the current study via reviewing the current literature, and through consultation with Dr Mike Davis. It is believed that no similar study has been undertaken on a New Zealand (NZ) sample.

Research on psychological distress in relation to hyperbaric treatment, and how patients cope, is presently a limited body of knowledge. Clark et al. (1994) showed that patients experienced anxiety before undergoing HBOT, and demonstrated a reduction in anxiety after the first HBOT session. While Clark et al. (1994) explored how trait anxiety and state anxiety may be related when undergoing HBOT, this study does not tell us about the potential relationship of other individual factors with state anxiety. More recently, Chalmers et al. (2007) examined the experiences of patients undergoing HBOT and outlined issues of concern experienced by patients. While Chalmers et al. (2007) report that responses to HBOT are influenced by individual personalities, their sample size was small (n = 7) and this conclusion was not subject to statistical analyses. While this does provide us with issues of concern regarding patient experiences during HBOT, further quantitative analyses would be beneficial. The current study differs from the two previous studies in a number of ways. It differs from Clark et al. (1994) in that it measures a number of individual factors that research has associated with distress in medical settings, rather than only trait anxiety. It also differs in that the current study used an outpatient sample, as opposed to patients from a Veterans' Hospital. Additionally, rather than only measuring state anxiety before and after one HBOT session, the current study incorporates a longer prospective design that assesses state anxiety from before an individual's first HBOT session to their very last session in an attempt to better demonstrate change in state anxiety levels. The current study also varies from Chalmers et al. (2007) in that it will use quantitative methods to investigate if patient individual factors influence HBOT experiences, rather than exploratory techniques.

Therefore, because of an expressed clinical need and a limited knowledge base, this study aims to examine individual factors and adverse psychological reactions during HBOT. The hypotheses of this research are as follows:

(1) The study hypothesises that we will find individual predictors of and/or associations with adverse psychological reactions to hyperbaric treatment; namely;
    a. Participants with higher trait anxiety disposition will experience higher state anxiety during their hyperbaric treatment.
    b. Participants with higher claustrophobia scores will experience higher state anxiety during their hyperbaric treatment.
    c. Participants with higher Anxiety Sensitivity will experience higher state anxiety during their hyperbaric treatment.
    d. Participants with higher treatment expectation and credibility regarding hyperbaric therapy will experience less state anxiety during their hyperbaric treatment.
    e. Past exposure to treatment will be a significant covariate to state anxiety.
    f. Wearing a head hood versus a face mask will be a significant covariate to state anxiety.

(2) Psychological reactions to hyperbaric treatment will decrease over time as individuals become experienced with hyperbaric treatment

Clinically and academically, more research on reducing distress in medical settings is needed. Two studies have focused on methods of reducing anxiety before HBOT. Allen et al. (1989) supported the use of modelling and distraction as ways to reduce anxiety pre-HBOT, and Hillard's (1990) case study successfully completed HBOT after relaxation, visualisation, and medication. However, what these studies lack is the ability to prepare patients *in vivo* and sufficient sample size. Therefore, the present study aimed to evaluate the effectiveness Öst's (1989) OSET because of its quick nature and its ability to be done in the chamber *in vivo*. Additionally, the present study aimed to evaluate OSET in a novel context – hyperbaric treatment. It was hypothesised that OSET would facilitate a decrease in anxiety regarding HBOT and consequently result in successful completion of hyperbaric treatment. However, while this part of the present study was prepared for, OSET was not able to be implemented due to no participants presenting suitable as for treatment.

CHAPTER TWO

2. METHOD

PART A – DESCRIPTIVE STUDY

2.1. SETTING

The Hyperbaric Centre used for this study is Christchurch Hospital's HMU and is located at Christchurch Hospital on the lower-ground floor, Parkside West, near the western lifts. When entering the unit patients are greeted with a relatively small open plan room that accommodates the multiplace chamber, an open waiting and reception area, a private doctor's office, and a patient care room. To the right of the rectangular multiplace chamber is an open technician area with an equipment panel (refer back to Image 2), a kitchen room, and two glass-surrounded offices for various staff members.

Current practice at the HMU includes patient referrals to the HMU for HBOT from a variety of sources, for example, General Practitioners, specialists, and other departments within the Christchurch Hospital. Patients are seen by an HMU doctor and subsequently accepted or declined for HBOT. Patients will also have an assessment with an HMU nurse to undergo further medical checks. Current practice is for patients to express a personal preference for wearing a face mask or a head hood during sessions, unless their condition dictates otherwise. Information regarding HBOT and the chamber are provided

by both the doctor and the nurse, and a leaflet (see Appendix 1) outlining information regarding HBOT is given. This leaflet provides information about what to expect, possible side effects, and how the treatment is effective. Additional information for patients is available via self-information provision on the HMU website (http://www.cdhb.govt.nz/hbu/). Currently, there are no official protocols or guidelines to manage patients who experience intrusive or high anxiety while contemplating or undergoing hyperbaric treatment. There is an attending nurse in the chamber during each session and those who feel distressed during the session are helped via the distraction of conversation with the nurse. The HMU commonly use this distraction method to help "take the patients' minds" off the anxieties involved in the treatment, especially during the last half hour where it physically can be the most uncomfortable. There is no official protocol in place to help those patients who refuse treatment altogether.

2.2. PARTICIPANTS

Participants recruited for this project were patients accepted to undergo HBOT at the HMU between July 2007 and May 2008. During initial HMU medical assessment, patients were informed by HMU staff about the current research. If the patient agreed, they were approached by the researcher either during or immediately after their medical assessment. Participation was entirely voluntary. Prior to this study a power analysis was done to identify an appropriate sample size. This analysis was based on the intention to perform correlational analysis and hierarchical regression between the aforementioned variables and state anxiety. The analysis suggested that a sample size of approximately 70

would provide an 80% probability of detecting differences. However, due to the nature of the participants in this sample the numbers were clinically determined.

Inclusion and exclusion criteria were as follows. Acute HBOT patients (e.g. decompression sickness; carbon monoxide poisoning) were excluded from participation because of their inability to participate fully, and because of the inappropriateness of approaching them under emergency circumstances. People with chronic conditions (e.g. diabetes) were included so long as they (a) were competent in spoken and written English, (b) were cognitively competent to complete questionnaires, and (c) gave written consent. A summary of participant exclusion and attrition can be seen in Figure 1.

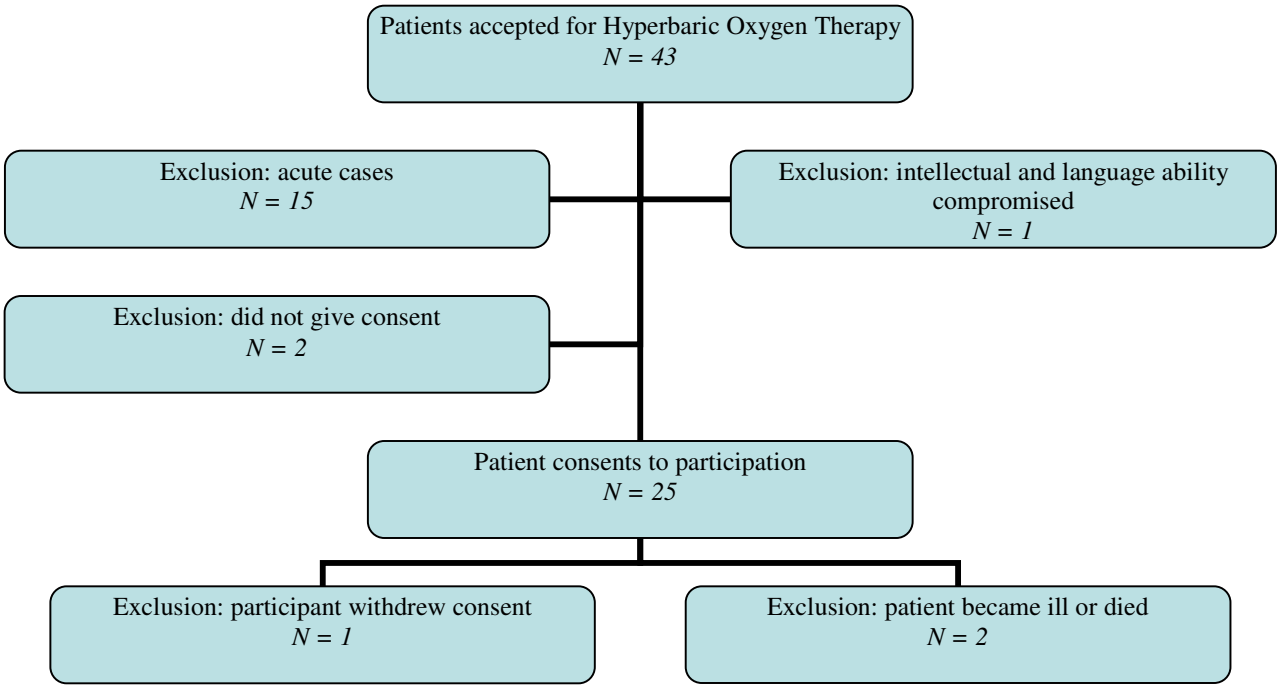


Figure 1. Summary of participant exclusion and attrition from July 2007 to May 2008

Twenty-eight patients were approached regarding this study between July 2007 and May 2008. Two patients did not consent to participation and one patient was excluded due to comprehension difficulties, leaving 25 patients agreeing to participate in this research. Participants consented both to complete the questionnaires and for the primary investigator and supervisors to have access to their medical records for information directly related to the study.[2] One participant withdrew consent after completing their first set of data. Consequently, all data from this participant was destroyed. Of the 24 remaining consenting patients, two became ill or died and four had incomplete data (see Table 4).

Table 4

Number of Participants with Complete Data at Times One, Two, and Three*

	Time One	Time Two	Time Three
Participants	24	20	21

***Time one was before participants' first session, Time two was before the tenth session, and Time three was before the last session.**

The initial sample (see Table 5) consisted of 24 participants, 17 males and 7 females, ranging in age from 19 to 81 years. The majority (91.7%) identified as NZ European, and 37.5% had undergone previous HBOT. The most common medical reasons for requiring HBOT were Problem Wounds (45.8%) and Radiation Tissue Damage (41.7%) (See Appendix 20).

[2] Initial ethical approval subject to minor changes was granted on the 17th of July, 2007. Once the changes were made, full ethical approval was obtained by the Upper South B Regional Ethics Committee on the 14th of August, 2007. This study was also submitted to Te Komiti Whakarite for consultation and was supported. Please refer to Appendices 12, 13, and 14 for these approval letters.

Table 5

Sample Characteristics at Time One (N = 24)

Characteristics	
Gender *n (%)*	
Male	17 (70.1%)
Female	7 (29.2%)
Age	
Range	19 – 81 years
Mean	62.9 years (S.D. = 13.4)
Median	65 years
Ethnicity *n (%)*	
NZ European	22 (91.7%)
Maori	1 (4.2%)
Samoan	1 (4.2%)
Previous HBOT *n (%)*	
Yes	9 (37.5%)
No	15 (62.5%)
Condition *n (%)*	
Problem Wounds	11 (45.8%)
Radiation Tissue Damage	10 (41.7%)
Other	3 (12.5%)
Headgear *n (%)*	
Mask	18 (75%)
Hood	6 (25%)
HBOT sessions per patients	
Average	28 (S.D. = 12.3)
Range	4 – 47
Average number of other patients in chamber per session	2.9 (S.D. = 0.22)

2.3. MATERIALS

The central variable of interest in this study was state anxiety. Specifically, the dependent variable was state anxiety, and independent variables were trait anxiety, claustrophobic fears, treatment expectancy and credibility, and anxiety sensitivity. Potential covariates investigated were age, gender, previous HBOT, and number of other people in chamber during each session (see Appendix 2 and 21). From here on, variables will be identified by capitalising the first letter of the variable names. For example, "…State Anxiety" specifies the variable State Anxiety in this thesis, as measured by the scale State-Trait Anxiety Inventory-State (STAI: Form Y-1). This also applies for Trait Anxiety (measured via STAI-Trait, Form Y-2) and Anxiety Sensitivity (measured via the Anxiety Sensitivity Index (ASI)). Subscales for the Treatment Credibility/Expectancy Questionnaire (CEQ) is referred to as Credibility and Expectancy, and the total score as CEQ-T. The Claustrophobia Questionnaire (CLQ) total scores and subscales – Fear of Suffocation and Fear of Restriction – may become cumbersome therefore are shortened to Suffocation and Restriction, respectively, and the total scores are referred to as CLQ-T.

A descriptive, correlational, prospective design was used for non-intervention participants. The dependent variable, State Anxiety, was measured repeatedly during each participants' HBOT course, that is, before session one, before session ten, and before the last session. It will be referred to as State Anxiety time one, State Anxiety time two, and State Anxiety time three. Independent variables were measured before participants' first HBOT session. The prospective design was used to allow for the

measurement of change in participants' State Anxiety over time. The descriptive, correlational design used self-report, observational questionnaires both to describe the sample, and in a relational approach to determine how variables were associated with one another.

Participants were required to complete three sets of Participant Booklets (refer to Table 6). In addition to participants completing Participant Booklet for Time one, clinicians were required to complete the Clinician's Questionnaire (see Appendix 2) which enquired: 1) had the patient had HBOT previously, 2) what was the main condition that the patient was receiving HBOT for, 3) what category of illness best describes this condition, and 4) was the patient using a face mask or a head hood? Lastly, the researcher collected information regarding participants' total number of sessions and average number of people in the chamber with participant after all their sessions were completed.

Table 6

Data Collected from Participants using Participant Booklets Time One, Two, and Three.

Time One*	**Time Two***	**Time Three***
Consent Form	State Anxiety	State Anxiety
Age		
Gender		
Ethnicity		
State Anxiety		
Trait Anxiety		
Treatment Credibility		
Treatment Expectancy		
Anxiety Sensitivity		
Claustrophobic Fears		

***Time one was before participants' first session, Time two was before the tenth session, and Time three was before the last session.**

2.1.1. Variables

Demographic Information (age, gender, and ethnicity) was collected and coded for each participant from a personal information form (see Appendix 21) and patient hospital labels. Participants were coded into ethnicity groups via self-identification with group/s according to Statistics New Zealand Census 2001. Information regarding clinical condition and condition category was collected from the Clinician Questionnaire.

Several variables were collated to aid the description of the experience of undergoing HBOT. These measures were as follows:

- *Headgear:* Participant's were coded as to whether they wore an oxygen head hood or an oxygen mask. (Refer to Appendix 2)
- *Previous HBOT:* Participants were coded as those who had previously undergone HBOT before and those who had not. (Refer to Appendix 2)
- *HBOT Sessions:* Since patients have varying sessions of HBOT, the number of HBOT sessions each participant underwent was recorded. (Refer to Appendix 4)
- *People in Chamber:* Since the number of people in the chamber for each dive varies, the number of other people present in the chamber (including the staff attending) for each session with the participant was recorded. (Refer to Appendix 4)

As described in the introduction, State and Trait Anxiety, Claustrophobia, Anxiety Sensitivity, and Treatment Credibility/Expectancy are core issues of interest in this study.

Therefore, the following measures participants were required to complete are described in detail.

2.1.2. The State-Trait Anxiety Inventory

The State-Trait Anxiety Inventory (STAI; Spielberger, 1983. See Appendix 5) is a 40-item questionnaire – two subscales of 20 questions – designed to measure both the State and Trait conceptual elements of anxiety. Of the two versions of the STAI, the more recent Form Y – used in this study – was developed in 1983, and is said to have improved psychometric properties than the previous version (Barnes, Harp, & Jung, 2002). Participants are asked to complete the two subscales, utilising two sets of instructions. The first set (State) asks for the participant to indicate how they are feeling *right* now, *at this moment* when answering the description statements. The second set (Trait) asks the participant to indicate how they *generally* feel in regards to the description statements. Answers are from 1 to 4 on an intensity scale (State – not at all, somewhat, moderately so, very much so; Trait – almost never, sometimes, often, almost always) with various answers inversed. It takes approximately 10 minutes to complete both subscales and is scored as two separate scores. Both State and Trait subscales can range from 20 to 80.

Spielberger (1983) reports adequate test-retest reliabilities for Trait scores with a correlation range of .65 to .86, but correlations were much lower for State scores, with a median of .33. This is understandable as mean levels of State Anxiety are amenable to change due the situational cues that influence it, as supported by findings in a review on

STAI reliability (Barnes et al., 2002). Internal consistency was high, Cronbach's alpha = .93 (State) and .90 (Trait) (Spielberger, 1983). Additionally, Spielberger (1983) reports good construct, concurrent, convergent and divergent validity of the STAI. Internal consistency reliability estimates for State and Trait scores obtained over various studies and populations investigated are generally satisfactory (Barnes et al., 2002).

Permission to use this questionnaire was acquired through the University of Canterbury. The Psychology Department Test Library has purchased the manual and thus provides copies of the instruments to students for academic use.

2.1.3. The Claustrophobia Questionnaire

The Claustrophobia Questionnaire (CLQ; Radomsky et al., 2001. See Appendix 6) is a 26-item, self-report questionnaire that measures the two reported components encompassing claustrophobia; fear of Restriction and fear of Suffocation. The questionnaire enables the calculation of two subscales along these dimensions as well as an overall score which measures claustrophobia. Each item is rated on a 0 to 4 scale from not at all anxious to extremely anxious, with participants asked to rate how anxious they would feel in the given places or situations. The range for the total score for the CLQ is from 0 to 104 (high scores = more claustrophobic distress). Items included were akin to "using an oxygen mask", "locked in a dark room without windows for 15 minutes", and "in a public washroom and the lock jams".

The CLQ appears to be a reliable and sensitive measure of claustrophobia and its component fears and has demonstrated its usefulness in a medical setting (e.g. McIsaac et al., 1998). Radomsky et al. (2001) showed good predictive and discriminant validity; when exposed to a confined situation, the CLQ was able to predict subjective fear, bodily sensations, and anxiety cognitions very well, but not fear reactions to snakes or heights. The measure has also demonstrated good internal consistency (Cronbach's alpha = .95), and good test-retest reliability ($r = .89$, $p < .001$), with normative data collected demonstrating the CLQ discriminating between community adults and claustrophobic individuals (Radomsky et al., 2001). Of pertinence to this study, the CLQ has demonstrated its usefulness in medical research by being highly predictive of anxiety and panic during MRI scans (McIsaac et al., 1998).

Permission for public use of the CLQ is found in Radomsky et al. (2001), and its use for research within medical procedure settings is encouraged. A courtesy letter and the findings will be sent to Dr. Radomsky at the time of any publication.

2.1.4. The Anxiety Sensitivity Index

The Anxiety Sensitivity Index (ASI; Reiss et al., 1986. See Appendix 7) is a 16-item, self-report questionnaire measuring fear of anxiety-related symptoms as rated by the participant. Conceptually, Anxiety Sensitivity has been distinguished from anxiety; anxiety is referred to as the frequency of symptom occurrence, whereas Anxiety Sensitivity is beliefs about the social and somatic consequences of anxiety symptoms

(Reiss et al., 1986). This distinction is discussed in more detail in section 1.3 above. Each item is rated for most appropriateness of personal consequences on a five-point scale from 0 (very little) to 4 (very much), and is scored by summing all 16 items. It takes approximately 3 to 5 minutes and higher scores reflect higher levels of Anxiety Sensitivity.

Studies to date have suggested that there may be some differences in Anxiety Sensitivity between medical and non-medical settings when ASI scores are categorised (Taylor, 1999). Therefore, this study will categorise ASI scores into low, medium, and high. In order to classify ASI scores in this distinct medical sample of participants, this study will follow the procedure of Carr, Lehrer, Rausch, and Hochron (1994) and use the mean and standard deviation of the present study's sample to classify ASI scores into low, medium, and high categories (high = one standard deviation above the mean; medium = within one standard deviation above and below the mean; and low = one standard deviation below the mean).

The ASI has adequate test-retest reliability with correlations in the range of .71 to .75 (Reiss et al., 1986) and appropriate internal consistency (Cronbach's alpha = .88; Peterson & Heilbronner, 1987). Reiss et al. (1986) demonstrated evidence for the criterion validity of the ASI and the validity of the distinction between Anxiety Sensitivity and anxiety. The ASI appears to be a reliable measurement instrument which is relatively independent of anxiety measures (Peterson & Heilbronner, 1987) and normative data collected for

nonclinical samples (with more than 4500 participants) reported a mean of 19.1(S.D. = 9.11) (Peterson & Reiss, 1992, cited in Peterson & Plehn, 1999).

Permission to use the ASI by researchers is free. No money is to be made from the present use of the ASI and access to the measure was gained through the Psychology Department, University of Canterbury.

2.1.5. The Treatment Credibility/Expectancy Questionnaire

The Treatment Credibility/Expectancy questionnaire (CEQ; Devilly & Borkovec, 2000) is a six item scale that has patients rate the credibility of their treatment, and measures their expectancies about the improvement of their symptoms from the treatment. While the instructions for the CEQ are specific, for the purpose of this study the wording was slightly modified to make it relevant to HBOT (refer to Appendix 8 for the modified CEQ). The sentence in the non-modified CEQ "We do not want your therapist to ever see these ratings, so please keep the sheet covered when you are done" was deleted from the instructions because of its irrelevance to HBOT. In addition, the term "trauma symptoms" on Set I, questions 2 and 4, and Set II, questions 1 and 2 was modified to "symptoms."

Participants are required to answer questions either on a scale from 1 (not at all logical) to 9 (very logical) or from 0% to 100% and the scale is divided into two sets, with items 1-4 (Set I) asking patients what they *think*, and items 5-6 (Set II) asking what they *feel*. However, Devilly and Borkovec (2000) cautioned future researchers when utilising the

scale because the two factors of Credibility and Expectancy are not derived from the two sets; Credibility has been found to be derived from the first three "think" questions (Set I, 1, 2, & 3) and Expectancy was derived from the fourth think question and the two "feel" questions (Set I, 4, & Set II, 1 & 2) (Devilly & Borkovec, 2000). Furthermore, because the scale utilises two metrics (1-9, and 0-100%) this study will standardise the scoring in the following way. For each question, the mean Likert score (1-9) or mean % score, and standard deviation will be calculated and each person's score will be expressed as a z-score (individual score – mean score)/standard deviation. The z-scores can now be summed, giving factor (Credibility or Expectancy) scores for each individual, with higher z scores meaning higher Credibility or Expectancy. These summed scores will be used for both calculating group means, and for correlations.

Devilly & Borkovec (2000) evaluated the psychometric properties of the CEQ for use in clinical outcome studies, reporting good internal consistency: the Credibility factor had a Cronbach's alpha of between 0.81 and 0.86; the Expectancy factor a standardised Cronbach's alpha of between 0.79 and 0.90; and, the whole scale a standardised Cronbach's alpha of between 0.84 and 0.85. Test-retest reliability also exhibited good correlations; 0.82 for Expectancy, and 0.75 for Credibility.

Use of the CEQ was made available when appended in Devilly and Borkovec (2000).

2.1.6. Hyperbaric Chamber

The hyperbaric chamber's overall size is 2640 X 2490 X 4732 MM. The Main Lock where patients sit is 2250W X 2100H X 2970L and accommodates four to five people. The chamber has two large 330mm clear viewing diameter flat disk viewports in the Main Lock. Depending on patient requirements, seats, armchairs, and beds are set up in the Main Lock where many of the fittings and pipes are visible. There is a speaker system that technical staff use for communication with nursing staff.

2.4. PROCEDURE

The recruitment process (see Figure 2) began once patients were accepted for HBOT. Patients were given an explanation of the research and an information sheet (see Appendix 3) after their initial assessment. A consent form (Appendix 9) and Booklet 1 was further explained to those interested. Participants were able to complete Booklet 1 either with the researcher, or independently, before their first HBOT session. Clinicians were also required to complete the clinician questionnaire before the participant's first HBOT session. Participants then completed Booklets 2 and 3 before their 10th and final session respectively. While Booklet 1 took approximately 20-30 minutes, Booklets 2 and 3 were a shortened version, taking approximately 5-10 minutes each. Participants were able to withdraw from the study at any time and received standard medical care as per normal.

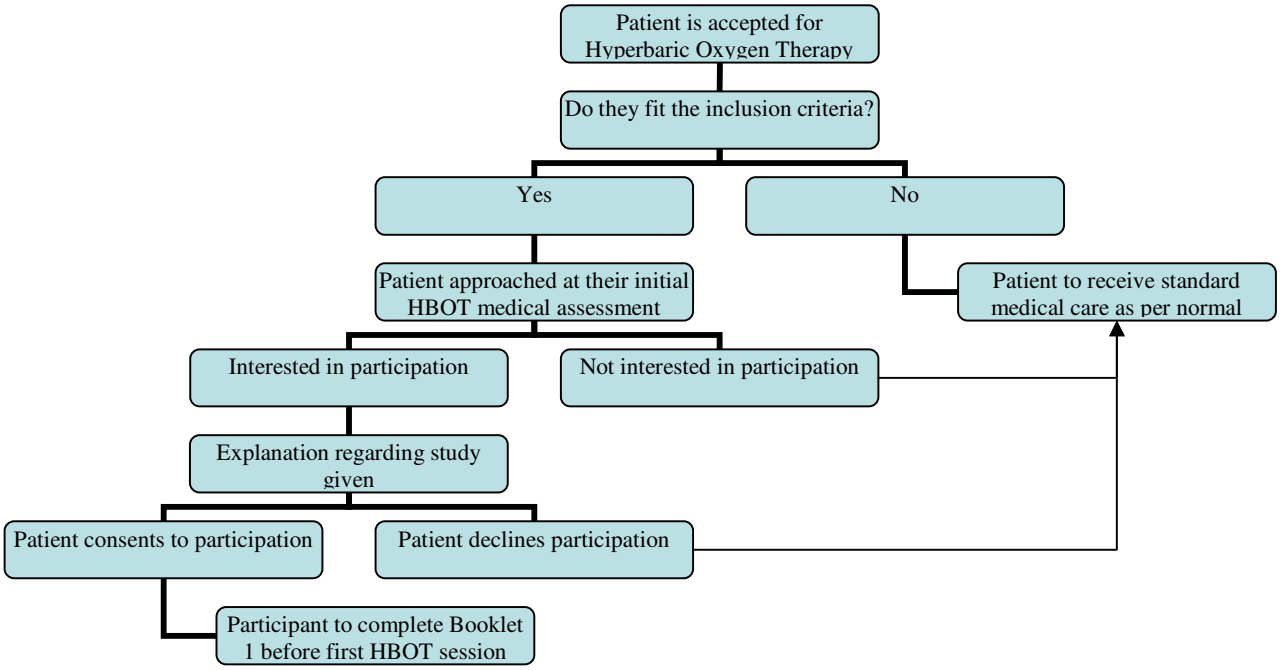


Figure 2. Summary of procedure for descriptive study participants

2.5. STATISTICAL ANALYSES

Statistica 8 for Windows was used for descriptive data. Exploratory data analysis, comparative data using t-tests for independent means (by groups), correlations, graphical analyses, and multiple regressions were performed.

Basic descriptive data were calculated for all variables. Differences between: male and female; age according to median split; head hood versus face mask; and previous HBOT or not, were tested via t-tests for independent means (by groups). Graphical analyses and Repeated Measures ANOVA were performed to assess change over time. Correlational analyses were done for all measures and according to gender. Hierarchical regression was used to investigate potential predictors of State Anxiety.

Handling of Missing Data

Missing case data was handled via the pair-wise method for correlational analyses. An examination of the distribution of missing data across the cells of the matrix for possible systematic "patterns" was done. Data from the one individual who withdrew consent was not included. Repeated Measures ANOVA and regressions used the case-wise method for handling missing case data.

PART B – INTERVENTION EVALUATION

2.6. PARTICIPANTS

Participants appropriate for intervention were identified via a screening measure from the descriptive study sample.

2.7. MATERIALS

Intervention participants were required to complete Booklet Time one pre- and post-intervention, with clinicians to complete the Clinician Questionnaire.

2.8. PROCEDURE

Intervention participants were further identified from the descriptive study sample subsequent to consent and completion of Participant Booklet 1 (see Figure 3). Participants with a score of 43 or above on the CLQ indicated that they were experiencing high claustrophobic distress and were subsequently approached regarding the intervention. This cut-off score was derived[3] in an effort to encompass the higher end of CLQ scores that would indicate high claustrophobic distress, specifically those who would potentially benefit from an intervention. These participants were then to be given the option to partake in the intervention component (namely, OSET) of the study. For those who consented, the two sessions with the therapist (the principal researcher) would both take place at Christchurch Hospital's HMU under the supervision of a supervisor who was a registered clinical psychologist. Those who declined the intervention would remain in the descriptive study sample and received routine care and support through HBOT from the HMU staff.

[3] A CLQ cut-off score of 43 was derived from normative data (Radomsky et al., 2000). The mean and standard deviation from a claustrophobic student sample was used by subtracting half a standard deviation from the mean (51.8-½(16.6) = 43.5).

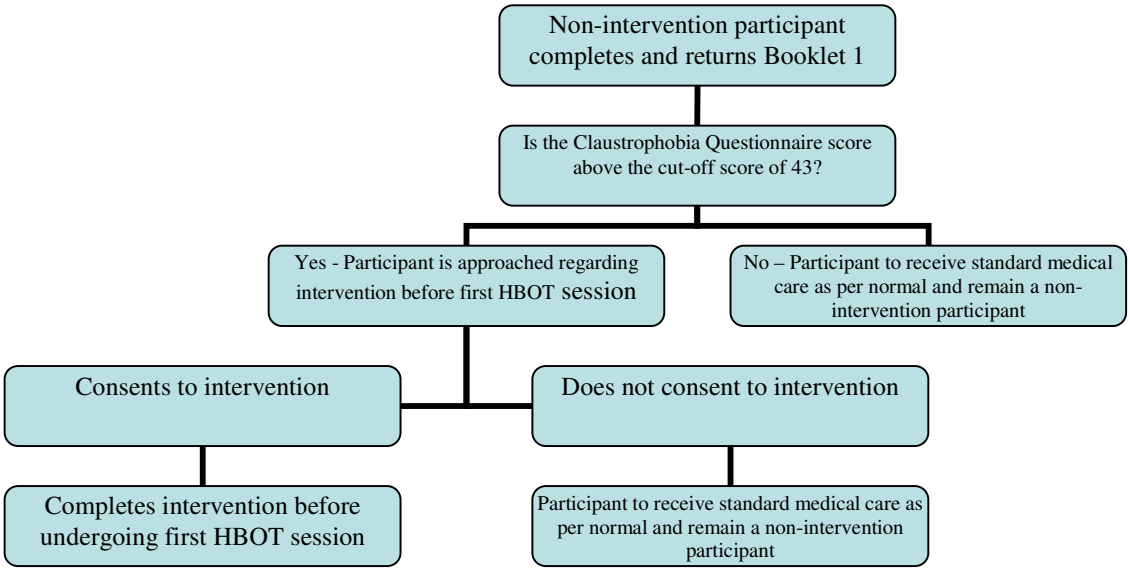


Figure 3. Summary of procedure for intervention participants

The first of the two sessions with the therapist was the Behavioural Analysis Interview (BAI; see Appendix 10). This takes approximately an hour, and is to collect information and determine suitability regarding the participant. This includes a topographic analysis of the patient's problem behaviour (its onset, development, the situations it occurs, and the factors that elicit and maintain it), and Behavioural Avoidance Tests (BATs) to assess approach behaviour to the phobic stimulus. BATs are the key outcome measure for treatment studies for specific phobias (Choy et al, 2007). At the end of the BAI the rationale for Öst's (1989) one-session method is outlined to the patient. This includes explanation that the patient will be exposed in a controlled manner, thus enabling him/her to realise that the consequences they feared would happen will not occur. The session will be planned, gradual and controlled, as opposed to natural situations. The therapist will also point out that this session is a start and the patient is expected to continue their own treatment by exposing themselves in everyday situations via a voluntary

maintenance program. Patient instructions emphasise in order to achieve a successful result it is important to have teamwork, hard work, equal responsibility, and an open attitude. Instructions also emphasise that there will be no unplanned situations, everything will be demonstrated first, and only with the patient's permission will they be asked to attempt the tests. An important point stressed is that within the session the patient will not exceed any previous feelings of anxiety experienced, even though they will be exposed to much more than ever before. They are told that while a high level of anxiety will be a side effect of the session, it is not a goal. The two goals of the session are that the patient should be able to manage in natural situations after completing the treatment, and that the therapist wants the patient to achieve during the therapy session.

The second session, a subsequent exposure therapy session set up as behavioural tests, was the intervention OSET (Öst, 1989, 1997). This takes a maximum of three hours and the OSET for claustrophobia, as outlined in Öst (1997), was modified for the purposes of the current study to make the therapy specific to HBOT patients and the hyperbaric chamber. The script was pilot-tested by the researcher and the registered clinical psychologist supervisor, and relevant modifications were applied. The full script of the modified intervention and intervention steps are further detailed are provided in Appendix 11. Participants were able to withdraw from the study at any time and receive standard medical care as per normal.

A single-case, multiple baseline design was to be used for intervention participants, in which anxiety ratings were recorded regularly at each step of the intervention. Anxiety

ratings used were Subjective Units of Distress (SUDs) and were recorded before and during each behavioural step within the intervention. The multiple baseline design was chosen to demonstrate the effectiveness of OSET. Effectiveness was assessed by measuring behaviour change (in this case, SUDs) that accompanied the introduction of each behavioural step.

It eventuated that there were no intervention participants for this study. Two participants scored above the cut-off mark on the screening measure but did not participate in the intervention. Of the two, one declined and one was not able to be offered the extra help due to practicality problems. Both were included as part of the descriptive study sample and consequently this component of the research will not be included in the Results section.

CHAPTER THREE

3. RESULTS

3.1. EXPLORATORY ANALYSIS

Analysis began by calculating descriptive statistics via means, standard deviations, range, and distributions for each pre-HBOT scale and for State Anxiety at times one, two, and three (see Table 7). Using *z* scores for comparisons where necessary, the current sample was then compared to normative data and appropriate research samples. The sample was then separated into categories according to gender, previous HBOT experience, type of headgear worn, and age. Descriptive data was calculated and group comparison for each of the sub-groups was made using t-tests for independent means.

Means, Standard Deviations, Range, and Distribution for Measures

Pre-HBOT scale means, standard deviations, and range for all variables and State Anxiety at all times are displayed in Table 7. The distribution for State Anxiety at time one was approximately normal, however distributions at times two and three were positively skewed. State Anxiety at time three had a strong positive skew, with most participants having low scores. Trait Anxiety also showed a slight positive skew. CLQ-T, Restriction, and Suffocation distributions were positively skewed, although if one extreme score was removed the distributions became approximately normal. Anxiety

Sensitivity displayed a positive skew with a slight floor effect, in that four participants scored very close to zero. The CEQ-T, Credibility, and Expectancy scales were negatively skewed and displayed a ceiling effect where some individuals scored the maximum on the scales.

The median age was 65 years but there was one extreme low score, one participant being 19 years of age. If this participant was removed the data became normally distributed around the median. Average number of 'other people' in the chamber, total number of sessions, and the amount of change in State Anxiety from time one to time three were all approximately normal.

Table 7

Means, Standard Deviations, and Range for Measures

Measures	Mean	*SD*	Range*
State Trait Anxiety Inventory (STAI)			
STAI - S^1 *(n=24)*	35.21	11.35	21 – 59
STAI - S^2 *(n=20)*	28.5	10.83	20 – 61
STAI - S^3 *(n=21)*	29.76	12.55	20 – 66
STAI - T	31.63	9.34	20 – 55
Claustrophobia Questionnaire (CLQ)			
CLQ – Total	19	19.76	0 – 90
CLQ – Restriction Scale	10.8	10	0 – 42
CLQ – Suffocation Scale	8.2	10.6	0 – 48
Anxiety Sensitivity Index (ASI)	20.29	14.4	2 – 55
Credibility/Expectancy Questionnaire** (CEQ)			
CEQ - Total	-0.22	4.48	-13.5 – 4.5
CEQ - Expectancy	0.39	2.61	-5.9 – 2.5
CEQ - Credibility	-0.61	2.56	-7.7 – 2

Notes:
Abbreviations: STAI- S^{123}=State-Trait Anxiety Sensitivity Index-State at times 1, 2, and 3. STAI-T=State-Trait Anxiety Index-Trait.
*Possible range for measures – STAI S & T: 20-80, CLQ: 0-104, ASI: 0-64
**CEQ scores have different scales (Likert & percentage) therefore this study standardised scores and displayed them as z scores

Reliability of Measures

While reliability coefficients from previous samples or test manuals are of use for comparative reasons, it is important to calculate reliability estimates from each study's own sample (Vacha-Haase, Hensen, & Caruso, 2002). The current study assessed reliability by Cronbach's alpha, which is a measure of internal consistency and describes the overall consistency of a measure. This estimation of reliability served as a pre-requisite for claims concerning the validity of the measures, as opposed to the manual coefficients. Therefore, Cronbach's alpha for all measures were calculated and are detailed in Table 8. All measures had good reliabilities with Cronbach's alpha ranging from .84 to .97.

Table 8

Cronbach's alpha for Measures Used in Present Study

Measure	Cronbach's Alpha
State Trait Anxiety Inventory	
State	.92
Trait	.92
Claustrophobia Questionnaire	
Total	.97
Restriction	.95
Suffocation	.95
Treatment Credibility/Expectancy Questionnaire	
Total	.85
Credibility	.85
Expectancy	.84
Anxiety Sensitivity Inventory	.95

Current Sample in Comparison to Normative Data and Other Research Samples

Means from all measures taken pre-HBOT were compared to normative data and appropriate published samples in medical settings by using *z* scores to describe the difference. These *z* scores were derived using the normative or published means and standard deviations and the current sample's means[4] (see Table 9). The normative data used for comparison of the CEQ was derived from a study of Generalised Anxiety Disorder (GAD; Devilly & Borkovec, 2000) and examined the association between Credibility and Expectancy of symptom improvement for GAD and anxiety outcome measures. No published sample was found for comparison to the CEQ due to insufficient reporting of descriptive data or detailing of transformations of the data.

[4] To compare the current sample's means to other samples, *z* score differences were calculated by using normative/research means and standard deviations ((Current Sample's *M* – Normative/Research *M*)/Normative/Research *SD*)). For example, the current sample's State Anxiety mean at time one was compared to normative data by the following equation ((35.21 – 42.38)/13.79)=-0.52) (see Table 9).

Table 9

Pre-HBOT Comparison of the Current Sample with Previously Reported Samples

	Comparison Data			Current Sample	Comparison Difference
Measures	*N*	*M*	*SD*	*M*	*SD unit*
Normative Data					
(Spielberger, 1983)					
STAI-S[1]	161	42.38	13.79	35.21	-0.52
STAI-S[2]	161	42.38	13.79	28.5	-1.01
STAI-S[3]	161	42.38	13.79	29.76	-0.92
STAI-T	161	41.91	12.7	31.63	-0.81
(Radomsky et al., 2001)					
CLQ-T	78	28.9	19.4	19	-0.51
CLQ-RS	78	19.9	12.8	10.8	-0.71
CLQ-SS	78	9.1	7.9	8.2	-0.11
(Sandin et al., 2001)					
ASI					
Male	152	18.8	9.3	18.1	-0.08
Female	238	22.1	9.2	25.7	0.39
Total	390	20.5	9.3	20.3	-0.02
(Devilly & Borkovec, 2000)*					
CEQ-Item 1	69	8.12	1.04	7.88	-0.23
CEQ-Item 2	69	7.31	1.45	7.75	0.30
CEQ-Item 3	69	7.40	1.56	7.63	0.15
CEQ-Item 4	69	67.61	17.24	78.18	0.61
CEQ-Item 5	69	6.67	1.48	8.08	0.95
CEQ-Item 6	69	66.79	18.06	79.09	0.68
Research Samples					
(Clark et al., 1994)					
STAI-S[1]	24	37.4[a]	11.1	35.21	-0.2
STAI-S[2]	24	31.2[aa]	9.3	28.5	-0.29
STAI-S[3]	24	31.2	9.3	29.76	-0.15
STAI-T	24	35.5	9.4	31.63	-0.41
(McIsaac et al., 1998)					
CLQ-T	75	26.33	18.95	19	-0.4
CLQ-RS	78	18.17	12.14	10.83	-0.6
CLQ-SS	76	9.24	8.93	8.17	-0.12
(McIsaac et al., 1998)					
ASI	80	17.67	9.35	20.29	0.28

Notes:
Spielberger (1983): Normative data was calculated from a general medical sample
Clark et al. (1994): Sample mean collected from patients before[a] and after[aa] HBOT
Radomsky et al. (2001): Normative data was collected from an adult community sample undergoing MRI
Sandin et al. (2001): Normative data was collected from a sample of Spanish university students
Abbreviations: STAI- S[123]=State Trait Anxiety Sensitivity Index-State at times 1, 2, and 3. STAI-T=State Trait Anxiety Index-Trait. CLQ-T=Claustrophobia Questionnaire total score. CLQ-RS=Claustrophobia Questionnaire-Restriction Scale. CLQ-SS=Claustrophobia Questionnaire-Suffocation Scale. ASI=Anxiety Sensitivity Index. CEQ=Treatment Credibility/Expectancy Questionnaire.
*Devilly & Borkovec (2000) report means and SD item by item un-standardised, thus this comparison is done here. Credibility factor loads from the first three items, whereas Expectancy factor loads from last three items.

State Anxiety at times one, two and three was compared to Spielberger's (1983) general medical sample (GMS). While State Anxiety at time one was lower than the GMS by approximately half a standard deviation, it was almost equivalent to a pre-HBOT sample (Clark et al., 1994). Additionally, while the current sample's State Anxiety decreased at times two and time three, bringing them to approximately one standard deviation lower than the GMS mean, times two and three still remained similar[5] to the State Anxiety of a post-HBOT sample. A noteworthy comparison was the current study's Trait Anxiety mean, almost one standard deviation lower than Spielberger's (1983) GMS and almost half a standard deviation lower than the HBOT sample (Clark et al., 1994). CLQ-T and Restriction scores indicated levels over half a standard deviation less claustrophobic than normative (Radomsky et al., 2001) and research sample means (McIsaac et al., 1998), whereas Suffocation scores were similar to normative and research sample means. The combined score for men and women for Anxiety Sensitivity from the current sample was just over one quarter of a standard deviation higher in Anxiety Sensitivity than the medical sample (McIsaac et al., 1998), however it was equivalent to normative data (Sandin et al., 2001). Anxiety Sensitivity for men was very similar to normative data and Anxiety Sensitivity for women was higher than normative data (Table 9).

The current sample was compared to a GAD sample (Devilly & Borkovec, 2000) on the CEQ items and exhibited higher Credibility and Expectancy scores on all items except item one, which was similar (Table 9).

[5] Approximately equal to or less than one quarter standard deviation is considered similar for the purposes of this study.

Categorical Comparison Data for Sample

The contribution of potential covariables of gender, previous experience of HBOT, type of headgear worn, and age – split at the current sample's median – were assessed by independent means sample t-tests (by group). Means and standard deviations are reported in Table 10 and significant differences are noted ($p < .05$).

Table 10

Mean HBOT Scores (Standard Deviations) for STAI-State, STAI-Trait, CLQ, CEQ, and ASI according to gender, previous HBOT, and age.

Measures administered before and during HBOT

Measures	Gender		Previous HBOT		Headgear		Age†	
	Men ***n*** = 17	**Women** ***n*** = 7	**Yes** ***n*** = 9	**No** ***n*** = 15	**Mask** ***n*** = 18	**Hood** ***n*** = 6	**≤ 64** ***n*** = 12	**≥ 65** ***n*** = 12
State Trait Anxiety Inventory (STAI)								
STAI - S[1]	34 (12.4)	38.1 (7.6)	31.8 (9.9)	37.3 (12)	34.8 (12)	36.5 (10)	36.2 (11.1)	34.3 (12)
STAI - S[2]***	26.1 (6.1)	34.2 (17.1)	27 (10.2)	29.3 (11.5)	29.3 (11.6)	26.2 (8.8)	31 (13)	25.4 (7)
STAI - S[3]****	25.7 (8.3)	**40 (16.1)***	32.4 (16.1)	28.4 (10.9)	25.1 (69)	**41.3 (16.5)****	34.5 (15.5)	24.6 (5.2)
STAI - T	29.6 (7.8)	36.6 (11.5)	31.7 (7.6)	31.6 (10.5)	30.8 (10)	34.2 (7)	35.7 (10.2)	**27.6 (6.5)***
Claustrophobia Questionnaire (CLQ)								
CLQ Total Score	13.9 (12.7)	**31.3 (28.6)***	16.2 (12.3)	20.7 (23.4)	14.2 (12.6)	**33.5 (30.4)***	21.4 (24.3)	16.6 (14.7)
CLQ Restriction Scale	8.8 (7.8)	15.7 (13.5)	9.6 (7.9)	11.6 (11.3)	8.4 (7.4)	**18.2 (13.8)***	12.1 (11.4)	9.6 (9.1)
CLQ Suffocation Scale	5.1 (5.7)	**15.6 (15.9)***	6.7 (5.6)	9.1 (12.8)	5.8 (6.2)	15.3 (17.3)	9.3 (13.8)	7 (6.2)
Anxiety Sensitivity Index (ASI)	18.1 (12.4)	25.7 (18.3)	15.8 (10)	23 (16.2)	18.7 (14.3)	25.2 (14.9)	22.9 (17.9)	17.7 (9.9)
Treatment Credibility/Expectancy Questionnaire (CEQ)								
CEQ - Total	0.1 (3.8)	-0.1 (6.1)	0.3 (6)	-0.5 (3.5)	-0.8 (5)	1.6 (1.8)	-1.1 (5.4)	0.6 (3.4)
CEQ - Expectancy	0.5 (2.2)	0.1 (3.7)	0.9 (2.7)	0.1 (2.6)	-0.3 (2.7)	**2.4 (0.3)***	0 (3.1)	0.8 (2)
CEQ - Credibility	-0.4 (2.3)	-1.0 (3.3)	-0.7 (3.4)	-0.6 (2)	-0.6 (2.8)	-0.8 (1.8)	-1.1 (3)	-0.1 (2)

Notes:

Abbreviations: S[123]=State Trait Anxiety Inventory-State at times 1, 2, and 3. T=State Trait Anxiety Inventory-Trait.

†Age was separated into two groups above and below the present study's median age (Median = 65 years).

***Differences significant at 0.05 level**

****Differences significant at 0.01 level**

****N*: S[2] - Men (14) Women (6). Yes HBOT (7) No HBOT (13). Mask (15) Hood (5). ≤64 (11) ≥65 (11).

*****N*: S[3] - Men (15) Women (6). Yes HBOT (7) No HBOT (14). Mask (15) Hood (6). ≤64 (11) ≥65 (10).

Gender

The present study found a number of gender differences. Women scored significantly higher than men on CLQ-T (t (22) = -2.09, $p < .05$) and Suffocation (t (22) = -2.43, $p < .05$). Women also experienced significantly higher State Anxiety at time three (t (19) = -2.71, $p < .05$).

Previous HBOT

No dependent variable differed significantly as a function of previous HBOT experience.

Headgear

Differences were found between those who wore a face mask and a hood. Those wearing a hood exhibited significantly higher State Anxiety at time three, t (19) = -3.25, $p < .01$, than face mask wearers. A chi-square analysis between headgear and gender was calculated and was significant (χ^2 (1) = 5.45, $p < .05$), indicating a relationship between gender and type of headgear worn.

Age

When the sample's age was split into two groups – above and below the sample median – only one significant difference was found. The younger group scored significantly higher on Trait Anxiety t (22) = -2.31, $p < .05$.

3.2. EXAMINATION OF CORRELATIONS

Bivariate correlations (Pearson's r) were calculated to examine associations between variables (see Table 11). Significant correlations only with State Anxiety are described. Other significant correlations are subsequently noted. Correlational matrices according to gender were calculated and are then discussed. Full correlational matrices including non-significant results can be seen in Appendix 15

Pairwise deletion was used for missing data (see Appendix 16 for correlation matrix of whole sample using casewise deletion method). Means and standard deviations for each subset of values used in the calculation of individual correlation coefficients were noted to be very similar, thus indicating no systematic bias in the correlation matrix.

Table 11

Correlations between Scales Measuring Individual Variables

	STAI-T	CLQ-T	CLQ-RS	CLQ-SS	CEQ-E	CEQ-C	CEQ-T	ASI	STAI-S 1	STAI-S 2	STAI-S 3
STAI-T	- -	ns	ns	ns	ns	ns	ns	**0.78****	ns	**0.61***	ns
CLQ-T		- -	**0.96****	**0.96****	ns	ns	ns	ns	ns	ns	**0.48***
CLQ-RS			- -	**0.84****	ns	ns	ns	ns	ns	ns	**0.5***
CLQ-SS				- -	ns	ns	ns	**0.5***	ns	ns	ns
CEQ-E					- -	**0.5***	**0.86****	ns	**-0.44***	**-0.58****	ns
CEQ-C						- -	**0.87****	ns	ns	ns	ns
CEQ-T							- -	ns	ns	**-0.45***	ns
ASI								- -	**0.51***	ns	ns
STAI-S 1									- -	ns	ns
STAI-S 2										- -	ns
STAI-S 3											- -

Notes:
* Correlation is significant at the .05 level
** Correlation is significant at the .01 level
Abbreviations: STAI-T=State Trait Anxiety Inventory-Trait; CLQ-T=Claustrophobia Questionnaire; CLQ-RS=CLQ Restriction Scale; CLQ-SS=CLQ Suffocation Scale; CEQ-T=Credibility/Expectancy Questionnaire total score; CEQ-E=CEQ Expectancy score; CEQ-C=CEQ Credibility score; ASI=Anxiety Sensitivity Index; STAI-S 1=STAI-State score at time 1; STAI-S 2=STAI-State score at time 2; STAI-S 3=STAI-State score at time 3.

Correlations

Correlations between State Anxiety at all Times

There were weak, non-significant correlations between levels of State Anxiety across all times.

Correlations between Trait Anxiety and State Anxiety

No significant correlation was found between Trait Anxiety and participants' State Anxiety at time one or time three. A moderately large, significant correlation between Trait Anxiety and State Anxiety was found at time two ($r = .61$, $p < .05$).

Correlations between Trait Anxiety and all Other Variables

Trait Anxiety had a large correlation with Anxiety Sensitivity ($r = .78$, $p < .01$). No other variable correlated significantly with Trait Anxiety.

State Anxiety with all Other Variables

There were large, significant correlations of State Anxiety at time three with CLQ-T ($r = .48$, $p < .05$) and Restriction ($r = .5$, $p < .05$). Anxiety Sensitivity significantly correlated with State Anxiety at time one ($r = .51$, $p < .05$). Significant correlations were not found between Anxiety Sensitivity and State Anxiety at times two or three.

Medium to large negative correlations were observed between higher Expectancy and lower State Anxiety at time one ($r = -.44$, $p < .05$) and at time two ($r = -.58$, $p < .01$).

There was no significant correlation of Expectancy and State Anxiety at time three or between Credibility and State Anxiety at any stage of HBOT. Age was not significantly correlated with State Anxiety at any stage of HBOT. There was a moderately large correlation between average number of people in the chamber for each participant and State Anxiety at time three ($r = 0.53$ $p < .05$). When partitioned by gender the correlation for women was large ($r = .90$, $p < .05$), but not significant for men ($r = .28$, $p > .05$) (see Appendix 17). This was not found at times one and two.

Other Significant Correlations

The CLQ subscales, Suffocation and Restriction, were significantly correlated ($r = .84$, $p < .01$) and, as expected, CLQ-T was highly correlated with both Suffocation ($r = .96$, $p < .01$) and Restriction scales ($r = .96$, $p < .01$). Therefore, further statistical analyses used CLQ-T only.

There was a moderate correlation between Expectancy and Credibility ($r = .50$, $p < .05$), and strong correlations between CEQ-T and its two factors (Expectancy; $r = .86$, $p < .01$; Credibility; $r = .87$, $p < .01$). Because of the suggested theoretical differences (Devilly & Borkovec, 2000) and moderate correlation, Credibility and Expectancy were used in further analyses as separate factors.

Anxiety Sensitivity was found to be moderately correlated with Suffocation ($r = .5$, $p < .05$). Age was positively correlated with Credibility ($r = 0.44$, $p < 0.05$). Gender (men = 0, women = 1) was significantly correlated with previous HBOT (yes = 0, no = 1) (r = -

.45, $p < .05$. See Appendix 15). Previous HBOT was significantly correlated with total number of sessions per participant ($r = .46$, $p < .05$. See Appendix 15).

Modified Data

A further variable of total individual State Anxiety change from time one to time three was calculated and investigated for its relationship with pre-HBOT scales. No significant correlations were found.[6]

Gender

Further investigations on gender differences were undertaken. Correlational matrices were calculated according to gender (see Tables 12 and 13).

[6] Other data was also modified. Anxiety Sensitivity scores were divided into low, medium, and high categories (see section 2.3.4.) to investigate any further relationships with State Anxiety. Due to insufficient sample size in each category further analyses were unable to be performed and Anxiety Sensitivity was used in further analyses as the complete sample.

Table 12

Correlations for Women

	STAI-T	STAI-S 1	STAI-S 2	STAI-S 3	CLQ-T	CLQ-RS	CLQ-SS	CEQ-T	CEQ-E	CEQ-C	ASI
STAI-T	--	ns	**.99****	ns	ns	ns	ns	ns	ns	ns	**.84***
STAI-S 1		--	ns	ns	ns	ns	ns	**-.85***	ns	**-.83***	ns
STAI-S 2			--	ns	ns	ns	ns	ns	ns	ns	**.88***
STAI-S 3				--	ns	ns	ns	ns	ns	ns	ns
CLQ-T					--	**.97****	**.98****	ns	ns	ns	ns
CLQ-RS						--	**.89****	ns	ns	ns	ns
CLQ-SS							--	ns	ns	ns	**.77***
CEQ-T								--	**.89****	**.85***	ns
CEQ-E									--	ns	ns
CEQ-C										--	ns
ASI											--

Table 13

Correlations for Men

	STAI-T	STAI-S 1	STAI-S 2	STAI-S 3	CLQ-T	CLQ-RS	CLQ-SS	CEQ-T	CEQ-E	CEQ-C	ASI
STAI-T	--	ns	ns	ns	ns	ns	ns	ns	ns	ns	**.71****
STAI-S 1		--	ns	ns	ns	ns	ns	ns	ns	ns	**.52***
STAI-S 2			--	ns	ns	ns	ns	ns	ns	ns	ns
STAI-S 3				--	ns	ns	ns	ns	ns	ns	ns
CLQ-T					--	**.96****	**.92****	ns	ns	ns	ns
CLQ-RS						--	**.78****	ns	ns	ns	ns
CLQ-SS							--	ns	ns	ns	ns
CEQ-T								--	**.85****	**.87****	ns
CEQ-E									--	ns	ns
CEQ-C										--	ns
ASI											--

Notes for Tables 12 and 13: * Correlation is significant at the .05 level. ** Correlation is significant at the .01 level

Abbreviations: STAI-T=State Trait Anxiety Inventory-Trait; CLQ-T=Claustrophobia Questionnaire; CLQ-RS=CLQ Restriction Scale; CLQ-SS=CLQ Suffocation Scale; CEQ-T=Credibility/Expectancy Questionnaire total score; CEQ-E=CEQ Expectancy score; CEQ-C=CEQ Credibility score; ASI=Anxiety Sensitivity Index; STAI-S 1=STAI-State score at time 1; STAI-S 2=STAI-State score at time 2; STAI-S 3=STAI-State score at time 3.

Gender Differences

Bivariate correlations revealed a number of different associations of State Anxiety and other pre-HBOT measures as a function of gender. Five associations displayed extremely large differences where women had very high correlations and men did not show significant correlations – CEQ-T and State Anxiety at time one (women, $r = -.85$, $p < .05$); Credibility and State Anxiety at time one (women, $r = -.85$, $p < .05$); Trait Anxiety and State Anxiety at time two (women, $r = .99$, $p < .05$); Anxiety Sensitivity and State Anxiety at time two (women, $r = .88$, $p < .05$); and Anxiety Sensitivity and Suffocation ($r = .77$, $p < .05$). Only Anxiety Sensitivity and State Anxiety at time one showed a significant correlation for men ($r = .52$, $p < .05$) but no significant correlation for women. While women showed a large relationship between Trait Anxiety and State Anxiety at time two, the distribution of State Anxiety scores for women at time two revealed a trimodal positively skewed distribution, meaning interpretation of this correlation should be done with caution. Lastly, women showed a strong ($r = .90$, $p < .05$) significant correlation between the average number of other people in the chamber over all sessions and State Anxiety at time three.

Gender Similarities

Correlations also revealed a number of similar associations (see Tables 12 and 13). Both men ($r = .71$, $p < .05$) and women ($r = .84$, $p < .05$) revealed large correlations between Anxiety Sensitivity and Trait Anxiety. CEQ-T with Credibility and Expectancy, and CLQ-T with Suffocation and Restriction demonstrated significant correlations (see

Tables 12 and 13) supporting the whole sample correlation matrix where similar correlations were found (see Table 11).

3.3. PREDICTORS OF OUTCOME

Exploratory hierarchical multiple regressions were carried out to determine the extent to which variables were able to predict State Anxiety before and during hyperbaric treatment. The regression models used were constrained for at least two reasons. First, the sample size (*n (time 1)* = 24, *n (time 2)* = 20, and *n (time 3)* = 21) was insufficient for all potential predictors to be entered into one regression, therefore, no more than three predictors in total were entered into any regression. Secondly, because of high correlations between some predictor variables, there was a multicollinearity problem in some cases.

Multicollinearity was evident for Anxiety Sensitivity and Trait Anxiety (r = .78). To resolve this, the two variables were converted to z scores then combined to make a new predictor variable, a composite measure of individual Dispositional Anxiety pre-HBOT, referred to as 'DisAnx'. DisAnx was entered into regressions in the first step, to control for the influence of levels of Dispositional Anxiety. While DisAnx was a significant predictor at times one and two, it did not account for variance at time three and consequently was not included in the regression model for time 3 State Anxiety.

A series of exploratory regressions were undertaken with each examining predictors of State Anxiety at times one, two, or three (see Appendix 18 for ideal regressions if sufficient *N*). For each regression, casewise deletion method was used in order to allow for Beta weight comparisons. Additionally, Tolerance levels and Semi-partial correlations were examined to ensure no predictor variables were too highly related causing multicollinearity.

The predictor variables entered were the pre-HBOT measures of Expectancy, Credibility, CLQ-T, and the composite variable DisAnx (Anxiety Sensitivity + Trait Anxiety). In addition, State Anxiety was investigated to observe if levels of State Anxiety at T_x predicted State Anxiety at T_{x+1} and T_{x+2}. Demographic information, namely age and gender, were examined in the exploratory regressions as control variables to observe any potential influences. Predictors were grouped into hierarchical subsets guided by theoretical considerations and the pattern of bivariate correlations, and all steps of the final models are reported in Table 14.

Table 14

Regression Results: Final Models for State Anxiety at Times One, Two, and Three

			Dependent Variable: State Anxiety at Time One								
Step		Predictor Variables	r	Beta	t	p	R^2	Adj R^2	R^2 Change	Sig. F Change	Semipart Cor.	Tolerance
	1	DisAnx	0.444	0.444	2.323	0.030	0.197	0.161				
	2	DisAnx	0.444	0.400	2.265	0.034					0.397	0.988
		Expectancy	-0.44	-0.398	-2.253	0.035	0.353	0.292	0.156	5.076	-0.395	0.988

			Dependent Variable: State Anxiety at Time Two								
Step		Predictor Variables	r	Beta	t	p	R^2	Adj. R^2	R^2 Change	Sig. F Change	Semipart Cor.	Tolerance
	1	DisAnx	0.493	0.493	2.407	0.027	0.244	0.201				
	2	DisAnx	0.493	0.371	2.022	0.059					0.359	0.936
		Expectancy	-.578	-0.4844	-2.101	0.017	0.463	0.400	0.220	6.959	-0.469	0.936

			Dependent Variable: State Anxiety at Time Three								
Step		Predictor Variables	r	Beta	t	p	R^2	Adj R^2	R^2 Change	Sig. F Change	Semipart Cor.	Tolerance
	1	Gender	0.529	0.529	2.714	0.014	0.279	0.241				
OR 1		Claustrophobia	0.479	0.479	2.376	0.028	0.229	0.188				
	2	Gender	0.529	0.391	1.820	0.086					0.346	0.785
		Claustrophobia	0.479	0.297	1.385	0.183	0.349	0.276	0.069	ns	0.263	0.785

Series 1: State Anxiety at times one and two in predicting time two and three.

Small, non-significant bivariate correlations suggest State Anxiety at times one and two had no predictive power for State Anxiety at times two and three respectively. Part of the preliminary investigation included regressions to investigate this, and these demonstrated that previous levels of State Anxiety did not significantly predict future State Anxiety. Therefore, the final models do not contain prior State Anxiety as a predictor.

Series 2: Dispositional Anxiety and Expectancy as Predictors of State Anxiety at Time One

After exploratory hierarchical regressions were performed, guided by bivariate correlations, two variables – Dispositional Anxiety and Expectancy of symptom improvement – made up the final model that significantly predicted State Anxiety at time one, $F_{[1, 22]} = 5.737$, $p < .05$ (Table 14). Even when controlling for Dispositional Anxiety, Expectancy still significantly predicted additional variance at time one, with both accounting for approximately 30% of the variance in State Anxiety. This model indicates that participants with higher Dispositional Anxiety and lower Expectancy were more likely to experience higher State Anxiety before undergoing HBOT. Further regressions showed no other variables significantly explained variance at time one.

Series 3: Dispositional Anxiety and Expectancy as Predictors of State Anxiety at Time Two

Two significant variables made up the final model that predicted State Anxiety at time two, $F_{[2, 17]} = 7.335$, $p < .05$ (Table 14). As at time one, Dispositional Anxiety and Expectancy of symptom improvement significantly predicted State Anxiety at time two, accounting for approximately 40% of the variance. Even when controlling for Dispositional Anxiety, Expectancy still significantly predicted additional variance at time two. This model indicates that participants with higher Dispositional Anxiety and lower Expectancy were more likely to still experience higher State Anxiety ten sessions into undergoing HBOT. Further regressions showed no other variables significantly explained variance at time two.

Series 4: CLQ and Gender as Predictors of State Anxiety at Time Three

The full model predicting State Anxiety at time three included CLQ-T and gender as predictors, $F_{[2,18]} = 4.82$, $p < .05$ (Table 14). However, neither of the individual predictors reached significance in the full model (although gender was approaching significance). Gender alone significantly predicted State Anxiety at time three, but when CLQ-T was entered, both became non-significant predictors. Because this can indicate multicollinearity, Tolerance levels and Semi-partial correlations were examined. Tolerance levels were lower than other models, although still reasonable high. Semi-partial correlations were also lower than other models and suggested some level of collinearity.

Simple regression coefficients between the three variables were examined – State Anxiety at time three, CLQ-T, and gender – and were shown to be moderately correlated (see Table 15). Partial correlations were performed to further examine the individual relationships between CLQ-T and gender with State Anxiety at time three. When CLQ-T was controlled, gender no longer had a significant correlation with State Anxiety at time three. When gender was controlled, CLQ-T also was no longer significant. Although gender and CLQ-T are only moderately correlated (r = .46), women scored significantly higher than men in both CLQ-T (t (22) = -2.09, $p < .05$) and State Anxiety at time three (t (19) = -2.71, $p < .05$) (as reported in section 3.1) and the regression model reflects this. The range of CLQ-T scores for women were approximately twice that of men (0 – 45 for men and 8 – 90 for women), and the standard deviation was very high (SD (men) = 12.6; SD (women) = 28.6). Additionally, the sample size was small, especially for women at time three (women = 6; men = 15). Therefore, it appears that the extreme scores for women and variance in CLQ-T, and the small sample size influenced the significant Beta values in the model, and gender and CLQ-T are explaining to some extent, some of the same variance in State Anxiety at time three. Because gender was explaining more variance (see Table 14), CLQ-T was deleted from the final model, leaving a simple bivariate regression equation of gender predicting State Anxiety at time three.

Table 15

Correlational Matrix – State Anxiety at Time Three, CLQ-T, and Gender

	Gender	CLQ-T	State 3
Gender	1.00	**0.46**	**0.53**
CLQ-T	**0.46**	1.00	**0.48**
State 3	**0.53**	**0.48**	1.00

All correlations were significant at $p < .05$ level

3.4. EXPOSURE TO HBOT

The study hypothesised that State Anxiety would change over the course of HBOT as individuals become more experienced with hyperbaric treatment. Figures 4 and 5 show the change in mean State Anxiety from time one to time two to time three for the whole sample, and for women and men respectively.

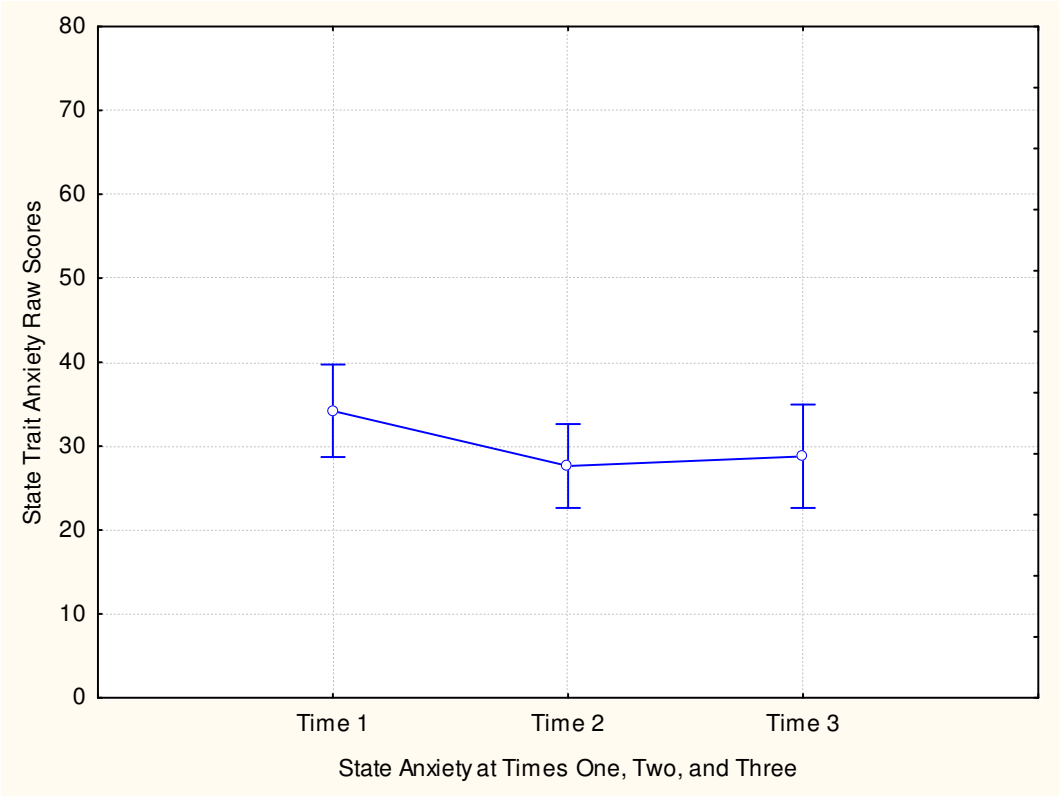


Figure 4: State Anxiety means over time for whole sample (Whiskers denote +/- 0.95 Confidence Intervals).

State Anxiety levels for the whole sample decreased slightly from time one to time two, and changed little from time two to time three, with considerable overlap across the three measurements.

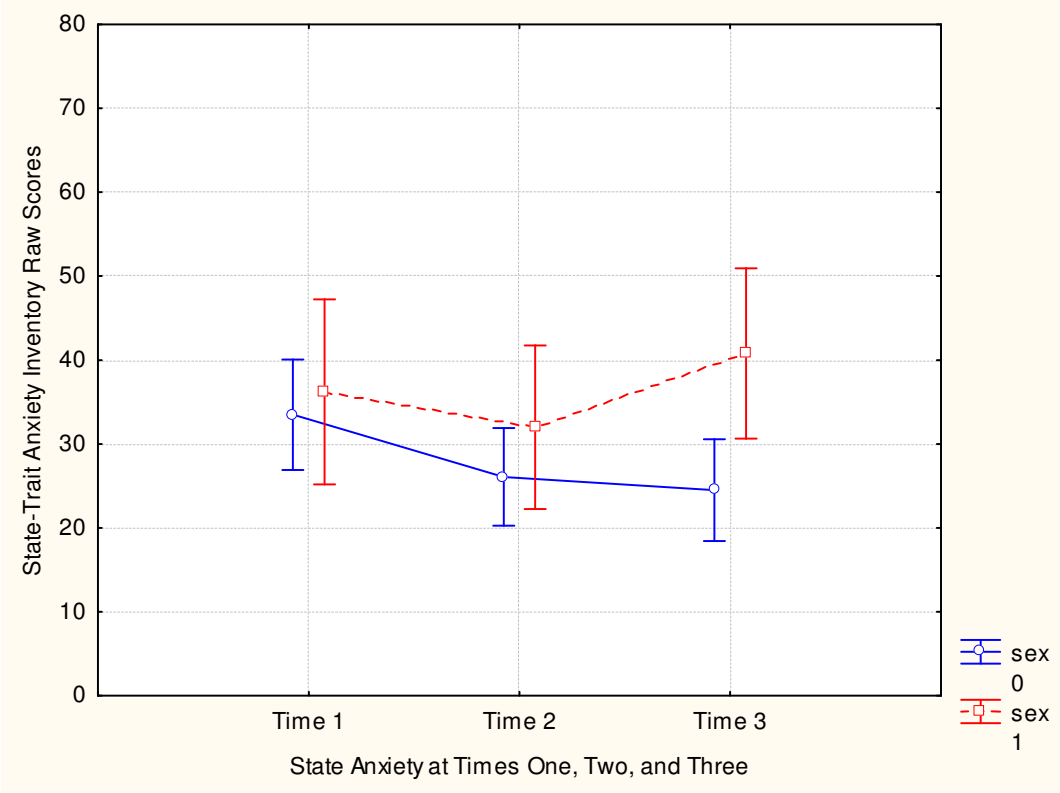


Figure 5. State Anxiety means over time for men (0) and women (1) (Whiskers denote +/- 0.95 Confidence Intervals).

State Anxiety levels for women decreased very slightly from time one to time two, but increased from time two to time three. The extremely large variance indicates considerable overlap across the three measurements. A Repeated Measures 2-way ANOVA found no significant change over time. State Anxiety levels for men decreased from time one to time two, and again from time two to time three. There was less overlap across the three measurements in the variance for men than women and although the

Repeated Measures 2-way ANOVA found no significant change over time for men, it was approaching significance ($F_{[2, 26]} = 3.2541$, p = .05480). There was a main effect of gender $F_{[1, 17]} = 6.83$, $p < .05$, but no interaction between gender and time ($F_{[2, 34]} = 1.51$, $p > .05$).

Figures 6 and 7 below describe participant change in State Anxiety from time one to time two (Figure 6) and from time one to time three (Figure 7). The vertical and horizontal lines on the figures represent Spielberger's (1983) GMS State Anxiety norm score (42). Therefore, being above or below this line portrays individuals in the present sample relative to those in a GMS (Spielberger, 1983). The diagonal line is the line of no change and represents where participants would sit if they did not change from time one to time two or time one to time three. Participants falling below the diagonal line represent those experiencing a reduction in State Anxiety from time one to time two or time one to time three, while those above the line represent those experiencing an increase in State Anxiety.

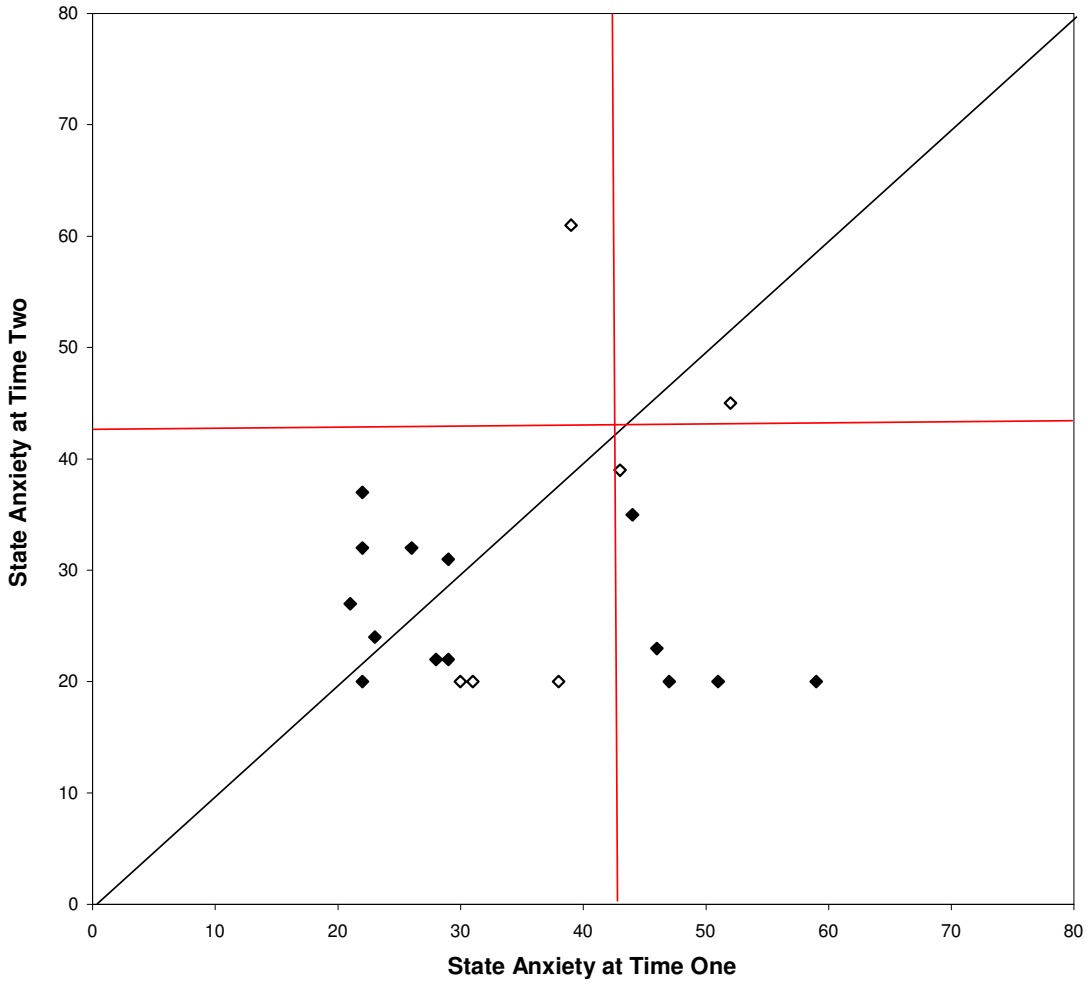


Figure 6. State Anxiety at time one plotted against State Anxiety at time two (dark points = men, light points = women).

Figure 6 shows a general trend for a reduction in State Anxiety from time one to time two. Before participants underwent their first HBOT session approximately one third had State Anxiety levels above Spielberger's (1983) GMS norm, however, approximately two thirds of participants decreased in State Anxiety from time one to time two and thus at time two almost all participants were less anxious than the GMS norm. One participant remained above the GMS norm at both time one and time two, and one participant's State Anxiety increased from below to above the GMS norm.

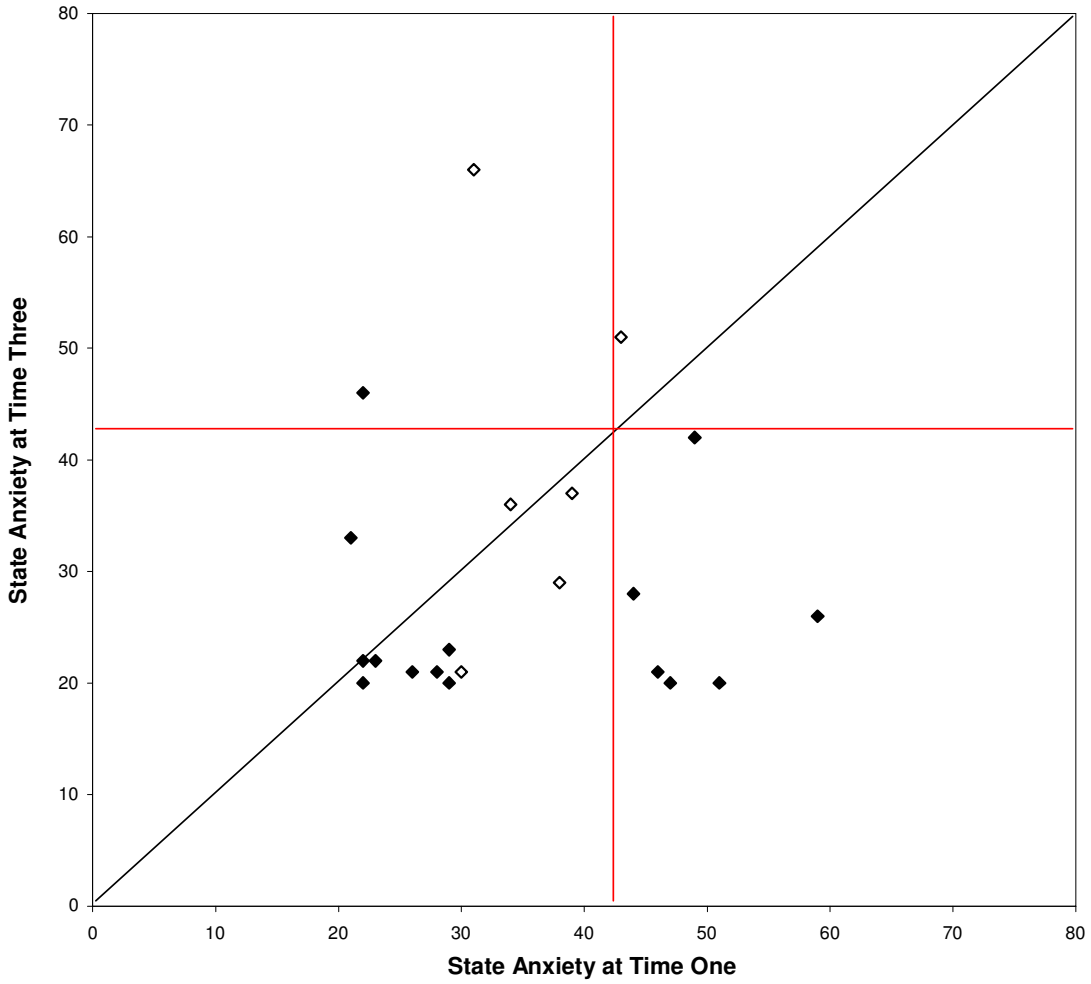


Figure 7. State Anxiety at time one plotted against State Anxiety at time three (dark points = men, light points = women).

Figure 7 also shows a general reduction in State Anxiety from time one to time three, although there was substantial variance. Again, a decrease in State Anxiety was seen in approximately two thirds of participants from time one to time three (see Figure 7), however, two participants' State Anxiety increased from below the GMS norm at time one, to above at time three, and one participant remained above at both time one and three.

CHAPTER FOUR

4. DISCUSSION

The goal of the current study was to investigate anxiety and fear responses to medical procedures, specifically HBOT. The current study's hypotheses were partially supported: 1) Dispositional Anxiety, Expectancy of symptom improvement, and gender, were found to be predictors of State Anxiety before and during HBOT, 2) no significant change in State Anxiety over the course of HBOT was found, and 3) Öst's (1989) OSET effectiveness was unable to be evaluated. The following section will initially discuss pertinent findings in individual variables and their associations with State Anxiety. This will be followed by a discussion of predictors of State Anxiety, exposure to HBOT, and the intervention evaluation.

4.1. INDIVIDUAL VARIABLES AND STATE ANXIETY

Individual Variables

The hypothesis that participants with higher Trait Anxiety and Anxiety Sensitivity will experience higher State Anxiety was confirmed. However, unlike previous studies reporting moderate correlations (Sandin et al., 2001), Trait Anxiety and Anxiety Sensitivity were found to be strongly correlated. Research suggests that Trait Anxiety and Anxiety Sensitivity are different, yet related constructs (Taylor, 1999), and as no further

analyses in the current study beyond bivariate correlations were able to be undertaken to further examine their relationship (e.g. factor analysis as in Sandin et al., 2001) this significant relationship should be interpreted with caution. Subsequently, for the purpose of the current study Trait Anxiety and Anxiety Sensitivity were combined to make a composite variable – Dispositional Anxiety, in an attempt to resolve the impact of their strong relationship. This variable was consequently able to represent individual levels of Dispositional Anxiety, a more stable, non-transitory measure of anxiety than State Anxiety.

The current study's findings are consistent with that predicted by Trait-State Theory (Spielberger, 1983), specifically, higher Dispositional Anxiety predicted higher levels of State Anxiety. This suggests, that individuals presenting for HBOT with higher levels of Dispositional Anxiety (Trait Anxiety + Anxiety Sensitivity) would find the procedure a more distressing experience. While Dispositional Anxiety was found to predict State Anxiety before and during HBOT, it is important to note that the current sample's mean for Trait Anxiety was low when compared to a normative GMS sample (Spielberger, 1983), and an HBOT sample recruited in Clark et al. (1994). While this suggests that participants in the current sample may have been presenting to the HMU in a position more able to cope than previous samples, further research is needed to distinguish whether this finding is representative of the wider HBOT population, or a unique characteristic of this study. Nevertheless, there are two possibilities contributing to these low Trait Anxiety scores. Firstly, while consistent with previous HBOT samples (Ellis & Mandal, 1983), initial investigations revealed that the current sample was not balanced by

gender (70% males). Research has found lower anxiety levels in men in medical settings (e.g. de Jong et al., 1994; Luck et al., 1999; Lukins et al., 1997). Secondly, although the current study's age range (19-81 years) was similar to other studies using medical samples (e.g. Clark et al., 1994, 27-81 years; Katz, Wilson, & Frazer, 1994, 18-81 years), its mean age (63 years) was higher than other medical studies (Harris et al., 2004; Katz et al., 1994). Research suggests a general trend for younger people to be higher in Trait Anxiety (Spielberger, 1983). In summary, the reported low number of males and high mean age in the current study may be a contributing factor to these lower State and Trait Anxiety scores exhibited (see Table 9).

CLQ-T's lack of relationship with State Anxiety before and during HBOT was an unexpected finding. While research in the context of MRI procedures has previously been able to predict outcomes related to fear or panic using psychometric indicators of claustrophobia (McGlynn et al., 2003; McIsaac et al., 1998), no relationship emerged between CLQ-T and State Anxiety at times one and two. Despite finding a positive relationship between CLQ-T scores and State Anxiety at time three, further examination revealed that rather than this being a direct relationship, it may instead be a function of women scoring significantly higher than men in CLQ-T, and gender (being a woman) being predictive of State Anxiety at time three. Thus, its utility as a predictor for HBOT patients is not supported by the findings of this study.

An explanation for the lack of relationship between CLQ-T and State Anxiety may be that the current sample's CLQ-T scores were below both normative (Radomsky et al.,

2001) and research (McIsaac et al., 1998) levels and therefore less likely to influence State Anxiety. It is unknown whether the low claustrophobic fears were a characteristic of the current study, or are representative of HBOT patients in general. However, what is clear is that claustrophobia did not emerge as a strong predictor for this sample as expected. Of additional interest, the finding that women revealed higher levels of claustrophobic fears than men corresponds to the reported ratio in the DMS-IV of more females with Claustrophobia than males (APA, 2000).

To my knowledge, no prior research has examined the relationship between Expectancy of symptom improvement and belief in Credibility of treatment with State Anxiety. Consistent with findings in both previous non-HBOT research (Devilly & Spence, 1999; Borkovec & Costello, 1993; Chambless & Tran, 1997; Collins & Hyer, 1986) and HBOT research (Stiegler et al., 2006) the present study demonstrated Expectancy of symptom improvement linked with an outcome measure – in this study State Anxiety. Lower Expectancy of symptom improvement indicated higher State Anxiety levels both before and after ten sessions of HBOT. Belief in the Credibility of HBOT however, showed no relationship with State Anxiety. While Credibility and Expectancy were moderately related – not dissimilar to previous research (Devilly & Borkovec, 2000) – Expectancy of symptom improvement for the present sample emerged as explaining more variance in State Anxiety than Credibility.

Credibility and Expectancy scores for the current sample tended to be higher than a comparative norm sample (Devilly & Borkovec, 2000). These high levels may have been

because information gained from HMU physicians directly influenced Credibility and Expectancy of HBOT, or it may be easier to accept rationale for HBOT than the psychological therapies used in Devilly and Borkovec (2000). However, to conclude why participants in this sample scored high in Expectancy and Credibility cannot be determined from the current findings. Of interest to consider is the negative relationship between Expectancy and State Anxiety – the higher comparable Expectancy rates found in the current study may provide some explanation of the lower State anxiety levels also reported in this study (Spielberger, 1983. See Table 9).

Confounding Variables

In addition to the above findings, some confounding variables emerged as influential to results and subsequently will be discussed.

Gender emerged as an influential covariate. When data were partitioned by gender, women exhibited larger values for all correlations (bar one) that were significant for both men and women. Additionally, correlations that emerged as significant for women and not for men tended to be very large. For instance, men showed no significant correlation between Anxiety Sensitivity and State Anxiety at time two, yet women demonstrated a strong relationship (r = .88). This suggests that, on the whole, women were displaying stronger relationships, from very small differences to extremely large differences, despite the much smaller number of women than men in the sample.

Research has been inconsistent in finding a relationship between State Anxiety and age in medical settings. While the current study found that older participants, when split by the sample median, reported significantly higher Trait Anxiety than younger participants, no relationship emerged between age and State Anxiety across the course of HBOT. The non-significance of age is consistent with Luck et al. (1999) in regard to precolonoscopy anxiety. Also of interest was the positive correlation of age and Credibility. It emerged that as age increased, so did the belief in the Credibility of HBOT as a successful and quality medical procedure. This may have been an attribute of the current study, or it may be suggesting that Credibility of HBOT is more easily given in older patients. Nevertheless, further research would be needed to understand the mechanisms underlying this relationship.

The hypothesis that past exposure to HBOT would be a significant covariate to State Anxiety was not confirmed. This finding was consistent with previous research (Harris et al., 2001) that reported no differences on any measures between those who had undertaken an MRI scan, and those had not.

4.2. PREDICTORS OF STATE ANXIETY

It was encouraging to find that both before HBOT and after ten sessions, Dispositional Anxiety and Expectancy of symptom improvement were significant predictors of State Anxiety. The predictive power of these variables at time two suggests that these individual factors remain important in continuing to predict participant levels of State

Anxiety after approximately two weeks of treatment. However, this pattern did not continue – thereby suggesting that these variables no longer were of significance on the last HBOT session.

Although further research regarding the sustained medical benefits of HBOT are needed (Wang, Schwaitzberg, Berliner, Zarin, & Lau, 2003), these ongoing medical benefits are presently understood to continue after final treatment. Therefore, it is possible that as patients have seen the results of treatment thus far, their Expectancy of improvement may have been adjusted by the last HBOT session. However, as Expectancy of symptom improvement was not measured at this time, further research would need to assess this postulate. Dispositional Anxiety, however, could be argued to still extract some variance in explaining State Anxiety at the last session owing to its theoretical link. Due to a small sample size, the power of the current study was compromised, and therefore may have influenced the lack of relationship between Dispositional Anxiety and State Anxiety at time three. What did emerge, however, was that gender (being a woman) predicted State Anxiety experienced on the last HBOT session. Women participants, rather than men, demonstrated the increased likelihood of experiencing more State Anxiety at time three.

4.3. EXPOSURE TO HYPERBARIC OXYGEN THERAPY

The hypothesis that there would be significant change between State Anxiety at participants' first, tenth, and last HBOT session was not supported. It was surprising to note that overall, State Anxiety at earlier times was not predictive of State Anxiety at

later times. This suggests that State Anxiety may have been independent across time, and therefore was influenced by other factors. However, the decrease from pre-HBOT and the tenth HBOT session was approaching significance and an overall significant effect for gender emerged. That is, when gender was examined separately, men were approaching significance in an overall decrease of State Anxiety change, but women were not. Because previous findings have shown a decrease in State Anxiety from pre- to post-HBOT (Clark et al., 1994), this may suggest that if sample size was larger, and thus power increased, a significant difference may have been detected.

The significant effect for gender was apparent through an interesting trend where women, but not men, increased in State Anxiety from the tenth HBOT session to the last. Of the five women who had data available at both times two and three, four exhibited increased State Anxiety levels over this period, despite all having decreased in State Anxiety from time one to time two (see Appendix 19). Of these four participants, three wore hoods for their oxygen intake during the HBOT sessions. This characteristic explains the finding of the significant relationship between gender and headgear and the significantly higher scores in State Anxiety at time three for those who wore a hood than those who wore a face mask. Because type of headgear worn is a personal preference, and participants were able to choose which headgear they would find less anxiety-provoking, it is unlikely that the hood is a confounding variable. Additionally, three of these four women who exhibited an increase in State Anxiety from times two to three had already undergone HBOT before, and all required HBOT because of problem wounds or radiation tissue damage. Therefore, the rationale for the trend of increased State Anxiety for women at

their last session is not clear. Many patients continue with further medical care at the completion of HBOT sessions (e.g. surgery), and anecdotal evidence suggests this increase may reflect worry regarding future health concerns. However, although there may be a number of reasons for this trend it may be a chance finding for this particular sample, hence generalising is unwise. To theorise about why women both increased in State Anxiety, and felt more anxious than men on the last day, would require further research – with an emphasis on gathering additional data on the last HBOT session. Information regarding fear surrounding one's health concerns and future prognosis may be of interest to assess at this point.

4.4. INTERVENTION COMPONENT

The third and final purpose of this study was to evaluate the effectiveness of Öst's (1989; 1997) OSET. Unfortunately, this component of the current study was not able to be investigated. Only two participants presented with claustrophobia scores above the cut-off mark. The first participant, who may have benefited, was not offered intervention due to practical issues. The second participant was offered intervention but after viewing the chamber, declined. Both participated in the descriptive study. Despite not partaking in the intervention, yet scoring very high in claustrophobic tendencies, both went on to tolerate HBOT. This may suggest that even patients who express high claustrophobic distress are able to cope with HBOT and that psychological intervention may only be necessary in extreme cases. From a clinical point of view, the support presently provided by the HMU staff at Christchurch Hospital may be satisfactory for most patients.

LIMITATIONS

A number of limitations are present in the current study. Most notable is the small sample size and the resulting impact on the study's power to detect significant differences. Participant numbers were clinically determined; therefore, with the exception of extending the study indefinitely, this limitation was unavoidable. Nevertheless, even with a small sample size, a number of significant effects were still found.

As the study utilised self-report data, social desirability bias, memory bias, and lack of comprehension may have influenced outcome measures and variables in some way. While it would be beneficial to the strength of the findings to compare physiological methods with self-report measures to further assess State Anxiety, it was not feasible for the particular study. Furthermore, generalisability from the current sample was limited and should be viewed with caution. The current sample was over-represented in males and represented an older population than comparable medical samples. Data from the NZ 2006 census (Statistics New Zealand, 2007) suggest that the current sample was over-represented in NZ European and under-represented in other ethnic groups identified in NZ. Additionally, the normative data used for comparison to Trait and State Anxiety was collected approximately 20 years ago (Spielberger, 1983) and may no longer be appropriate. However, strength of this study was its inclusion of both inpatients and outpatients, unlike Clark et al.'s (1994) previous HBOT study.

While all the current study's questionnaires revealed good reliabilities for the present sample, there were possible limitations for two specific measures when used on medical samples. Firstly, the ASI included questions regarding physical sensations. In those who are already unwell, question prompts about fear of physical symptoms (e.g. "It scares me when I feel 'shaky' (trembling)") may cue specific fear regarding their illness, rather than the more general construct of Anxiety Sensitivity. To attempt to control for this in further research, investigating information regarding individual perceptions of illness may be necessary. Secondly, because the current sample was a medical sample, there is potential that State Anxiety measured may be representing non-HBOT related anxiety, for example, anxiety surrounding specific fears regarding illness prognosis, HBOT's potential impact on pain levels associated with illness, or other health-related issues.

IMPLICATIONS

The current study was focused on increasing understanding behind psychological distress regarding HBOT, and as a consequence, be able to minimise distress for future HBOT patients. The study was able to provide some understanding by identifying important predictors of State Anxiety before and during HBOT. However, due to the aforementioned limitations extreme caution is needed when making inferences from the findings. Nevertheless, some comments can be made.

Low levels of Trait and State Anxiety may suggest that current practices at Christchurch Hospital's HMU are appropriate for the majority of their patients. However, because of biases in the representation of the sample, it is difficult to comment without valid normative data. The findings may however, tentatively allow for making physicians aware that Expectancy of symptom improvement and Dispositional Anxiety continue to predict State Anxiety after approximately two weeks of treatment.

To advise on screening measures before undergoing HBOT from the predictors that emerged in this study is tempting. Expectancy has the potential to be assessed via four oral questions, but Dispositional Anxiety is more burdensome due to being assessed in this study via two measures. However, without further replication of the current study's

results, and research that addresses the limitations of this study, it is unwise to suggest these clinical changes.

An interesting finding for the current study was the gender differences. At the least, the findings suggest that more research is needed to gain a further understanding of the relationships between gender and HBOT. At the most, the findings suggest women may need an extra element of support on their last HBOT session that men perhaps do not. From a clinical standpoint, it may be of benefit to refer patients, particularly women, back to visit their primary healthcare provider as a function for support. Again, however, the limitations of the current study limit the basis for this inference, and replication is needed to investigate whether this is a unique feature of the present sample.

In summary, this research has attempted to use a NZ sample to provide information to benefit staff at the HMU. Tentatively, individual predictors of State Anxiety before and during HBOT were identified, however lack of methodological strength limits the scope for which to utilise them.

FUTURE RESEARCH

Ideally, for research to influence clinical practice, a number of improvements from the current study would need to be made. Research utilising multiple hyperbaric centres would enhance participation levels, generalisation, and current NZ normative data for HBOT patients. Additionally, the current study used only self-report measures and clinician information and these methods of data collection are not ideal. Future research could benefit from assessing physiological (e.g. blood pressure and heart rate) and behavioural (e.g. BATs) measures of anxiety in conjunction with self-report, including participants rate subjective units of distress immediately before, during and after specified HBOT sessions. Furthermore, the development of an HBOT measure with items particular to issues specified in previous HBOT research may be a valuable tool for physicians assessing patients at risk of experiencing distress.

Research (Anderson & Masur, 1983) has recognised the importance of assessing patients overall medical status. Further HBOT research assessing comprehensive information of medical status and clinical outcome data, and its impact on State Anxiety during HBOT, would be very informative. For example, factors such as pain status, concerns regarding further medical attention, and perceptions of prognosis could be assessed. Additionally, HBOT is a relatively uncommon medical procedure and can be a complete unknown to many patients. Despite this, the changing nature of technology in the medical field means

patients are becoming more tolerant of technological and remarkable machines necessary for treatments. Despite this, it is important to recognise that well-known procedures such as MRIs are still warranting research. Lastly, to further understand the mechanisms behind the relationship of Expectancy of symptom improvement and State Anxiety would be beneficial in the hopes of understanding how this can make patient experiences during HBOT less distressing.

In summary, since there are few studies on psychological distress and HBOT, this study warrants replication with a larger sample size, including more women and a more ethnically diverse sample. Despite the limitations, this study has been able to raise awareness surrounding anxiety experienced by patients undergoing HBOT, and builds on current knowledge of HBOT patient experiences. Research to further understand the mechanisms behind HBOT distress would be valuable for staff and patients alike.

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APPENDICES

1. Hyperbaric Medicine Unit Patient Information Leaflet
2. Clinician's Questionnaire
3. Information Sheet
4. Number of Sessions per Participant and Number of other People in Chamber with participant
5. State-Trait Anxiety Inventory
6. Claustrophobia Questionnaire
7. Anxiety Sensitivity Index
8. Treatment Credibility/Expectancy Questionnaire
9. Consent Form
10. Behavioural Analysis Interview – Script and Outline
11. One Session Exposure Therapy – Script and Outline
12. 17th July Ethics Approval Letter
13. 14th August Ethics Approval Letter
14. Te Komiti Whakarite Approval Letter
15. Correlation Matrix for Whole Sample (with r, n, and p levels)
16. Casewise Deletion Method Correlation Matrix
17. Correlation Matrix for Men/Women (with r, n, and p levels)
18. Ideal Regression Model
19. State Anxiety Change for Women
20. Full Ethnicity and Category Tables
21. Personal Information Sheet

manoeuvre (squeezing the nose and blowing *gently*) can also be effective. A constant check will be kept for any ear problems you may experience both during and after treatments.

Sinus and tooth pain

Sinus or tooth pain may also occur as the pressure increases and it is important that you let the nurse know immediately if you are experiencing any difficulties.

After HBOT some patients experience ear discomfort during normal daily activities. This can be remedied by gently repeating the ear-clearing techniques you have used successfully in the chamber.

Communication

The operator on the outside of the chamber is trained to look after your HBOT and is in constant touch with both the nurse attendant and the doctor in charge of the treatment. He can also see what is happening in the chamber via a video camera at all times. If you require anything, e.g. a drink, visit the toilet, etc., the attendant will advise the chamber operator what is required. Our modern facilities include a toilet in the chamber.

What should I wear?

Because of the increased fire hazard with high oxygen concentrations in the chamber you will need to wear 100% cotton clothing (e.g. cotton T-shirt, jeans or skirt) or change into clothing provided. NO lighters, matches, cigarettes, pens or shoes are allowed in the chamber.

What can I do during the treatment?

It is possible to read, listen to the radio or your favourite cassette/CD or just relax during the treatment. Because you wear an oxygen mask or hood, talking is limited to one or two air breaks during the treatment. At that time, you may also have a drink which is sent in through the medical lock. This is not possible in all treatments.

What are my responsibilities?

- Communicate any concerns/queries to the staff promptly.
- Co-operate with instructions/advice from medical/nursing staff to the best of your ability.
- Smokers – No smoking for 24 hours before and after HBOT.

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Hyperbaric Medicine Unit, Christchurch Hospital
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Canterbury
District Health Board
Te Poari Hauora o Waitaha

Hyperbaric Medicine Unit

Christchurch Hospital
Te Whare Hau o Te Ha Ora

Information for Patients

Canterbury
District Health Board
Te Poari Hauora o Waitaha

Welcome to the Hyperbaric Medicine Unit at Christchurch Hospital. We hope this information will assist in answering any questions you may have concerning your treatment.

What is a Hyperbaric Chamber?

A hyperbaric chamber is a chamber built to withstand increased internal pressure. The chamber at Christchurch Hospital is approximately 4.2 metres long, 2.2 metres wide and 2.1 metres high. It is rectangular in design and divided into a small outer chamber and a larger inner chamber where the daily treatments are conducted. Patients are always accompanied by a nursing attendant.

What is Hyperbaric Oxygen Therapy (HBOT)?

Hyperbaric oxygen therapy is the administration of 100% oxygen in an environment of increased atmospheric pressure. Oxygen is delivered by a mask and valve system or through the use of a head hood system. Its purpose is to provide increased amounts of oxygen to the body. It is effective for a number of different medical and surgical conditions. It can be used either by itself or as an additional therapy with other medical treatments, such as antibiotics, surgery or dressings.

How does it w

The air we breathe nor ·y consists of about 21% oxygen, 79% nitr ·en. During HBOT, the pressure is increas·d two to three times more than normal, and you will breathe 100% oxygen. The combination of the high concentration of oxygen and increased atmospheric pressure causes large amounts of oxygen to be dissolved in your blood and other tissues. There can be as much as 10-15 times the usual tension of oxygen dissolved in the blood and this high tension then drives more oxygen to the rest of your body. As oxygen travels in the blood, it makes new capillary loops and takes all the nutrients in the blood to the area needing healing.

What conditions are treated with HBOT?

A number of different problems have been shown to benefit from HBOT or are under investigation. Some of the most common are decompression illness ('the bends'), carbon monoxide poisoning, non-healing infected wounds (especially in diabetics), radiation injury to bone or soft tissue, and gas embolism.

What will I feel during a treatment?

Once you are in the chamber and the door is closed you will hear the air beginning to circulate as the chamber operator starts a gradual increase in pressure. This is called "compression". There will be an increase in air temperature as the chamber is compressed. However, this will settle when the treatment pressure is reached. A registered nurse, trained in hyperbaric medicine, will remain with you in the chamber throughout the treatment to assist you with any problems. The chamber is pressurised and the treatment managed by a trained operator and a safety supervisor. A hyperbaric doctor is always available in the hospital and may sometimes accompany you.

Side Effects of HBOT

Like all therapies there are potention complications. Your trained hyperbaric team are there to minimise these problems.

- Claustrophobia, anxiety – occasionally.
- Trauma to ear drums, sinuses or teeth due to the pressure – usually mild and easily dealt with.
- Mild rise in blood pressure – not of concern.
- Mild cough and soreness behind the breast bone – uncommon.
- Mild reduction in quality (acuity) of distance vision – only with daily HBOT course over several weeks. Reversible in almost all patients once HBOT ceases.
- Oxygen convulsion – this is like an epileptic fit and is one of very few major complications of HBOT. Convulsion is rare (about 1:10,000 risk) and with proper nursing care, no harm should occur.
- Hyperbaric chambers have an increased fire hazard.

Care of your ears

Before going in the chamber a doctor will examine your ears to look at your ear drums. It is important that if you have any ear problems at all, the doctor and nurse are aware of them before the treatment is started. To help prevent any problems with your ears during the treatment, the nurse will teach you how to "clear" your ears. On descent "swallowing" or sipping a drink will help clear your ears. If swallowing does not help, a "Valsalva"

APPENDIX 2

CLINICIAN QUESTIONNAIRE

Attach patient label:

1. Has this patient had hyperbaric treatment before? (Please circle)

YES NO

2. What is the main condition that this patient is receiving hyperbaric treatment for?

…….

3. What category best describes this condition? (Please tick)

- ❑ Bubble Injury
- ❑ Acute Ischaemic Conditions
- ❑ Infective Conditions
- ❑ Radiation Tissue Damage
- ❑ Problem Wounds
- ❑ Gas Poisoning
- ❑ Ocular Ischemic Pathology
- ❑ Other (specify)
- ❑ Miscellaneous (specify main)

4. What type of head gear will this patient use during their therapy?

MASK HOOD

Date……

APPENDIX 3

INFORMATION SHEET

Coping and Hyperbaric treatment

Date…….

You are invited to participate in a study on how people manage hyperbaric treatment. You have been approached because you are scheduled to have hyperbaric treatment in Christchurch Hospital's Hyperbaric Medicine Unit during 2007 through to early 2008. The purpose of this study is to look at what factors may help staff understand how people cope with the treatment and how reactions to the treatment may change over the treatment period. For a small group of people who become very worried about having the treatment, the study will also look at the usefulness of a brief treatment to manage these worries.

You will be offered to take part in this study at the time of initial assessment with the Hyperbaric Medicine Unit. You will then have time before your first treatment to decide whether or not you would like to participate. Please feel free to discuss this decision with whanau or friends. Participating in this study is entirely voluntary (your choice) and you will receive the standard hyperbaric treatment available. Any information obtained in this study that can be identified with you will remain confidential and will be disclosed only with your permission. By completing the questionnaires, you are consenting to publication of your data as part of the results of the research but no information identifying any patient will be published. All data is stored at the University of Canterbury and will be destroyed after five years. You may withdraw from the study at any time, without giving reason, and this will in no way affect your continuing health care.

Participation means that you will be asked to complete questionnaires about coping in addition to giving some information about yourself. Extra information about

your health condition leading to hyperbaric treatment, and your past use of this treatment, will be provided by the Hyperbaric Medicine Unit staff. If you end up being offered extra help to cope with hyperbaric treatment, you will be asked to attend two extra sessions at the HMU. A voucher to help out with travel will be given to cover the extra time involved.

Please indicate on your consent form whether you would like to receive a copy of the results, however, please note that there may be a significant delay between data collection and publication of results. This study has received ethical approval from the _____ Ethics Committee.

If you have any questions regarding this research please do not hesitate to contact me. You have the option of whanau/support person/s to accompany you to ask questions and/or to understand and complete the study. My email contact is reh35@student.canterbury.ac.nz and mobile number is 027-3555-653. Alternatively, any queries or concerns can be directed to my supervisor, Associate Professor Neville Blampied (Tel. 3642199).

Thank you for your time and participation in this research

Rachel Hodge
Masters Thesis student
University of Canterbury

Associate Professor Neville Blampied
Principal Supervisor
University of Canterbury

APPENDIX 4

Number of other People in Hyperbaric Chamber and Total Number of Sessions

ID #: Date :

HBOT Session	# OTHER people in HC	HBOT Session	# OTHER people in HC
1		21	
2		22	
3		23	
4		24	
5		25	
6		26	
7		27	
8		28	
9		29	
10		30	
11		31	
12		32	
13		33	
14		34	
15		35	
16		36	
17		37	
18		38	
19		39	
20		40	

APPENDIX 5

SELF-EVALUATION QUESTIONNAIRE

Developed by Charles D. Spielberger
in collaboration with
R. L. Gorsuch, R. Lushene, P. R. Vagg, and G. A. Jacobs

STAI Form Y-1

Name _____ Date _____ S ____

Age _____ Sex: M ____ F ____ T ____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle 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. I feel calm	①	②	③	④
2. I feel secure	①	②	③	④
3. I am tense	①	②	③	④
4. I feel strained	①	②	③	④
5. I feel at ease	①	②	③	④
6. I feel upset	①	②	③	④
7. I am presently worrying over possible misfortunes	①	②	③	④
8. I feel satisfied	①	②	③	④
9. I feel frightened	①	②	③	④
10. I feel comfortable	①	②	③	④
11. I feel self-confident	①	②	③	④
12. I feel nervous	①	②	③	④
13. I am jittery	①	②	③	④
14. I feel indecisive	①	②	③	④
15. I am relaxed	①	②	③	④
16. I feel content	①	②	③	④
17. I am worried	①	②	③	④
18. I feel confused	①	②	③	④
19. I feel steady	①	②	③	④
20. I feel pleasant	①	②	③	④

Consulting Psychologists Press, Inc.
3803 E. Bayshore Road • Palo Alto, CA 94303

SELF-EVALUATION QUESTIONNAIRE

STAI Form Y-2

Name _____ Date _____

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

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
21. I feel pleasant	①	②	③	④
22. I feel nervous and restless	①	②	③	④
23. I feel satisfied with myself	①	②	③	④
24. I wish I could be as happy as others seem to be	①	②	③	④
25. I feel like a failure	①	②	③	④
26. I feel rested	①	②	③	④
27. I am "calm, cool, and collected"	①	②	③	④
28. I feel that difficulties are piling up so that I cannot overcome them	①	②	③	④
29. I worry too much over something that really doesn't matter	①	②	③	④
30. I am happy	①	②	③	④
31. I have disturbing thoughts	①	②	③	④
32. I lack self-confidence	①	②	③	④
33. I feel secure	①	②	③	④
34. I make decisions easily	①	②	③	④
35. I feel inadequate	①	②	③	④
36. I am content	①	②	③	④
37. Some unimportant thought runs through my mind and bothers me	①	②	③	④
38. I take disappointments so keenly that I can't put them out of my mind	①	②	③	④
39. I am a steady person	①	②	③	④
40. I get in a state of tension or turmoil as I think over my recent concerns and interests	①	②	③	④

APPENDIX 6

Claustrophobia Questionnaire

	Not at all anxious	Slightly anxious	Mod-erately anxious	Very anxious	Extreme-ly anxious
SS					
(1) Swimming while wearing a nose plug	0	1	2	3	4
(2) Working under a sink for 15 min	0	1	2	3	4
(3) Standing in an elevator on the ground floor with the doors closed	0	1	2	3	4
(4) Trying to catch your breath during vigorous exercise	0	1	2	3	4
(5) Having a bad cold and finding it difficult to breathe through your nose	0	1	2	3	4
(6) Snorkeling in a safe practice tank for 15 min	0	1	2	3	4
(7) Using an oxygen mask	0	1	2	3	4
(8) Lying on a bottom bunk bed	0	1	2	3	4
(9) Standing in the middle of the third row at a packed concert realizing that you will be unable to leave until the end	0	1	2	3	4
(10) In the centre of a full row at a cinema	0	1	2	3	4
(11) Working under a car for 15 min	0	1	2	3	4
(12) At the furthest point from an exit on a tour of an underground mine shaft	0	1	2	3	4
(13) Lying in a sauna for 15 min	0	1	2	3	4
(14) Waiting for 15 min in a plane on the ground with the door closed	0	1	2	3	4
RS					
(1) Locked in a small DARK room without windows for 15 min	0	1	2	3	4
(2) Locked in a small WELL-LIT room without windows for 15 min	0	1	2	3	4
(3) Handcuffed for 15 min	0	1	2	3	4
(4) Tied up with hands behind back for 15 min	0	1	2	3	4
(5) Caught in tight clothing and unable to remove it	0	1	2	3	4
(6) Standing for 15 min in a straitjacket	0	1	2	3	4
(7) Lying in a tight sleeping bag enclosing legs and arms, tied at the neck, unable to get out for 15 min	0	1	2	3	4
(8) Head first into a zipped up sleeping bag, able to leave whenever you wish	0	1	2	3	4
(9) Lying in the trunk of a car with air flowing through freely for 15 min	0	1	2	3	4
(10) Having your legs tied to an immovable chair	0	1	2	3	4
(11) In a public washroom and the lock jams	0	1	2	3	4
(12) In a crowded train which stops between stations	0	1	2	3	4

How *anxious* would you feel in these places or situations? Circle the most appropriate number.

Radomsky, A. S., Rachman, S., Thordarson, D. S., McIsaac, H. K., & Teachman, B. A. (2001). The Claustrophobia Questionnaire. *Anxiety Disorders, 15*, 287-297.

APPENDIX 7

Anxiety Sensitivity Index (Reiss et al., 1986)

Instructions: The statements below describe the thoughts and feelings of some people when they feel anxious. Indicate how each item below applies to you by circling the appropriate number.

Very Little	Little	Some	Much	Very Much
0	1	2	3	4

1. It is important for me not to appear nervous…	0 1 2 3 4
2. When I cannot keep my mind on a task, I worry that I might be going crazy…	0 1 2 3 4
3. It scares me when I feel 'shaky' (trembling)…	0 1 2 3 4
4. It scares me when I feel faint…	0 1 2 3 4
5. It is important to me to stay in control of my emotions…	0 1 2 3 4
6. It scares me when my heart beats rapidly…	0 1 2 3 4
7. It embarrasses me when my stomach growls…	0 1 2 3 4
8. It scares me when I am nauseous…	0 1 2 3 4
9. When I notice that my heart is beating rapidly, I worry that I might have a heart attack…	0 1 2 3 4
10. It scares me when I become short of breath…	0 1 2 3 4
11. When my stomach is upset, I worry I might be seriously ill…	0 1 2 3 4
12. It scares me when I am unable to keep my mind on task…	0 1 2 3 4
13. Other people notice when I feel shaky…	0 1 2 3 4
14. Unusual body sensations scare me…	0 1 2 3 4
15. When I am nervous, I worry that I might be mentally ill…	0 1 2 3 4
16. It scares me when I am nervous…	0 1 2 3 4

APPENDIX 8

Treatment Credibility/Expectancy Questionnaire

We would like you to indicate below how much you believe, *right now*, that the therapy you are receiving will help to reduce your anxiety. Belief usually has two aspects to it: (1) what one *thinks* will happen and (2) what one *feels* will happen. Sometimes these are similar; sometimes they are different. Please answer the questions below. In the first set, answer in terms of what you *think*. In the second set answer in terms of what you really and truly *feel*.

Set I

1. At this point, how logical does the therapy offered to you seem?

1	2	3	4	5	6	7	8	9
not at all logical			somewhat logical				very logical	

2. At this point, how successfully do you think this treatment will be in helping your symptoms?

1	2	3	4	5	6	7	8	9
not at all useful			somewhat useful				very useful	

3. How confident would you be in recommending this treatment to a friend who experiences similar problems?

1	2	3	4	5	6	7	8	9
not at all confident			somewhat confident				very confident	

4. By the end of the therapy period, how much improvement in your symptoms do you think will occur?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Set II

For this set, close your eyes for a few moments, and try to identify what you really *feel* about the therapy and its likely success. Then answer the following questions.

1. At this point, how much do you really *feel* that therapy will help you to reduce your symptoms?

1	2	3	4	5	6	7	8	9
not at all				somewhat				very much

2. By the end of the therapy period, how much improvement in your symptoms do you really *feel* will occur?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

APPENDIX 9

CONSENT FORM
Coping and Hyperbaric treatment

Researchers:	Rachel Hodge	03 364 2987 ext 3400/027 3555 653
	Associate Professor Neville Blampied	033642199/021 022 8287
	Dr Lois Surgenor	03 372 0400
	Dr Mike Davis	03 364 0045

Project explained by Rachel Hodge Project role: Master of Science

Date……. Signature……..

- I understand that I need to be competent in spoken and written English to participate in this project.
- I have read and I understand the information sheet dated _____ for volunteers taking part in the study designed to investigate coping with hyperbaric treatment. I have had the opportunity to discuss this study. I am satisfied with the answers I have been given.
- I have had the opportunity to use whanau support or a friend to help me ask questions and understand the study.
- I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without having to give a reason and this will in no way affect my continuing health care.
- I understand that my participation in this study is confidential and that no material which could identify me will be used in any reports on this study.
- I have had time to consider whether to take part.
- I know whom to contact if I have any side effects or have any questions about the study.
- I wish to receive a summary of the results YES NO

I _____ (full name) hereby consent to take part in this study.

Date…….

- I consent to the researcher, Rachel Hodge, her supervisors Associate Professor Neville Blampied and Dr Lois Surgenor, to have access to my medical records for information that is related to the purpose of this study.

Date……. Signature……...

APPENDIX 10

Behavioural Analysis Interview (BAI)
SCRIPT

Black – background information **Bold – my verbal script**

The BAI is a screening interview and its purpose is to establish whether or not the patient fulfilled the criteria necessary, and to do the BATs. It is a semi-structured interview based on Öst's (1989, 1997) instructions and using questions based from the Interview Guide for Evaluating DSM-IV disorders (First, Gibbon, Spitzer, & Williams, 2002).

Establish rapport with patient **– engage in small talk.**

Overview:
The purpose of today's session is to have a chat about yourself and how you're feeling. It is also to give you some information about the extra help we are offering. First, I will ask you some questions about yourself, and about your worries and thoughts concerning the hyperbaric treatment you are going to receive at the hospital. We'll then chat a bit about the help we are offering. If at any stage in both our sessions together you decide you don't want to carry on, this is absolutely fine and this will not affect your medical care in any way, ok? Do you have any questions?

I will be writing down a few notes as we go along today, just as a reminder for me. So please bear with me as I write.

My Prompt
- Investigate their catastrophic beliefs – note down their CBs and investigate these as much as possible.
- "What do you think will happen if you encounter your feared situation?" i.e. feelings/sensations, images, physical behaviours. Think about their reactions; self-report, behavioural, and physiological.
- Get participant to tell you their CBs and to make predictions about what might happen in their feared situations. Note these down.
- Summarise what they tell me so make it clear what their CBs are.

If they are having problems identifying their anxious thoughts, ask them to imagine being in an enclosed space with no escape and to then tell you what they would think might happen and how they think they may feel.

First I want to ask you some questions about yourself; just to get an understanding of your worries and where you're at.

1. **I noticed from your questionnaires that you have a few worries about some situations; can you tell me about these?**
    a. **Are you afraid of closed places and confined situations? (Ask this question if they have not already mentioned this)**
2. **I'd like to get more specific about your worries you have mentioned, for instance,**
    a. **Which situations do you feel worried about? E.g. closets, elevators, toilets.**
    b. **Did you always feel frightened when you were confronted with [closed/confined or aforementioned situations]?**
    c. **Do you remember when first started feeling this way?**
3. **What were you afraid would happen or what are you afraid will happen, when you are confronted with [closed/confined or aforementioned situations]?**
    a. **How strong are these feelings when you encounter these situations?**
    b. **If you can't get away from these situations, what do you think would happen?**
    c. **What is the worst thing that might happen to you in these situations?**
    d. **How certain are you that the worst thing will happen to you, give me your certainties in differing situations.**
    e. **Have you ever been in a confined place where you felt frightened?**
4. **These worries you have (e.g. faint), have they ever happened before?**
    a. **Do you know what it is like for this to happen to you?**
5. **Did you or do you think that you were more afraid of [closed/confined or aforementioned situations] than you should have been or should be?**
6. **Did you or do you go out of your way to avoid [closed/confined or aforementioned situations]?**
    a. **How often will you avoid the situation? i.e. every time, sometimes, etc.**
7. **Are there things you didn't do or you don't do because of this fear, which you would have otherwise done or do? If so, what are these?**
8. **How are these (and have these) worries/fears interrupting and/or interfering with your daily life?**
    a. **Have you noticed any good things that come out of you having these worries [positive consequences]?**
    b. **Can you think of anything in particular that might be negative if you didn't worry about [confined places/feared situation]?**

Assessing Suitability for Treatment (Öst, 1989)

Inclusion and Exclusion Criteria:

a. The patient must have scored above the cut-off score 43 on the Claustrophobic Questionnaire

[Refer to participant's questionnaire booklet and re-check what their CLQ score was].
As I've said, we've asked you to come along today because from your questionnaires, I can see that there are some situations that you are worried about.

From this, we believe that you might benefit from receiving some help from us before you have your hyperbaric treatment.

b. The phobia should be monosymptomatic and only concern one specific situation or object

This should have been established via the above questions, specifically under 2a (which situations?). Thus, the participant should be specifically worried either about the hyperbaric chamber, or closed and confined spaces [situation].

c. The patient must be motivated enough to get rid of his/her phobia and be prepared to tolerate a possibly high level of anxiety over a rather long time

Something that is important in making sure you benefit from our extra sessions is for you to be ready and willing to help yourself.

- **How prepared are you to try to change how you think about hyperbaric treatment and the chamber?**

Also, there is a possibility that you may feel quite nervous at times throughout our session, which may take a wee while.

- **Are you ok with this possibility?**

d. There must be no predictable negative consequences if phobia treatment is successful

This question should have been answered during the earlier questioning – in number 8.

Rationale (Öst, 1997)

The extra help that we want to offer you is like an introduction exercise and I just want to give you a quick explanation as to what it's about. Our purpose is for you to be able to undergo hyperbaric treatment and to feel ok about doing that. Together we'll go through a few practical steps that will help you become more comfortable with the chamber. The reasons that we are going to use this particular exercise is; (1) it is a quick, effective approach that we can do together here at HMU using the actual chamber, (2) it's been shown to be a really good way for helping people who are worried about enclosed places and, (3) is a way to introduce the hyperbaric chamber to you in a controlled and non-threatening way.

Another part of this exercise that is important in helping you to overcome your worries is that it helps you learn new information about what will happen when you enter the chamber. Some usual concerns of people who have a fear of enclosed places can be worries about being trapped or having a lack of fresh air. This exercise will help you to learn new information about these worries and may change possible misconceptions you may have about enclosed situations. As I understand, you have avoided these types of situations in the past, and by avoiding these situations you essentially are not seeing whether or not these worries that you have,

are coming true or not. So, to just summarise that, this exercise works in 2 ways: first, we are going to gradually introduce to the chamber so you feel more comfortable, and second, while doing this, we are going to test out your worries in order to get new information to about them.

A really important point I want you to know is that this exercise is very different from being out in the real world because it's planned, gradual, and controlled. When you come across these situations in everyday life, they are generally quite uncontrolled. For example, think about getting into a hot bath. Compare getting thrown in the water all in one go as compared to getting in bit by bit, toe by toe. When you have no control over it you may panic, you may be shocked by the hot water and have intense pain (like your worries about being in the chamber). But by gradually getting in the hot water you can let your body adjust bit by bit to the hot water. Same goes for this; we will take you step by step getting "adjusted" to the hyperbaric chamber. We gradually will test out your worries together, and you will decide how far we go at each step ok?

Lastly, I do want to let you know that this exercise may not make you completely "worry-free" in terms of enclosed spaces, but it is a start for you to build upon. It should help give you some skills to be able to try to deal with situations you worry about in everyday life after you leave here.

Pre-Treatment Instructions (Öst, 1997)

We're now coming to the end of our session today, but before we finish I'm going to go over some instructions that will be helpful for when we do the exercise. It is important for both of us and your success that we try and follow these.

1. **Firstly, teamwork is important in carrying out this exercise and we're going to do this together. Both you and I have equal responsibility for achieving a good result. Is this ok?**

2. **Next, I want to emphasise again that I will never do anything unplanned during the exercise; this is not a "shock" therapy. Instead, I will describe to you what will happen, and then demonstrate it myself, and finally will get your permission to do it. Only with your permission will you be asked to try out anything I've demonstrated. Ok?**

3. **Because I understand that you may be worried about being nervous, I want you to think about the most frightening and worried situation that you have ever experienced in relation to enclosed places. Call this your "personal record of anxiety" and give it a maximum score of 10 on a 0-10 anxiety scale. I want you to know that because this introduction exercise is gradual, you will not break your "personal record of anxiety". Ok?**

4. **Finally, I want you to know that a high level of anxiety is not a goal in itself, but can be considered a consequence. However, you will probably experience less anxiety than you expect. What is important however is that you give me a commitment that we will stay in the situation until you feel comfortable? Is this ok?**

Do you have any questions?

Behavioural Avoidance Tests (BATs)

Ok, the last thing we're going to do before we finish is to see how you feel when I ask you to approach and enter the chamber, and how you feel when asked to try on the head gear. I will let you know what I'd like you to try to do as we go along, but I do want you to know that you don't have to do any more of this than you want to. If you don't even want to go in the chamber yet, that is ok, and if you want to stop at any time, that is ok too.

1. "Approach Test".

The first of our assessments is going to be approaching and standing in the doorway of the chamber. You may find you have no trouble doing this, or you may find it quite stressful. Either is ok. I will be asking your anxiety score, which is your 0 to 10 on your anxiety scale, at various times ok? Are you ready to start?

a. Participant is to stand 3 metres from the door and rate their anxiety using the SUDs ratings.
b. Participant is to stand 1.5 metres from the door and rate their anxiety using the SUDs ratings.
c. Participant is to stand at the outer doorway and rate their anxiety using the SUDs ratings.
d. Participant is to stand at the inner doorway and rate their anxiety using the SUDs ratings.

There will be two scores:

- The time they spend in the foyer will be their first score (i.e. max. is 3mins)
- They will also be asked to rate their SUDs at every 30 seconds; from 0 seconds to 180 seconds.

2. **"Mask/Hood Test"**

Lastly, I am now going to ask you to wear the mask and then the hood for as long as you feel comfortable, up to 5 minutes. Again, I will also be asking you to rate your anxiety score at different periods through these 5 minutes. Ok?

a. The patient will be asked to wear the mask for up to 5 minutes. The participant's first score will be their time. They will also be asked to rate their SUDs at every 30 seconds.
b. The patient will be asked to wear the hood for up to 5 minutes. The participant's first score will be their time. They will also be asked to rate their SUDs at every 30 seconds.

That's really great; we will be doing those again after the exercise session. Are you feeling ok and do you have any questions?

APPENDIX 11

OUTLINE OF ONE-SESSION EXPOSURE THERAPY Adapted Version
(Öst, 1989, 1997)

Focus of treatment – to reduce the patient's anxiety regarding hyperbaric treatment.

SUMMARY

The first step in the procedure is the Behavioural Analysis Interview (see Appendix 10). This interview is to establish whether or not the patient fulfils the criteria necessary to be included in the study, as well to conduct the behavioural avoidance tests.

Outline of therapy:
- Pre-session behavioural analysis to determine suitability for treatment.
- Exposure situation involves a set of behavioural tests regarding phobic stimulus.
- Patient makes a commitment to remain in the exposed situations until their anxiety subsides.
- Patient is encouraged to approach stimulus as much as possible and remain until their anxiety goes away.
- The therapy session is not ended until the anxiety level has been reduced by at least 50%, or has completely gone.
- Therapist will demonstrate first then gradually involve patient.

Goals of therapy:
1. For patient to manage in natural situations after treatment.
2. The therapist wants the patient to achieve (this goal is not communicated to the patient because of the potential to not turn up for treatment and to prevent rumination).

Rationale of therapy:
Therapist will outline clearly:
- Exposure is controlled, planned and gradual and what they fear will happen does not occur; and
- The session is a *start* and the patient is expected to continue their own treatment by exposing themselves in everyday situations.

Instructions of therapy:
Emphasis is on:
- Teamwork and hard work between patient and therapist;
- No unplanned situations;
- Patient permission is always sought; and
- Anxiety will not exceed anything previously experienced.

Intervention Steps

Go through very quickly how the door locks.

Thanks for coming along today, how are you doing? [Small talk] **Before we start today/now I want to quickly go over a few things we talked about in our previous session we had together recently. Our purpose is to introduce you to hyperbaric treatment in a controlled way, so we can try and learn some new information about what might happen when you have your hyperbaric treatment. Our final goal is for you to be able to undergo hyperbaric treatment and to feel ok about doing that, does that make sense?**

Rationale & Instructions Reiteration:

- **So, can you tell me what you understand today's session is about?**

Quick, effective way to help
We can use actual chamber
It's getting you used to the chamber slowly and gradually
Helps teach you new information

- **Also, can you remember the instructions that are helpful for us that we talked about in our previously? For instance, the emphasis on teamwork, no unplanned situations, and permission.**

Teamwork and equal responsibility
Nothing unplanned, permission always sought
Reiterate anxiety ratings
Expect some anxiety – probably less than you anticipate

Last minute instructions:

And lastly, before we start, today we are going to check out your worries we talked about at our last session/just before by trying out some situations that might make you nervous, and attempting to stay there until you feel more comfortable. You and I need to be completely honest with each other, and it would be really helpful for you to think "let's give it a go and see what happens in these situations". As I have said, you will not be asked to do anything without your permission, and each practical step will be gradual. Remember how we talked about your anxiety score being out of 10; with 10 being the most scared you've ever been in enclosed spaces? Well, I will be asking you for your current anxiety scores regularly throughout the session and for my memory's sake I need to note these down, so please bear with me while I do that. Last but not least, I want you to chat to me about how you're feeling, and what you are thinking as we go through our session. So, do you have any questions before we start and are you ready to begin?

If yes – ask for their first anxiety rating.
If no – what is it you are feeling hesitant about?

The following steps will have to be modified for participants who may be in wheelchairs.

1. The patient is to take a peek in the open door of the HC, but not to enter.

    - The patient may want to know how the lock works to be sure about how it is opened from inside

    - The first task is to take a peek in the open door of the HC, but not to enter.
        - Please give me your SUDs rating right now
    - I will now do this myself and you just need to watch (do task).
    - Do I have your permission to ask for you now to do this task?
        - Please give me your SUDs rating
    - Please will you now take a peek in the open door of the HC, but not to enter.
        - [When task is finished] Please give me your SUDs rating

2. Then the patient is encouraged to enter the HC with the therapist and close the door.

    - If they want to, the patient can exit

    - The second task is to enter the HC with me and to close the door.
        - Please give me your SUDs rating right now
    - I will now do this myself and you just need to watch (do task).
    - Do I have your permission to ask for you now to do this task?
        - Please give me your SUDs rating
    - Please will you now enter the HC with me and close the door.
        - [When task is finished] Please give me your SUDs rating

3. The next step is to enter the HC with the therapist and close the door and sit down and stay there for a while.

    - While the patient is inside the therapist prompts him/her to constantly talk aloud and verbalise what and how he/she is doing and feeling. In this way tendencies to cognitive avoidance are greatly reduced.
    - After a while the patient may want to exit and talk with the therapist about the experience.

    - The third task is to enter the HC with me and to close the door and sit down, but this time to remain here for a while.
        - Please give me your SUDs rating right now
    - I will now do this myself and you just need to watch (do task).
    - Do I have your permission to ask for you now to do this task?
        - Please give me your SUDs rating
    - Please will you now enter the HC with me, close the door and sit down and remain with me for a while.
        - [When task is finished] Please give me your SUDs rating

4. The next step is for the patient to enter the HC again with the therapist, close the door, sit down, and stay there longer than before.

    - While the patient is inside the therapist prompts him/her to constantly talk aloud and verbalise what and how he/she is doing and feeling. In this way tendencies to cognitive avoidance are greatly reduced.

    - The fourth task is to enter the HC again with me, sit down, and to close the door and remain there longer than before.
        - Please give me your SUDs rating right now
    - I will now do this myself and you just need to watch (do task).
    - Do I have your permission to ask for you now to do this task?
        - Please give me your SUDs rating
    - Please will you now enter the HC with me, close the door, sit down, and remain there longer than last time.
        - [When task is finished] Please give me your SUDs rating

    - Ask patient to make conclusions on their catastrophic belief predictions

5. The next step is to enter and sit in the HC with the door closed with the therapist. This time the technician will simulate chamber noise.

Patient is to be told they will be feeling a change in pressure when they next enter. They will be taught the exercises used during hyperbaric treatment to clear the pressure in one's ears.

- The next step is to enter and sit in the HC with the door closed with therapist. This time the technician will simulate chamber noise.
    - Please give me your SUDs rating right now
- I can do this first with you watching, or we can do it together?
- Do I have your permission to ask for you now to do this task?
    - Please give me your SUDs rating
- Please will you now enter and sit in the HC with the door closed with me. This time the technician will simulate chamber noise.
    - [When task is finished] Please give me your SUDs rating

6. The next step is to enter and sit in the HC with the door closed. This time the door will be locked and the technician will put the pressure to approximately a ½m.

    - The next step is to enter and sit in the HC with the door closed with therapist. This time the door will be locked and the technician will give the chamber a tiny bit of pressure.
        - Please give me your SUDs rating right now
    - I can do this first with you watching, or we can do it together?
    - Do I have your permission to ask for you now to do this task?
        - Please give me your SUDs rating

- Please will you now enter and sit in the HC with the door closed with therapist. This time the door will be locked and the technician will give the chamber a tiny bit of pressure.
- [When task is finished] Please give me your SUDs rating

7. The next step is to enter and sit in the HC with the door closed. This time the door will be locked and the technician will put the pressure to approximately 2m. Exercises will be necessary.

- The next step is to enter and sit in the HC with the door closed with therapist. This time the door will be locked and the technician will give the chamber a bit more pressure than last time and we will remain here for a few minutes.
    - Please give me your SUDs rating right now
- I can do this first with you watching, or we can do it together?
- Do I have your permission to ask for you now to do this task?
    - Please give me your SUDs rating
- Please will you now enter and sit in the HC with the door closed with therapist. This time the door will be locked and the technician will give the chamber a bit more pressure than last time and we will remain here for a few minutes.
- [When task is finished] Please give me your SUDs rating

8. The next step for the patient is to begin to wear the headgear for a short while.

This is to be done over by the bed area, with participants sitting or standing as appropriate.

a. The patient is to put on the mask [hood] for a few moments without it being properly done up, and then can take it off straight away.

- The patient is to put on the mask [hood] for a few moments without it being properly done up, and then can take it off straight away if they like.
    - Please give me your SUDs rating right now
- I will now do this myself and you just need to watch (do task).
- Do I have your permission to ask for you now to do this task?
    - Please give me your SUDs rating
- Please will you now put on the mask [hood] for a few moments without it being properly done up, and then can take it off straight away if you like.
- [When task is finished] Please give me your SUDs rating

b. The patient is to put the mask [hood] on and do it up properly. They can take it off after a short while if they like.

- The patient is to put on the mask [hood] and do it up properly. They can take it off after a short while if they like.
    - Please give me your SUDs rating right now
- I will now do this myself and you just need to watch (do task).

- Do I have your permission to ask for you now to do this task?
    - Please give me your SUDs rating
- Please will you now put on the mask [hood] and do it up properly. You can take it off after a short while if you like.
- [When task is finished] Please give me your SUDs rating

c. The patient is to put the mask [hood] on and do it up properly and leave it on for a few minutes.
    - While the patient is wearing the mask the therapist prompts him/her to constantly talk aloud and verbalise what and how he/she is doing and feeling. This may not be possible with the headgear, thus when the headgear comes off the patient is to talk about how they felt and did.

- The patient is to put on the mask [hood] and do it up properly and leave it on for a few minutes.
    - Please give me your SUDs rating right now
- I can do this first if you like, and you just need to watch (do task), or you can do it now.
- Do I have your permission to ask for you now to do this task?
    - Please give me your SUDs rating
- Please will you now put on the mask [hood] and do it up properly and leave it on for a few minutes.
- [When task is finished] Please give me your SUDs rating

How are you feeling? What does it feel like? Is your breathing ok? Is there anything worrying you at the moment?

d. Repeat steps a) to c) with the hood.

9. Then the patient will go through a series of steps that combine time in the HC as well as wearing the headgear for a set amount of time. They will be using the headgear that they will be using for their HBOT sessions.

- The therapist and the participant are to talk about the participant's catastrophic thoughts after each step.

a. The patient is to enter the HC and then put the headgear on briefly, but not to attach it to the oxygen system. They do not need to close the door and they may exit when they wish.

- The patient is to enter the HC, sit down, and then put the headgear on briefly, but not to attach it to the oxygen system. They do not need to close the door and they may exit when they wish.
    - Please give me your SUDs rating right now
- I can do this first if you like, and you just need to watch (do task), or you can do it now.

- Do I have your permission to ask for you now to do this task?
    - Please give me your SUDs rating
- Please will you now enter the HC and sit down and put the headgear on. You do not need to close the door and you may exit when you wish.
- [When task is finished] Please give me your SUDs rating

b. The patient is to now enter the HC and close the door, then put on the headgear and attach it to the oxygen system and sit there for a wee bit (without actual oxygen).

- The patient is to now enter the HC and close the door, then put the headgear on and therapist will attach it to the oxygen system. The patient is to sit there for a wee bit (without actual oxygen).
    - Please give me your SUDs rating right now
- I can do this first if you like, and you just need to watch (do task), or you can do it now.
- Do I have your permission to ask for you now to do this task?
    - Please give me your SUDs rating
- Please will you now enter the HC and close the door, put the headgear on and I'll attach it to the oxygen system and you can sit there for a wee bit. You won't be getting actual oxygen.
- [When task is finished] Please give me your SUDs rating

c. The patient is to now enter the HC and close the door, then put on the headgear and attach it to the oxygen system and sit there for a few minutes. This time the technician will release oxygen.

- The patient is to now enter the HC and close the door, then put the headgear on and therapist will attach it to the oxygen system. The technician will release oxygen and the patient is to sit there for a few minutes.
    - Please give me your SUDs rating right now
- I can do this first if you like, and you just need to watch (do task), or you can do it now.
- Do I have your permission to ask for you now to do this task?
    - Please give me your SUDs rating
- Please will you now enter the HC and close the door, then put the headgear on and I will attach it to the oxygen system. The technician will release oxygen and you are to sit there for a few minutes.
- [When task is finished] Please give me your SUDs rating

10. The final goal is that the patient should be able to stay inside the locked HC wearing their headgear, fully attached with oxygen and with the chamber at a small pressure, for approximately 10 minutes with a maximum Subjective Units of Disturbance rating of 20 (this may be adjusted depending on the level of the patient's initial anxiety).

- The last step if for the patient to enter the HC and close the door, then the therapist will attach their headgear to the oxygen system. The technician will release oxygen and give the chamber a small feeling of pressure. The patient is to sit there for approximately 10 minutes with the therapist.
    - Please give me your SUDs rating right now
- We will do this together now.
- Do I have your permission to ask for you now to do this task?
    - Please give me your SUDs rating
- Please will you now enter the HC and close the door, and then I will attach your headgear to the oxygen system. The technician will release oxygen and give the chamber a small feeling of pressure. We are to sit here for approximately 10 minutes together.
- [When task is finished] Please give me your SUDs rating

Final step – The participant will be encouraged to continually expose him or herself post-treatment.

Lastly, I do want to let you know that today may not make you completely "worry-free" in terms of enclosed spaces, but it is a start for you to build upon. Although obviously you will not be able to practice on hyperbaric chambers in the future, when you come across situations that you're worried about, I'd like you to try to use the skills you have learnt today to deal your worries and the situation. Are there any situations that you can see yourself avoiding and that you now might try and face? I.e. perhaps lifts, crowded places, goggles? *Talk about future situations.*

The last thing we are going to do is to repeat the assessments we did at our previous session, so we can see the difference from before today's session. Also, just before you leave I am going to give you the same set of questionnaires that you filled in previously we had. You will need to bring it completed to your first HBOT session.

Do BATs, and then give the participant the questionnaire booklet.

Thanks so much for your hard work today, you've done really well. How are you feeling?

Together with the participant, talk about their anxieties before the therapy started, and compare to how they are feeling now. Go through how their anxieties changed step by step, as well as showing them the comparisons on their BATs. Hopefully, these should show that their avoidance behaviours have improved. Get the participant as involved as possible in making these comparisons.

Thank them again for their hard work and go over with them when they will have their first hyperbaric session.

APPENDIX 12

Health and Disability Ethics Committees

Upper South B Regional Ethics Committee
Ministry of Health
4th Floor, 250 Oxford Terrace
PO Box 3877
Christchurch
Phone [redacted]
Fax [redacted]

17 July 2007

Ms Rachel Hodge
Christchurch Hospital
318 Two Chain Road
R. D. 5
Rolleston
Christchurch

Dear Ms Hodge

Ethics Ref: URB/07/07/023
Coping during hyperbaric treatment: Predictors and Intervention
Investigators: R Hodge, A/Prof N Blampied, Dr L Surgenor, Dr M Davis

Thank you for the above application which was considered by the Upper South B Regional Ethics Committee at its meeting on 9 July 2007 and approved subject to the following conditions.

Information Sheet

1. Please include a statement that this is a research project for a Master's thesis.

2. Please include the appropriate ACC statement relevant to Form A (as per the recommended Guidelines) as follows:

   "In the unlikely event of a physical injury as a result of your participation in this study, you may be covered by ACC under the Injury Prevention, Rehabilitation and Compensation Act. ACC cover is not automatic and your case will need to be assessed by ACC according to the provisions of the 2002 Injury Prevention Rehabilitation and Compensation Act. If your claim is accepted by ACC, you still might not get any compensation. This depends on a number of factors such as whether you are an earner or non-earner. ACC usually provides only partial reimbursement of costs and expenses and there may be no lump sum compensation payable. There is no cover for mental injury unless it is a result of physical injury. If you have ACC cover, generally this will affect your right to sue the investigators.

   If you have any questions about ACC, contact your nearest ACC office or the investigator."

Appendix 4

3. The committee requests clarification of the relevance of income to the study

Health and Disability Ethics Committees

Upper South B Regional Ethics Committee
Ministry of Health
4th Floor, 250 Oxford Terrace
PO Box 3877
Christchurch
Phone (03) 372 3018
Fax (03) 372 1015

Please forward your response in letter format with amended documents to the Committee administrator. Your response will be reviewed by a Committee member and if the above points have been addressed to their satisfaction, final ethical approval will be given by the Chairperson under delegated authority.

If you have any queries, please contact me.

Yours sincerely

Di Rutledge

Di Rutledge
Upper South B Regional Ethics Committee Administrator

APPENDIX 13

Health and Disability Ethics Committees

Upper South B Regional Ethics Committee
Ministry of Health
4th Floor, 250 Oxford Terrace
P.O. Box 3877
Christchurch
Phone: 03 377 3018
Fax: 03 377 1018

14 August 2007

Ms Rachel Hodge
318 Two Chain Road
R. D. 5
Rolleston
Christchurch

Dear Ms Hodge

Ethics Ref: URB/07/07/023
Coping during hyperbaric treatment: Predictors and Intervention
Investigators: Ms Rachel Hodge, Assoc. Professor Neville Blampied, Dr Lois Surgenor, Dr Mike Davis
Locality: Christchurch Hospital, Canterbury University

The above study has been given ethical approval by the Upper South B Regional Ethics Committee. A list of members of this committee is attached.

Approved Documents
Information Sheet version 2
Consent Form version 2
Appendix A
Appendix B
Appendix E
Appendix F

Certification
The Committee is satisfied that this study is not being conducted principally for the benefit of the manufacturer or distributor of the medicine or item in respect of which the trial is being carried out.

Accreditation
The Committee involved in the approval of this study is accredited by the Health Research Council and is constituted and operates in accordance with the Operational Standard for Ethics Committees, April 2006.

Final Report
The study is approved until 31 August 2008 . A final report is required at the end of the study. The report form is available on http://www.newhealth.govt.nz/ethicscommittees and should be forwarded along with a summary of the results. If the study will not be completed as advised, please forward a progress report and an application for extension of ethical approval one month before the above date.

Requirements for SAE Reporting
The Principal Investigator will inform the Committee as soon as possible of the following:

- Any related study in another country that has stopped due to serious or unexpected adverse events
- withdrawal from the market for any reason
- all serious adverse events occurring during the study in New Zealand which result in the investigator breaking the blinding code at the time of the SAE or which result in hospitalisation or death.
- all serious adverse events occurring during the study worldwide which are considered related to the study medicine. Where there is a data safety monitoring board in place, serious adverse events occurring outside New Zealand may be reported quarterly.

All SAE reports must be signed by the Principal Investigator and include a comment on whether he/she considers there are any ethical issues relating to this study continuing due to this adverse event. It is assumed

Health and Disability Ethics Committees

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Ministry of Health
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Christchurch
Phone (03) 372 3018
Fax (03) 372 1015

by signing the report, the Principal Investigator has undertaken to ensure that all New Zealand investigators are made aware of the event.

Amendments
All amendments to the study must be advised to the Committee prior to their implementation, except in the case where immediate implementation is required for reasons of safety. In such cases the Committee must be notified as soon as possible of the change.

Please quote the above ethics committee reference number in all correspondence.

The Principal Investigator is responsible for advising any other study sites of approvals and all other correspondence with the Ethics Committee.

It should be noted that Ethics Committee approval does not imply any resource commitment or administrative facilitation by any healthcare provider within whose facility the research is to be carried out. Where applicable, authority for this must be obtained separately from the appropriate manager within the organisation.

Yours sincerely

Di Rutledge

Di Rutledge
Upper South B Regional Ethics Committee Administrator
Email: di_rutledge@moh.govt.nz

APPENDIX 14

Te Komiti Whakarite
Annette Finlay
Level 1
33 St Asaph St
Private Bag 4710
Christchurch

Rachel Hodge
318 Two Chain Rd
RD 5
Rolleston
CHRISTCHURCH

Tena koe Rachel,

Thank you for submitting your study: *Psychological Distress During Hyperbaric Treatment: Assessment and Interventio*, to Te Komiti Whakarite.

Te Komiti Whakarite have reviewed this study and would like to have ethnicity data collected, we advise the use of the 2001 census ethnicity data question.

Some Maori may request that a whanau (family) member or friend to be present while the explanation occurs, and that the side effects of treatment should be confirmed with them that they clearly understand that this may occur. The patient and/or whanau may also request to carry out Karakia (prayers) before each investigation takes place.

The findings from this project may contribute to the development of future research hypotheses or projects and it is important that you disseminate your findings to the Maori community, I would be happy to assist you with contacts if required. I am also happy to be named as the contact person for the committee.

We wish you well with your study

Naku noa

Na Annette Finlay
Chairperson
Te Komiti Whakarite

APPENDIX 15

	age	sex	p HBOT	trait	CLQ	CLQ RS	CLQ SS	CEQ Exp	CEQ Cre	CEQ Tot	ASI	State 1	State 2	State 3	Tot # ses	avg # HC	SA Change	DisAnx
age	1.00	0.00	-0.25	-0.06	-0.04	-0.11	0.03	0.20	**0.44**	0.36	0.08	-0.01	-0.10	-0.10	-0.19	-0.14	0.15	0.03
	N=24	N=24	N=24	N=24	N=24	N=24	N=24	N=24	**N=24**	N=24	N=24	N=24	N=20	N=21	N=23	N=23	N=21	N=24
	p= ---	p=.989	p=.242	p=.799	p=.856	p=.621	p=.897	p=.360	**p=.033**	p=.080	p=.706	p=.967	p=.683	p=.654	p=.397	p=.520	p=.513	p=.892
sex	0.00	1.00	**-0.45**	0.35	**0.41**	0.32	**0.46**	-0.08	-0.11	-0.11	0.25	0.17	0.35	**0.53**	-0.12	0.00	-0.36	0.30
	N=24	N=24	**N=24**	N=24	**N=24**	N=24	**N=24**	N=24	N=24	N=24	N=24	N=24	N=20	**N=21**	N=23	N=23	N=21	N=24
	p=.989	p= ---	**p=.027**	p=.096	**p=.048**	p=.128	**p=.024**	p=.712	p=.600	p=.606	p=.245	p=.429	p=.129	**p=.014**	p=.586	p=.982	p=.106	p=.151
prev HBOT	-0.25	**-0.45**	1.00	0.00	0.11	0.10	0.11	-0.16	0.02	-0.08	0.25	0.24	0.10	-0.15	**0.46**	-0.04	0.40	0.16
	N=24	**N=24**	N=24	N=24	N=24	N=24	N=24	N=24	N=24	N=24	N=24	N=24	N=20	N=21	**N=23**	N=23	N=21	N=24
	p=.242	**p=.027**	p= ---	p=.987	p=.605	p=.639	p=.601	p=.442	p=.922	p=.696	p=.243	p=.260	p=.662	p=.505	**p=.028**	p=.858	p=.069	p=.463
trait	-0.06	0.35	0.00	1.00	0.35	0.28	0.38	-0.19	-0.08	-0.16	**0.78**	0.28	**0.61**	0.30	-0.03	0.32	-0.12	**0.92**
	N=24	N=24	N=24	N=24	N=24	N=24	N=24	N=24	N=24	N=24	**N=24**	N=24	**N=20**	N=21	N=23	N=23	N=21	**N=24**
	p=.799	p=.096	p=.987	p= ---	p=.096	p=.183	p=.065	p=.383	p=.695	p=.463	**p=.000**	p=.186	**p=.004**	p=.183	p=.888	p=.138	p=.606	**p=.000**
CLQ	-0.04	**0.41**	0.11	0.35	1.00	**0.96**	**0.96**	-0.11	-0.23	-0.19	0.40	0.18	0.40	**0.48**	-0.15	0.28	-0.20	0.40
	N=24	**N=24**	N=24	N=24	N=24	**N=24**	**N=24**	N=24	N=24	N=24	N=24	N=24	N=20	**N=21**	N=23	N=23	N=21	N=24
	p=.856	**p=.048**	p=.605	p=.096	p= ---	**p=.000**	**p=.000**	p=.621	p=.282	p=.367	p=.053	p=.408	p=.077	**p=.028**	p=.486	p=.204	p=.377	p=.052
CLQ RS	-0.11	0.32	0.10	0.28	**0.96**	1.00	**0.84**	-0.10	-0.30	-0.23	0.27	0.08	0.35	**0.50**	-0.22	0.28	-0.29	0.29
	N=24	N=24	N=24	N=24	**N=24**	N=24	**N=24**	N=24	N=24	N=24	N=24	N=24	N=20	**N=21**	N=23	N=23	N=21	N=24
	p=.621	p=.128	p=.639	p=.183	**p=.000**	p= ---	**p=.000**	p=.653	p=.160	p=.289	p=.202	p=.724	p=.130	**p=.021**	p=.304	p=.193	p=.201	p=.170
CLQ SS	0.03	0.46	0.11	0.38	**0.96**	**0.84**	1.00	-0.11	-0.15	-0.15	**0.49**	0.26	0.43	0.43	-0.07	0.25	-0.12	**0.47**
	N=24	N=24	N=24	N=24	**N=24**	**N=24**	N=24	N=24	N=24	N=24	**N=24**	N=24	N=20	N=21	N=23	N=23	N=21	**N=24**
	p=.897	p=.024	p=.601	p=.065	**p=.000**	**p=.000**	p= ---	p=.619	p=.493	p=.494	**p=.014**	p=.221	p=.061	p=.050	p=.735	p=.253	p=.618	**p=.019**
CEQ Exp	0.20	-0.08	-0.16	-0.19	-0.11	-0.10	-0.11	1.00	**0.50**	**0.87**	-0.05	**-0.44**	**-0.58**	0.03	0.04	0.04	-0.34	-0.11
	N=24	N=24	N=24	N=24	N=24	N=24	N=24	N=24	**N=24**	**N=24**	N=24	**N=24**	**N=20**	N=21	N=23	N=23	N=21	N=24
	p=.360	p=.712	p=.442	p=.383	p=.621	p=.653	p=.619	p= ---	**p=.013**	**p=.000**	p=.810	**p=.031**	**p=.008**	p=.902	p=.853	p=.868	p=.134	p=.607
CEQ Cre	**0.44**	-0.11	0.02	-0.08	-0.23	-0.30	-0.15	**0.50**	1.00	**0.86**	0.05	-0.23	-0.22	0.04	0.00	-0.18	-0.09	-0.01
	N=24	N=24	N=24	N=24	N=24	N=24	N=24	**N=24**	N=24	**N=24**	N=24	N=24	N=20	N=21	N=23	N=23	N=21	N=24
	p=.033	p=.600	p=.922	p=.695	p=.282	p=.160	p=.493	**p=.013**	p= ---	**p=.000**	p=.829	p=.270	p=.342	p=.855	p=.992	p=.423	p=.709	p=.980
CEQ Tot	0.36	-0.11	-0.08	-0.16	-0.19	-0.23	-0.15	**0.87**	**0.86**	1.00	0.00	-0.39	**-0.45**	0.04	0.02	-0.08	-0.27	-0.07
	N=24	N=24	N=24	N=24	N=24	N=24	N=24	**N=24**	**N=24**	N=24	N=24	N=24	**N=20**	N=21	N=23	N=23	N=21	N=24
	p=.080	p=.606	p=.696	p=.463	p=.367	p=.289	p=.494	**p=.000**	**p=.000**	p= ---	p=.986	p=.058	**p=.046**	p=.848	p=.918	p=.720	p=.237	p=.754
ASI	0.08	0.25	0.25	**0.78**	0.40	0.27	**0.49**	-0.05	0.05	0.00	1.00	**0.51**	0.38	0.08	0.20	0.21	0.27	**0.97**

	N=24	N=24	N=24	**N=24**	N=24	N=24	**N=24**	N=24	N=24	N=24	N=24	**N=24**	N=20	N=21	N=23	N=23	N=21	**N=24**
	p=.706	p=.245	p=.243	**p=.000**	p=.053	p=.202	**p=.014**	p=.810	p=.829	p=.986	p= ---	**p=.011**	p=.102	p=.747	p=.365	p=.340	p=.238	**p=.000**
State	-0.01	0.17	0.24	0.28	0.18	0.08	0.26	**-0.44**	-0.23	-0.39	**0.51**	1.00	0.07	0.03	0.24	-0.07	**0.66**	**0.44**
1	N=24	N=24	N=24	N=24	N=24	N=24	N=24	**N=24**	N=24	N=24	**N=24**	N=24	N=20	N=21	N=23	N=23	**N=21**	**N=24**
	p=.967	p=.429	p=.260	p=.186	p=.408	p=.724	p=.221	**p=.031**	p=.270	p=.058	**p=.011**	p= ---	p=.771	p=.893	p=.278	p=.735	**p=.001**	**p=.030**
State	-0.10	0.35	0.10	**0.61**	0.40	0.35	0.43	**-0.58**	-0.22	**-0.45**	0.38	0.07	1.00	0.25	0.18	0.12	-0.22	**0.49**
2	N=20	N=20	N=20	**N=20**	N=20	N=20	N=20	**N=20**	N=20	**N=20**	N=20	N=20	N=20	N=19	N=20	N=20	N=19	**N=20**
	p=.683	p=.129	p=.662	**p=.004**	p=.077	p=.130	p=.061	**p=.008**	p=.342	**p=.046**	p=.102	p=.771	p= ---	p=.306	p=.440	p=.619	p=.365	**p=.027**
State	-0.10	**0.53**	-0.15	0.30	**0.48**	**0.50**	0.43	0.03	0.04	0.04	0.08	0.03	0.25	1.00	-0.11	**0.53**	**-0.73**	0.17
3	N=21	**N=21**	N=21	N=21	**N=21**	**N=21**	N=21	N=21	N=21	N=21	N=21	N=21	N=19	N=21	N=21	**N=21**	**N=21**	N=21
	p=.654	**p=.014**	p=.505	p=.183	**p=.028**	**p=.021**	p=.050	p=.902	p=.855	p=.848	p=.747	p=.893	p=.306	p= ---	p=.641	**p=.014**	**p=.000**	p=.459
Tot	-0.19	-0.12	**0.46**	-0.03	-0.15	-0.22	-0.07	0.04	0.00	0.02	0.20	0.24	0.18	-0.11	1.00	-0.12	0.23	0.11
#	N=23	N=23	**N=23**	N=23	N=23	N=23	N=23	N=23	N=23	N=23	N=23	N=23	N=20	N=21	N=23	N=23	N=21	N=23
Ses	p=.397	p=.586	**p=.028**	p=.888	p=.486	p=.304	p=.735	p=.853	p=.992	p=.918	p=.365	p=.278	p=.440	p=.641	p= ---	p=.576	p=.309	p=.605
avg #	-0.14	0.00	-0.04	0.32	0.28	0.28	0.25	0.04	-0.18	-0.08	0.21	-0.07	0.12	**0.53**	-0.12	1.00	-0.43	0.27
in HC	N=23	N=23	N=23	N=23	N=23	N=23	N=23	N=23	N=23	N=23	N=23	N=23	N=20	**N=21**	N=23	N=23	N=21	N=23
	p=.520	p=.982	p=.858	p=.138	p=.204	p=.193	p=.253	p=.868	p=.423	p=.720	p=.340	p=.735	p=.619	**p=.014**	p=.576	p= ---	p=.050	p=.221
State	0.15	-0.36	0.40	-0.12	-0.20	-0.29	-0.12	-0.34	-0.09	-0.27	0.27	**0.66**	-0.22	**-0.73**	0.23	-0.43	1.00	0.13
Change	N=21	N=21	N=21	N=21	N=21	N=21	N=21	N=21	N=21	N=21	N=21	**N=21**	N=19	**N=21**	N=21	N=21	N=21	N=21
	p=.513	p=.106	p=.069	p=.606	p=.377	p=.201	p=.618	p=.134	p=.709	p=.237	p=.238	**p=.001**	p=.365	**p=.000**	p=.309	p=.050	p= ---	p=.582
Dis	0.03	0.30	0.16	**0.92**	0.40	0.29	**0.47**	-0.11	-0.01	-0.07	**0.97**	**0.44**	**0.49**	0.17	0.11	0.27	0.13	1.00
Anx	N=24	N=24	N=24	**N=24**	N=24	N=24	**N=24**	N=24	N=24	N=24	**N=24**	**N=24**	**N=20**	N=21	N=23	N=23	N=21	N=24
	p=.892	p=.151	p=.463	**p=.000**	p=.052	p=.170	**p=.019**	p=.607	p=.980	p=.754	**p=.000**	**p=.030**	**p=.027**	p=.459	p=.605	p=.221	p=.582	p= ---

Whole sample correlations including both non-significant and significant results and p levels

Note:

Headgear was not included because patients were not always aware of the type of headgear that would wear for HBOT when they completed the questionnaires. Headgear was investigated through independent t-tests and chi square analysis.

APPENDIX 16

	age	sex	prev HBOT	trait	CLQ	CLQ RS	CLQ SS	CEQ Exp	CEQ Cre	CEQ Tot	ASI	State 1	State 2	State 3	Tot # ses	avg # in HC	State Chan	DisAnx
age	1.00	0.02	-0.27	-0.02	-0.10	-0.19	-0.03	-0.04	0.35	0.21	0.10	0.15	0.01	-0.13	-0.19	-0.11	0.19	0.06
	p= ---	p=.922	p=.266	p=.932	p=.675	p=.448	p=.914	p=.856	p=.138	p=.394	p=.692	p=.550	p=.962	p=.588	p=.433	p=.657	p=.428	p=.821
sex	0.02	1.00	-0.37	0.23	0.45	0.31	**0.54**	-0.04	0.16	0.09	0.15	0.11	0.26	**0.58**	-0.12	0.11	-0.35	0.19
	p=.922	p= ---	p=.124	p=.346	p=.054	p=.192	**p=.017**	p=.885	p=.504	p=.724	p=.535	p=.663	p=.286	**p=.010**	p=.613	p=.654	p=.138	p=.436
prev	-0.27	-0.37	1.00	0.24	0.17	0.17	0.17	-0.23	-0.13	-0.22	0.44	0.42	0.24	-0.17	**0.71**	-0.15	0.40	0.39
HBOT	p=.266	p=.124	p= ---	p=.324	p=.474	p=.477	p=.498	p=.354	p=.604	p=.363	p=.056	p=.073	p=.314	p=.497	**p=.001**	p=.551	p=.092	p=.102
trait	-0.02	0.23	0.24	1.00	0.39	0.34	0.41	-0.15	0.16	0.02	**0.80**	0.13	**0.56**	0.26	0.07	0.43	-0.10	**0.92**
	p=.932	p=.346	p=.324	p= ---	p=.102	p=.160	p=.083	p=.550	p=.522	p=.950	**p=.000**	p=.591	**p=.013**	p=.285	p=.782	p=.066	p=.673	**p=.000**
CLQ	-0.10	0.45	0.17	0.39	1.00	**0.96**	**0.97**	0.09	-0.18	-0.07	**0.50**	0.20	0.39	0.45	0.21	0.30	-0.19	0.48
	p=.675	p=.054	p=.474	p=.102	p= ---	**p=.000**	**p=.000**	p=.725	p=.451	p=.776	**p=.031**	p=.400	p=.101	p=.056	p=.385	p=.216	p=.430	p=.038
CLQ	-0.19	0.31	0.17	0.34	**0.96**	1.00	**0.88**	0.20	-0.22	-0.03	0.38	0.10	0.30	**0.48**	0.18	0.32	-0.28	0.38
RS	p=.448	p=.192	p=.477	p=.160	**p=.000**	p= ---	**p=.000**	p=.414	p=.362	p=.914	p=.108	p=.671	p=.212	**p=.039**	p=.449	p=.176	p=.244	p=.106
CLQ	-0.03	**0.54**	0.17	0.41	0.97	0.88	1.00	-0.01	-0.14	-0.10	**0.57**	0.28	0.44	0.39	0.22	0.26	-0.11	**0.53**
SS	p=.914	**p=.017**	p=.498	p=.083	p=.000	p=.000	p= ---	p=.953	p=.564	p=.676	**p=.012**	p=.248	p=.060	p=.096	p=.361	p=.286	p=.667	**p=.019**
CEQ	-0.04	-0.04	-0.23	-0.15	0.09	0.20	-0.01	1.00	0.24	**0.76**	-0.16	-0.40	**-0.49**	0.14	**-0.52**	0.20	-0.36	-0.16
Exp	p=.856	p=.885	p=.354	p=.550	p=.725	p=.414	p=.953	p= ---	p=.328	**p=.000**	p=.524	p=.093	**p=.035**	p=.576	**p=.022**	p=.419	p=.130	p=.512
CEQ	0.35	0.16	-0.13	0.16	-0.18	-0.22	-0.14	0.24	1.00	**0.81**	0.16	-0.04	-0.01	0.09	-0.28	-0.23	-0.09	0.16
Cre	p=.138	p=.504	p=.604	p=.522	p=.451	p=.362	p=.564	p=.328	p= ---	**p=.000**	p=.525	p=.877	p=.970	p=.701	p=.249	p=.341	p=.701	p=.502
CEQ	0.21	0.09	-0.22	0.02	-0.07	-0.03	-0.10	**0.76**	**0.81**	1.00	0.01	-0.27	-0.30	0.15	**-0.50**	-0.03	-0.28	0.01
Tot	p=.394	p=.724	p=.363	p=.950	p=.776	p=.914	p=.676	**p=.000**	**p=.000**	p= ---	p=.972	p=.272	p=.211	p=.551	**p=.029**	p=.889	p=.244	p=.962
ASI	0.10	0.15	0.44	**0.80**	**0.50**	0.38	**0.57**	-0.16	0.16	0.01	1.00	**0.53**	0.36	0.07	0.21	0.29	0.29	**0.97**
	p=.692	p=.535	p=.056	**p=.000**	**p=.031**	p=.108	**p=.012**	p=.524	p=.525	p=.972	p= ---	**p=.021**	p=.127	p=.771	p=.389	p=.227	p=.226	**p=.000**
State	0.15	0.11	0.42	0.13	0.20	0.10	0.28	-0.40	-0.04	-0.27	**0.53**	1.00	-0.06	-0.03	**0.47**	-0.09	**0.68**	0.40
1	p=.550	p=.663	p=.073	p=.591	p=.400	p=.671	p=.248	p=.093	p=.877	p=.272	**p=.021**	p= ---	p=.812	p=.888	**p=.042**	p=.702	**p=.001**	p=.093
State	0.01	0.26	0.24	**0.56**	0.39	0.30	0.44	**-0.49**	-0.01	-0.30	0.36	-0.06	1.00	0.25	0.29	0.13	-0.22	0.46
2	p=.962	p=.286	p=.314	**p=.013**	p=.101	p=.212	p=.060	**p=.035**	p=.970	p=.211	p=.127	p=.812	p= ---	p=.306	p=.227	p=.595	p=.365	p=.049
State	-0.13	**0.58**	-0.17	0.26	0.45	**0.48**	0.39	0.14	0.09	0.15	0.07	-0.03	0.25	1.00	0.06	**0.55**	**-0.76**	0.15
	p=.588	**p=.010**	p=.497	p=.285	p=.056	**p=.039**	p=.096	p=.576	p=.701	p=.551	p=.771	p=.888	p=.306	p= ---	p=.803	**p=.015**	**p=.000**	p=.542
Tot #	-0.19	-0.12	**0.71**	0.07	0.21	0.18	0.22	**-0.52**	-0.28	**-0.50**	0.21	**0.47**	0.29	0.06	1.00	-0.12	0.26	0.16
ses	p=.433	p=.613	**p=.001**	p=.782	p=.385	p=.449	p=.361	**p=.022**	p=.249	**p=.029**	p=.389	**p=.042**	p=.227	p=.803	p= ---	p=.637	p=.277	p=.501
avg #	-0.11	0.11	-0.15	0.43	0.30	0.32	0.26	0.20	-0.23	-0.03	0.29	-0.09	0.13	**0.55**	-0.12	1.00	**-0.46**	0.36
in HC	p=.657	p=.654	p=.551	p=.066	p=.216	p=.176	p=.286	p=.419	p=.341	p=.889	p=.227	p=.702	p=.595	**p=.015**	p=.637	p= ---	**p=.045**	p=.129

State	0.19	-0.35	0.40	-0.10	-0.19	-0.28	-0.11	-0.36	-0.09	-0.28	0.29	**0.68**	-0.22	**-0.76**	0.26	**-0.46**	1.00	0.15
Change	p=.428	p=.138	p=.092	p=.673	p=.430	p=.244	p=.667	p=.130	p=.701	p=.244	p=.226	**p=.001**	p=.365	**p=.000**	p=.277	**p=.045**	p= ---	p=.539
DisAnx	0.06	0.19	0.39	**0.92**	**0.48**	0.38	**0.53**	-0.16	0.16	0.01	**0.97**	0.40	**0.46**	0.15	0.16	0.36	0.15	1.00
	p=.821	p=.436	p=.102	**p=.000**	**p=.038**	p=.106	**p=.019**	p=.512	p=.502	p=.962	**p=.000**	p=.093	**p=.049**	p=.542	p=.501	p=.129	p=.539	p= ---

Casewise Deletion full correlation matrix

APPENDIX 17
Men

Correlation matrix including both non- and significant correlations for **men**

	age	prev HBOT	trait	CLQ	CLQ RS	CLQ SS	CEQ Exp	CEQ Cre	CEQ Tot	ASI	State 1	State 2	State 3	Tot # ses	avg # in HC	State Change	DisAnx
age	1.00	-0.32	0.00	0.01	-0.08	0.15	0.02	0.38	0.24	0.16	0.12	0.08	-0.22	-0.15	-0.11	0.23	0.11
	N=17	N=17	N=17	N=17	N=17	N=17	N=17	N=17	N=17	N=17	N=17	N=14	N=15	N=16	N=16	N=15	N=17
	p= ---	p=.212	p=.987	p=.958	p=.746	p=.569	p=.950	p=.136	p=.361	p=.532	p=.652	p=.773	p=.441	p=.592	p=.693	p=.419	p=.685
prev HBOT	-0.32	1.00	-0.07	0.09	0.12	0.04	-0.24	-0.13	-0.21	0.18	0.40	-0.17	0.04	0.33	-0.31	0.40	0.09
	N=17	N=17	N=17	N=17	N=17	N=17	N=17	N=17	N=17	N=17	N=17	N=14	N=15	N=16	N=16	N=15	N=17
	p=.212	p= ---	p=.798	p=.740	p=.660	p=.887	p=.357	p=.630	p=.419	p=.501	p=.114	p=.560	p=.883	p=.217	p=.235	p=.137	p=.737
trait	0.00	-0.07	1.00	0.07	0.02	0.14	0.37	0.18	0.32	**0.71**	0.17	-0.11	0.37	-0.14	**0.60**	-0.10	**0.89**
	N=17	N=17	N=17	N=17	N=17	N=17	N=17	N=17	N=17	**N=17**	N=17	N=14	N=15	N=16	**N=16**	N=15	**N=17**
	p=.987	p=.798	p= ---	p=.776	p=.935	p=.595	p=.142	p=.497	p=.217	**p=.001**	p=.523	p=.704	p=.177	p=.606	**p=.013**	p=.720	**p=.000**
CLQ	0.01	0.09	0.07	1.00	**0.96**	**0.92**	-0.35	-0.11	-0.26	-0.13	0.00	-0.17	0.45	-0.49	0.25	-0.10	-0.06
	N=17	N=17	N=17	N=17	**N=17**	**N=17**	N=17	N=17	N=17	N=17	N=17	N=14	N=15	N=16	N=16	N=15	N=17
	p=.958	p=.740	p=.776	p= ---	**p=.000**	**p=.000**	p=.169	p=.675	p=.308	p=.609	p=.989	p=.552	p=.089	p=.052	p=.350	p=.731	p=.826
CLQ RS	-0.08	0.12	0.02	**0.96**	1.00	**0.78**	-0.26	-0.14	-0.23	-0.20	-0.14	-0.05	0.51	-0.42	0.26	-0.27	-0.13
	N=17	N=17	N=17	**N=17**	N=17	**N=17**	N=17	N=17	N=17	N=17	N=17	N=14	N=15	N=16	N=16	N=15	N=17
	p=.746	p=.660	p=.935	**p=.000**	p= ---	**p=.000**	p=.310	p=.597	p=.373	p=.431	p=.594	p=.855	p=.053	p=.101	p=.327	p=.329	p=.629
CLQ SS	0.15	0.04	0.14	**0.92**	**0.78**	1.00	-0.43	-0.06	-0.27	-0.02	0.20	-0.35	0.33	**-0.54**	0.21	0.13	0.05
	N=17	N=17	N=17	**N=17**	**N=17**	N=17	N=17	N=17	N=17	N=17	N=17	N=14	N=15	**N=16**	N=16	N=15	N=17
	p=.569	p=.887	p=.595	**p=.000**	**p=.000**	p= ---	p=.088	p=.830	p=.288	p=.943	p=.440	p=.219	p=.236	**p=.031**	p=.439	p=.640	p=.864
CEQ Exp	0.02	-0.24	0.37	-0.35	-0.26	-0.43	1.00	0.47	**0.85**	0.32	-0.42	0.08	-0.23	0.21	-0.04	-0.37	0.36
	N=17	N=17	N=17	N=17	N=17	N=17	N=17	N=17	**N=17**	N=17	N=17	N=14	N=15	N=16	N=16	N=15	N=17
	p=.950	p=.357	p=.142	p=.169	p=.310	p=.088	p= ---	p=.056	**p=.000**	p=.216	p=.095	p=.782	p=.402	p=.424	p=.884	p=.172	p=.151
CEQ Cre	0.38	-0.13	0.18	-0.11	-0.14	-0.06	0.47	1.00	**0.87**	0.31	-0.04	-0.07	-0.15	-0.11	-0.42	0.03	0.28
	N=17	N=17	N=17	N=17	N=17	N=17	N=17	N=17	**N=17**	N=17	N=17	N=14	N=15	N=16	N=16	N=15	N=17
	p=.136	p=.630	p=.497	p=.675	p=.597	p=.830	p=.056	p= ---	**p=.000**	p=.233	p=.870	p=.824	p=.584	p=.692	p=.107	p=.908	p=.285
CEQ Tot	0.24	-0.21	0.32	-0.26	-0.23	-0.27	**0.85**	**0.87**	1.00	0.36	-0.26	-0.01	-0.22	0.06	-0.28	-0.18	0.37
	N=17	N=17	N=17	N=17	N=17	N=17	**N=17**	**N=17**	N=17	N=17	N=17	N=14	N=15	N=16	N=16	N=15	N=17
	p=.361	p=.419	p=.217	p=.308	p=.373	p=.288	**p=.000**	**p=.000**	p= ---	p=.153	p=.312	p=.982	p=.428	p=.831	p=.300	p=.523	p=.143
ASI	0.16	0.18	0.71	-0.13	-0.20	-0.02	0.32	0.31	0.36	1.00	**0.52**	-0.49	-0.17	0.08	0.17	0.51	**0.96**
	N=17	N=17	N=17	N=17	N=17	N=17	N=17	N=17	N=17	N=17	**N=17**	N=14	N=15	N=16	N=16	N=15	**N=17**

	p=.532	p=.501	p=.001	p=.609	p=.431	p=.943	p=.216	p=.233	p=.153	p= ---	**p=.031**	p=.074	p=.535	p=.757	p=.531	p=.054	**p=.000**
State 1	0.12	0.40	0.17	0.00	-0.14	0.20	-0.42	-0.04	-0.26	**0.52**	1.00	-0.41	-0.02	0.25	-0.20	**0.85**	0.41
	N=17	N=17	N=17	N=17	N=17	N=17	N=17	N=17	N=17	**N=17**	N=17	N=14	N=15	N=16	N=16	**N=15**	N=17
	p=.652	p=.114	p=.523	p=.989	p=.594	p=.440	p=.095	p=.870	p=.312	**p=.031**	p= ---	p=.143	p=.946	p=.345	p=.462	**p=.000**	p=.098
State 2	0.08	-0.17	-0.11	-0.17	-0.05	-0.35	0.08	-0.07	-0.01	-0.49	-0.41	1.00	0.34	-0.02	0.09	-0.48	-0.37
	N=14	N=14	N=14	N=14	N=14	N=14	N=14	N=14	N=14	N=14	N=14	N=14	N=14	N=14	N=14	N=14	N=14
	p=.773	p=.560	p=.704	p=.552	p=.855	p=.219	p=.782	p=.824	p=.982	p=.074	p=.143	p= ---	p=.229	p=.944	p=.758	p=.081	p=.188
State 3	-0.22	0.04	0.37	0.45	0.51	0.33	-0.23	-0.15	-0.22	-0.17	-0.02	0.34	1.00	-0.13	0.28	**-0.55**	0.04
	N=15	N=15	N=15	N=15	N=15	N=15	N=15	N=15	N=15	N=15	N=15	N=14	N=15	N=15	N=15	**N=15**	N=15
	p=.441	p=.883	p=.177	p=.089	p=.053	p=.236	p=.402	p=.584	p=.428	p=.535	p=.946	p=.229	p= ---	p=.633	p=.306	**p=.035**	p=.899
Tot # ses	-0.15	0.33	-0.14	-0.49	-0.42	**-0.54**	0.21	-0.11	0.06	0.08	0.25	-0.02	-0.13	1.00	-0.40	0.22	0.00
	N=16	N=16	N=16	N=16	N=16	**N=16**	N=16	N=16	N=16	N=16	N=16	N=14	N=15	N=16	N=16	N=15	N=16
	p=.592	p=.217	p=.606	p=.052	p=.101	**p=.031**	p=.424	p=.692	p=.831	p=.757	p=.345	p=.944	p=.633	p= ---	p=.123	p=.431	p=.996
avg # in HC	-0.11	-0.31	**0.60**	0.25	0.26	0.21	-0.04	-0.42	-0.28	0.17	-0.20	0.09	0.28	-0.40	1.00	-0.29	0.36
	N=16	N=16	**N=16**	N=16	N=16	N=16	N=16	N=16	N=16	N=16	N=16	N=14	N=15	N=16	N=16	N=15	N=16
	p=.693	p=.235	**p=.013**	p=.350	p=.327	p=.439	p=.884	p=.107	p=.300	p=.531	p=.462	p=.758	p=.306	p=.123	p= ---	p=.290	p=.171
State Change	0.23	0.40	-0.10	-0.10	-0.27	0.13	-0.37	0.03	-0.18	0.51	0.85	-0.48	**-0.55**	0.22	-0.29	1.00	0.30
	N=15	N=15	N=15	N=15	N=15	N=15	N=15	N=15	N=15	N=15	N=15	N=14	**N=15**	N=15	N=15	N=15	N=15
	p=.419	p=.137	p=.720	p=.731	p=.329	p=.640	p=.172	p=.908	p=.523	p=.054	p=.000	p=.081	**p=.035**	p=.431	p=.290	p= ---	p=.283
DisAnx	0.11	0.09	**0.89**	-0.06	-0.13	0.05	0.36	0.28	0.37	**0.96**	0.41	-0.37	0.04	0.00	0.36	0.30	1.00
	N=17	N=17	**N=17**	N=17	N=17	N=17	N=17	N=17	N=17	**N=17**	N=17	N=14	N=15	N=16	N=16	N=15	N=17
	p=.685	p=.737	**p=.000**	p=.826	p=.629	p=.864	p=.151	p=.285	p=.143	**p=.000**	p=.098	p=.188	p=.899	p=.996	p=.171	p=.283	p= ---

APPENDIX 17
Women

Correlation matrix including both non- and significant correlations for **women**

	age	prev HBOT	trait	CLQ	CLQ RS	CLQ SS	CEQ Exp	CEQ Cre	CEQ Tot	ASI	State 1	State 2	State 3	Tot # ses	avg # in HC	State Change	DisAnx
age	1.00	-0.17	-0.19	-0.14	-0.19	-0.09	0.59	0.64	0.71	-0.08	-0.72	-0.40	-0.32	-0.34	-0.24	0.22	-0.13
	N=7	N=7	N=7	N=7	N=7	N=7	N=7	N=7	N=7	N=7	N=7	N=6	N=6	N=7	N=7	N=6	N=7
	p= ---	p=.712	p=.686	p=.766	p=.690	p=.844	p=.162	p=.119	p=.076	p=.857	p=.071	p=.437	p=.536	p=.454	p=.609	p=.679	p=.781
prev	-0.17	1.00	0.59	0.70	0.54	**0.79**	-0.22	0.12	-0.07	**0.81**	0.26	0.72	0.19	**0.83**	0.33	0.05	**0.76**
HBOT	N=7	N=7	N=7	N=7	N=7	**N=7**	N=7	N=7	N=7	**N=7**	N=7	N=6	N=6	**N=7**	N=7	N=6	**N=7**
	p=.712	p= ---	p=.163	p=.081	p=.207	**p=.033**	p=.638	p=.793	p=.886	**p=.026**	p=.581	p=.109	p=.716	**p=.020**	p=.474	p=.918	**p=.049**
trait	-0.19	0.59	1.00	0.38	0.37	0.37	-0.74	-0.34	-0.63	**0.84**	0.53	**0.99**	0.03	0.34	0.04	0.11	**0.94**
	N=7	N=7	N=7	N=7	N=7	N=7	N=7	N=7	N=7	**N=7**	N=7	**N=6**	N=6	N=7	N=7	N=6	**N=7**
	p=.686	p=.163	p= ---	p=.396	p=.413	p=.409	p=.057	p=.460	p=.128	**p=.019**	p=.226	**p=.000**	p=.949	p=.463	p=.931	p=.835	**p=.002**
CLQ	-0.14	0.70	0.38	1.00	**0.97**	**0.98**	0.10	-0.29	-0.09	0.73	0.42	0.42	0.25	0.38	0.34	0.00	0.62
	N=7	N=7	N=7	N=7	**N=7**	**N=7**	N=7	N=7	N=7	N=7	N=7	N=6	N=6	N=7	N=7	N=6	N=7
	p=.766	p=.081	p=.396	p= ---	**p=.000**	**p=.000**	p=.825	p=.530	p=.845	p=.060	p=.351	p=.404	p=.634	p=.395	p=.449	p=.994	p=.135
CLQ	-0.19	0.54	0.37	**0.97**	1.00	**0.89**	0.09	-0.43	-0.17	0.64	0.44	0.38	0.32	0.18	0.33	-0.12	0.56
RS	N=7	N=7	N=7	**N=7**	N=7	**N=7**	N=7	N=7	N=7	N=7	N=7	N=6	N=6	N=7	N=7	N=6	N=7
	p=.690	p=.207	p=.413	**p=.000**	p= ---	**p=.008**	p=.845	p=.336	p=.708	p=.120	p=.317	p=.459	p=.539	p=.703	p=.473	p=.827	p=.192
CLQ	-0.09	**0.79**	0.37	**0.98**	**0.89**	1.00	0.11	-0.15	-0.02	**0.77**	0.37	0.44	0.18	0.54	0.34	0.09	0.65
SS	N=7	**N=7**	N=7	**N=7**	**N=7**	N=7	N=7	N=7	N=7	**N=7**	N=7	N=6	N=6	N=7	N=7	N=6	N=7
	p=.844	**p=.033**	p=.409	**p=.000**	**p=.008**	p= ---	p=.816	p=.743	p=.973	**p=.041**	p=.410	p=.382	p=.733	p=.211	p=.455	p=.862	p=.118
CEQ	0.59	-0.22	-0.74	0.10	0.09	0.11	1.00	0.52	**0.89**	-0.40	-0.66	-0.80	0.19	-0.28	0.11	-0.25	-0.56
Exp	N=7	N=7	N=7	N=7	N=7	N=7	N=7	N=7	**N=7**	N=7	N=7	N=6	N=6	N=7	N=7	N=6	N=7
	p=.162	p=.638	p=.057	p=.825	p=.845	p=.816	p= ---	p=.231	**p=.007**	p=.369	p=.107	p=.058	p=.715	p=.540	p=.813	p=.626	p=.195
CEQ	0.64	0.12	-0.34	-0.29	-0.43	-0.15	0.52	1.00	**0.85**	-0.22	**-0.83**	-0.31	0.21	0.19	0.10	-0.33	-0.27
Cre	N=7	N=7	N=7	N=7	N=7	N=7	N=7	N=7	**N=7**	N=7	**N=7**	N=6	N=6	N=7	N=7	N=6	N=7
	p=.119	p=.793	p=.460	p=.530	p=.336	p=.743	p=.231	p= ---	**p=.014**	p=.642	**p=.021**	p=.547	p=.695	p=.685	p=.823	p=.519	p=.553
CEQ	0.71	-0.07	-0.63	-0.09	-0.17	-0.02	**0.89**	**0.85**	1.00	-0.36	**-0.85**	-0.64	0.32	-0.07	0.12	-0.46	-0.49
Tot	N=7	N=7	N=7	N=7	N=7	N=7	**N=7**	**N=7**	N=7	N=7	**N=7**	N=6	N=6	N=7	N=7	N=6	N=7
	p=.076	p=.886	p=.128	p=.845	p=.708	p=.973	**p=.007**	**p=.014**	p= ---	p=.426	**p=.016**	p=.170	p=.531	p=.881	p=.791	p=.354	p=.270
ASI	-0.08	**0.81**	**0.84**	0.73	0.64	**0.77**	-0.40	-0.22	-0.36	1.00	0.55	**0.88**	0.09	0.59	0.27	0.17	**0.98**

	N=7	**N=7**	**N=7**	N=7	N=7	**N=7**	N=7	N=7	N=7	N=7	N=7	**N=6**	N=6	N=7	N=7	N=6	**N=7**
	p=.857	**p=.026**	**p=.019**	p=.060	p=.120	**p=.041**	p=.369	p=.642	p=.426	p= ---	p=.203	**p=.021**	p=.869	p=.165	p=.565	p=.746	**p=.000**
State	-0.72	0.26	0.53	0.42	0.44	0.37	-0.66	**-0.83**	**-0.85**	0.55	1.00	0.60	0.09	0.33	0.24	0.21	0.56
1	N=7	N=7	N=7	N=7	N=7	N=7	N=7	**N=7**	**N=7**	N=7	N=7	N=6	N=6	N=7	N=7	N=6	N=7
	p=.071	p=.581	p=.226	p=.351	p=.317	p=.410	p=.107	**p=.021**	**p=.016**	p=.203	p= ---	p=.211	p=.860	p=.473	p=.607	p=.683	p=.190
State	-0.40	0.72	**0.99**	0.42	0.38	0.44	-0.80	-0.31	-0.64	**0.88**	0.60	1.00	0.03	0.66	0.09	0.15	**0.96**
2	N=6	N=6	**N=6**	N=6	N=6	N=6	N=6	N=6	N=6	**N=6**	N=6	N=6	N=5	N=6	N=6	N=5	**N=6**
	p=.437	p=.109	**p=.000**	p=.404	p=.459	p=.382	p=.058	p=.547	p=.170	**p=.021**	p=.211	p= ---	p=.963	p=.150	p=.859	p=.804	**p=.002**
State	-0.32	0.19	0.03	0.25	0.32	0.18	0.19	0.21	0.32	0.09	0.09	0.03	1.00	0.13	**0.90**	**-0.95**	0.07
3	N=6	N=6	N=6	N=6	N=6	N=6	N=6	N=6	N=6	N=6	N=6	N=5	N=6	N=6	**N=6**	**N=6**	N=6
	p=.536	p=.716	p=.949	p=.634	p=.539	p=.733	p=.715	p=.695	p=.531	p=.869	p=.860	p=.963	p= ---	p=.802	**p=.015**	**p=.003**	p=.896
Tot #	-0.34	**0.83**	0.34	0.38	0.18	0.54	-0.28	0.19	-0.07	0.59	0.33	0.66	0.13	1.00	0.42	0.10	0.51
ses	N=7	**N=7**	N=7	N=7	N=7	N=7	N=7	N=7	N=7	N=7	N=7	N=6	N=6	N=7	N=7	N=6	N=7
	p=.454	**p=.020**	p=.463	p=.395	p=.703	p=.211	p=.540	p=.685	p=.881	p=.165	p=.473	p=.150	p=.802	p= ---	p=.346	p=.845	p=.241
avg #	-0.24	0.33	0.04	0.34	0.33	0.34	0.11	0.10	0.12	0.27	0.24	0.09	0.90	0.42	1.00	-0.75	0.19
in HC	N=7	N=7	N=7	N=7	N=7	N=7	N=7	N=7	N=7	N=7	N=7	N=6	N=6	N=7	N=7	N=6	N=7
	p=.609	p=.474	p=.931	p=.449	p=.473	p=.455	p=.813	p=.823	p=.791	p=.565	p=.607	p=.859	p=.015	p=.346	p= ---	p=.086	p=.690
State	0.22	0.05	0.11	0.00	-0.12	0.09	-0.25	-0.33	-0.46	0.17	0.21	0.15	**-0.95**	0.10	-0.75	1.00	0.15
Change	N=6	N=6	N=6	N=6	N=6	N=6	N=6	N=6	N=6	N=6	N=6	N=5	**N=6**	N=6	N=6	N=6	N=6
	p=.679	p=.918	p=.835	p=.994	p=.827	p=.862	p=.626	p=.519	p=.354	p=.746	p=.683	p=.804	**p=.003**	p=.845	p=.086	p= ---	p=.772
DisAnx	-0.13	**0.76**	**0.94**	0.62	0.56	0.65	-0.56	-0.27	-0.49	**0.98**	0.56	**0.96**	0.07	0.51	0.19	0.15	1.00
	N=7	**N=7**	**N=7**	N=7	N=7	N=7	N=7	N=7	N=7	**N=7**	N=7	**N=6**	N=6	N=7	N=7	N=6	N=7
	p=.781	**p=.049**	**p=.002**	p=.135	p=.192	p=.118	p=.195	p=.553	p=.270	**p=.000**	p=.190	**p=.002**	p=.896	p=.241	p=.690	p=.772	p= ---

APPENDIX 18

Ideal Regression if Sufficient *N*

Ideally, if the current study had sufficient *n* the following series of regressions would have been performed. These series would have allowed for controlling Trait Anxiety because of its theoretical relationship, in addition to State Anxiety for series two and three. However, because of insufficient *n* only a maximum of three predictors could be entered into each series.

Series 1: Dependent Variable – State Anxiety at time one

Step 1: Enter Trait Anxiety
Step 2: Enter Claustrophobia scores and Anxiety Sensitivity

AND

Step 1: Enter Trait Anxiety
Step 2: Enter Expectancy and Credibility

Series 2: Dependent Variable – State Anxiety at time two

Step 1: Enter Trait Anxiety
Step 2: Enter State Anxiety at time one
Step 3: Enter Claustrophobia scores and Anxiety Sensitivity

AND

Step 1: Enter Trait Anxiety
Step 2: Enter State Anxiety at time one
Step 3: Enter Expectancy and Credibility

Series 3: Dependent Variable – State Anxiety at time three

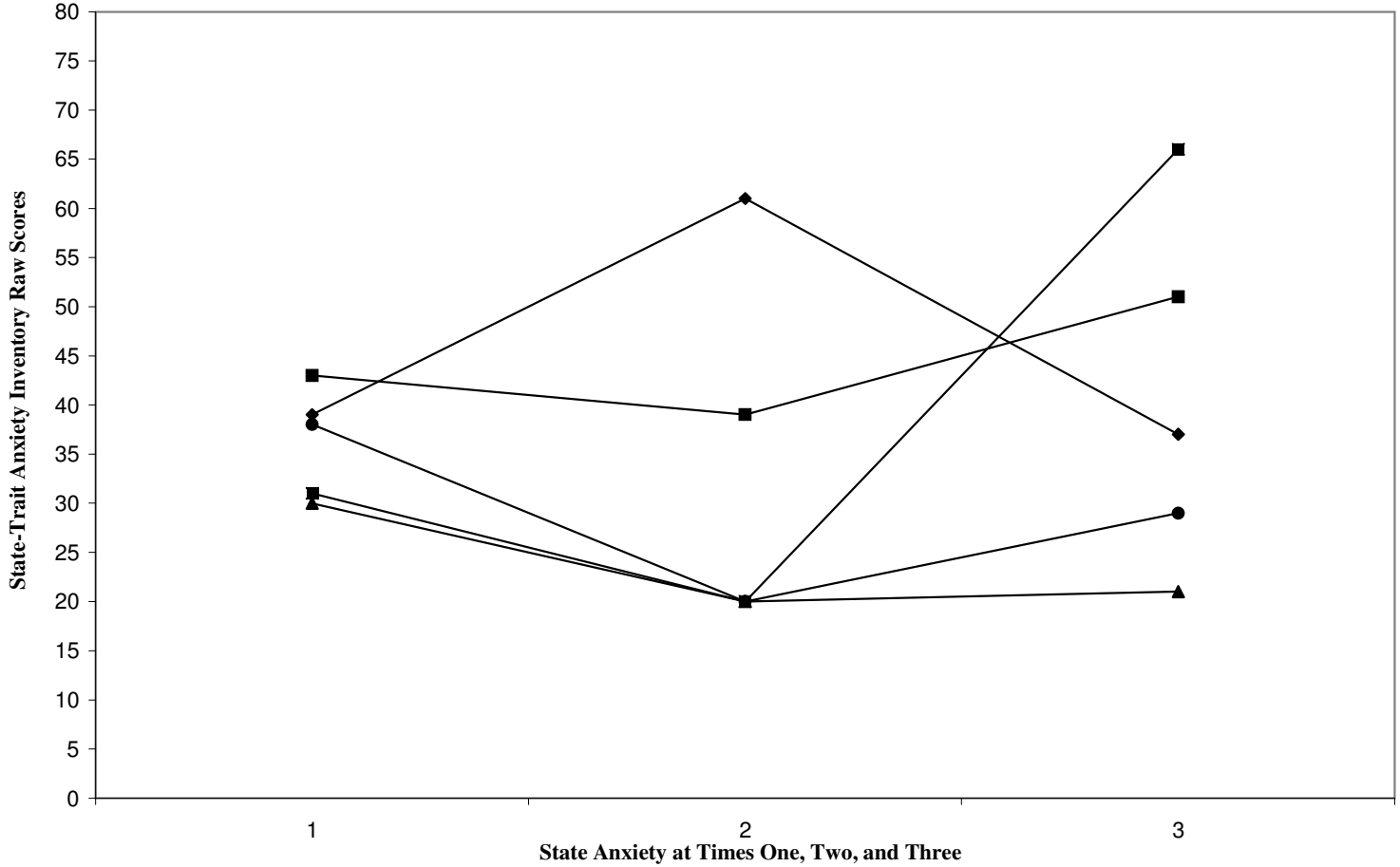
Step 1: Enter Trait Anxiety
Step 2: Enter State Anxiety at time one
Step 3: Enter State Anxiety at time two
Step 4: Enter Claustrophobia scores and Anxiety Sensitivity

AND

Step 1: Enter Trait Anxiety
Step 2: Enter State Anxiety at time one
Step 3: Enter State Anxiety at time two
Step 4: Enter Expectancy and Credibility

APPENDIX 19

State Anxiety Change for Women from Times One, Two, and Three



APPENDIX 20

Ethnicity Data as per Statistics New Zealand 2001 Census

Ethnicity *n (%)*	
New Zealand European	22 (91.7%)
Maori	1 (4.2%)
Samoan	1 (4.2%)
Cook Island Maori	0
Tongan	0
Niucan	0
Chinese	0
Indian	0
Other	0

Condition Prompting HBOT

Condition *n (%)*	
Bubble Injury	0
Acute Ischaemic Conditions	0
Infective Conditions	0
Radiation Tissue Damage	10 (41.7%)
Problem Wounds	11 (45.8%)
Gas Poisoning	0
Ocular Ischemic Pathology	0
Other (specify)	1 (4.2%)
Miscellaneous (specify main)	2 (8.3%)

APPENDIX 21

PERSONAL INFORMATION

Attach patient label:

First, we are interested in some things about you:

Gender: Male Female

Which ethnic group or groups do you belong to?