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Clinically Anxious Asthma Patients
The Role of Catastrophic Cognitions

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Clinically Anxious Asthma Patients: The Role of Catastrophic Cognitions

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Abstract

Background

Epidemiological studies have established a strong link between asthma and anxiety disorders especially panic disorder. In addition, asthma patients with psychological distress have been reported to disclose more impaired quality of life than patients with healthier mental functioning. Severity of asthma alone fails to predict impaired quality of life and suggests that psychological factors may play a significant role in counteracting wellbeing.

The cognitive model of panic (Clark, 1986), developed in psychiatric populations emphasizes the importance of catastrophic cognitions in precipitating and maintaining panic. The first objective of the study was to apply the assumptions of the cognitive model of panic in a sample of clinically anxious asthma patients to investigate whether illness specific catastrophic cognitions of physical sensations have an impact on asthma quality of life. The second objective of the study was to explore and identify the illness specific catastrophic cognitions, in terms of physical, mental and social cognitions, and their behavioral outcomes of patients with asthma and clinical levels of anxiety.

The results of this study can inform the development of screening measures and therapeutic interventions specifically designed for asthma patients with heightened psychopathology.

Methods

The study fell into two phases: the quantitative and qualitative phase. The first phase was a within subjects cross sectional study using questionnaire data from patients with different levels of physician-diagnosed asthma and clinical levels of anxiety. Following ethical approval, 77 patients were screened with the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983) for clinical levels of anxiety, and were recruited from three respiratory departments within the UK. For the second phase of the study, 15 clinically anxious asthma patients were randomly selected from the original sample of the quantitative phase, to attend semi-structured interviews that took place in the Respiratory Units of Birmingham and Manchester NHS Hospitals.

Results

All patients participated in the quantitative phase were between the ages of 19 and 72 years (mean 43.83) and had an average level of clinical anxiety of 14.06 (a score of 11 indicated the baseline for clinical levels). Illness specific catastrophic cognitions of physical symptoms made a unique statistical contribution to the prediction of impairment of quality of life of asthma patients ($\beta=.243$, $p=0.031$) even when disease and demographic variables were accounted for. The sample of the qualitative phase consisted of 9 females and 6 males with a mean score of age of 46.5 years. The average level of clinical anxiety for this sample was 15.13. Patients revealed a number of catastrophic cognitions from which the most prevalent physical catastrophic cognitions concerned thoughts of dying (n=9/15) and becoming ill (n=8/15); thoughts of becoming panicky (n=11/15) and being unable to control thinking (n=5/15) were the cognitions mostly reported by the participants about their mental state. Feelings of embarrassment (n=7/15) and fear of negative evaluation from others (7/15) were the most prevalent social catastrophic cognitions. Finally, investigation of the behavioural tactics employed by the participants revealed that the majority of patients displayed high levels of agoraphobic behavior and cognitive avoidance.

Discussion and Conclusion

This study is the first to date to investigate the role of catastrophic cognitions in asthma quality of life and to identify the illness specific catastrophic cognitions and the behavioural outcomes of asthma patients with clinical levels of anxiety. Results indicated that the assumptions of the cognitive model of panic can provide some explanation about the effects of anxiety on quality of life of asthma patients. Maladaptive behavioural patterns and emotional distress caused by catastrophic cognitions can affect greatly the quality of life of asthma patients in addition to the physical impairments imposed by their illness. However, further inspection of the interview data showed that perhaps the relationship between anxiety and catastrophic thinking is not so direct as suggested by the cognitive hypothesis of anxiety. Other factors may be related to the development, severity and maintenance of catastrophic cognitions in asthma such as perceptions of asthma and panic control. The present findings represent an important foundation in predicting asthma patients' cognitive and behavioural patterns that may significantly affect their quality of life. Implications for therapeutic interventions and future research are discussed.

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PART I

Literature Review

Chapter 1

Introduction to Asthma

This chapter presents several issues related to asthma. Definition and diagnosis of asthma are introduced. Types of asthma severity are discussed. Epidemiological findings of incidence and prevalence of asthma are reviewed, and illustrated in appropriate tables. Risk factors for asthma morbidity and mortality are also examined. Finally, medical assessment of asthma is introduced and pharmacological treatment and non-pharmacological management of the disease are also reviewed.

1.1 Definition of Asthma

The diagnosis of asthma remains controversial (Pearce et al; 1999) because it is a clinical one; there is no specific diagnostic test thus asthma is best defined in terms of the phenomena involved (British Thoracic Society guidelines, 2003). However, the clinical diagnosis of asthma is complex making it difficult for clinicians to agree on one specific definition. A widely accepted definition of asthma is the one proposed in the International Consensus Report (National Heart, Lung and Blood Institute, 1992).

Asthma is *"a chronic inflammatory disorder of the airways…in susceptible individuals, inflammatory symptoms are usually associated with widespread but variable airflow obstruction and an increase in airway response to a variety of stimuli. Obstruction is often reversible, either spontaneously or with treatment"* (cited in British Thoracic Society guidelines, 2003).

1.2 Diagnosis of Asthma

Some of the symptoms featured in asthma may are also displayed in other lung diseases such as chronic obstructive airways disease, bronchiectasis or cystic fibrosis (BTS guidelines, 2003). The major symptoms of asthma include breathlessness, cough, wheeze, and chest tightness. Since none of these symptoms are specific to asthma, clinicians must determine whether these symptoms vary, are provoked by exercise or are worsened during the night in order to avoid misdiagnosis. Additional information like family history of asthma or allergy should also be taken into account. Finally, objective tests also exist to confirm a diagnosis of asthma, and should be always used, before long-term therapy is prescribed (British Thoracic Society guidelines, 2003).

Asthma produces a decrease in both peak expiratory flow (PEF)† and forced expiratory volume in one second (FEV^1)‡. Variability of one or both measures should be obtained sequentially as it is a strong characteristic of asthma. Variability of 20% and more in amplitude best performance percentage (%), for three days per week during a period of two weeks, is a strong indicator of asthma (Siersted et al; 1996).

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†PEF: Peak expiratory flow is the speed of air moving out of the lungs at the beginning of the expiration

‡FEV^1: Forced expiratory volume in 1 second is the amount of air forcibly blown out in one second.

1.3 Assessment of Asthma Severity

The concept of severity is very important as it helps to understand the etiology of the disease, draw hypotheses about the causes of the illness and help in the decision making of the medical management and assessment of its effectiveness (Woolcock et al; 1998). Since the nature of asthma remains unclear it is difficult to determine severity accurately without the existence of a universally validated and accepted measurement tool (Wahlgren et al; 1997). The most common assessment of severity is the measurement of airway responsiveness. Measurement of airway responsiveness has been widely used in epidemiological studies in determining severity of asthma (Mitsuta et al; 2001;Peat J.K.,1998) and is considered a useful tool in making a diagnosis of asthma by many clinicians (O'Byrne et al; 2003).

However the factors within the airways of an individual that are responsible for this exaggerated airway narrowing are not specific, generating some disagreement as to whether the measurement of airway responsiveness is an important implement in severity assessment (Postma & Kerstjens, 1998).

In 1997, the British Thoracic Society recommended the usage of oxygen saturation (SaO_2) monitoring as an objective tool of severity assessment. When the saturation level drops to less than 92% it is a strong indication of the possibility of a rapid fall in the arterial partial oxygen pressure. Knowledge of the oxygen values can identify patients who are at greater risk of significant hypoxia (i.e. shortage of oxygen in the body) (Cunningham & McMurray, 2006). However, despite the strong recommendations from the British Thoracic Society guidelines that measures of oxygen levels may be used as a valuable objective tool to assess asthma severity and that they should be used in both primary and secondary care, Cunningham and McMurray (2006) found that oxygen level measures were limited across the country, even when the equipment was available.

1.4 Asthma Severity

Asthma severity varies and it can be categorized from mild to life threatening severe asthma. In this section two syndromes at the severe end are introduced: Brittle asthma and acute severe with life threatening features asthma.

1.4.1 Brittle Asthma

According to Haqqee and Hasan (2007) around 5% of all asthma patients do not respond adequately to conventional medication. To account for the non responders certain subtypes of asthma have been introduced such as severe and difficult to control asthma. Under the definition of severe asthma, there are distinct sub-phenotypes such as brittle asthma.

Diagnosis of Brittle Asthma

Turner-Warwick (1977) first coined the term "brittle asthma" to account for those individuals with asthma whose peak expiratory flow (PEF) can vary significantly despite maximal treatment. The importance of this subgroup of asthma patients is that it has been well demonstrated from previous studies that variability in PEF may contribute significantly to mortality of asthma (Bateman et al, 1979;

Boulet et al, 1991). Currently, the diagnosis of brittle asthma is based on clinical observation, that is the measurement of the variability of the peak flow, and reports by patients of the unpredictability and uncertainty of the onset of asthma symptoms despite maximal medical treatment (Haqqee and Hasan, 2007). However, such a definition does not take into account patients who had well-controlled asthma and experienced unexpected, severe, acute life threatening attacks. For that reason, brittle asthma was divided into two categories: Type 1 is persistent, with chaotic variability in PEF diurnal variation >40% for more than 50% of the time despite medical therapy. Type 2 is sporadic; sudden falls in PEF on a background of normal or near normal lung function and well-controlled asthma (Ayres et al, 1998).

Epidemiology of Brittle Asthma

Brittle asthma is rare and may occur in 0.05% of all asthmatics (Haqqee and Hasan, 2007). Little is known about the incidence or prevalence of brittle asthma. In type 1 brittle asthma there are usually no identifiable trigger factors that are related to the falls in PEF (Garcia et al. 2003). Many of the patients have psychological problems and there may be problems with adherence to therapy (Miles et al. 1995). However, this cannot be regarded as the only reason for the difficulties experienced by brittle asthma patient (Miles et al.1997). Brittle asthma is not due to poor compliance. In type 2 brittle asthma, there may be rapid and unexpected falls in PEF with severe exacerbations that may require ventilation (Kolbe et al. 1998).

Because of these definitional and diagnostic problems, the incidence and prevalence rates of brittle asthma are low. Ayres and colleagues (1998), in their study based on the West Midlands Brittle Asthma Register, classified 76 individuals into the brittle asthmatic group out of 300,000 who are registered. Females in Type 1 brittle asthma were predominant, between the ages of 18-55 years. In Type 2, there were no gender differences. Although it is established that variation in PEF accounts for mortality, actual rates of asthma deaths in brittle asthma patients have not been investigated. Hospital admissions are frequent in these groups, with Type 1 brittle patients having regular admissions and Type 2, with less use of health services and at unpredictable intervals (Ayres et al, 1998). The investigators also claim that Type 1 brittle asthma is a reason for increased use of medical care, as patients need large amounts of prescribed medication, and attend the emergency department more frequently.

Brittle diagnosis and clinical practice

On the basis of the hypothesis that brittle asthma is a distinct form of asthma, Gupta and Ayres (2001) attempted to define it more precisely. They aimed to eliminate inaccuracies in the measurement of diurnal variation in PEFR due to the non-linear characteristics of mini-peak flow meters. Moreover, for type 1 brittle asthma they require a monitoring period of at least 150 days during which variation of >40% is observed for >50% of the time in spite of high doses of inhaled steroids. They believe that this definition will facilitate more reliable epidemiological studies so that a distinct group of patients can be identified for further study.

Unfortunately, this definition is likely to prove too awkward for general practitioners who need to identify rapidly patients who might be at high risk. Moreover, as mentioned above brittle asthma diagnosis is based on observation of clinical phenomena (variability of PEF) and personal phenomena (such as uncertainty or unpredictability of sudden onset of severe asthma symptoms despite maximal drug treatment. However some have criticised the validity of PEF for severity classification (Pérez-Yarza et al. 2007) and it could be argued that uncertainty and unpredictability of symptoms can be affected by other factors such as anxiety for example. It could be then argued that anxious asthma patients may get a false diagnosis of brittle asthma since they are more likely to misperceive more their somatic sensations than non anxious patients.

The way illness is presented can affect the way patients respond to it (Leventhal et al, 1980). Past research work on illness representations on asthma suggests that patients tend to view their illness as an acute condition (e.g. episodic) (Insel et al. 2005). However, it may be the case that a diagnosis of brittle asthma can have a contrary outcome in anxious patients meaning that it may lead patients to believe their condition is unusual and therefore is not controllable. Locus of control is important in asthma management and can interfere with their therapeutic adherence by lack of motivation for self-management (Halimi et al. 2007). Finally, such a diagnostic label could have negative and stigmatising connotations which could influence their perceptions of social identity and therefore affect their social interactions and thus impact on their quality of life.

Conclusion: Variability in peak expiratory flow has been linked with asthma mortality. It seems therefore necessary to differentiate patients whose PEF varies considerably so that appropriate medical attention and treatment can be given to this group of patients. Brittle 1 and 2 type of asthma was introduced to account for those patients whose peak expiratory flow can vary considerably despite an apparent well-controlled asthma. Despite the attempt to classify this subcategory of the asthmatic population, definitional problems still exists as the asthma symptoms of brittle 1 and 2 types do not account for all the severe repeated asthma attacks and mortality rates and diagnosis is only based on clinical and personal phenomena. Because of this, research on the epidemiology of brittle 1 or 2 type of asthma mortality has not been conducted yet.

1.4.2 Acute Severe Asthma

Severe asthma is difficult to define, it generally includes cases with difficult to control or drug therapy resistant asthma (Papiris et al, 2002). Patients with acute severe asthma, account for the majority of emergency hospital admissions and mortality rates (Kaza et al; 2007). The initial assessment for patients with acute severe asthma is obtained with the measurement of peak expiratory flow (PEF) and oxygen saturation when available (British Thoracic Society, 2003). If the best or predicted value of PEF is 33-50%, patients are referred for hospital admission where they are given high dosage of β2 bronchodilator usually via oxygen-driven nebuliser. Individuals with acute severe asthma are referred for immediate hospital admission with the indication of life threatening asthma when the peak expiratory flow is less than 33% of the best or predicted value.

The majority of patients have mild to moderate asthma that can be satisfactory managed with the administration of anti-inflammatory drugs. Nevertheless, about 10% of the asthmatic population suffer from severe symptomatic asthma despite treatment with high dosage of β_2 bronchodilators and inhaled corticosteroids (Holgate & Polosa, 2006). According to the British Thoracic Society guidelines (2003) there are a number of adverse behavioural and psychosocial features that may account for the poor management of acute severe asthma. Risk factors for asthma morbidity and mortality include non adherence with treatment, failure to attend appointments, denial, social isolation and psychiatric illness (Robinson et al, 2003) [section 1.6.5 & 1.6.6].

1.5 Introduction to Epidemiology

Epidemiology is the study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems. The main purpose is to examine variations of the disease, in respect of age, gender, ethnicity, and to target the possible risk factors for either the development of the disease or its maintenance. The epidemiological studies of asthma can be complicated mainly because the disease itself is not well defined.

1.5.1 Definition of Key Terms in Epidemiology: Incidence and Prevalence

Two main terms used in epidemiological research are incidence and prevalence. The incidence of a disease accounts for the number of new cases derived from a defined population during a specific period. Prevalence on the other hand, relates to the proportion of individuals in a defined population who have a specific condition. Prevalence must be investigated at a specific point in time, either over a period of time (usually 12 months) or over lifetime.

1.6 Epidemiological Approach to Asthma

Asthma is a major public health problem. According to the UK 2001 Asthma Audit by the National Asthma Campaign the number of people with asthma had reached the 5.1 million of whom, 4.1 million were adults. The estimated number of people who suffered from asthma in 1999 was 3.5 million people, showing a substantial increase in the short period of two years (National Asthma Campaign, 2001 & 1999). Asthma is such a common illness and for that reason its economic impact on health resources is heavy. According to the National Asthma Campaign Audit 2001, the total cost that asthma puts to the UK health care services exceeded £850 million a year; £1.2 billion in lost productivity and a further £161 million in social security costs. Epidemiological studies are therefore vital as they investigate possible risk factors responsible for the development and maintenance of the disease that provide a greater insight as to what measures should be taken in order to decrease asthma morbidity and prevent future asthma attacks.

Epidemiologists (Pearce et al; 2000; Jenkins et al; 1996) investigating asthma aim first to detect asthma presence at one point of time or lifetime presence and second to characterize asthma phenotypes (i.e. the natural history of asthma) by using well-standardized questionnaires and taking several lung function tests. The method used for epidemiological research, is the observational design that includes cross sectional studies, cohort studies and case-control studies. The cross sectional study involves collection of data about the presence of asthma and the risk factors for its presence. A cohort study is a follow up study of people over time, during which new asthma cases can be detected and risk factors can be estimated either at the start of the follow up or during the course of the study. A case control study is the comparison of asthma patients with controls.

1.6.1 Testing Methods of Asthma Prevalence

Pearce et al. (2000) have questioned the accuracy of the methods used in testing asthma prevalence. They claim that standardized comparisons (in either international or between subpopulations where investigation of several socio-demographic variables takes place), can provide useful information about the causes of asthma and the causes of the increase in the prevalence of the condition once valid methods have been used. The problem arises from the difficulty in defining asthma and the lack of a single test in determining the boundaries of either the presence or the absence of asthma. The authors examined the role of bronchial responsiveness (BHR) as an objective tool for obtaining information about asthma symptoms against self-reported symptom questionnaires. Bronchial responsiveness is valuable as it cannot be influenced by variations in symptom perception nor can it be influenced by diagnostic trends. Support for the application of BHR came from a study conducted by Basagana et al. (2001). They investigated the incidence of asthma and its determinants. They found that bronchial responsiveness (BHR) was the most important predictor of asthma incidence. But, they also reported that it may detect abnormal airway responsiveness in people who do not have asthma.

Another method of measuring asthma prevalence is the administration of questionnaires. Self-reported questionnaires are assumed to suffer from subjective recall whereas the test of bronchial responsiveness is an independent and more objective test. On the other hand, self-reported questionnaires are both cost effective and take into account the participants' perspectives of their symptoms. Jenkins et al (1996) found that when investigating differences in asthma prevalence in populations subject to the same diagnostic criteria, symptom perception and the same language, then the test of bronchial responsiveness provides no greater validity than the use of self-reported questionnaires. In addition to this, the application of BHR is somewhat problematic. It can reduce response rates resulting in a smaller sample size and therefore minimizes the validity of the design of the study. Pearce et al (2000) suggest that self reported symptom questionnaires should be used for testing asthma prevalence in population studies and the application of bronchial responsiveness should be supplementary to that and not a sole screening tool.

Conclusion: Asthma is a multi-factorial disease and the lack of a single test for diagnosis worldwide can produce considerable problems when investigating its incidence and prevalence. Self-report questionnaires are the most common methods used in epidemiological studies to detect the presence of asthma. They are easy to use particularly for very large population studies and cost effective, but they may suffer from subjective bias. Vague questions such as “Do you believe you have asthma?” are more likely to suffer from response bias as opposed to more specific questions such as “Have you ever had physician diagnosed asthma?”. The underlying problem of asthma epidemiology derives from the lack of definite pathophysiological criteria of asthma that cannot be manipulated by certain factors such as cultural bias or environmental variables for example. On the other hand, objective measures such as bronchial responsiveness provide a more valid identification of asthma as it remains uninfluenced by different diagnostic methods or symptom perception. The disadvantages are that they are time consuming which reduces the probability of responses and they may detect abnormal airway responsiveness in individuals who do not have asthma. Although it is a strong predictor of asthma, epidemiologists argued that it should be regarded as a supplementary tool in detection of asthma and not as a sole screening tool to maximise the validity of asthma diagnosis.

1.6.2 Incidence of Asthma

Incidence reports on asthma can provide important information relevant to theories of the aetiology of the disease and they can define whether asthma is increasing in well-defined populations (Ownby et al; 1996). Most evidence for asthma incidence derives from retrospective studies but these studies may suffer from selection bias (Brogger, 2004). Only limited data is available about the incidence of asthma based on longitudinal prospective studies (Toren and Hermansson, 1999). Additionally, the results from different studies on incidence vary considerably depending on the age composition of the cohorts under study, the used methods and the criteria for disease (Table 1.1).

Toren et al. (2004) conducted a longitudinal study to estimate the incidence rates of asthma in 14,731 adults aged 30-54years old. The follow up sample was taken randomly from the overall sample of the European Respiratory Health Survey (ECRHS) in Denmark, Norway, Sweden, Estonia and Iceland in 1999-2001. The incidence rate of asthma was 2.2 cases per 1000 person. The incidence of asthma in women was found to be higher than that of the men (2.9 cases per 1000 and 1.5 cases per 1000 respectively).

Basagana and colleagues (2001) measured the incidence of asthma and the factors that determined its rates during 1991-93 (1,931 adults aged 26-50 years old) and 1998-99 (n= 1,640) in Spain. Incidence of asthma was greater in females than males. Moreover the authors found that bronchial hyper-responsiveness (BHR) was a robust predictor of asthma incidence. On the other hand, incidence of asthma was found to be the same in atopic and non-atopic individuals. The overall incidence rates were ranging from 1.50 to 5.53.

De Marco et al. (2000) aimed to estimate the age and sex specific incidence of asthma from birth to 44 years in men and women in several countries. The data were collected from the European Community Respiratory Health Survey (data were obtained from 15 countries: United Kingdom, Sweden, Netherlands, Germany, Greece, Italy, France, Portugal, Brussels, Switzerland, Spain, India, Australia, United States and New Zealand). Data from 18,659 patients were analyzed using the age when the first asthma attack was recorded, as the onset of the disease. Results revealed that the incidence rates were reversed between the two sexes after puberty where women were more susceptible to asthma than men (age specific ratios of asthma for women versus men were from 1.38 to 5.91). Higher incidence rates in women immediately after puberty suggest etiological links with hormonal changes, which could also play a role in the exacerbation and severity of asthma (Venn et al; 1998).

Huovinen and colleagues (1999) examined the incidence of asthma in 11,540 Finnish adult twins during a 15 year period. Data were obtained from a retrospective study comprised of twin adults aged 18-45 years old. Results revealed that the incidence of asthma between men and women was similar (2.3% for men and 2.6% for women) during the 15-year period which means that on average 1.6 new diagnoses of asthma were made each year during per 1,000 adults.

Toren and Hermansson (1999) investigated the incidence rates of asthma in a random sample of 15813 adult aged from 20 to 50 years. The study took place in Sweden and was conducted using a short respiratory questionnaire. The incidence for women was 1.3 cases per 1000 whereas for men was found slightly lower at 1.0 cases per 1000.

Table 1.1: Summary of results from epidemiological studies on asthma incidence

Author	Sample/Country	Screening Method	Incidence rates	Comments
Toren et al. (2004)	N=14.731 Age: 30-54yrs Country: Sweden, Norway, Estonia, Iceland and Denmark	Interview	2.2	Women showed greater rates of asthma incidence than men
Basagana et al. (2001)	N=1.931 Age: 26-50yrs Country: Spain	Measures of BHR and atopy	1.50-5.53	Greater incidence of asthma in women
De Marco et al. (2000)	N=18.659 Age:0-44yrs Country: 11 European countries and India, Australia, USA and New Zealand	Interview	1.38-5.91	Greater incidence of asthma in women after puberty
Huovinen et al. (1999)	N=11.540 Age: 18-45 Country: Finland	Postal Questionnaire	2.3-2.6	Similar rates of asthma incidence in men and women
Toren and Hermansson (1999)	N=15.813 Age:20-50yrs Country: Sweden	Postal Questionnaire	1.3-1.0	Higher incidence of asthma in women than men

Key findings on asthma incidence findings:

1. Females exhibit higher incidence rates of asthma after puberty than males
2. Bronchial hyper-responsiveness was a strong predictor of asthma incidence whereas atopy was not.

1.6.3 Asthma Prevalence

Soriano and colleagues (2003) conducted a retrospective study from 1990 to 1998, to estimate the physician diagnosed asthma in primary care in UK. Patients' data were collected from the General Practice Research Database (GPRD) where up to 472 GP practices were registered providing with a sample of 3.4 million patients. From 1990 to 1998 there was an increased prevalence rate of adult asthma of 4.11%, more specifically women showed a continuous increase in asthma prevalence from 3.01% in 1990 to 5.14% in 1998, whereas men showed had an increase in prevalence of 3.44% in 1990 to 5.06% in 1998.

Hoare and colleagues (2003) investigated the trends in the prevalence of asthma in England and Wales during the period 1994-1998. The retrospective data were obtained from 210 general practices that contribute to the General Practice Research Database. All the participating general practices have to follow certain guidelines and provide clinical data such as medical prescriptions and hospital admissions on a regular basis.

The accuracy of this system and the opportunities it provides for epidemiological research has been already acknowledged (Hollowell, 1997). Data was included for the analysis of this study on the basis that patients were alive and were receiving medical treatment for their asthma during the course of the study and that was independent of the severity of their condition. Patients' data were categorized into 6 groups according to their age: 0-4, 5-15, 16-24, 25-44, 45-64 and 65 years old and above. The prevalence of treated asthma increased for both sexes and for all the age groups except in children under the age of 5 years old. The age-standardized prevalence for males was 74 per

1,000 and for females 77 per 1,000. In particular, the prevalence of treated asthma increased in the age group 25-44 between the years 1994-98; from 44 to 52 per 1,000 males and 52 to 64 per 1,000 females. In the age group of 45-64, the prevalence of treated asthma increased from 45 to 51 for 1,000 males and 58 to 80 for 1,000 females during 1994-1998.

Hansen and colleagues (2000) studied asthma prevalence in a large Danish sample of young adults aged 20-35. The authors first obtained data from 1034 individuals between 1976 and 1978 and then 15 years later, received data from a new sample comprising of 1104 adults. All participants completed questionnaires on respiratory symptoms and underwent several respiratory tests. Results revealed that asthma prevalence was higher during 1991-94 than during 1976-78. More specifically, the prevalence of self-reported asthma increased from 1.5% to 4.8% during the 15 years period.

Upton and colleagues (2000) investigated the trends in the prevalence of both asthma and hay fever (atopic asthma) between 1972 and 1976 and compared it with the prevalence of the offspring of those participants, 20 years later in 1996, in Scotland. All residents from two towns in west Scotland were invited to participate in the study in 1972. Married couples (n=1477) were recruited in 1972 and 2338 offspring in 1996. The prevalence of asthma was compared in 1708 parents and 1124 offspring aged 45-54. The prevalence of asthma increased considerably for both men and women during the 20-year interval especially in those who reported having hay fever as well. The twofold to threefold increase of lifetime prevalence during the 20 years interval found in this study was highly associated with trends in atopy measured with hay fever.

In particular, atopic asthma increased with a prevalence ratio of 2.52 whereas the prevalence of non atopic asthma remained the same.

The Asthma Insight and Reality in Europe survey (AIRE, 2000) was a household based telephone survey across seven countries in Europe: Sweden, Netherlands, Germany, United Kingdom, Spain, France, and Italy. The study found that 8.6% of the total sample of participants among the seven countries (n=73,880) were diagnosed with asthma. The rates of current asthma were slightly lower at 6.3% of the total sample. The highest rates of household prevalence were found in United Kingdom (15.2%) whereas in Germany the rates were as low as 2.5%. The total number of individuals in the 73,880 households was 213,158. The population prevalence of current asthma was in all seven countries 2.7%.

Conclusion: From seven European countries the UK had the highest prevalence rates in asthma of 15.2%. Adult asthma prevalence in UK had an increase from 1990 to 1998 of 4.11%, where women showed a continuous increase in asthma prevalence from 3.01% in 1990 to 5.14% in 1998 and men showed had an increase in prevalence of 3.44% to 5.06% respectively.

1.6.4 Risk Factors for Asthma Development

Risk factors are characteristics of people that increase the probability that they will experience a specific disease or a condition associated with a disease. Risk factors for asthma include genetic predisposition and environmental exposures, such as house dust mites and environmental tobacco smoke.

1.6.4.1 Genetic factors

Pearce and colleagues (2000) examined whether atopy, that is the level of production of serum IgE when the organism is exposed to common environmental allergens (Jarvis & Burney, 1998), contributes to the development of asthma and the extent of its contribution. They reviewed comparison population-based studies of 600 participants and more with cross-sectional, longitudinal and case control designs where definition of asthma was based on variable airflow obstruction and proportions of atopy were reported. The authors reviewed studies that were particularly focused on skin prick test positivity (i.e. test of reaction of various allergens on skin).They reviewed seven cross-sectional studies on adult populations and they found that around 58% of all studied asthma adults were skin prick test positive and 24% of non-asthma adults were skin prick test positive. Such findings imply that although atopy plays a considerable role in the development of a significant proportion of asthma cases, its contribution as a cause of the condition may have been magnified. This may result in inadequate research on other factors that may also contribute to the etiology of asthma.

The European Community Respiratory Health Survey Group (1997) examined whether the family history of asthma can contribute to the development of asthma in the offspring. Results revealed that the asthma prevalence was 6.9% and the risk of asthma for an offspring was a threefold increase in one parent was diagnosed with asthma and up to sevenfold increase in case where both parents were asthmatics. A common limitation of this study is the lack of a worldwide accepted definition of asthma and for that reason a transcultural comparison of asthma prevalence among studies is not feasible. Moreover, genetic differences may also exist among countries, and environmental factors may cause variations due to environmental exposure such as air pollution or viral epidemics.

Previous research on the etiology of asthma has found genetic factors to be a powerful component in the condition (Koppelman et al; 1999) but they do not provide sufficient explanation of the increase in asthma prevalence during recent years (Huoniven et al; 2001). To test several socio-demographic factors against the genetic susceptibility of asthma, the same authors conducted a case-control study with adult twins both monozygotic and dizygotic, who had shared the same exposures during childhood. Several factors were investigated such as allergies, social class, and education, smoking and physical activities in 262 twin pairs aged 20 to 50 years old. The diagnosis of asthma was a clinical one, which caused cases with milder or borderline asthma to be excluded from the study. Results revealed that smoking was associated with higher prevalence of asthma but only in women. They also found significant differences between asthmatic and non-asthmatic co-twins in educational level and physical activity with those two factors playing a protective role against the asthma (i.e. the educational level and physical activity reflects a way of life that is not so much at risk of developing asthma). The authors proposed that further investigation is needed to examine the association of living conditions and factors like the ones presented in this study, which may change host resistance.

1.6.4.2 Environmental factors

Several studies have explored the relationship of poverty and asthma both as a contributing factor to the etiology of the condition and as a contributor to asthma severity, but results remain inconsistent. This could occur because there are many factors (e.g. living conditions) involved when investigating poverty therefore making studies incomplete if such factors are not taken into account. On the other hand, risk factors for asthma such as air pollution (Anderson et al; 1998), obesity, damp housing (Lewis et al; 2002; Williamson et al; 1997), smoking and work environment (Banks & Tarlo; 2000) are more prevalent in populations with socioeconomically disadvantaged backgrounds. Poverty, therefore, could be associated with asthma in a more indirect way (Rona, 2000).

An important criterion for a diagnosis of occupational asthma is when some aspect of the workplace environment causes it (Banks & Tarlo; 2000). The diagnosis of occupational asthma is a difficult one and can be integrated into three main steps. First, diagnosis of asthma should take place, second, a positive relationship between asthma and work environment should be confirmed, and third, a specific cause should be identified. Once a diagnosis is made, patients fall into two subgroups of occupational asthma. The first group includes those who report asthma symptoms within 24 hours after being exposed to a high inhaled concentration in the work environment; and those who report symptoms during their time at work. The first type of occupational asthma is called irritant-induced asthma and the second, sensitiser-induced asthma (Tarlo & Liss, 2003). The management of both types of occupational asthma is the same: both types should be treated, and sufferers either should reduce exposure to irritants or sensitisers in the work environment, or if necessary be removed from exposure.

Asthma is a common condition often with a late onset and occupational asthma may account up to 9%- 10% of adult onset asthma (Meredith et al, 1996; Blanc and Toren, 1999). This estimation though has been derived from cross-sectional and case-control studies. Karjalainen and colleagues (2001) conducted a national population based prospective study, to assess asthma incidence that is connected to the work environment. The authors stated the importance of conducting large population incidence studies as they could find variability between subcategories of occupational asthma and therefore estimate more efficiently the factors in the working place, which contribute to asthma. The Finnish population, they claimed, is ideal for such studies, on the basis that individuals with clinically diagnosed asthma are provided with special compensation of medication from the national health insurance scheme and hence they are all registered. All employed Finns aged 25-59 years and without a history of asthma, were followed from 1986-1998. Incidence of asthma was defined either when the individual was registered for asthma medication, or when a confirmation of occupational asthma was made. There were 49,575 asthma incidence cases reported of which 2,464 were identified as cases of occupational asthma. The observed incidence rates indicated that the significance of causal factors of asthma attributed to work, are up to five times more than it was previously thought. The risk occupations fell into a wider range than before, with agricultural, service work and manufacturing being the predominant risk occupations.

Harris and colleagues (1997) assessed the importance of environment (e.g indoor air exposures, socioeconomic status, parental smoking etc) in the development of asthma. They obtained data from 5, 864 Norwegian twins when they reached the age of 18-25 years old. The authors divided the data into 13 age categories (e.g. 0-1, 2-3, 4-5 etc). Participants were asked to complete questionnaires about their health history and zygosity classification. Results showed that only a small proportion, 5.7% (n=332) had a lifetime history of asthma. The authors failed to find support for environment acting as a risk factor for asthma.

The Health Survey for England investigated the prevalence of physician - diagnosed asthma and self-reported wheeze in adults over the age of 16 years for the last twelve months. Social factors like occupation were not a risk factor for physician diagnosed asthma in adults but patients derived from the unskilled and partly skilled social classes were more likely to report wheeze than those with professional or managerial status (ONS, Health Survey for England 1996).

Conclusion: Asthma remains a very complicated disease and further medical investigation is needed to understand the underlying causes of asthma. Risk factors for the etiology of asthma have been investigated extensively. Research findings remain contradictory, primarily as to whether or not it is genes or the environment that play the most important role for the etiology and prevalence of the disease. A transcultural comparison for genetic causation is not feasible as there are genetic differences among countries and there is not yet an accepted global definition for asthma. Nevertheless, the risk for asthma increases with the number of affected relatives, suggesting that inheritance may play a role in the development of the disease. On the other hand, environmental factors such as living and work conditions appear to be a strong risk factor for asthma prevalence. Both house and work environment are linked with income, with the more economically deprived individuals being under greater risk for developing asthma than those who are under better living and working conditions. Moreover, socioeconomic status has been linked with levels of educational status and higher levels of education revealed a bigger percentage of healthy lifestyles, which contributed as a preventive factor against asthma symptomatology, and thus better management of the disease. Finally, atopy has been found in many studies to co-exist with asthma. Researchers suggest that its connection to asthma causation has been magnified as atopy can be detected in individuals who do not have asthma.

1.6.5 Risk factors for asthma morbidity

Risk factors of asthma were measured in terms of asthma severity, demographic variables and psychosocial factors.

1.6.5.1 Psychosocial Factors for Asthma Morbidity

Campbell and colleagues (1995) have identified several factors that account for excessive use of health services and mortality due to asthma attacks. Non-adherence to drug therapy (i.e. overuse of medication), poor socioeconomic background and psychological distress are some of the most important factors. Adams et al (2000) aimed to identify factors for which asthma patients tend to be admitted frequently to emergency departments other than severity and poor living conditions. They recruited 293 Australian adult (aged 15+) asthma patients with moderate to severe asthma. Severity of disease was assessed with the National Asthma Education and Prevention Program guidelines. There were 293 patients at baseline, 268 at 6 months and 212 at 12 months. Demographic data were explored concerning the income, education level etc. Psychosocial variables were also investigated including the personal coping styles of the patients categorized into three groups: avoidance coping both behavioural and cognitive; active coping also behavioural and cognitive and denial coping. Finally, decision-making preferences were studied concerning medical treatment after an asthma attack. Socio-demographic data showed that less than half (46%) of the total sample had more than 10 years of education, and more than half (51%) had economic difficulties with major concerns about the cost of drug therapy. This caused them either to avoid or delay medical care for their condition. Men were more likely to have hospital admissions than women were, but women showed higher rates of emergency department visits. Education of 10 years and below was found to be a significant risk factor for both hospital admissions and emergency department visits independent of the gender of the patients. Clinical data such as lung function and drug treatment were not risk factors for hospital admissions. Patients who had a written plan by their physician with self-treatment guidelines were less likely to be admitted to hospital than those without an action plan. Patients with dependent behaviour and lower autonomy preferences were associated with higher rates of hospital admissions. These were risk factors for emergency department visits too. No notable differences in hospital admissions in relation to gender were found although women had more emergency department visits than men. Individuals, who showed low preference for decision making for drug therapy after an asthma attack and were solely dependent on their physician's advice, were associated with more hospital admissions than those who were more active about their asthma management. Finally, patients who had avoidance coping styles were more likely to be admitted to hospital than those with active or denial coping.

Wainwright and colleagues (2007) examined the role of psychosocial factors on data from 20,854 asthma patients aged 41-80 years available from the Norfolk cohort study. They found that rates for hospital admission were higher for patients who reported that the support they received from their closest friends was negative (30%) and for those who felt that life events have had a great impact in their lives (40%). The authors concluded that patients with restricted or impaired social support may find it more difficult to manage their asthma as effectively as patients who have greater support.

Conclusion: Cognitive appraisals influence behaviour and thus, the coping style a patient will adopt in order to manage the disease. Different coping styles have different management outcomes. Patients with preference for avoidant behaviour are more likely to withdraw from treatment and cancel their appointments with their consultant physician and this could result in poor management of asthma. Patients who show avoidant behaviour in an attempt to lessen their anxiety symptoms caused by their asthma try to escape from anything that has reference to the disease. On the other hand, individuals with a more active approach to the management of the disease are more likely to have a better awareness of their condition, adhere to their pharmaceutical recipe and thus achieve greater control over their asthma symptoms. Finally, patients with greater social networks or higher perceived social support are more likely to manage their asthma symptoms more accurately and more effectively.

1.6.5.2 Gender

Linked information on both first admissions and re-admissions in Scotland for the years 1981 until 1997 was obtained from the Information and Statistics Division of the Common Services Agency of the NHS. Age and gender specific rates were estimated per 100 000 population. There were 5 age groups: 0-4, 5-14, 15-39, 40-59 and 60+. The overall number of admissions for the period 1981-1997 was 160 039 involving 82 421 patients. Data revealed that during 1980s and early 1990s the rates for hospital admissions doubled but in the late 1990s started to decrease. Children aged 0-14 years and elderly people over the age of 60 showed the higher rates for admission during the 1980s but they fell significantly the next decade. For the other age groups (15+) the rates for admissions increased constantly. The rates for first admissions were much higher for all age groups, in both sexes, than the rates for re admissions during the 1980s and 1990s. Boys were more likely to be admitted for asthma than the girls under the age of 15 years, and the reverse, females, over the age of 15 years showed higher rates for hospital admission than the males (Morrison et al; 2001). These results support previous findings that gender seems to be a risk factor for asthma morbidity.

Trawick et al (2001) conducted a 10 year retrospective study from 1985 to 1994 to examine the influence of gender in hospitalization rates, length of stay in hospital and hypercapnea in 103 American adult (18-50 years) asthma patients who had experienced multiple admissions. In total, there were 382 admissions. Results showed that 75 out of 103 were female patients accounting for 262 hospital admissions out of the total 382. Moreover, females were more likely to be admitted to hospital in older age than men. Gender seems to play a risk factor for hospital admissions with females being at greater risk for hospitalisation than men.

Further support for the association between female gender and hospitalisation derives from the investigation of hospital data from 17,601 Canadians, 12 or older years old (Chen et al; 2001). The authors further found that older age, low levels of education and low income served as risk factors for hospitalisation.

Conclusion: Such results show that demographic and socioeconomic factors may play some role in the relationship of asthma and number of hospital admissions, suggesting that there may be a subgroup of asthma patients, who are at greater risk of hospitalisation than the rest of the asthmatic population.

1.6.5.3 Severity of asthma

Ford and colleagues (2001) explored the relationship between poor access to health services, psychological distress, severity of asthma and emergency department visits. Three hundred and seventy five (375) American adults with a clinical diagnosis of asthma were recruited. Severity of disease was assessed with the National Asthma Education and Prevention Program guidelines. Results showed that severe asthma patients had a mean number of emergency department visits of 3.6 per year, for moderate asthma patients the mean number was 2.4 and for mild asthmatics was 1.7. Therefore, severity of asthma was the strongest predictor of use of emergency department visits and patients with severe or moderate asthma were 3.8 times more likely to be admitted to emergency department than patients with milder cases of asthma. In addition, the authors found that comorbidity of other disorders was a risk factor for emergency department visits. On the other hand, psychological variables of anxiety and worry and depression did not predict frequency of emergency visits when severity of asthma was controlled.

As discussed earlier, the psychological status of the patient is likely to have a direct impact on the individual's approach to the disease. Anxiety for example, may alter the patient's attitude and behaviour in a way that is no longer beneficial to the management of asthma. For instance, avoidance behaviour and denial are behavioural and cognitive outcomes of anxiety. These factors seem to have an indirect impact on asthma morbidity since patients who adopt these behaviours and ways of thinking, are more likely to be admitted to the emergency care than patients who do not. However, the degree to which psychological distress affects asthma morbidity is not yet clear, whereas, severity of asthma seems to appear as a stronger risk factor for asthma morbidity independent of the patients' psychological status.

Summary of risk factors of asthma morbidity: Gender appears to play an important role in asthma morbidity. Females are more likely as they grow older, to be admitted to hospital than males. Furthermore, medical non-adherence has been linked with an increase in hospital admissions and use of the emergency care. Patients who suffer from psychological distress, such as anxiety, are more likely to engage in denial thinking and avoidance behaviour. The consequence of this could be withdrawal from the drug therapy and cancellation of appointments with the consultant physician. These actions may lead to patients' higher risk of hospitalisation. This holds true, mainly in the cases of severe asthma but does not apply to patients with milder symptoms. Severity on the other hand, was found to predict asthma morbidity independent of the patients' psychological status.

1.6.6 Asthma Mortality

Asthma mortality signifies failure to manage the disease appropriately (British Thoracic Society, 1982). The interpretation of asthma mortality rates has been criticized because mortality data is not often available for many countries. In addition, different diagnostic mortality criteria may overlap with other lung diseases such as chronic bronchitis and emphysema especially in the elderly. Recent reports on asthma mortality have shown a decrease in asthma deaths after the middle of 1980s into the 1990s as compared with mortality trends of the 1960s and 1970s in England and Wales (Campbell et al., 1997). Observation of those rates, suggest a wider asthma awareness among physicians and patients that improves asthma management and thus lower mortality rates over the years. Therefore, despite the definitional problems with asthma and the overlap of asthma symptoms with those of other pulmonary diseases over time, there is sufficient evidence that mortality due to asthma has decreased in the last two decades possibly as a result of better awareness of asthma and improved drug therapy.

1.6.6.1 Risk Factors for Asthma Mortality

1.6.6.1a Medication

Lanes, Rodriguez and Huerta (2002) examined the effect of level of asthma medication on asthma mortality in UK, recruiting data from 96,258 asthma patients available from the General Practice Research Database during 1994-1998. For each asthma case, the investigators selected 20 controls aged 10-79 years. Forty-three deaths were identified as asthma deaths and there were 860 deaths for the controls. The overall mortality rate from asthma was 12.5 deaths per 100,000. Age was a risk factor but not gender. Inhaled steroids were the most frequently prescribed drugs and they were associated with a decrease in asthma deaths. On the other hand, short acting β agonists, which were taken at least once per month, were related to a high risk of asthma mortality. A possible explanation of this association could be that short acting β agonists are linked with excessive use whereas inhaled steroids are linked with patients who take the recommended doses by their physician (Lanes et a; 2002). In addition, the number of prescriptions of short acting β agonist was found to be a risk factor for asthma mortality (51.6 was the risk ratio for 13+ prescriptions of short acting β agonist and 16.2 was the risk ratio for prescriptions falling in the range of 7-12). The authors indicated that such results could be due to the fact that short β agonists are usually prescribed to patients with Chronic Obstructive Pulmonary Disease. Moreover, the sample of the study consisted of elderly patients and therefore there is a high probability of diagnostic misclassification in death rates, and many may have been COPD disease related and not asthma related.

Abramson and colleagues (2001) investigated the relationship between asthma medications and mortality. They obtained retrospective data from 89 individuals who had died before the age of 60 years old and compared their data to 322 asthma controls. Medications were divided into five categories: 1) inhaled symptomatic medications (i.e. drugs to relieve symptoms), 2) nebulised symptomatic drugs, 3) inhaled preventive medication, 4) oral symptomatic drugs and 5) oral preventive medication. The authors found that salbutamol concentrations were much higher in the cases than in controls, suggesting that some of the deaths could have been caused by salbutamol toxicity, as high concentrations of the substance can cause cardiac problems. However, since the investigators did not control for the severity of the asthma attack as such data were not available at the time of the death, high concentrations of salbutamol cannot be proven to play a causal role to the asthma deaths.

Meier and Jick (1997) studied the effects of drug therapy on asthma mortality, in association with several patient characteristics such as age, comorbidity with other lung disease, number of practitioner visits and hospital admissions. Patients' data were obtained from the General Practice Research Database first in 1992 and again in 1995 in UK. Data were retrieved from patients (aged 12-64 years) who were identified as first time users for long acting β agonist drugs such as salmeterol, ipratropium bromide or theophylline and they were followed for sixteen weeks. Deaths were distinguished between respiratory, cardiovascular, cancer and other causes and were separately estimated for the three asthma drugs specified above. A total of 8386 asthma patients taking salmeterol were identified, 2937 for ipratropium bromide and 2937 for theophylline. There were 70 deaths during the following up period of the 16 weeks from which 28 deaths were due to respiratory causes. From the 28 deaths, 5 were patients taking salmeterol, 14 patients receiving ipratropium bromide, 4 taking theophylline and finally 5 receiving mix drug treatment. Twenty-one patients of the 28 who died from respiratory causes had either a chronic obstructive pulmonary disease or emphysema. The severity of their respiratory condition of the 28 patients who died was compared with 100 patients who survived matched in age and sex and receiving the same drug therapy. Results revealed that the number of asthma drug prescriptions gave a risk ratio for asthma mortality due to ipratropium was 7.9, for theophylline users the risk ratio was 1.1 and for mixed drug users the risk ratio was 2.2 when these rates were compared to salmeterol users.

Hospital visits and admissions to emergency department were also a risk factor for mortality with a risk ratio of 6.2 for patients who have been admitted to hospital more than 10 times in the past. Moreover, the presence of a cormobid respiratory disease like Chronic Obstructive Pulmonary disease, were also predictors for deaths in this asthmatic population. Because there was just a small number of cases without COPD (just 7 cases with asthma alone), the authors were not able to calculate the risk factor for comorbidity of COPD and asthma in this study. Drugs such as salmeterol, ipatropium and theophylline, are regularly used in UK practice to treat patients with severe asthma symptoms. Ipatropium bromide and theophylline were associated with an increase in mortality rates whereas salmeterol did not.

1.6.6.1b Psychosocial Factors

Sturdy and colleagues (2002) investigated the effects of several psychosocial factors in asthma mortality. Data were collected from 533 asthma patients and 533 hospital controls from seven regions of Britain during 1994 and 1998. Cases and controls were 65 years old and under. Eighty-five per cent of the asthma cases (n=453) and 86% of the controls (n=458) had a psychosocial problem such as anxiety and substance abuse. Analysis linked four major psychosocial problems with increased risk of mortality. These were psychosis, drug and/or alcohol consumption, financial problems and learning difficulties. Anxiety and sexual problems were also related to risk of mortality. Other psychosocial factors such as domestic abuse, family problems and social isolation did not correlate with asthma deaths.

Summary:

- Epidemiology on asthma mortality suffers from considerable criticism because available data on asthma mortality fails to distinguish various factors that may intercorrelate with asthma deaths among different countries, such as, different diagnostic criteria and environmental variables (e.g. air pollution or viral epidemic).

- Age is a risk factor for asthma mortality.

- Rapid onset of asthma attack and clinical levels of anxiety are risk factors for developing life threatening severe asthma.

- Comorbidity of other lung diseases such as Chronic Obstructive Pulmonary Disease (COPD) is a risk factor for asthma mortality.

- Excess of use of long acting β agonist is a risk factor for asthma deaths.

- Several psychosocial variables such as psychosis, drug/alcohol abuse and anxiety are risk factors for asthma morbidity and mortality.

1.7 Medical management of asthma

Drug therapy aims to help patients with asthma gain control over their symptoms. More specifically, appropriate drug therapy can decrease symptoms of asthma day and night, help the patients to expand their physical activities, to reduce the intake of reliever medication and have a normal lung function (British Thoracic Society, 2003). Drug therapy differs between countries and continents (cited in Barnes, 1997). However, control of asthma is typically achieved with the administration of certain drugs like β2 agonists and steroids worldwide (cited in Barnes, 1997).

The British Thoracic Society has developed a stepwise medication therapy to suit the individual needs of each patient. According to this method, it is the severity of the asthma symptoms of each patient that will determine which drugs are more appropriate and the amount of dose that is needed. For the purposes of this research, we use the British Thoracic Society guidelines to assess asthma severity in our participants. These guidelines are reviewed briefly below. There are five steps with step 1 indicating the mildest form of asthma. Patients with symptomatic asthma are prescribed short-term reliever medication such as short acting β_2 agonists either inhaler, tablets or syrup; theophyllines and ipratropium bromide (British Thoracic Society, 2003). In step 2, inhaled steroid therapy is introduced to patients with impaired lung function and recent exacerbation, twice daily (200μg daily). Other preventive medication includes cromones, leukotriene receptor antagonists and long acting β_2 agonists. In step 3, patients who present poor control over their symptoms with low dosage of inhaled steroid therapy, are advised to increase the drug dosage usually in long acting β_2 agonists up to 800μg daily. Patients who do not respond effectively with the drug dosage in step 3, proceede to step 4 where a higher dose of inhaled steroids (2000 μg daily) and additional preventive therapy takes place. The most severe form of asthma is observed at patients in step 5 where oral steroid therapy is introduced and frequent or continuous intake is needed.

All the drugs described above have both advantages and disadvantages. The most popular drugs are the β_2 agonists and steroids β_2 agonists are the most effective bronchodilators in treating asthma. They relieve symptoms rapidly by smoothing airway muscle cells, and in low dosages have no known side effects when inhaled. Oral intake though, may cause tachycardia (i.e. palpitation) and tremor. Research has shown that short acting β_2 agonists contribute to asthma mortality and morbidity. Nevertheless, it is not still clear whether this is due to overdose of the drug or just the presence of severe asthma (Sears et al; 1990). The most effective drug therapy is obtained through glucocorticoids as they reduced the inflammation in the airways. Patients who are on tablet steroid long term therapy though and not inhaled, are at risk of developing diabetes mellitus and osteoporosis (British Thoracic Society, 2003).

There are no drugs available to cure asthma, possibly because the underlying causes of asthma are not yet understood (Barnes, 1997). However, with anti-asthma drugs patients can achieve and maintain control over their symptoms, with minor side effects, if used properly. Barnes (1997) suggests that improvement of medication therapy should lead to oral administration of drugs as it has been proved by research (Kelloway et al; 1994) that oral therapy is both cost effective and convenient to the patient.

Summary: Drug therapy for asthma varies across countries. Nevertheless, the most common drugs described worldwide are the β agonists and steroids. In Britain, physicians in respiratory medicine apply the five-step medication guidelines developed by the British Thoracic Society. Severity of asthma symptoms will determine the nature of drugs as well as the amount of those drugs that will be described for the patient.

Conclusion: Further research is needed towards a better medication therapy, which will enable patients to prevent asthma symptomatology without taking the risks of adverse side effects. To achieve this further investigation regarding the natural history of asthma is necessary to understand the most common phenotypes of asthma and produce a drug, which will be with fewer physical side effects.

1.8 Non pharmacological management of asthma

Drug therapy is essential for the control of symptoms and the maintenance of good lung function. Along with pharmacotherapy, recently there has been an increasing interest in various factors that may either help in delaying or even preventing the onset of the disease (primary prophylaxis) or help reducing the impact of symptoms after diagnosis for the disease is made (secondary prophylaxis) (British Thoracic Society, 2003).

Allergen Avoidance seems to be one of the most effective measures both to prevent the onset of asthma and to reduce its impact once diagnosed. Aeroallergens are divided into outdoor and indoor. Outdoor air pollution has been proven to induce asthma exarcebations. Pollutants like ozone can either have a direct effect on asthma symptomatology or intensify the effect of allergens to which an individual is sensitive (BSACI, 1995). Anderson and colleagues (1998) investigated the relationship between air pollution and hospital admissions for in all National health services in hospitals in London between the years 1987-1992. Patients were divided for the purpose of the study into three age subgroups: 0-14, 15-64, 65+. Results showed that ozone was associated with hospital admissions particularly in the group age of 15-64, whereas other pollutants like nitrogen dioxide and sulphur dioxide were associated with the other two age groups. The inconsistency that exists across the age groups in a specific pollen accord with the results from previous publishes studies on air pollution and asthma admissions, and suggests that although there is an apparent link between air pollution and admissions, it lacks consistency (Anderson et al, 1998).

Indoor aeroallergens include damp housing, tobacco smoke, house dust mite and animal hair. Damp housing has proved very problematic, since it is associated greatly with exarcebation of respiratory symptoms like wheeze (Brunekreef, 1992). There have been also case-control studies, which suggest that people with asthma are more likely to live in a damp house. Williamson and colleagues (1997) wanted to investigate this further and tested the link between asthma and damp housing. The design of this study is case-control where the cases were 102 asthma diagnosed patients and the controls were 196 matched for age and gender individuals. Participants were both interviewed and a qualified surveyor assessed dampness and mould in participants' houses. Asthma patients reported dampness in their house more frequently than their controls. The surveyor also reported more dampness and mould in the asthma patients' houses than in controls'. Interesting findings from this study is that both asthma patients and controls seemed to under-report the dampness in their house, and therefore eliminates any possible assumption of response-bias. The authors acknowledge the link between damp housing and asthma morbidity but propose further investigation to examine whether dampness predisposes asthma development or provokes its symptoms.

Key points:

- Drug therapy helps patients to maintain a good lung function. On the other hand, if patients take some prophylactic measures they may reduce or even prevent the development of asthma.

- Allergen Avoidance (outdoor and indoor) is considered as a very important prophylactic measure against asthma symptomatology.

- Air pollution is a risk factor for asthma exarcebations and hospital admissions.

- Indoor allergens such as house dust mite and tobacco smoke are risk factors for wheeze.

- Research findings suggest a link between individuals with asthma and house dampness. Conclusions still remain to be drawn as to whether or not house dampness is a risk factor for asthma development or whether it provokes asthmatic symptoms.

Chapter 2

Introduction to Anxiety

This chapter introduces the definition of anxiety and its classification into trait and state anxiety. It presents the definition and classification of clinical anxiety and finally examines the relationship between anxiety and cognition.

2.1 Definition of Anxiety

Anxiety is an emotional response with several somatic, cognitive and behavioural symptoms to a perceived threat or danger. It is important though, to distinguish between fear and anxiety. Fear is the logical appraisal of a threatening stimulus whereas anxiety is the emotional response to that appraisal. Fear is activated when the individual is exposed (physically or psychologically) to a situation s/he considers as dangerous. It makes sense to talk about "realistic" or "irrational" fear on the basis that an individual's assumptions and reasoning could be either logical or faulty according to cognitive processes that are involved during an objective observation. On the other hand, anxiety should not be labeled as rational or irrational, as it represents an affective response and not an evaluation of reality (Beck, 1971). Nevertheless, an individual may feel anxious without being clinically anxious, making a distinction between normal and pathological anxiety. As described above, anxiety is the normal emotional reaction aroused by a threat and it disappears when the danger is no longer present. Clinical anxiety on the other hand, is the disproportionate emotional response to the severity of threat and it continues despite the fact that the objective danger no longer exists.

2.1.1 State and Trait Anxiety

An anxious personality differs dramatically from a person who becomes anxious under specific circumstances in the sense that the former is a constant condition without time constraints (i.e. an individual has an anxious personality when s/he has the tendency to become anxious most of the time) whereas the latter is an ephemeral situation. The distinction between anxiety as a temporary condition and as an enduring characteristic is not new (Cattell & Scheier, 1960). The authors coined the term state anxiety for temporary anxiety and the term trait anxiety for a permanent characteristic. Spielberger (1972) emphasized the importance of such a distinction (i.e. that trait and state anxiety differ) and established it as a basic consideration when conducting research in anxiety. Moreover, Spielberger (1980) made a further distinction between worry and emotionality, where worry refers to the cognitive component of anxiety (i.e. concern about impending danger or low perceived control over the threat) and emotionality refers to the perceived arousal element of anxiety (i.e. physical symptoms such as sweating, palpitations and other bodily sensations.). Consequently, an individual who has an anxious personality will exhibit more worry and greater emotionality than a non-anxious person or an individual with state anxiety.

2.1.2 High and Low Trait Anxiety

Trait-state anxiety, tend to be correlated. Given a complex or feared condition, trait anxious individuals are very likely to exhibit state anxiety. For that reason, Spielberger et al. (1984) stated that individuals who exhibit high trait anxiety are more exposed to stress and are more likely to perceive a wide range of stimuli as dangerous. Because they tend to view the world as dangerous they often experience state anxiety, with greater intensity than do individuals with lower trait anxiety. As Eysenck and colleagues (1987) argued, there are substantial cognitive processing differences between high and low trait anxious individuals in respect to attention and memory. Scott and Burns (2001) found that high anxious individuals were more likely to spell threatening words when they underwent a spelling test using 20 homophones (e.g. pain-pane) than those with lower levels of anxiety. Finally, Pury and Mineka (2001) investigated the encoding processes of both affective content information and non-affective in high and low trait anxious individuals. They found that individuals with high trait anxiety were more likely to encode faster relatively salient information if it was affective than when it was not. It seems that individuals who differ in anxiety level (high or low trait anxiety) will differ also in their allocation of processing resources to threatening and non-threatening stimuli. Specifically, threatening stimuli seem to capture the attention of highly anxious individuals and therefore, the level of trait anxiety can serve as a vulnerability factor that determines a person's reaction to external events.

2.2 Clinical Anxiety

Clinical anxiety, as defined by House & Stark (2002), is a state of intense apprehension, uneasiness, uncertainty, or fear, resulting from the anticipation of a threatening event or situation, often to a degree that the normal physical and psychological functioning of the affected individual is severely disrupted.

2.2.1 Classification and Symptoms of Clinical Anxiety

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; 1994), there are 11 anxiety disorders:

i. Panic disorder with or without agoraphobia
ii. Agoraphobia without a history of panic disorder
iii. Generalised anxiety disorder
iv. Anxiety disorder due to a medical condition
v. Post-traumatic stress disorder
vi. Substance induced anxiety disorder
vii. Atypical anxiety disorder
viii. Social phobia
ix. Specific phobia
x. Obsessive compulsive disorder
xi. Acute stress disorder

Symptoms of clinical anxiety can be described in four categories: the emotional symptoms, the physical, the cognitive and the behavioural symptoms. The emotional part of anxiety is fear (fear of dying, fear of passing out, fear of losing control and fear of going crazy). Individuals who are moderately anxious, may describe this feeling as nervousness while individuals who exhibit high levels of anxiety are more likely to experience panic. The most familiar physical symptoms include shortness of breath, palpitations, sweating and choking (House & Stark, 2002). Anxiety can also affect an individual's cognitive mechanisms either by influencing attention (i.e. the affected individual may narrow his/her attention towards threat stimuli) (Mathews & MacLeod, 1994) or by influencing memory (i.e. the individual may only retrieve information that is threat related)(Williams et al; 1988). Subsequently the behavioural outcome of an anxiety experience is avoidance, safety-seeking behaviour or agoraphobia. It is very important to acknowledge the four different functional systems of anxiety to allow a more effective treatment.

2.3 Anxiety and Cognition

The study of cognitive functioning in anxious individuals has a long history within the domain of experimental clinical psychology (Beck & Emery, 1985; Ingram & Kendall, 1987). Cognitive research into anxiety has focused upon the patterns of selective information processing that are associated with high levels of anxiety. For example, an individual may consider an information either in an ordinary or peculiar content, may process that information in a normal or pathological manner and may make conclusions which are either correct or erroneous (Ingram & Kendall, 1987). Butler and Mathews (1983) found that patients suffering from anxiety were more likely to interpret ambiguous stimuli in a threatening manner than non- anxious individuals did.

Information Processing in Anxiety

According to the cognitive models of anxiety (e.g. Cognitive Model of panic by Clark, 1986), anxious individuals process information selectively about stimuli they perceive as a personal threat. As a result, associated schemata (i.e. cognitive structures) are activated, which are further organized into subsystems corresponding to broad motivational concerns like fear and danger.

Mathews and MacLeod (1985) investigated the selective processing of threat cues in patients with anxiety. They recruited 24 anxious and 24 non-anxious individuals who were asked to colour name words (i.e. participants were given a list of words. All words were accompanied with the colour name) related to physical or social threat, and words that had no threatening content. Results revealed that although anxious individuals were slow in colour naming words independent of content, they were particularly slow in colour naming threatening words. The authors argued that either anxious individuals tend to maintain threatening schemata in relatively permanent states of activation, or, those schemata are easier to be activated in anxious individuals.

Attentional Bias in Anxiety

Evidence for attentional bias comes from a study conducted by Mathews and McLeod (1985). In their experimental work, two groups, one with individuals with generalised anxiety disorder and one with non-anxious individuals, were asked to detect a visual dot, which sometimes appeared on the screen, as they were asked to read the top word of a pair of words. Some of the words appeared on the screen were threat words and the dot could either be present on the upper or lower location of the screen. The authors found that participants gave different responses depending on the location of the dot. Anxious individuals spotted the dot regardless of its location, especially when threat words appeared on the screen. For the non-anxious individuals on the other hand, the pattern of attention was exactly the opposite; they tended to spot the dot when positive words appeared on the screen. They concluded that individuals with clinical levels of anxiety are prone to attentional bias with regards to stimuli that they perceive as threatening or dangerous.

The same study was replicated by Broadbent & Broadbent (1988). In this study, the authors examined the relationship of response time to trait and state anxiety in a non-clinical population. They found that individuals with trait anxiety gave more correct responses than individuals with state anxiety, especially those with very high levels of trait anxiety. The authors concluded that attentional bias may become more severe in cases with extreme anxiety.

Nay and colleagues (2004) examined the role of threat biased attentional processes on emotional and/or fearful responses. They recruited 87 anxious individuals who underwent an inhalation of 20% carbon dioxide (CO_2) challenge during a masked/unmasked emotional Stroop task (i.e. presenting stimuli at durations that allow both conscious (unmasked) and nonconscious (masked) processing). After the challenge participants were asked to rate their emotional responses on presented stimuli. They found that individuals responded fearfully to both masked and unmasked stimuli.

Cognitive avoidance in Anxiety

The effects of threatening cues and anxiety on attention in high and low trait anxious individuals, was investigated by Broomfield and colleagues (Broomfield et al; 2005). One hundred participants with different levels of trait anxiety were presented with threat and non threat words using the Posner cueing task. Heart rate and eye movement were also recorded to assess the attentional processes during the task. The authors found that high trait anxious participants were first unable to inhibit eye movement towards threat and they then rapidly disengaged from the threat cues. They concluded that anxious individuals tend to employ cognitive avoidance to prevent any emotional processing during a stressful situation.

The effect of emotional vulnerability on attention was investigated by Manguno-Mire et al; (2005). They compared the emotional responses of both anxious and non anxious individuals during a masked/unmasked Stroop task. Their results revealed that anxious individuals were more likely to categorise masked words as threatening than non anxious participants.

Harrison and Turpin (2003) examined the impact of threatening words and trait anxiety on implicit memory performance. Forty participants were allocated into two equal groups depending on the level of their trait anxiety (low trait anxious individuals were distinguished from high trait anxious participants according to pre-arranged cut-offs). Participants were asked first to view threat and non-threat words and then to complete primed and unprimed wordstems (complete and incomplete wordstems respectively). Implicit memory (i.e. word recall) performance was measured according to time response and accuracy. Interestingly the authors found that participants revealed an implicit memory bias towards non-threatening words and they based their findings on "vigilance-avoidance" model of attention that predicts the inhibition of more meaningful processing of threat stimuli in anxious individuals as a strategy to lessen the experience of anxiety. On the other hand, Cloitre and Liebowitz's findings (1991) failed to support the cognitive avoidance hypothesis. They compared and evaluated anxious and non-anxious individuals' memory on threatening, positive and neutral words. Their results showed that anxious individuals showed a preferential processing of threatening information than of positive or neutral. The authors suggested that cognitive avoidance is a product of the relationship of state and trait anxiety, and the level of threat of the stimulus, and when the individual has high trait and state anxiety and the stimulus is threat related, there is a consistent memory bias towards the threat related stimuli.

Conclusion: Highly anxious individuals show the tendency to process ambiguous information in a threatening manner and exhibit attentional bias towards any stimuli they perceive as threatening. Conversely, individuals with low trait and state anxiety are more likely to engage in avoidance behaviour towards the threatening stimulus, in order to cope with their anxiety symptoms. Furthermore, highly anxious personalities tend to process affective information faster than any other information that has no affect content. They show a memory bias towards threatening events and tend to retrieve threatening information easier than information that is more salient.

2.4 Quality of Life across the Spectrum of Anxiety Disorders.

Lochner and colleagues (2003) investigated quality of life in terms of objective and subjective impairment in 337 outpatients with obsessive compulsive disorder, panic disorder and social anxiety disorder. They found that although the level of overall impairment appeared to be the same in all three disorders, each disorder was affected differently in various domains. In particular, panic disorder patients exhibited an inability to stop using drugs that were not prescribed by their physician; socially anxious patients were more affected in their social life and leisure activities and obsessive compulsive disorder patients revealed a greater impairment in their family life and everyday activities.

The quality of life of panic disorder patients was compared to the quality of life of socially anxious patients and normal controls (Simon et al; 2002). Participants' quality of life was measured by the administration of the Medical Outcomes Study Short-Form (SF-36). The investigators found that although the socially anxious patients displayed greater impairment than controls, they were less impaired in terms of both physical and mental functioning than patients with panic disorder.

2.5 Treatment of Anxiety Disorders

The presence of anxiety symptoms often does not serve as a sufficient reason for the anxious individual to ask for medical help. According to Jenike (1996) individuals with severe anxiety symptoms wait approximately 12 years from the time of onset of their anxiety until they seek treatment. There are two main methods of treating anxiety disorders: Drug therapy and Cognitive Behavioural therapy.

a) The pharmacological approach

The selective serotonin reuptake inhibitors (SSRIs) are the main drug treatment for anxiety disorders. Although the SSRIs may cause substantial improvement in the quality of life of the patients, they do not provide a fully satisfactory treatment (Shears; 2003). For most patients, the SSRIs suppress their anxiety symptoms, therefore, once treatment is stopped the symptoms return. Benzodiazepines (BZDs) are sometimes effective in patients with treatment-resistance disease and they are prescribed, once two or three different SSRIs prove ineffective.

b) The non-pharmacological approach

The most well known psychological therapy of anxiety disorders is the Cognitive Behaviour Therapy (CBT). It is an action-oriented form of psychological therapy that assumes that maladaptive thinking patterns cause maladaptive behaviour and negative emotions. The treatment focuses on changing an individual's thoughts in order to change his/her emotional state and behaviour (Beck &

Emery; 1985). Cognitive behaviour therapy may not suit all individuals though. Patients must have a behavioural issue they wish to address and must be willing to take a very active role in the treatment process. Norton and Price (2007) conducted a meta-analytic review on the cognitive behavioural treatment outcome in patients with anxiety disorders. Their review consisted of the examination of 180 cognitive behavioural trials. Cognitive therapy was found effective across all spectrums of anxiety disorders with an especial efficacy in generalized anxiety disorder and posttraumatic stress disorder. Barlow et al. (2000) have shown that CBT if properly conducted, has more probability of leading to full remission of anxiety symptoms than drug therapy alone. Nevertheless, the combination of psychotherapy and drug therapy is considered more effective than either treatment alone.

Chapter 3

Introduction to Panic

In this chapter, the concept of panic attacks and panic disorder was examined. The chapter investigates the epidemiology of panic disorder in the general population and discusses the biological and psychological models that explain this disorder with a specific emphasis on the Cognitive Model of Panic by Clark (1986) from which this study's hypotheses are drawn.

3.1 Definition of Panic Disorder

According to the Diagnostic and Statistical Manual of Mental Disorders, the fourth edition (DSM IV) (1994) a patient could be classified as having panic disorder if s/he experienced recurrent panic attacks some of which should be spontaneous (i.e. not linked to specific environmental cues). According to this manual, a panic attack is a sudden increase of autonomic arousal which lasts from 10 to 30 minutes. To be classified as a "full blown" attack there must be present at least 4 of the overall 13 symptoms that characterise panic. The occurrence of a limited attack (i.e. less than 4 clinical symptoms) is also possible and is clinically important. Panic attacks are also common to the general population (Telch et al; 1989), therefore to distinguish between general and clinical populations, it is essential to take into account the negative social experiences that are often caused by panic attacks (i.e. continuous worry, embarrassment, social stigma, ostracization) and the behavioural consequences that come out of this (i.e. safety-seeking behaviours).

3.1.1 Symptoms of Panic Attacks

There are thirteen physical and cognitive symptoms that characterise panic disorder according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, 1994):

The physical symptoms of panic are: Palpitations, sweating, trembling, shortness of breath, choking, chest pain, nausea, dizziness and hot flushes or chills. The cognitive symptoms of panic include derealisation, fear of losing control, fear or dying and paresthisesias.

3.1.2 Introduction to Agoraphobia and its Relation to Panic

Agoraphobia literally means fear of open places and derives from the Greek words "agora" which is the open market and "phobos" which is phobia. However, agoraphobia is a more complex condition. People with agoraphobia may fear entering into shops, develop fear of crowds, fear travelling alone on buses/trains/airplanes. Agoraphobic individuals are not necessarily afraid of the open spaces or other places or other people, but, they rather fear of the panicky feelings they may experience as a result of being in such places or situations. In particular, they fear of finding themselves in situations they consider embarrassing or dangerous with no escape or where escape may be difficult or where help may not be available (DSM-IV, 1994). As a result they engage in a series of safety seeking behaviours in order to avoid provoking their anxiety sensations and experience a panic attack.

3.1.3 Safety Seeking Behaviours

The core concept of safety behaviours is avoidance. Avoidance behaviours range from overt to more subtle efforts to lessen contact with the phobic stimulus and are divided into three major categories: Situational, interoceptive and experiential avoidance. Situational avoidance (Raffa et al. 2004) occurs when a person refuses to enter phobic locations (e.g. shops). Interoceptive avoidance (Moses & Barlow, 2006) takes place when a person refuses certain substances or activities that arouse feared somatic sensations. Experiential avoidance (Soriano et al. 2004) involves denying, withdrawing or minimising contact with the phobic stimulus through the use of avoidance tactics or thought strategies (e.g. distraction). Experiential avoidance is thought to occur when the patient is unwilling to remain in contact with certain experiences including sensations, emotions and thoughts.

3.2 Investigation of Risk Factors in Quality of Life in Panic Disorder

The quality of life in panic disorder patients was investigated by Carrera et al. (2006). They recruited 125 panic disorder patients and were compared with a community control group by administering the Medical Outcomes Study 36 item Short Form Health Survey (SF-36). The questionnaire assesses two broad dimensions: mental and physical health in respect to physical and social functioning, bodily pain, psychological distress and role limitations due to physical and emotional problems. Research findings showed that panic disorder patients scored worse than the controls both in physical and social functioning with greater psychological distress.

Bankier and colleagues (1999) recruited 88 patients with panic disorder with or without agoraphobia. Patients were administered the Agoraphobic Cognitions questionnaire and the Sheehan Disability scale that measures psychosocial impairment. They found that although patients revealed a number of cognitions regarding their physical functioning (e.g. fear of getting a heart attack or dying) it was social and mental catastrophic cognitions that were significantly associated with disabilities in daily life such as losing control and fear of becoming dependent on others because of their impairment. The authors concluded that despite the fact that physical cognitions have an impact on quality of life, mental and social catastrophes may play a greater role in patients' daily functioning.

The role of the course of the illness, medication, psychopathology and social support in quality of life of 57 panic disorder outpatients was investigated by Yen and colleagues (2006). Data analysis revealed that perceived low social support and severe panic symptoms correlated highly with poor outcomes in the quality of life measure. Overall, the authors suggested that quality of life in panic disorder patients seems to be affected greatly by individualized interactions with social environment and treatment.

The role of demographic variables and clinical variables in the quality of life of panic disorder patients was examined by Hollifield and colleagues (1997). They compared 62 patients with panic disorder with 63 controls in terms of demographics, presence of physical illness and personality traits and physical functioning and mental health by administering the FS-36 and conducting a structured clinical interview. Panic disorder patients (PD) revealed greater impairment than controls in both physical and mental functioning. Moreover, panic disorder patients who showed high levels of neuroticism, were older in age and had less education were more likely to have more impairment quality of life than PD patients who did not belong to this category. Finally, the authors found that gender made a small impact in quality of life whereas chronic medical illness did not make any contribution.

3.3 The Study of Prevalence of Panic Disorder

Norton, Cox and Malan (1992) have argued that it is very important to take into account when studying prevalence surveys three variables: the type of method used; the definition of a panic attack and the sample of the study. For that reason researchers should conduct studies with populations that have similar characteristics with respect to numbers in the sample by age, gender, ethnicity and socioeconomic status. It is also important when exploring the prevalence of a disease or disorder to use the same diagnostic criteria among different studies to avoid misratings. Wittchen and Essau (1993) claimed that due to the inflexibility of the diagnostic systems, the estimates of panic prevalence are fairly consistent across studies.

3.3.1 Prevalence of Panic Disorder in the General Population

Norton et al (1986) reported that up to 3% of the general population (USA) gave an account of sufficient frequency of panic attacks to meet the DSM- III criteria for panic disorder. Telch and colleagues (1989) examined the prevalence of panic attacks in a non-clinical sample of 2,375 college students. According to the DSM-III-R criteria 12% reported having experienced at least one panic attack and 2.6% met the criteria for panic disorder (Table 3.1). They further examined the differences between the people who reported infrequent panic attacks and those who met the criteria for panic disorder in their sample. Individuals with panic disorder reported more panic symptoms, higher anxiety sensitivity (i.e. the belief that the autonomic arousal can have dangerous results) and greater behavioural avoidance towards perceived threatening situations that could lead in a panic attack according to their estimation, than those with infrequent panic attacks.

Kessler et al (1998) estimated lifetime and 12-month time prevalence of panic disorder in a non-institutionalised national population in United States, according to the DSM-III-R criteria. The lifetime prevalence of panic disorder was 3.5% and the 12-month prevalence was 2.3% (Table 3.1), findings that come in accordance with previous studies from Norton (1986) and Telch (1989) for the general population in United States according to the DSM-III and DSM-III-R criteria for panic disorder.

Reed and Wittchen (1998) examined panic prevalence, both lifetime and twelve month, in a community sample of adolescents and young adults in Germany. The sample consisted of 3021 individuals aged from 14 to 24 years. Diagnosis of panic disorder and panic attacks were assessed by the Munich-Composite International Diagnostic Interview, which is a customized version of the World Health Organisation Composite International Diagnostic Interview, supplemented by questions to cover both DSM-IV and ICD-10 criteria. Data showed that 4.3% of the total sample had experienced a DSM-IV panic attack in their lifetime, whereas almost half of them (2.7%) had experience a panic attack during the past 12 months (Table 3.1). The lifetime prevalence of panic disorder was 1.6%. This result shows a slightly less prevalent case of panic disorder in their sample as opposed to the prevalence rates of panic disorder reported in other non-clinical population studies described above. The authors suggested that the small difference in the panic disorder lifetime prevalence may be due to the improved and more rigid diagnostic criteria of DSM-V as opposed to earlier versions (i.e. DSM-III) and possibly due to the small difference in the age range of their sample which is slightly younger than in other studies.

Carlbring et al (2002) examined the prevalence of 12 months of panic disorder with or without agoraphobia, in 1,000 Swedish adults who were randomly selected from the general population. According to the DSM-IV diagnostic criteria the twelve-month prevalence of panic disorder was around 2.2% (n=274) whereas the prevalence of panic attacks without panic disorder was around 2.0% (n=335). Moreover, there were gender differences in panic disorder prevalence with females having greater rates than males (5.6% and 1% respectively) (Table 3.1).

Conclusion: Definitional problems of panic attacks should be taken into account when referring to prevalence rates. Most researchers use the Diagnostic Criteria for Mental Disorders (DSM) as an assessment tool for panic disorder. The argument here lies in the fact that limited and full-blown attacks are not qualitatively distinct. That is, individuals with limited panic attacks are more likely to experience the same symptoms, physical and psychological but to a lesser degree. Results from epidemiological studies described above revealed that the lifetime prevalence of panic disorder in the general population is around 3.5% and the twelve month prevalence is about 2.3%, whereas in clinical populations the lifetime prevalence is higher, around 8.6%.

Table 3.1 Lifetime prevalence of panic disorder in community based studies

Authors	Sample	Measures	Prevalence rates	Major findings
Telch et al. (1989)	2,375 college students community sample USA	DSM-III-R	12% prevalence rates for experiencing a panic attack 2.6% prevalence of panic disorder	Individuals with panic disorder diagnosis differ not only in the higher frequency of panic attacks but also in behavioural avoidance and experience of anxiety sensitivity from those with infrequent panic attacks
Reed and Wittchen (1998)	3021 general population Germany	DSM-IV ICD-10 criteria	4.3% prevalence rates for experiencing a panic attack in lifetime 2.6% prevalence rates for a panic attack during the last 12 months. 1.6% lifetime prevalence of panic disorder	Lifetime panic disorder prevalence is slightly less in younger aged than in older populations.
Carbring et al. (2002)	591 general population Sweden	DSM-IV	2.2 % prevalence of panic disorder during the last 12 months 2.0% prevalence of panic attacks without panic disorder	Females had higher prevalence of panic disorder (5.6%) than males (1%) did.
Birchall et al. (2000)	1152 general practice population UK	Structured Clinical Interview for DSM-III-R	8.6% lifetime prevalence of panic disorder	Lifetime prevalence rate of panic disorder in clinical populations is substantially higher than in the general populations.

3.4 Etiological Theories of Panic

There are several theoretical models that attempt to explain the etiology of panic disorder. Some of these theories have proposed that biochemical and physiological markers are to blame for the presence of panic attacks, others have concentrated their attention on maladaptive cognitions involved in a panic attack. For the purposes of this review both neurobiological and psychological theories are investigated and critically appraised.

3.4.1 Neurobiological theories

Biological theorists like Donald Klein (1993, 1994), conceptualize panic disorder as a distinct psychiatric condition, which underlies a biological dysfunction. Support for the biological etiology of panic disorder derives from several lines of evidence including genetic studies, laboratory provocation studies and hyperventilation studies.

3.4.1a Genetic Studies

Family Studies

The genetic hypothesis of panic asserts that the disorder can be genetically transmitted. Weissman (1993) has reviewed family studies on panic disorder morbidity and he found that although the lifetime prevalence of PD in the general population varies from 1.2%-2.4%, the lifetime prevalence in first degree relatives is as high as 20.5%. Despite the evidence of higher prevalence of panic disorder between family members that suggests that PD may be genetically transmitted, the mode of the transmission remains unclear (Merikangas & Low, 2005).

Twin Studies

While family studies aim to demonstrate that panic disorder runs in the families, twin studies seek to prove that genes contribute to this familiarity. Perna et al (1997) examined the role of genetics in panic disorder and sporadic panic attacks in 120 twins who were recruited from the general population. They found that monozygotic twins revealed a high comorbidity of PD as opposed to dizygotic twins (73% and 0% respectively) confirming the role of the genetic predisposition in panic disorder but not for the occurrence of sporadic panic attacks. Van den Heuvel et al. (2000) argued that is necessary to consider environmental factors when examining the genetic predisposition of panic disorder. Longitudinal studies are important to encompass the changing factors that characterise the interaction of genetics and environment. They proposed that collaboration of studies from numerous disciplines such as epidemiology, clinical psychiatry and molecular genetics could provide a better understanding about the nature of panic and perhaps a causal definition of the disorder.

Conclusion: Although research findings from family and twin studies support the notion of inheritance in panic disorder, the mode of the genetic transmission of panic is still unknown. Moreover, integrated investigation of genetics, environmental factors and psychological trait markers would offer a better understanding about the nature of panic disorder.

3.4.1b Laboratory Provocation Studies

Neurobiological theories of panic state that patients are vulnerable to panic attacks after exposure to panicogenic substances such as carbon dioxide and sodium lactate. After inhaling carbon dioxide or receiving lactate infusion, panic disorder patients have shown several respiratory abnormalities which are considered to be exclusive to panic pathophysiology. Carbon dioxide challenge tests are biological tests which aim to induce respiratory changes by influencing multiple brain centres. According to Gorman et al (1984), individuals with panic disorder have very sensitive carbon dioxide receptors. Therefore, when they are triggered by carbon dioxide, they start to hyperventilate which produces first hypocapnia (lower concentrations of carbon dioxide) and second alkalosis (a disturbance of acid-base state of the body). This two-stage process represents a panic attack. According to this theory, carbon dioxide-induced panic in a laboratory resembles a naturally occurring panic (Perna et al, 1995). Carbon dioxide hypersensitivity in patients with panic disorder is regarded as a unique neurobiological characteristic as it cannot be explained by either the induction of carbon dioxide (Papp et al, 1993) nor can it be explained on the basis of different anxiety levels between panic patients and psychiatric comparisons (Griez et al, 1990). Papp and colleagues (1989) have found that panic patients show hypersensitivity to carbon dioxide even when their anxious response is comparable with that of normal participants. However, the level of pulmonary impairment due to the induction of carbon dioxide during the challenge test, which will leave an individual more vulnerable to hypercapnia (i.e. a condition where there is too much CO_2 in the blood), has not been found to predict anxiety and panic (Porzelius et al. 1992). Although this model can offer some information about the physiological mechanisms of panic (i.e. that individuals with panic disorder are more sensitive to carbon dioxide from the rest of the population due to specific brain receptors that are exclusive to this category) it fails to support the role of anxiety in carbon dioxide sensitivity. Research findings from the studies described above, suggest that patients with panic will inevitably show higher carbon dioxide sensitivity when compared with controls, even when their levels of anxiety are the same as in the control population.

Interestingly, other neurobiologists have failed to establish this unique hypersensitivity to carbon dioxide to patients with panic disorder only. They have found some respiratory abnormalities underlying panic attacks but their results were not conclusive. In particular, Papp and colleagues (Papp et al; 1997) aimed to identify specific respiratory predictors of panic disorder in 59 panic disorder patients (according to the DSM-III-R criteria) aged 19 to 58 years old; and 39 normal controls, aged 20 to 60 years old. Both groups underwent two respiratory challenges of 5% and 7% of carbon dioxide. All participants were given information on how to use the canopy to inhale the carbon dioxide and how to free themselves from it if they wanted. Panic attacks were measured by both the participants and a clinician. Panic disorder patients reported considerably more panic attacks during the 7% carbon dioxide inhalation than during the 5%. During the latter, 31 patients reported panic attacks whereas the clinician identified only 14 attacks. During the 7% carbon dioxide inhalation, 34 patients rated themselves as panicking and 26 were identified by the clinician. There were differences in respiratory rates, tidal volume (i.e. the volume of gas inhaled and exhaled during one respiratory circle) and minute ventilation between panic disorder patients and controls, but those did not reach significance. The most important finding was that during the challenges, normal controls and patients who did not panic responded to carbon dioxide inhalation by increasing the tidal volume, whereas the patients who panicked showed greater respiratory rates and a moderate tidal volume response. The authors concluded that although their findings support the theory of respiratory abnormalities (e.g. breathlessness) in the pathogenesis of panic there are still many factors that remain unanswered. They claim that neurobiological theorists must establish the carbon dioxide sensitivity to panic disorder patients only. It needs to be investigated further whether such respiratory abnormalities are a trait phenomenon or an induced state; further neurobiological research may lead to the discovery of a central nervous system abnormality that would be exclusive to panic disorder patients and that would justify the findings observed during the respiratory challenges.

The inconsistency in research findings described above, as to whether there is a genetic predisposition in patients with panic disorder suggests methodological diversity among different laboratory studies. Rassovsky and Kushner (2003) have reviewed studies with carbon dioxide challenges and have suggested pragmatic and theoretically based recommendations concerning the methodological approach of the challenge tests in order to establish a valid laboratory definition of panic. The authors have identified three primary methods for the induction of panic. First, the steady-state method where participants are exposed to carbon dioxide slowly by breathing through a mask a mix of carbon dioxide (5%) and air; second, the re-breathing technique where participants are asked to breath in and out gas of 5%-7% through a mouthpiece. Because gas is re breathed the concentration of carbon dioxide in the system gradually increases. Finally, they propose of a single or double breathe inhalation. This is the method that produces the highest levels of carbon dioxide concentration in the system (35%-65%). Gas is delivered with a mask that is covering both the nose and mouth).

The methodology used determines the panic rates the patients will experience during the biological challenges. Therefore, each methodological type of carbon dioxide induction would determine the intensity of panic attacks during the challenge.

Another problem that also needs to be overcome is the definition of a panic attack in the laboratory. The most common measurement of panic in a laboratory setting is self-report information on the occurrence of a panic attack. Methodological problems appear due to the definition of a panic attack. Some researchers (Papp et al; 1997) defined a panic attack according to the DSM criteria, whereas other investigators either use categorical data (i.e. presence or absence of self-report panic attack) or made judgments upon observation (i.e. premature termination of the test by the participant). The problem lies in the fact that although the DSM criteria have been developed for clinical settings, they are restricting in the laboratory (Barlow et al; 1994). These authors suggested that definition of a panic attack in laboratory settings should include the three core components of emotional responding: the physiological, the behavioral and the subjective response during a panic attack.

Conclusion: Some of the above research findings show that panic disorder patients display greater sensitivity to induction of carbon dioxide than individuals with other disorders or normal individuals. This has led some researchers to make the assumption that panic disorder has a underlying biological dysfunction which is unique to this condition. But most importantly, there is a lack of exclusiveness of panic provocation to panic disorder patients only and therefore it fails to provide a sufficient explanation for the development of panic attacks to this population.

3.4.1c Hyperventilation theories

The hyperventilation theories (suffocation false alarm theory (Donald Klein, 1993), dyspnea-fear theory (Ley, 1989)) suggest that hyperventilation is causally related to panic attacks. During hyperventilation there is an imbalance between the oxygen inhaled and the carbon dioxide exhaled, so that more carbon dioxide is exhaled than produced, which lowers the carbon dioxide levels of the body. In order to compensate for the amount of carbon dioxide that is absent in the body, patients experience a variety of physical symptoms such as shortness of breath, palpitations and dizziness. Hyperventilation theorists propose that panic disorder patients are chronic hyperventilators who increase breathing during stress which eventually leads to a panic attack.

Suffocation false alarm theory of panic disorder

Donald Klein (1993) suggests that panic disorder patients' suffocation threshold is much lower than normals. This means that their suffocation alarm system is oversensitive to carbon dioxide. As a result, the brain's suffocation monitor falsely signals low oxygen supply. Once patients believe they are suffocating they start hyperventilating in order to keep the level of carbon dioxide below the level of threshold and they experience shortness of breath. Therefore, according to Klein, hyperventilation, rather than causing panic attacks, is viewed as a defense against panic onset. According to this theory, respiratory symptoms would discriminate the panic attacks from sufferers of panic disorder and individuals without the disorder. Vickers and McNally (2005) tested this hypothesis using data from 609 people who had a lifetime history of panic attacks and have participated in the National Comorbidity Survey. They found that respiratory symptoms did not differentiate patients with panic disorder and individuals who have experienced panic attacks without ever having the disorder. However, there were other factors such as fear of dying and loss of control that seemed to distinguish these two groups. They concluded that cognitive factors may be more explanatory in discriminating clinical versus non clinical panic attacks (McNally et al; 1995).

Dyspnea-fear Theory

Dyspnea-fear theory, (Ley, 1989), predicts that patients with panic disorder experience fear as a direct response to severe hyperventilation induced dyspnea, in the sense that they have little or no perceived control over the cause of their symptoms. A panic attack reoccurrence leads to an increase of hyperventilation until the individual experiences a full-blown panic attack. But Beck & Scott (1988) have shown that hyperventilation may produce symptoms of panic but in many cases fails to produce a full blown attack. Clark (1988) suggested that the only way hyperventilation can produce panic is when the bodily sensations induced by hyperventilation are misinterpreted in a catastrophic way. Research by Carr et al (1992) aimed to test this theory of dyspnea-fear in a sample consisting of panic disorder patients, asthma patients and non-asthmatics. They showed that verbal reports of dyspnea were a significant predictor of panic fear in asthmatics. However, they found no relation between dyspnea in non-asthmatics with panic disorder although they experienced the same levels of anxiety. Based on their results, they concluded that other factors must play an important role in the development of panic/fear in panic disorder. In his response, Ley (1994) suggested that his theory provides explanation for panic fear during attacks that are produced through hyperventilation and not for panic fear during other types of panic. Ley's dyspnea-fear theory attempt to explain panic is limited, as it appears to provide reasons for its presence only to individuals with respiratory diseases. Even so, it fails to establish a clear link between hyperventilation and panic, as hyperventilation as a single factor may or may not provoke a full-blown panic attack. It seems that for a panic attack to happen, it does not have to rely exclusively on somatic sensations such as dyspnea, but also to the level of threat that this sensation will generate in the individual.

3.4.2 Psychological theories

There are many psychological theories indicating the importance of psychological factors in the development of panic disorder. In this section four psychological theories are examined: The integrated model of anxiety, the looming vulnerability model of anxiety, the expectancy theory and the cognitive model of anxiety.

3.4.2a Integrated Model of Anxiety

According to Barlow (1988) the initial panic attack is a false alarm in which panic occurs in the absence of a life threatening stimulus. In contrast, true alarms happen when panic occurs in the presence of a dangerous event. It is proposed that panic disorder patients have a biological vulnerability, which means that they respond to stressful or threatening events with exaggerated neurobiological activity. This vulnerability suggests that individuals with panic disorder tend to perceive life stressors as truly dangerous events. The initial panic attack (i.e. the false attack) is associated with somatic sensations. This association leads in future to the development of learned alarms where the individuals learn to become fearful of these somatic sensations because they believe they will lead to another attack. This cognition leads further to the development of panic disorder. Barlow further suggests that some people are more prone to develop panic disorder if they lack social support or if they are overly dependent personalities. These individuals later develop behavioural avoidance as a coping strategy against unexpected panic attacks. Although Barlow reported that panic disorder patients had experienced a stressful event prior to the development of the disorder, other studies indicate that stress plays an important role in other psychiatric or physical disorders too, suggesting that the association of panic and stress is not unique. Although Barlow's integrated model of anxiety offers a combination of many interacting factors (i.e. genetic, developmental, environmental and psychological) to explain the etiology of panic, it fails to establish the association of these factors to panic alone. Moreover, while external stress is viewed in this theory as a precipitating factor to the development of panic disorder it can be argued that sudden stressors are potent only when they hit an individual's specific vulnerabilities and thus this psychobiological process mainly contributes in non-specific arousal and its somatic manifestations.

3.4.2b Looming vulnerability model of anxiety

The model known as "looming vulnerability model of anxiety" by Riskind (1997) assumes that much of what produces anxiety both in everyday life as well as in cases of pathological anxiety, for these individuals is "looming". That means that they are vulnerable to threat and they exhibit biases in their primary cognitive judgment and as a consequence they feel that it is urgent to either cope with the situation or neutralise it. The fact that they feel they must be in a hurry to cope with the looming threat leads them to use coping strategies that are maladaptive, such as avoidance and escapism and makes them feel inadequate to deal with the situation. Empirical evidence to support this model comes from a later study by Riskind and Williams (1999), who investigated the relationship between catastrophising, worry and likelihood in 138 undergraduate students. The participants were interviewed, and were administered questionnaires on looming maladaptive style, on catastrophising and worry. Results revealed that the looming maladaptive style is the only variable that actually predicts catastrophising over time. The authors suggest the model of looming vulnerability may offer new information about the interrelations between worry, uncertainty and bias information processing in anxiety disorders (Riskind & Williams, 2005).

Hedley and colleagues (Hedley et al;2001) investigated the relationship between vulnerability to harm, functional incompetence, behavior avoidance, thoughts of losing control, and fear of bodily symptoms in 59 panic disorder patients with agoraphobia undergoing cognitive behavior therapy. The authors took measures at the start of the treatment and 6 months after. Results revealed that vulnerability to harm was influencing the fear of bodily sensations, the fear of losing control and avoidance. Functional incompetence did not predict any aspect of panic disorder with agoraphobia. Such results are in accordance with the schema theory (i.e. cognitive process theory) and presume that vulnerability to harm may play a role in the maintenance of panic disorder.

3.4.2c Expectancy theory

Expectancy theory by Reiss & McNally (1985) suggests that anxiety sensitivity (i.e. the belief that autonomic arousal can have dangerous results) is on a continuum. At the low end, people are relatively undisturbed by anxiety symptoms. In the middle, people are uncomfortable with anxiety symptoms and try to avoid them. At the upper extreme, people view anxiety symptoms as signs of physical or mental illnesses. Individuals at the upper extreme are more likely to develop panic attacks or a panic disorder. Several researchers (Plehn et al; 2002; Cox et al; 1995) investigated the concept of anxiety sensitivity. It is found that anxiety sensitivity is more prevalent to patients with anxiety disorders than to individuals with other disorders. It can predict anxious responding to 35% carbon dioxide inhalation, hyperventilation and other biological challenges even to individuals without a history of panic and it can predict as a consequence, the development of anxiety disorders in individuals with no past history of psychiatric illness.

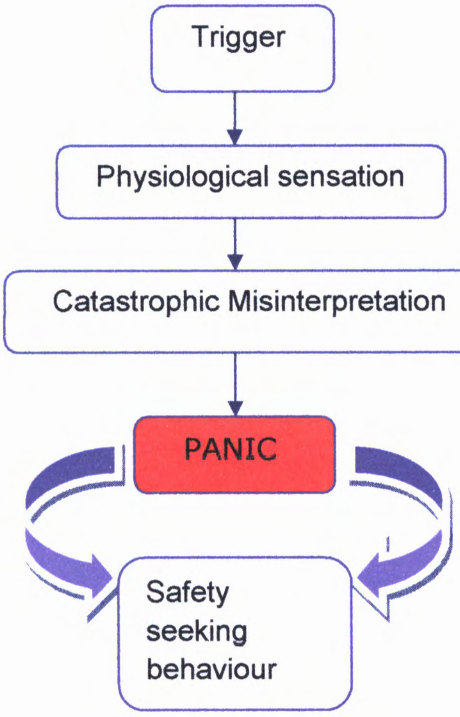
Plehn et al. (2002) investigated the fear of certain bodily sensations as a dispositional factor for the development of panic disorder and panic attacks. Data was collected from 505 undergraduate students. Participants were asked to complete three questionnaires, one assessing fear of bodily sensations (otherwise known as anxiety sensitivity), another for trait anxiety and finally one self-report questionnaire to measure personal and family history of panic. The anxiety sensitivity was revealed to be the strongest predictor of panic attacks but when trait anxiety was controlled it failed to predict the development of panic attacks.

The latter findings suggest that anxiety sensitivity can be independent of panic and it is the cognitive appraisals during a panic attack that play the central role in the disorder. Cox and colleagues (Cox et al; 1995) investigated the relationship between 23 symptoms of panic and the 16 symptoms that are described in the Anxiety Sensitivity Index in a sample of 209 panic disorder patients. The results are in accordance with the cognitive model of panic that the catastrophic cognitions occurring during panic attacks are related to the cognitive styles of the individual rather than the severity of the physical symptoms.

3.4.2d Cognitive Model of Panic

The cognitive model of Clark (1986) proposes that panic attacks occur when individuals perceive certain somatic sensations as considerably more dangerous than they truly are, and then they interpret them to mean that they are about to experience sudden, imminent disaster (see Figure 3.1). The vicious circle ending in a panic attack develops when a stimulus perceived as threatening creates a feeling of anxiety. Therefore, if the somatic sensations that accompany this state of anxiety are catastrophically misinterpreted, the individual starts to experience a further increase in anxiety, followed by elevated somatic sensations until a full-blown panic attack occurs (e.g. palpitation could be regarded as a sign of having a heart attack).

Figure 3.1 Illustration of the Cognitive Model of Panic



However, Margraf and colleagues (1987) argued that although this model may provide a plausible explanation for panic attacks during relaxation when bodily sensations are apparent, it fails to justify the occurrence of panic attacks during the deep stages of sleep. Moreover, Ley (1988a,b) reviewed retrospective data from previous studies (e.g. Craske et al; 1986) on panic attacks that occur during sleep, and results showed that the majority of panic attacks did not relate to dreams (i.e. the individuals who suffered from panic attacks during sleep, did not have any recollection of any thoughts preceding the attacks). Another critique against the cognitive model of panic is that it fails to explain why panic disorder patients continue to misinterpret somatic sensations when they have evidence to the contrary (i.e. when catastrophic misinterpretations do not come true) (Perna et al; 1997). However, most panic disorder patients engage in avoidance behaviour as a precaution to prevent the occurrence of an attack and therefore they never truly realise that their panic attacks would not lead to a catastrophe (Clark, 1986).

Investigation of the Cognitive Model of Panic

According to the cognitive theory of panic, there should be a significant relationship between the bodily symptoms and the cognitions experienced during panic attacks. Therefore, physical symptoms like palpitations, sweating and breathlessness should be associated with cognitions about physical danger like heart attack, and mental symptoms like difficulties in concentration should be linked with cognitions about mental threat such as losing total control.

Robinson and Birchwood (1991) investigated the relationship between cognitions experienced during panic episodes. Fifty-eight people, aged from 21 to 59 years and diagnosed for panic disorder according to DSM-III-R criteria were included in the study. The measurement of cognitions fell into four categories: cognitions about physical danger, mental catastrophe, behavioural difficulties (i.e. losing control) and social catastrophe (panic in public). Panic symptoms were measured in respect of somatic symptomatology and of experiential symptoms (i.e. difficulties in concentration, depersonalisation etc). Avoidance behaviour, agoraphobic avoidance and depression were measured. All of the participants identified cognitions of a catastrophic nature concentrating on physical illness, death, loss of self-control and social embarrassment. This emphasises the importance of patients' misinterpretations of somatic symptoms in the onset and maintenance of panic attacks. Finally, cognitions about social catastrophe were greatly associated with avoidance behaviour. The authors suggested that this resulted from the fact that patients who are very much concerned about social consequences, such as social embarrassment, are more likely to avoid a great range of events that involves contact with other people.

Zoellner and colleagues (1996) examined whether panic disorder patients were capable of recognising the irrationality of their cognitions during their panic attack and at times they were not panicking. They recruited 56 panic disorder patients with or without agoraphobia. Results revealed that women were more likely to maintain their catastrophical cognitions even at times when they were not panicking. Twenty- two patients of the overall sample maintained their cognitions in a moderate conviction at all times and 9 patients had a strong conviction about their catastrophic cognitions at all times. Results from this study provide further support for the cognitive model of panic disorder. Patients with panic disorder are likely to generate both attentional and memory bias towards a threatening cue or situation.

The link between social catastrophic cognitions and avoidance behaviour may also result from the absence of a safety situation where the patient can turn to in case of an emergency. Carter and colleagues (1995) tested this hypothesis in the laboratory. They examined the effect of having a safe person present on artificially induced anxiety among panic disorder patients. There were two groups in this experiment, panic disorder patients and normal controls. Anxiety symptoms were induced by 5.5% carbon dioxide inhalation. Normal controls underwent the procedure without a safe person, panic patients were randomly assigned to go through this procedure with or without a safe person. Panic patients, who were exposed to carbon dioxide without a safe person, reported more catastrophic cognitions, higher levels of distress and greater level of physiological arousal than did a panic patient who underwent the procedure with a safe person. These results provide further support for the cognitive model of panic, which states that safety behaviour is very important to anxious individuals who engage in such behaviour in order to lessen their anxiety symptoms.

Salkovskis et al (1996) examined the link between safety behaviours, avoidance behaviour and catastrophic cognitions. Participants were 147 DSM-III-R panic disorder patients who had experienced at least three panic attacks in the 3 weeks before the start of the study. Participants were administered two questionnaires, the Agoraphobic Cognitions Questionnaire (Chambless et al; 1984) and the Safety Seeking Behaviour Scale. The catastrophic thought of having a heart attack was significantly associated with keeping still and asking for other people around to help. The catastrophic thought of losing control and behaving in a foolish way was associated with efforts to keep control and escape and the thought of having a stroke was associated only with a focus of attention to the body. The authors suggested that the discrimination between safety seeking behaviours and avoidance behaviours depends upon the notion of what is being avoided. That means that the degree to which avoidance behaviour is effective relies on whether it serves as a means of anxiety reduction or as an actual prevention of danger.

Windhaber et al (1998) aimed to explore further the influence of catastrophic cognitions on behaviour avoidance. Seventy-one panic disorder patients with or without agoraphobia were included in the study. They were administered three questionnaires to assess agoraphobia, avoidance and depression. 62 (87%) of the sample had received a diagnosis of panic disorder with agoraphobia. Results showed that it is actually the intensity of the catastrophic cognitions that produces an increase in avoidance behaviour.

Marks and colleagues (1991) tested the hypothesis that catastrophic cognitions are related to threat relevant anxiety symptoms. Participants of the study were 140 clinically phobic outpatients according to the ICD-10 criteria. They were administered 2 questionnaires, one symptom checklist which included 20 anxiety symptoms and the Agoraphobic Cognitions Questionnaire (Chambless et al; 1984). Symptoms like respiratory and cardiovascular symptoms were the best predictors of physical illness thoughts. Tingling and numbness accounted for 10% of thoughts about physical illness, whereas palpitations, dyspnea and chest pain accounted for 20%. Patients with chest pain, dyspnea and tingling reported thoughts of having a heart attack or going through a stroke.

Chambless and colleagues (2000) investigated the fear of physical symptoms and the cognitive appraisals of those symptoms in panic disorder patients. They found that the cognitive misinterpretation of physical and psychological symptoms was highly related with the fear of those symptoms which provides further support for the cognitive model of panic. In addition, the investigators identified four systems where patients' thoughts and symptoms were highly related. These were the cardiovascular, the neurological, the behavioural control system and finally the gastrointestinal system. The authors suggested that the nature of fear of panic could vary among patients (some patients could experience fear about symptoms that are related to the cardiovascular system such as chest pain and palpitations). This would be especially so when the patient suffers from a disease that has a direct impact on these systems.

Westling and Öst (1993) aimed to examine the relation between distressing cognitions and symptoms experienced during panic attacks. Their sample of 36 patients, aged from 23-45 years with panic disorder was diagnosed according to the DSM-III-R criteria. Participants were trained to monitor their panic attacks, giving information in a "panic" diary about the date and situation of the attack, the intensity, and the level of general anxiety experienced during the day. The course of self-monitoring lasted for two weeks. Results showed a total of 285 panic attacks recorded from sample during the period of study, having therefore a mean average of 7.9 panic attacks for each patient. Cognitive data was divided into first, physical catastrophes, where the main cognitions reported were fear of dying, getting ill or having a stroke. Second, the social catastrophes like fear of not being able to function properly in work or during social events. Third, the mental catastrophes like fear of losing control and finally, non-catastrophic cognitions which would either be self-defeat, self-coping or neutral cognitions. Ninety-four percent of the sample revealed a tendency towards physical catastrophic cognitions, 82% for social, 88% for mental catastrophic cognitions and 87% for non catastrophic cognitions in all categories. Comparing cognitions with intensity of attacks, results showed that high intensity was significantly correlated with more catastrophic cognitions. The relationship of "full blown" and "limited" attacks and cognitions was also examined. For physical cognitions the rate for full blown attacks was 58% (n=110) and for limited attacks, 31% (n=29). Out of a total of all catastrophic cognitions were

91% with full blown attacks and 57% for limited attacks. The rates for all categories of non-catastrophic cognitions were 9% and 43% respectively. Panic attacks that contained catastrophic thoughts were more intense and included more symptoms than panic attacks that did not contain maladaptive cognitions. Such results support the importance of catastrophic cognitions in panic attacks.

But still it is not clear whether the catastrophic misinterpretation of bodily sensations precede the panic/anxiety or whether it is the high levels of anxiety of the individual that produce such catastrophic thoughts about bodily sensations. Furthermore, the cognitive model of panic states that panic attacks will occur only when bodily sensations are perceived in a catastrophic manner. Results from this study revealed that although catastrophic cognitions were highly associated with panic attacks (i.e. they were associated with 91% of total panic attacks) they did not accompany all attacks occurred. In particular, in 58 out of the total 285 panic attacks, patients did not report catastrophic cognitions.

Kennardy and colleagues (1988) aimed to investigate the association of cognitions and panic attacks. They recruited three patients with panic attacks and agoraphobia. Participants were exposed to situations that they rated as highly fearful. Physiological symptoms, such as heart rate was measured. Cognitions and subjective anxiety were obtained at one minute intervals, where the patients were asked to report aloud the thoughts they had prior to the exposure and then rate their anxiety from a scale 0-100. Cognitions were classified as adaptive/positive, negative and neutral. Results revealed that all three participants underwent at some occasions dramatic heart rate changes and reported negative cognitions and anxiety until they experienced a panic attack. The authors concluded that their results supported the importance of cognitions in moderate panic. Although physiological variables (i.e. heart rate) did not predict a panic attack, change in physiological functioning and catastrophic cognitions is what appears to be important in the onset of panic attacks.

The relatively high prevalence of non-catastrophic cognitions found in this study is in accordance with other studies. For example, Russell and colleagues (1991) found that 23% of the total sample on their study with neurology patients suffered from cormobid panic disorder but did not report any anxiety or fear during the panic attacks. In an earlier study, Rachman et al (1987) asked 20 panic disorder patients (diagnosed according to the DSM-III-R criteria) to enter several fearful situations and then report all the cognitions and symptoms they had experienced. There have been 69 test trials in total and a panic attack occurred in 30 out of the total 69 trials. In eight of the panic trials (26.6%) patients did not report any catastrophic cognitions. Westling and Öst argued (1993) that this could be due to the fact that patients feel some shame of reporting such cognitions and therefore there may be a response bias. They also suggested that catastrophic misinterpretations could be either on the conscious or unconscious level. As Clark (1989) argued such cognitions may be so brief, regular and fast that is possible that patients fail to recognize them. There is a need therefore to develop a measure of catastrophic cognitions that does not rely exclusively on self- report (Westling & Öst, 1993). Alternative measures have been derived from experimental work in memory research, which is able to capture cognitive processes in both conscious and unconscious levels.

According to those models the process of misinterpretation is an association between cognitions and autonomic arousal. There is substantial evidence that patients with panic disorder have both attention and memory bias which enables them to detect even the most minor bodily changes, and even the smallest autonomic arousal can become dramatic for these patient (Ehlers, 1993).

Cloitre and colleagues (1994) assessed the presence of explicit (cue recall) and implicit (word completion) memory bias for catastrophic associations for bodily sensations. The sample of the study consisted of three groups: 24 DSM-III-R panic disorder patients, 24 normal comparisons and 24 clinicians with no history of panic, who had experience of cognitive behaviour treatment. All participants were asked to complete the State-Trait Anxiety Inventory (Spielberger et al., 1970) and the Beck Depression Inventory (Beck et al., 1961). The task was to recall and complete words from 9 threat related words (i.e. palpitations-heart attack), positive related, and neutral related word pairs as well as from 9 threat unrelated words, 9 positive unrelated words and 9 neutral unrelated word pairs. Results showed that panic disorder patients remembered more threat words than the other two groups. In the implicit memory task, panic patients showed a tendency for threat words when compared with the normals and the clinicians. Such results therefore indicated a bias from the behalf of the panic disorder patients in both conscious (explicit) and unconscious (implicit) memory processes.

Kamieniecki and colleagues (1997) investigated whether panic disorder patients misinterpret somatic sensations that were symptoms of either harmless events or non anxious states. They also investigated whether patients were able to provide explanations for their bodily sensations that were previously interpreted in a catastrophic way. They recruited 15 patients with PD with agoraphobia and 15 normal controls. Results revealed significant differences in the way the two groups perceived their somatic sensations. Panic disorder patients were unable to explain somatic sensations that were due to non anxiety states or harmless events and they were more likely than the controls to misinterpret bodily sensations in ambiguous situations in an anxiety related manner.

It is established that anxious individuals process some anxiety related information differently than normal individuals. Physiological arousal is associated with information about threat (Foa & Kozak, 1986). The "fear of fear" hypothesis by Goldstein and Chambless (1978) states that anxious individuals show memory bias towards ambiguous stimuli (i.e. perceive ambiguous information as threatening) only for information concerning physiological arousal. McNally and Foa (1987) recruited 9 patients with panic attacks and agoraphobia who had not received treatment for their condition, 9 treated patients and 9 normal controls. All participants were given 3 questionnaires to complete, concerning their interpretation of several ambiguous stimuli; self ratings of the personal cost unpleasant situations may have on them and self-rating about the likelihood of such situations happening to them. Results revealed that untreated patients interpreted ambiguous stimuli with a threatening content no matter if they were internal or external (i.e. internal stimuli could be chest pain whereas an external stimuli could be noise). Such findings do not support explicitly the fear of fear hypothesis which states that bias would be found only in internal stimuli concerning physiological arousal. Nevertheless, untreated patients perceived internal stimuli as both very likely to happen and costly. The increased likelihood of threatening non-ambiguous events can be explained by the ease with which anxious individuals retrieve threat related memories (Butler & Mathews, 1982).

Patients with panic disorder have demonstrated cognitive bias towards ambiguous stimuli (i.e. they have shown the tendency to perceive them as threatening). Austin and Richards (2001) investigated cognitive appraisals in individuals who do not have clinical panic but are at high risk of developing the disorder. Three groups, 25 individuals with non-clinical panic, 20 panic disorder patients and 69 controls without panic, were measured on interpretative bias of bodily sensations. Results revealed that individuals with panic disorder and those with non clinical panic did not differ compared to controls on the way they tend to interpret ambiguous stimuli into a threatening manner concerning their bodily sensations.

Summary: The cognitive model of anxiety as adapted from Clark (1986) has gained much support from various studies using different methodological approaches (both self-report and experimental studies). Anxious individuals tend to perceive somatic sensations as threatening. Maladaptive cognitive appraisals enhance anxiety which will inevitably lead to a panic attack. Unpleasant past incidents of experiencing a panic attack will produce memory biases and anxious individuals will show a tendency to pay specific attention to threatening stimuli which serve as a major concern for them. Anxious people's perception of personal inability to control their anxiety symptoms under a harmful situation will lead them to escapism, behavioural avoidance and safety seeking behavior.

Conclusion

Investigation of panic has led researchers into two main paths. First, these are those who believe that biological factors trigger panic attacks. Second, these are those who believe that biological factors produce certain bodily sensations that seem play a role in the development of panic. The extent to which those factors influence the development of panic attacks will largely depend on psychological factors. Neurobiological theories of panic hypothesise that panic disorder patients are oversensitive to the induction of carbon dioxide, more than individuals without panic disorder. Research findings, revealed that although there is substantial support for the oversensitivity of panic disorder patients to the inhalation of carbon dioxide, they do not provide exclusive results to this population only. Furthermore, it has appeared that the degree to which individuals panic does not solely depend on carbon dioxide inhalation, but with its interaction with other factors such as cognitions and anxiety. The psychological models of panic go some way to fill this gap. All psychological models of panic disorder have made two main predictions about patients with panic attacks:

1. Panic disorder patients will display high levels of anxiety when they are exposed to somatic sensations.
2. Panic disorder patients regard somatic sensations as threatening or dangerous.

As it has been shown above, there is a large body of research that provides support for the psychological approach in explaining panic disorder. In particular, the cognitive model has obtained, so far, the greatest support. Research findings show that most panic attacks are accompanied first by catastrophic cognitions and second with behavioural avoidance. On the other hand, the cognitive model of panic disorder has failed to establish the order of sequence of symptoms. The assumption is that somatic sensations will precede the occurrence of a panic attack. That is, patients with panic disorder will misinterpret bodily sensations in a catastrophic manner, such misinterpretation will produce elevated levels of anxiety/fear which will lead into a panic attack. But so far, the results from various studies give inconclusive results suggesting a better designed study with specific interest to investigate the order of symptoms in panic disorder remains to be conducted. Moreover, another area that needs investigating is whether these cognitions influence panic disorder maintenance is an issue that still remains unknown. Longitudinal studies would provide great insight into this issue. Research needs to be done to investigate whether it is the presence of the cognitions, their frequency or their severity that helps in the development and maintenance of panic disorder.

Chapter 4

Introduction to Asthma and Anxiety Disorders

The importance of psychological factors in asthma is increasingly recognised, although attempts to relate these to asthma outcomes often produce only weak results (Greaves et al; 2002). It is not uncommon for individuals with asthma to experience psychological difficulties, including anxiety disorders, because of their symptoms (Lehrer et al; 1993). On the other hand, other research findings suggest that anxious individuals are more likely to suffer from severe asthma attacks than non-anxious individuals. In this section, we will investigate whether there is a relationship between asthma and anxiety disorders by looking at the prevalence of anxiety disorders in asthmatic populations and prevalence of asthma in psychiatric populations.

4.1 Psychological Factors and Asthma

Psychological factors appear to play a very important role in asthma. There are various reasons why that might be the case. Patients' sense of control over their symptoms is often threatened by inaccurate perception of airway obstruction (Chetta et al; 1998) and by sudden asthma exacerbations. The main characteristic of asthma is sudden and unexpected attacks of impaired breathing. Both the attacks themselves and the prospect of attacks can cause much anxiety in asthma patients. (ten Thoren & Petermann, 2000). Additionally, because asthma can be unpredictable, patients have learnt to pay close attention to their somatic sensations for internal cues in order to prevent an asthma attack from happening. However, such close attention to somatic stimuli may produce more anxiety towards their illness (Carr, 1999). Asthma attack symptoms such as dyspnea and suffocation may be experienced with high degrees of dread that may lead to panic and phobic avoidance (Yellowless et al; 1990). Nevertheless, it has been reported that asthma patients may experience panic related symptoms and engage in agoraphobic behaviour for reasons that are not related to their asthma attacks (Shavitt et al; 1992). Carr and colleagues (1994) have suggested that past experiences of severe asthma attacks may have sensitised patients towards certain respiratory symptoms causing them elevated levels of anxiety about these symptoms out of fear of the possibility of experiencing a future asthma attack. Asthma patients may avoid, therefore, certain situations in which asthma attacks have occurred in the past (Smoller et al; 1998). The impact of anxiety/panic in asthma is significant and it can affect the onset of asthma attacks, and influence the patient's sense of personal control over their symptoms (Rietveld & Creer, 2003). Perceived control is a crucial factor for patients' adjustment to the disease and low control may lead to psychological disturbances (i.e. anxiety and panic) and poor quality of life (Bonala et al; 2003; Hommel et al; 2002). The more patients with asthma feel they are in control of their symptoms the less the risk of experiencing severe asthma attacks in the future and utilising the emergency health care departments (Calfee et al; 2006).

4.2 Relationship of Asthma and Panic

Panic disorder has several symptoms (e.g. dyspnea, hyperventilation, choking and increased anxiety) which are common between panic disorder and asthma. According to Carr (1999), the presence of asthma alone should be considered as a risk factor for the development of panic because of the respiratory disturbances that underlie panic disorder. Many similar symptoms have been reported between asthma and panic anxiety, of which dyspnea is the most well known. Schmaling and Bell (1997) suggested patients who have and are aware of their comorbid asthma and anxiety, could be confused between their asthma and panic symptoms because of their similarities. This may result in inappropriate treatment, leaving the patient with overuse of either corticosteroids or β agonists. Schmaling and Bell (1997) compared the symptomatology of asthma and panic attacks and identify which symptoms discriminate between them. They recruited two groups consisting of 71 panic disorder patients without present or past history of asthma and 71 asthma patients. Both groups were matched in age (age range: 22-68). All participants completed the Asthma Symptom Checklist (ACS) but in the case of the panic disorder group, references to asthma in the questionnaire, were changed to panic. The authors found that four categories of symptoms differentiate panic from asthma attacks. Panic/fear and hyperventilation/hypocapnia were more dominant in the panic disorder group and airways obstruction, dyspnea and congestion in the asthma group. Generally, the course of a panic attack differs in both duration and peak of symptoms from that of an asthma attack but identifying discriminating symptoms in patients who suffer from both asthma and anxiety would be a challenge. According to Carr (1999) patient education on asthma attack related symptoms and panic attack related symptoms is the first step to help these patients reduce their sense of uncontrollability when they experience either type of attack. Moreover, if dyspnea reflects a symptom of a panic attack the patients could benefit from antixiolytic medication and similarly they may put themselves at risk of worsening their panic symptoms if they treat it with asthma medication that can cause some further increase of anxiety levels (Smoller & Otto; 1998).

4.3 Anxiety and Adherence in Asthma

Medical non-adherence is a common problem in asthma (Vermeire et al. 2001) and it has been identified as a risk factor for poor control over asthma symptoms (Trueman, 2000). The cornerstone of asthma treatment is corticosteroids. Their availability suggests that asthma can be well controlled for most patients. However, current trends in asthma prevalence and morbidity rates indicate that asthma is poorly controlled for the majority of patients

(Chapman et al, 2001). Several behavioural patterns need to be applied by patients to maximise asthma control such as treatment adherence, self-monitoring and managing environmental triggers.

Smith and colleagues (2005) aimed to identify the characteristics of patients with severe asthma who do not adherent with the recommended management plans by their physician (use of medication, attendance in appointments and monitoring asthma). They found that poor compliant patients had more impaired asthma specific quality of life, more emergency attendances and hospital admissions than patients who were more compliant with medical plans. Moreover, the authors identified significant psychological and social factors that were associated with non adherence such as anxiety, younger age, being on benefits and having no current occupation.

Harrison (2005) identified factors that were associated with poor adherence in patients with problematic asthma and he suggested that around two thirds of this asthmatic population is characterised by poor compliance by not attending scheduled appointments. Poor adherence was greatly associated with anxiety, social deprivation and adverse family circumstances. He proposed that attention to psychosocial adversity is essential when treating difficult asthma patients and that healthcare professionals, need to identify and manage the condition causing the symptoms rather than prescribing more and more asthma medications.

Negative mood states such as depression have been found to influence medical adherence and interfere with daily self-monitoring abilities. That is patients exhibit difficulty initiating and maintaining regimes that require effort which is crucial in managing the illness (Bosley et al, 1995). On the other hand, asthma patients with co-morbid anxiety, they are hyper-vigilant to bodily sensations that may signal danger (such as shortness of breath) and therefore they are more likely to monitor their symptoms and intervene in order to control them. However, due to high vigilance to bodily sensations, anxious asthma patients are at risk of over perceiving and misinterpret their somatic sensations to mean danger. Such behaviour may lead to overuse of drug intake (Lavoie et al. 2006). The authors claimed that such behaviour may lead anxious asthma patients to a control dependent behaviour towards bronchodilators. Finally, asthma patients with co-morbid anxiety and/or panic may misperceive certain symptoms of anxiety for asthma symptoms (such as breathlessness) which may lead to an inappropriate self-management (Schmaling and Bell, 1997).

4.4 Asthma, Anxiety/Panic and Quality of Life

There is a consistency in findings that anxiety disorders and asthma are comorbid and such results are crucial for treatment planning (Goodwin, 2003). Anxiety disorders are treatable. High levels of anxiety can provoke feelings of low self-control in some individuals with asthma that may cause inadequate management of their asthma symptoms. Poor self-management can lead to increased rates of hospital admissions and use of emergency care. A decrease therefore in the prevalence of anxiety disorders in the asthmatic population may help some individuals deal more effectively with their symptoms and improve their physical functioning.

Psychological comorbidity has clearly a significant direct effect on quality of life. Hommel and colleagues (2002) examined the influence of anxiety on asthma specific quality of life. They recruited 64 young adults and obtained objective measurements of illness severity, measurements of anxiety status and asthma specific quality of life measures. After controlling for demographic and disease variables, they found that anxiety predicted impaired functional status and they suggested that assessment of anxiety may help to identify individuals who are at risk for more impaired functional status.

Ten Brinke et al. (2001b) investigated the link between psychological dysfunction and health care utilization in a large group of outpatients with severe asthma. Results indicated an association between psychological distress and increase in health care utilization. More specifically, when patients with psychiatric comorbidity were compared to normal controls (i.e. asthmatic patients without psychopathology), they showed higher rates of emergency department visits, visits to general practice and hospital admissions due to inadequate self-management of their symptoms.

4.5 Epidemiology of Asthma and Anxiety Disorders

In this section the prevalence of asthma in psychiatric populations is reviewed, and finally the prevalence of anxiety disorders in asthma population is also examined (Table 4.1 & Table 4.2).

4.5.1 Clinical Studies of Asthma Prevalence in Psychiatric Populations

In this section, two clinical studies that aimed to investigate the prevalence of asthma in psychiatric populations will be introduced.

Zandbergen and colleagues (1991) explored the prevalence of asthma in patients with panic disorder. Retrospective data was obtained from outpatient files held at a psychiatric centre. In total, data from 90 adult patients was obtained. Thirty patients had panic disorder with or without agoraphobia, 30 patients were diagnosed with obsessive-compulsive disorder and another 30 patients suffered from eating disorders. From the panic group three patients had current asthma and fourteen lifetime asthma. Point prevalence of asthma was similar to the other two groups but lifetime prevalence was much lower with four people in each group having ever had asthma in their lifetime. Although the lifetime prevalence of asthma was higher in panic disorder patients (47%) than in patients with obsessive-compulsive disorder and eating disorders, the sample of this study was very small to permit any link for causation between panic disorder and asthma symptomatology.

Spinhoven and colleagues (1994) conducted a study to estimate the point and lifetime prevalence of respiratory disorders in panic disorder patients. Data was retrospective and collected from outpatient files from an outpatient university based clinic. They obtained data from 100 patients with panic disorder with or without agoraphobia, from another 100 patients with major depressive disorder and 100 V-code patients (i.e. patients with conditions not attributable to a mental disorder which are a focus of attention and treatment). Results revealed that both point and lifetime prevalence was higher in the panic group rather in the other two groups. In particular, 10 panic disorder patients had current asthma as opposed to 7 and 2 patients of depressive disorder and V-code disorder respectively. Lifetime prevalence of asthma for the panic disorder groups was 16 patients from 100, whereas in the depressive disorder group was 9 and in the V-code group was 5 patients. A limitation of the study was the nature of data (retrospective) and the lack of formal diagnosis regarding the respiratory symptoms of the patients. Nevertheless, these findings support previous findings of higher prevalence rates of asthma in panic disorder patients than in the general population or other psychiatric disorders.

Table 4.1 Prevalence of Asthma in Patients with Anxiety Disorders

AUTHORS	SAMPLE	MEASURES	% OF ANXIETY DISORDERS	CONCLUSION
Zandbergen et al. 1991	30 PD Ss 30 OCD Ss 30 Eating disorder Ss	Retrospective data	47% of asthma prevalence in the panic disorder group	Point prevalence of respiratory symptoms was the same for the three groups. Significant differences between lifetime prevalence of asthma in PD Ss and the other patients.
Spinhoven et al. 1994	100 PD Ss 100 patients with major depressive disorder & 100 V-code patients	Retrospective data	16/100 PD Ss had a lifetime prevalence for asthma	Higher point a lifetime prevalence of asthma in the PD group There was no formal diagnosis of asthma

4.5.2 Prevalence of Anxiety Disorders in Asthma Diagnosed Patients.

Yellowlees and colleagues (1987) investigated the identification and description of psychiatric features in patients with chronic airflow obstruction. Fifty patients diagnosed with asthma, chronic bronchitis, or emphysema (aged over 40 years) who had been admitted at least once to hospital because of their illness, participated in the study. After conducting several physiological tests and a psychiatric interview, results revealed that 34% of the sample (15/50 patients) suffered from anxiety disorders with 12 patients indicating a lifetime prevalence of panic disorder. The authors proposed a number of reasons why the prevalence of anxiety disorders is particularly high in patients with chronic airflow obstruction. Psychological factors such as the traumatic experience of breathlessness appeared to play a major role in physical functioning and social behaviour (i.e. limited physical performance of daily activities and behavioral avoidance either of situations where the patients would be alone or without an inhaler).

The most acknowledged way to accurately diagnose anxiety disorders in the medically ill population is assessment by a structured psychiatric interview. Nevertheless, the use of this method is minimised because of the cost and the lack of expert diagnosticians. Davis and colleagues (2002) proposed an easier strategy to detect psychiatric disorders in the primary care settings. This is a two-fold plan where trained nurses would administer a validated self-report questionnaire to detect high at risk patients who would later be given a structured clinical interview to discover whether they actually meet the DSM-IV criteria for anxiety disorders. Data from 91 asthma patients with age range from 18-76 was received. The first screening for anxiety was assessed by the use of two self-report questionnaires: the Anxiety Sensitivity Index (ASI) (Peterson & Reiss, 1992) and the Sheeham Patient Rated Anxiety Scale (SPRAS) (Sheehan, 1986). Both measures possess good internal consistency values with α= 0.82-0.91 for the first and 0.95 for the latter. Two trained nurses who were monitored by the authors to evaluate the reliability of the diagnoses made use of the structured interview named the Anxiety Disorders Interview Schedule-IV (Barlow & diNardo, 1994). Thirty-five patients were diagnosed with anxiety disorders, of whom, 10 met the criteria for panic disorder with or without agoraphobia. The most striking finding of this study was the comorbidity of more than one anxiety disorder. The asthma participants included 8 participants who suffered from two anxiety disorders and 6 who were diagnosed with three or more anxiety disorders. The authors stated that a number of different types of anxiety disorder might take place at the same time and possibly have serious adverse outcomes in asthma management. Interestingly enough the authors reported that none of their participants had ever received appropriate treatment for their psychopathology despite the elevated levels of anxiety they had.

Stauder and Kovacs (2003) examined first, the prevalence of anxiety disorders in allergic patients and second, they looked at whether self-administered questionnaires are reliable in detecting anxiety disorders. Data from 646 allergic patients of whom 173 were asthma patients, aged from 16-65 years old, were received. Fifty-eight patients from the original sample participated in the psychiatric interviews. Allergic patients were divided into 3 categories: those who were diagnosed with rhinitis, asthma and other allergy. Anxiety was assessed using the Spielberger State-Trait Anxiety Inventory (STAI) and via the psychiatric interview. Trait and state anxiety were more prevalent in patients with asthma than in the other two groups using the STAI questionnaire. Twenty-nine patients from the 58 interviewees met the criteria for a psychiatric disorder with seven cases having a panic attack/disorder, four cases having agoraphobia without panic disorder and two having generalized anxiety disorder. The scores from the Trait anxiety scale were highly correlated with the anxiety diagnosis made from the psychiatric interview. The authors concluded that anxiety is more prevalent in asthma patients rather than patients with rhinitis or other type of allergy.

A comparison study conducted by Centanni et al. (2000) also examined the prevalence of anxiety in asthma. There were three groups of participants in their study: 80 asthmatic individuals, 40 patients with liver disease and 40 healthy individuals. Anxiety levels were tested in all participants with the administration of the State-Trait Anxiety Inventory (STAI) (Spielberger et al; 1970). The anxiety levels were higher in asthmatic patients than in patients with Hepatitis B or C, and healthy controls. More specifically, 34 out of 80 asthma patients scored higher than the cut off point in the STAI (State) questionnaire (scoring range from 20-80, with cut off point 40). The high incidence of state anxiety in asthma patients suggests that there is a subpopulation of asthma patients that feel more anxious about their physical condition. Therefore physicians should monitor the psychological profile of their patients so that appropriate care is given according to individual needs.

Rimington and colleagues (2001) tested the prevalence of psychiatric disorders in asthma and their impact on quality of life. Their sample consisted of 114 asthma patients (age range 16-60) who have received treatment for their illness and had no comorbidity of other pulmonary or cardiac disease and mental illness. Illness severity was assessed by several physiological measures including forced expiratory volume in one second (FEV_1), forced vital capacity (FVC) and peak expiratory flow (PEF). Psychological profiles were assessed with the administration of the Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith; 1983). Patients were given two measures of quality of life: the Asthma Quality of Life Questionnaire (AQLQ) (Juniper et al; 1993) and the Q score (Pearson & Bucknall; 1999). Data analysis showed that overall 34 patients (30% of the total sample) indicated clinical caseness of anxiety. Scores on the HADS (for both anxiety and depression) correlated significantly with the AQLQ and Q score, both of which measure the health status in asthma. Because of the high prevalence of anxiety and its impact on quality of life of the patients, the authors emphasised the importance of considering other possible causes in medical practice when the symptom report by some patients is not a result of asthma.

Shavittt et al. (1992) investigated the prevalence of anxiety disorders in asthma. They recruited 107 asthma outpatients aged from 15 to 58 years old. Participants were screened for panic anxiety symptoms. From the overall sample, 26 patients gave positive results during the screening and underwent a further psychiatric interview. Results revealed that 6.5% (7/26 patients) had panic disorder and 14 patients of the overall sample met the criteria for agoraphobia without panic disorder. The authors found that none of the patients with comorbid anxiety disorder from their sample received additional therapy for their condition. They suggested that apart from the similarities between asthma and panic anxiety symptoms that may contribute to underdiagnosis of anxiety disorders, another crucial reason could be the tradition in medical practice to look out for a single diagnosis. They recommended that physicians should consider comorbid psychiatric symptoms in patients with asthma.

Perna et al. (1997) also investigated lifetime psychiatric diagnoses in asthma patients. The authors recruited 51 adult asthma outpatients. The Diagnostic Interview Schedule, version III-R, was used to detect any psychiatric morbidity.

In addition, the presence of sporadic unexpected panic attacks was measured according to the DSM-IV definition of a panic attack. Data analysis revealed that the highest prevalence of psychiatric illness was for panic disorder accounting for the 19.6% (n=10) of all participants. Thirteen asthmatics showed a history of unexpected panic attack but did not meet the criteria for DSM-IV. Twenty-three of the patients (45%) had experienced at least once an unexpected panic attack, of whom 22 (96%) claimed to distinguish the panic attack from their acute asthma attack. Just one of them reported experiencing a panic attack in a similar way as an asthma attack. The investigators concluded that because all patients but one could distinguish an asthma attack from a panic attack, the high prevalence of panic in the asthma population cannot be explained only by the theory of catastrophic misinterpretation of respiratory symptoms (Clark, 1986). On the other hand, the onset of an asthma attack preceded the onset of a panic attack in 9 out of their ten participants with panic disorder suggesting that asthma may actually induce panic in individuals who are predisposed to panic attacks. Questions about the reliability of the information related to the onset of attacks in this study were raised as data were based on the participants' memories and not on experimental observation.

Anke S. Van Peski-Oosterbaan and colleagues (1996) compared the prevalence of panic disorder between adult patients with asthma and patients with other medical illness. They recruited 123 outpatients from the Department of Pulmonology and Internal Medicine of the University of hospital in Leiden. Participants were referred to a lung function laboratory for a histamine challenge test to investigate their perceptions of somatic sensations during induced bronchoconstriction. Seventy-eight patients were diagnosed with asthma, six patients were diagnosed with Chronic Obstructive Pulmonary Disease and the others with various respiratory disorders. Asthma severity was assessed by spirometry and bronchial responsiveness. All participants were administered several self-report questionnaires including the State-Trait Anxiety Inventory (STAI) (Spielberger et al; 1970), the Panic Attack Questionnaire (PAQ) (Norton et al; 1985) and the Body Sensations Questionnaire (BSQ) (Chambless et al; 1984). Rates of both point and lifetime prevalence were taken. Results revealed no significant differences between the group of asthmatic patients and the group of non-asthmatics. Point prevalence for the group of asthma patients was 9% (n=7) whereas in the other group was 8.9% (n=4). Despite the relatively high prevalence of panic disorder to the asthmatic population of the sample, the authors failed to establish a specific relationship of panic and asthma alone. On the other hand, they found that patients with panic comorbidity reacted with higher levels of perceived breathlessness during the challenge test. They suggested that further experimental manipulation of the cognitions of asthma patients during challenge tests are necessary in order to investigate to what extent symptom perception (i.e. breathlessness) is mediated by cognitive appraisals of somatic sensations induced during the challenge.

Carr (1994) examined 93 asthma patients to investigate the prevalence of panic attacks and panic disorder. Another sample of 32 healthy controls with no past or present history of asthma and panic disorder and 10 patients with panic disorder were recruited for comparison. Self-report measures such as the Bodily Sensations Questionnaire (BSQ) (Chambless et al; 1984) were assessed and pulmonary function was measured with spirometry. Twenty-two per cent of the total sample of asthma patients (n=21) reported experiencing panic attacks, of which 9.7% (n=9) met the criteria for panic disorder according to the DSM-III-R diagnostic criteria. The incidence of panic appears to be up to eight times higher in people with asthma when compared with the 1.7%-2.6% prevalence of panic disorder in the general population (Weissman & Merikangas, 1986). Asthma patients who reported high levels of anxiety sensitivity and fear of body sensations were more likely to suffer from comorbid panic disorder than those with medium or low levels. Pulmonary function did not correlate with panic disorder comorbidity. These findings support the cognitive model (Clark, 1986) which states that the misinterpretation of bodily sensations have a strong impact on but are not sufficient for the development of panic disorder.

Vamos and Kolbe (1999) investigated the levels of psychological distress in a sample of 80 outpatients with severe asthma. Asthma management was measured from case records and psychological profiles were assessed by self-report questionnaires. Results showed that patients had high levels of psychological distress, as 25% (n=20) of the sample indicated definite caseness for anxiety. Patients reported high levels of anxiety even between attacks.

The frequency of anxiety disorders especially panic disorder in asthma patients was assessed by Nascimento et al. (2002). Eighty-six outpatients with asthma and no other co-morbid lung disorder were selected for the study. The version 4.4 of the Mini-International Neuropsychiatric Interview was administered for the assessment of psychiatric disorders (MINI; Sheehan et al; 1996). Forty-five patients (52.3%) met the diagnostic criteria for at least one anxiety disorder.

The most common anxiety disorder was agoraphobia without panic disorder at 26.8% of the sample (n=23). The frequency in generalised anxiety disorder occurred in 24.4% (n=21) and another 13.9% (n=12) accounted for the presence of panic disorder. The findings of this study reveal higher psychiatric morbidity rates than has been found in previous studies (Yellowlees; 1988; Shavitt; 1992; Carr; 1994; Perna; 1997). The authors argued that one limitation of the study was the lack of evaluation of asthma severity and comorbidity of other medical illness that could have accounted for those elevated rates of psychiatric morbidity.

Brown and colleagues (2000) screened asthma patients for psychopathology. Thirty-two patients with moderate to severe asthma, aged 18-65 years old, participated in the study. The most prominent psychiatric disorder found in this population was mood disorders, and the second most common was anxiety disorders occurring in 59% (19 out of 32 patients) of the sample population. More specifically two patients were diagnosed with panic disorder without agoraphobia and three patients had panic disorder with agoraphobia. The results suggest that mood and anxiety disorders are prevalent in patients with moderate to severe asthma. However, because of the small sample size and limited range of asthma severity, the authors were unable to explore the relationship between asthma severity and psychopathology. Further investigations are needed to investigate the link between psychiatric features and asthma in a larger sample with a broader range of asthma severity, in order to investigate whether psychopathology is related to asthma disease independent of its severity or not.

Chronic illness can cause emotional problems, and the severity of a disease may play a very important role in the prevalence of anxiety disorders. Rocco and colleagues (1998) investigated whether patients who have survived from a severe asthma attack may possess a distinct psychiatric profile from patients with moderate asthma. The sample of the study constituted of 17 near fatal asthma patients (NFA). These are patients who had survived a near fatal asthma attack are those who had experienced either a respiratory arrest or were in need for mechanical ventilation. These were 17 asthma patients who had never experienced a severe attack. The mean age of the NFA patients was 44.05 whereas the mean age of the control group was 37.27. All participants underwent a psychiatric screening using interviews and standardized questionnaires. Their results did not confirm the link between asthma and anxiety as no pathological levels of anxiety were found in either groups. They argued that a possible explanation for the negative association of asthma and anxiety could be the relatively small sample size, which was not sufficiently powerful to identify the differences between those two groups.

Yellowlees and colleagues (1988) investigated the relationship of asthma severity and anxiety disorders. Thirteen patients with a near miss asthma death (i.e. patients who had experienced respiratory arrest) and 36 asthma patients who had not experienced a severe asthma attack were recruited for the study. All participants underwent a psychiatric interview. Results revealed that panic disorder was detected in 2 out of 13 who constituted a near miss asthma death group (i.e. patients who had experienced a near fatal asthma attack) and in 4/36 in the control group. Additionally, the near miss asthma death patients were admitted around 22 times to hospital during their lives due to severe asthma attack, whereas patients in the control group were admitted on average 8 times during their lives. Although high levels of psychopathology were found in this study, no significant differences in anxiety disorders were detected between the two groups. The authors suggested that a possible explanation could be that patients with near miss asthma death receive close medical attention. Frequent monitoring from the physicians boost their confidence that help can be received and is at hand if an emergency occurs.

Kolbe and colleagues (2002) attempted to determine the differences in psychopathology between asthma patients with different levels of severity. The sample of the study constituted of 77 patients with severe life-theratening asthma (SLTA) who had received intensive care, 239 patients treated for moderate to mild grading of asthma in general practices and 100 randomly selected community controls with asthma. They found that patients with asthma who were hospitalized were more likely to suffer from anxiety than were community controls. On the other hand, they found no differences between SLTA patients and patients who were hospitalized for asthma on general wards. Caseness for anxiety as measured by the use of HADS was found to be 36% of the sample of SLTA patients (28/77) and 38% of the hospital controls (91/239). The prevalence of anxiety in the community controls was relatively lower constituting the 28% of the sample (28/100). The authors proposed that while anxiety was common to all groups of asthma, it was more prevalent to patients with more severe asthma than in patients with milder symptoms of asthma.

Table 4.2 Prevalence of Anxiety Disorders in Adults with Asthma

AUTHOR	SAMPLE	MEASURES	% OF ANXIETY DISORDERS	CONCLUSION
Yellowlees et al. 1987	50 patients with asthma, chronic bronchitis and emphysema	Psychiatric interview and several physiological tests	34% anxiety disorder prevalence	The traumatic experience of breathlessness plays an important role in the development of psychiatric disorders
Yellowlees et al. 1988	13 near miss asthma Ss - 36 asthma controls with severe attacks	Medical assessment and Diagnostic Interview Schedule	12% panic disorder prevalence and 25.8% generalized anxiety disorder in asthma Ss	High levels of anxiety/panic in both groups. No differences in prevalence of panic and anxiety in those two groups
Shavitt 1992	107 asthma patients 26 patients were screened positive for anxiety	Psychiatric interview	6.5% prevalence of panic	There was an underdiagnosis of anxiety disorders.
Carr 1994	93 asthma Ss – 10 Ss with PD -32 healthy controls	ASI,ACQ,BSQ and spirometry	9.2% PD in asthma Ss	Higher levels of panic in asthma Ss than in controls. Fear of bodily sensations and anxiety sensitivity associated with panic disorder
Van Peski-Oosterbaan et al. 1996	78 asthma Ss -45 controls with other respiratory disease	SUDS PAQ Borg Scale	point prevalence of PD 9% in asthma Ss and 8.9% in controls	Higher prevalence of panic in asthmatic population than in the general population. Similar point prevalence of panic between asthma Ss and controls.
Perna et al. 1997	51 asthma patients	Psychiatric interview	45% prevalence of panic attacks	Since the majority of Ss could distinguish between a panic and an asthma attack, the high prevalence of panic in asthma cannot be explained by the catastrophic misinterpretation of respiratory symptoms

Rocco et al. 1998	17 NFA Ss 17 patients with milder grading of asthma	Psychiatric interview	No significant results	There were no significant results to confirm the link between asthma and psychopathology. This was possibly due to the very small size of the study sample.
Vamos et al. 1999	80 severe asthma Ss	HADS	25% prevalence of definite case of anxiety	High prevalence of clinical anxiety even between asthma attacks
Brown et al. 2000	80 asthma Ss 40 liver disease Ss and 40 healthy Ss	STAI	34/80 of the asthma Ss had high levels of State Anxiety	High incidence of anxiety in asthma
Kolbe et al. 2002	77 asthma Ss in intensive care-239 hospital asthma controls-100 community based controls		36%, 38% and 28% prevalence of anxiety in Ss in intensive care, hospital controls and community based controls respectively	Higher prevalence of anxiety in patients with more severe symptoms of asthma. No significant differences between Ss in intensive care and hospital controls.
Davis et al. 2002	91 asthma Ss	ASI SPRAS	35/91 were diagnosed with anxiety disorder 10/35 had panic disorder	High prevalence of anxiety disorders Anxiety disorders were underdiagnosed in the study sample
Nascimento et al. 2002	86 asthma Ss	MINI	13.9% prevalence of PD	High prevalence of anxiety disorders

Conclusion

Research findings described above showed a high co-morbidity of anxiety disorders in the asthmatic population. However, not all asthma patients are anxious. Investigation of whether such an association is stronger when asthma symptoms are more severe has had some support but it does not elucidate the extent to which asthma severity may act as a primary cause of anxiety. Perhaps there are other factors, besides asthma severity, that play a role in the development and maintenance of anxiety disorders and can explain why some patients worry more about their condition than other patients. The cognitive model of anxiety is focused on the maladaptive cognitive appraisals of somatic sensations. According to this model, asthmatic individuals with anxious personalities should be more vulnerable to threat and they should be likely to misinterpret their somatic sensations in such catastrophic way that will eventually lead to elevated levels of anxiety and thus the occurrence of a panic attack. Furthermore, the cognitive model of anxiety suggests that anxious individuals who tend to catastrophise their somatic symptoms are likely to engage in maladaptive behaviour patterns such as escapism and avoidance. Such a suggestion may explain why some asthma patients have restricted physical and social activities that do not account for their actual physical functioning and thus limit their quality of life. It becomes apparent that it is of high importance to focus on anxiety in the context of asthma management and screening asthma patients for anxiety should comprise questions that directly address the issue of fear and worry without including any respiratory symptom.

PART II

Quantitative Phase

Chapter 5

Methodology of Quantitative Phase

In this section the rationale and hypotheses of this part of the study are presented. The sample and the process of recruitment are described. The instruments used for the quantitative analyses are reviewed and, the rationale and procedure for statistical analysis are also described.

5.1 Rationale of the quantitative phase

Epidemiological studies have established a strong link between asthma and anxiety disorders especially panic disorder (Table 4.2). In addition, asthma patients with psychological distress have been reported to disclose more impaired quality of life than patients with healthier mental functioning. Previous research studies on asthma and quality of life (Lavoie et al., 2005) have found that severity of asthma alone fails to predict impaired quality of life and suggest that psychological factors may play a significant role in counteracting wellbeing (Carr, 1999). However, despite the high co-morbidity of asthma and anxiety disorders no study to date has investigated the mechanisms through which anxiety may affect both the physical and emotional wellbeing of asthma patients with heightened psychopathology. The cognitive model of panic (Clark, 1986) developed in psychiatric populations emphasises the importance of catastrophic cognitions in precipitating and maintaining panic and anxiety. Application of the assumptions of the cognitive model of panic would mean that anxious asthma individuals are more likely to perceive somatic sensations as threatening and dangerous, and as a result, they would experience more anxiety that eventually would lead to a full blown panic attack. In order to lessen the probability of a panic attack, anxious asthma individuals would engage in safety seeking behaviours. As a result they may alter their lifestyle a great deal more than may be necessary to avoid future panic attacks or lessen their anxiety feelings.

Catastrophic cognitions have been investigated by numerous researchers in mental ill health populations, especially in panic disorder patients. A few studies have been also investigated catastrophic cognitions and Chronic Obstructive Pulmonary Disease (Sutton et al., 1999; Gurney-Smith et al., 2002). No study to date has investigated general and illness specific catastrophic cognitions in relation to asthma population with clinical levels of anxiety.

This study investigates the role of physical catastrophic cognitions and the extent to which they may affect quality of life in asthma patients with clinical levels of anxiety. The contribution of the proposed research will be to examine theory driven hypotheses of the associations between general trait anxiety and panic, and between illness specific cognitions, bodily sensitivity, and behavioural avoidance. The results of this study may then inform the development of therapeutic interventions.

5.1.1 Rationale of the Hypotheses

In summary, the overall rationale of the quantitative phase was to examine whether the cognitive model of panic, if applied to asthma patients with clinical levels of anxiety can inform about the mechanisms through which anxiety may operate on their quality of life. The hypotheses were therefore based on the three assumptions of the cognitive model of panic:

a) According to the model asthma patients with high levels of anxiety (as measured in terms of both clinical and trait anxiety) will report more frequent panic attacks.

b) Asthma patients with high levels of trait anxiety will report high levels of catastrophic cognitions.

c) Asthma patients with high levels of catastrophic cognitions will report high levels of behavioural avoidance.

Hypotheses

1) Individuals who report high frequency of panic attacks will display higher levels of clinical anxiety than individuals with lower frequency of panic attacks.

2) Individuals with higher trait anxiety will report more frequent panic attacks, but have low illness specific anxiety.

3) Those with high levels of trait anxiety will report more catastrophic cognitions about their symptoms, but have low illness specific anxiety.

4) Individuals who report high levels of behavioural avoidance will have higher levels of illness specific catastrophic cognitions but report lower levels of catastrophic cognitions of general somatic sensations.

5) People who report more catastrophic cognitions will have more impaired quality of life than people who do not tend to catastrophise. This relationship will hold when illness levels (FEV1) and demographic variables are entered.

5.2 Design of the Quantitative Study

The study is a within subjects cross-sectional design using questionnaire data from a group of participants with different levels of physician diagnosed asthma and clinical levels of anxiety.

5.3 Participants

The participants for this phase were 77 adult patients (aged 19 yrs +) who met the criteria for a diagnosis of asthma according to the British Thoracic Guidelines (Thorax, 1997). Eligible participants had a level of clinical anxiety above the "caseness" threshold (HADS score of ≥11). Patients not meeting the criteria for clinical anxiety, where asthma was not the primary diagnosis, or having other pulmonary or cardiac diseases, were excluded from the study. The total number of asthma patients who were approached in the three sites was 283 of whom 134 had clinical levels of anxiety according to HADS score of ≥11 (47% prevalence of clinical anxiety in 283 asthma patients). Seventy-seven patients gave consent and took part in this study achieving 57% of response rate (Appendix Y).

5.4 Collaborating Sites

Clinically anxious asthma patients were recruited from three sites. These were the Severe Asthma clinic in Heartlands Hospital NHS Trust in Birmingham (n=37), the Chest clinic in Coventry and Warwickshire Hospital within the Coventry and Warwickshire Hospitals NHS Trust (n=12) and the Asthma clinic in Wythenshawe Hospital within the South Manchester University Hospitals NHS Trust (n=28).

5.5 Ethical Approval

Prior to data collection, ethical approval and registration with the trusts were obtained. Permission for patient recruitment was also obtained from the consultant respiratory physicians responsible for the care of all participants contacted.

5.6 Procedure of Recruitment

Patients were approached at the clinic, by the lead investigator, prior to their appointment with their physician. They were screened for caseness of clinical anxiety by administering the anxiety sub-scale of the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983). Patients, who scored 11 or above on the HADS, were introduced to the aims of the study, and were invited to participate. Eligible patients who agreed to consider taking part, were given a package of the questionnaires, a briefing about the aims of the study and three forms to consent in a pre-paid envelope. Patients who did not respond within three weeks from the initial invitation were sent a reminder note with the questionnaire package and were asked to complete and return it in an addressed pre-paid envelope.

5.7 Measures

The participants were asked to complete eight instruments on demographic and disease history, trait anxiety, illness specific anxiety, frequency of panic attacks, catastrophic cognitions of general and illness specific somatic symptoms and asthma quality of life.

5.7.1 Demographic and Illness Related Variables

Demographic information of age, gender, marital status, educational background and current occupation status (i.e. whether patients are currently employed or not) were collected with a self-report questionnaire developed for this study (Appendix A).

Information relating to asthma such as onset of disease, medical treatment, general health status and additional medication, was also obtained with a self-report questionnaire developed for the purposes of this study. Onset of physician diagnosed asthma was categorised into three groups: early, intermediate and late according to the age of the participant. Similarly, general health status was categorised into three groups: asthma patients with major co-morbid disease such as cancer or diabetes, with minor co-morbid disease such as back pain or osteoporosis and patients with no other co-morbid illness. Finally, additional medication was viewed in terms of medication or alternative therapy taken by the participants apart from the drug therapy suggested by their physician (example in Appendix B).

Objective measures of illness severity were also assessed by the use of a Spirometer. There are several measures taken in Spirometry, for this study the observed Forced Expiratory Ratio (FEV_1%) of each respondent was collected. Forced Expiratory Ratio is the percentage of the volume of lungs from full inspiration to forced maximal expiration in the first second. Lung function is stated as a percentage of the observed/predicted for the patient's age, height and gender, ventilatory capacity. Percentages of FEV_1 were recorded by the nurse, at the clinic. Lower scores indicated more severe restriction in ventilatory capacity.

5.7.2 Measures of Anxiety

Measurement of clinical anxiety, trait and illness specific anxiety, were assessed by the administration of the Hospital Anxiety and Depression Scale, the State-Trait Anxiety Inventory and the Asthma Symptom Checklist.

a) Hospital Anxiety and Depression Scale (HADS)

Developed by Zigmond and Snaith (1983), the Hospital Anxiety and Depression scale is a 14 item self-report measure of anxiety and depression designed for use in medical out-patient populations. Specific attention was paid by the authors to select items that would distinguish between anxiety and depression symptoms and avoid overlaps. For these reasons the questionnaire was considered appropriate for use but only the Anxiety Scale was administered since only levels of anxiety of asthma patients needed to be measured. The Anxiety scale is comprised of 7 items which score from 0 to 3, with a range of 0-21 for each scale. Higher scores indicate higher levels of anxiety. Scores falling in the range of 0-7 are considered normal or non-clinical, scores falling in the range of 8-10 are considered borderline, in the range of 11-14 (moderate) and in the range of 15-21 (severe) patients are reported with clinical levels of anxiety (example in Appendix C). This measure has been administered in numerous studies investigating the relationship between psychological status and asthma (e.g. Oga et al; 2007; Nishimura et al; 2004, Rimington et al; 2001, Bosley et al; 1995).

b) State-Trait Anxiety Inventory (STAI)

Developed by Spielberger, Gorsuch and Lushene (1970), this self-report measure consists of two 20 item scales designed to assess state and trait anxiety. The purpose was to measure anxiety proneness as a personality characteristic and therefore only the trait anxiety scale was used. This scale measures the general tendency to react with anxiety to a wide range of stimuli. The scores range from 20-80, with higher scores indicating more severe anxiety (Appendix D). This questionnaire has been widely used to measure anxiety in medical settings and there are various studies to date where this self-report measure has been used in asthma populations (e.g. Grover et al; 2002, Centanni et al; 2000, van Peski-Oosterbaan et al; 1996).

c) Asthma Symptom Checklist (ASC)

Developed by Robert Kinsman et al. (1977) the ASC is a 36 item self-administered questionnaire which measures subjective symptoms reported to occur during asthmatic attacks. Since the patients' fearful responses specifically to asthma symptoms were needed to assess levels of anxiety related to their illness that are independent of the severity of the illness, only the panic-fear scale has been used. This subscale consists of seven symptoms and participants score on a scale from never to always the magnitude of the symptoms presented during an asthma attack (example in Appendix E). The Asthma Symptom Checklist has been used in numerous studies (Put et al; 2003, Feldman et al; 2002, Grover et al; 2002; Ritz et al; 2001; Belloch et al; 1997) a couple of which have re-evaluated its validity.

5.7.3 Measure of Panic Attacks

Panic attacks were measured in terms of existence and frequency by the administration of the Panic Attack Questionnaire.

Panic Attack Questionnaire (PAQ)

Developed by Norton, Harrison, Haunch and Rhodes (1985), the PAQ is a self-report measure which assesses different aspects of panic phenomenology. Panic disorder symptoms are assessed based on the Diagnostic and Statistically Manual III (DSM-III; American Psychiatric Association; 1980) and individuals, based on this information, construct their self-assessment. For the purposes of this study, adaptation of this measure for use in respiratory population by van Peski-Oosterbaan and colleagues (1996) was used. The PAQ presents 11 of the total 13 symptoms that characterize a panic attack according to DSM IV (APA, 1994). These symptoms are both somatic (e.g. palpitations or shaking) and cognitive (e.g. fear of dying). Patients who report four or more of these symptoms, are considered to meet the criteria for a clinical panic attack. Additionally, patients rate on a 5 point scale the frequency of their panic attacks during the last two weeks prior to the assessment of the questionnaire. There is no psychometric data for this measure (Appendix F).

5.7.4 Catastrophic Cognitions of Physical Symptoms

Catastrophic cognitions were measured for both general and illness specific physical symptoms by the administration of the Body Sensations Questionnaire and the Interpretation of Breathing Problems Questionnaire (short revised version).

a) Body Sensation Questionnaire (BSQ)

Chambless, Caputo, Bright and Gallagher (1984) developed the Body Sensations Questionnaire to assess the fear of 17 anxiety-related bodily sensations. This measure was originally developed for use in people with panic attacks and agoraphobia. Patients rate on a scale of 1-5 how frightened they would be by sensations such as palpitations or nausea (1= not frightened, 5= extremely frightened). Scores range from 17-85. Higher scores indicate higher anxiety sensitivity (Appendix G).

b) Interpretation of Breathing Problems Questionnaire (IBPQ-SR)

The IBPQ-SR is a self report measure of catastrophic thoughts related to the physiological symptoms of pulmonary diseases. The original questionnaire was developed by Sutton et al. (1999) and it consisted of 14 scenarios describing the experience of pulmonary symptomatology, as well as activities and several situations avoided. Gurney-Smith et al. (2002) reduced it to eight items, with the same psychometric properties (internal consistency, α= 0.87; construct validity, r = 0.45). Anna Regan (2002) reduced it further to four brief scenarios (e.g. "you are sitting at home with a friend and you are notice you are wheezing"). These are followed by four visual analogue scales to assess first, the anxiety patients experience in the situation, second the severity of catastrophic thoughts that are relevant to the scenario and finally, the degree to which patients would avoid the particular situation. The current measure does not present the same internal consistency with the preceding measures of IBPQ but it still has satisfactory consistency ($\alpha = 0.75$). Scores for this version fall between 28 and 196 points. Higher scores indicate higher levels of catastrophisation (Appendix H).

5.7.5 Behavioral Avoidance

Behavioral avoidance was measured with the Interpretation of Breathing Problems Questionnaire S-R (Regan, 2002). The questionnaire consists of 4 scenarios where patients are asked to rate on a scale ranging from 1 to 10 how likely they feel they would avoid the situation under question. Scores fall between 4-40 points, and higher scores indicate higher levels of avoidant behavior (Appendix H).

5.7.6 Asthma Quality of Life

The Mini Asthma Quality of Life (Mini-AQLQ)

Developed by Juniper and colleagues (1999), this is a self report questionnaire that measures physical, emotional and social problems associated with asthma. There are four domains: symptoms, activity limitations, emotional function and environmental stimuli. It possesses good psychometric values (reliability α=0.83 and construct validity r =0.90). It has 15 questions where responses are rated on a scale from 1 (greatest impairment) to 7 and is responsive to change with a minimum important difference of 0.5 for both improvement and deterioration in clinical condition. For the purposes of this study only items measuring emotional distress, asthma symptoms and activity limitations were used. The Mini Asthma Quality of Life Questionnaire has been used to measure control over asthma symptomatology in various studies (Pinnock et al; 2003, Rosenhall et al; 2002). (see example in Appendix I).

5.8 Procedure of Preliminary Analysis

- Measurement of the reliability of the scales used was conducted.
- Descriptive statistics for demographic, illness related and psychological variables were obtained.
- To assess the significance of the relationship and its direction between a set of variables, correlation analyses were conducted prior to investigating the variables further in theory driven hypotheses. A scatter-plot matrix (Appendix Q) was created for further investigation of the relationships between variables.

5.9 Rationale and Procedure of Hypotheses Testing

- Hypothesis 1: an independent samples t-test was conducted to examine whether difference in the frequency of panic attacks (high and low frequency) will result in difference of the levels of clinical anxiety experienced by the patients. Frequency of panic attacks was measured by the Panic Attack Questionnaire (Norton et al; 1986). Originally, frequency of panic attacks fell into five categories. It was decided to collapse the five categories into two categories for the following reasons: first, most of the participants' responses fell into three categories with category one having only 5 responses and category five having just 1 response. Second, it was important to be able to distinguish between patients with high and low frequency of panic attacks and compare the levels of clinical anxiety experienced in the two groups.

- Rationale for method of statistical analysis for hypotheses 2, 3, 4 and 5. A standard multiple regression analysis was conducted in order to examine the predictors of trait anxiety, behavioural avoidance and asthma quality of life respectively. This type of regression analysis was preferred from other types such as sequential and statistical regression for the following reasons. Both standard and sequential regression analyses use forced entry (or otherwise the Enter method) in which all predictors are forced simultaneously into the model. However, unlike sequential regression, standard analysis relies on a theoretical framework to include the chosen predictors and makes no decision about the order in which these predictors are entered. According to Field (2005) the way the predictors are included into the model can have a great impact in the outcome and unless there is substantial evidence based on past work to base a hierarchical order of the variables it is better to run a standard regression instead to avoid researcher bias. Finally, statistical regression is based upon mathematical criteria and therefore the computer decides which predictors should be included into the model based on the statistics computed from the particular sample drawn. Thus statistical regression is rather a model-building than a model-testing procedure (Tabachnick & Fidell, 2001). According to Wright (1997) slight statistical differences in the variables can contrast dramatically with the theoretical importance of a predictor to the model and for this reason this type of analysis is best avoided except for exploratory model building.

- Hypothesis 5: The hypothesis states that catastrophic cognitions of somatic symptoms will predict impairment in asthma quality of life even when demographic and illness variables are entered. The selection of demographic variables entered into the model was based on past research findings and logic. Regression analysis is particularly sensitive to the combination of the variables included in the model (Tabachnick & Fidell, 2001) and for this reason randomly selected predictors should be avoided (Field, 2005). Originally, there were five demographic variables (age, gender, marital status, educational level and occupational status). From these variables only age, marital and occupational status, were used as predictors of quality of life. Gender was not selected as a predictor since the vast majority of the participants were females (n=62/77). The educational level was also not selected first, because the majority of respondents had as their highest level of education either secondary school or sixth form (n=30/77 and n=24/77 respectively) and therefore there was little diversity in the different levels of educational status among the participants. Second, there is not enough evidence derived from research findings to back up the selection of educational level as a significant predictor of impairment of quality of life. On the other hand, personal relationship status, age and occupational status have been found to play a role in the quality of life of asthma patients in past research findings (Giardino et al., 2002; Hesselink et al., 2006). Finally, to run a regression analysis independent variables must be either continuous or dichotomous. For the purposes of the study, marital status was collapsed into a binary variable, indicating patients with or without a partner. Multiple regression makes a number of assumptions about the data and certain requirements must be met before conducting the regression: a) The first assumption is the sample size requirements. According to Tabachnick and Fidell (2001) the overall rule is N> 50+8m (where m is the number of predictors of the multiple regression). Thus, for the hypotheses 2, 3 and 4 the size sample needed was 66 participants (two predictors) whereas for hypothesis 5, it was 90 participants (five predictors). However, Stevens (1996) recommends that 15 participants per predictor are needed for a reliable equation for social sciences research and therefore a total sample size of 75 participants is considered sufficient to conduct a multiple regression for the fifth hypothesis. b) The second assumption refers to multicollinearity and singularity among the independent variables. None of the predictors were highly correlated (Appendices R to U) and there was no issue of singularity of all independent variables. c) The third assumption refers to the normality and linearity of the dependent variables. Investigation of the normal P-P plots (Appendices R to U), indicate that there was no violation of the assumption of normality and linearity.

Chapter 6

Results of Quantitative Phase

This chapter presents the findings from the analysis of the quantitative data. First, the measurement of the reliability of the scales used in the study is conducted. Second, descriptive statistics for the demographic, disease-related, psychological characteristics and asthma related quality of life aspects are examined. Third, correlation analyses of several psychological constructs are introduced. Finally, investigation of the hypotheses is conducted using different methods of statistical techniques to fit the purpose of the questions and the variables examined (e.g. standard multiple regression analyses and independent samples t-test).

6.1 Measurement of Reliability of the Questionnaires

Measure of the reliability of a scale indicates whether it consistently reflects the construct that it is measuring. A common measure of internal scale reliability is the Cronbach's alpha (α) (Cronbach, L.J; 1951).

Table 6.1 Cronbach's alpha values

SCALES	α values
ASTHMA SYMPTOM CHECKLIST-PANIC FEAR SUBSCALE (7 items)	0.90
BODILY SENSATIONS QUESTIONNAIRE (17 items)	0.74
STATE TRAIT ANXIETY INVENTORY-TRAIT SCALE (20 items)	0.80
HOSPITAL ANXIETY AND DEPRESSION SCALE-ANXIETY SUBSCALE (7 items)	0.69
MINI ASTHMA QUALITY OF LIFE-EMOTION, ASTHMA SYMPTOMS AND ACTIVITY LIMITATIONS (12 items)	0.75
INTERPRETATION OF BREATHING PROBLEMS QUESTIONNAIRE-CATASTROPHIC COGNITIONS ITEMS (24 items)	0.87
INTERPRETATION OF BREATHING PROBLEMS QUESTIONNAIRE-AVOIDANCE (4 items)	0.65

From the table 6.1 we see that all scales have values that indicate a good consistency of the construct measured by these scales (Kline, 1999) and were appropriate for use.

6.2 Descriptive Statistics for Demographic Characteristics of the Sample.

From the outputs of the descriptive analysis of the demographic data of the sample (table 6.2) we know that there are 15 males (20%) and 62 females (80%) giving a total of 77 respondents. The mean age of the sample was 43.83 (minimum age: 19 years and maximum age: 72 years). The majority of the sample were married (N=32/77) or were in a long-term relationship (N=17/77). The largest proportion of the sample had the legal minimum education (i.e. secondary school) (N=30/77) following by college/sixth form (N=24/77). About two thirds of the sample did not have a current occupation (N=51/77).

Table 6.2 Descriptive Statistics for Categorical Demographic Data

	Frequency	Percent
GENDER		
Males	**15**	**19.5%**
Females	**62**	**80.5%**
MARITAL STATUS		
Single	**12**	**15.6%**
Long-term relationship	**17**	**22.1%**
Married	**32**	**41.6%**
Separated	**6**	**7.8%**
Divorced	**7**	**9.1%**
Widowed	**3**	**3.9%**
EDUCATIONAL LEVEL		
Primary school	**3**	**3.9%**
Secondary school	**30**	**39.0%**
College/sixth form	**24**	**31.2%**
University	**13**	**16.9%**
Trade/professional qual	**7**	**9.1%**
EMPLOYEMENT STATUS		
Currently employed	**26**	**33.8%**
Not employed	**51**	**66.2%**

6.3 Descriptive Statistics of Illness Related Characteristics of the Sample.

From the descriptive analysis of the disease and illness related characteristics of the participants (table 6.3) it was found that the majority had moderate asthma (65%) [Mean=75.81, SD=10.95; (minimum: 53% and maximum: 96%), that was diagnosed early in their lives (61%), had no other disease (58%) and were not taking additional medication apart from the ones described by their respiratory physician (79%).

Table 6.3 Descriptive Statistics for Illness Related Characteristics

	Frequency	Percent
FEV_1%		
< 60% Severe Asthma	6	7.8%
60%-80% Moderate Asthma	50	64.9%
> 80% Mild Asthma	21	27.3%
Onset of Diagnosed Asthma		
Early	47	61%
Intermediate	21	27.3%
Late	9	11.7%
Comorbid Disease		
Major	7	9.1%
Minor	25	79.2
None	45	58.4%
Additional Medication		
Yes	16	20.8%
No	61	79.2%

6.4 Descriptive Statistics of the Psychological Characteristics of the Sample.

The psychological characteristics of the participants in respect of panic attacks, trait anxiety, clinical and illness specific anxiety, catastrophic cognitions of somatic symptoms and behavioural avoidance were examined.

6.4.1 Descriptive Statistics on Anxiety

Anxiety measures included clinical anxiety by the administration of the Hospital Anxiety and Depression scale (Zigmond and Snaith; 1983); trait anxiety by the administration of the State-Trait Anxiety Inventory (Spielberger et al., 1970) and illness specific anxiety by the administration of the Asthma Symptom Checklist-panic fear subscale (Kinsman et al., 1977).

Scores on clinical anxiety as measured by the Hospital Anxiety and Depression Scale fall between 11-21 points. The sample had a mean of 14.06 (SD=2.39). Statistically, a cut off point of 15 indicated those with low and high levels of clinical anxiety (n=50/77 and n=27/77 respectively).

Scores on the trait anxiety as measured by the State-Trait Anxiety Inventory, fall between 20-80 points. The sample revealed a mean of 60.25 (SD=6.3, n=77). According to Spielbelger and colleagues (1970) a cut-off point of 40 corresponds significantly to clinical levels of generalised anxiety disorder.

Illness specific anxiety was measured by the Asthma Symptom Checklist where scores fall between 7-35 points. Participants had a mean score of 16.06 (SD=4.14, n=77).

6.4.2 Descriptive Statistics on Panic

Investigation of ever experiencing a panic attack in their lifetime and frequency of panic attacks were examined by the administration of the Panic Attack Questionnaire (Norton et al., 1985).

From the output of the analysis (table 6.4) it was found that the vast majority of the sample has experienced a panic attack in their lifetime (94%). During the last two weeks before the administration of the questionnaire almost half of the participants reported experiencing one or two panic attacks per week (31%, n=72) following by 21 respondents (27%) who experienced at least three panic attacks per week but less than one per day. Five participants had not experienced a panic attack during the last two weeks before the completion of the questionnaire.

Table 6.4 Frequency of Panic Attacks

	Percent	Frequency
No panic attacks	5	6.5%
One panic attack per two weeks	21	27.3%
One or two panic attacks per week	24	31.2%
At least three panic attacks per week but less than one per day	21	27.3%
One or more panic attacks per day	1	1.3%

6.4.3 Descriptive Statistics on Catastrophic Cognitions of Somatic Symptoms

Catastrophic cognitions of bodily symptoms were examined by the administration of two measures: The Body Sensations Questionnaire (Chambless et al., 1984) is a generic instrument for several physical symptoms and the Interpretation of Breathing Problems Questionnaire (Regan, 2002) which measures catastrophic cognitions for respiratory symptoms (e.g. wheeze, cough and chest tightness).

The total score of the Body Sensations Questionnaire falls between 17-85 points. The sample showed a mean score of 53.8 (SD=6.027, n=77) with a range of 39 to 71 points. The total score of the catastrophic cognitions as measured by the Interpretation of Breathing Problems Questionnaire, falls between 24 to 168 points. The participants had a mean score of 96.9 (SD=15.44, n=77) with a range of 61 points to 139 points.

6.4.4 Behavioural Avoidance

Behavioural avoidance was measured by the administration of the Interpretation of Breathing Problems Questionnaire (Regan, 2002). It consists of 4 items that describe two safe and two unsafe situations (e.g. presence or absence of either a safe person or safe environment). The total scores fall between 4 points to 40 points. The sample revealed a mean score of 23.43 (SD=5.97, n=77) with a range of 9 to 40. Scores of behavioural avoidance in unsafe and unsafe situations fall between 2 points to 20 points. Respondents had a mean score of

14.7 in unsafe scenarios (SD=3.23, n=77) with a range of 6 to 20. In safe situations, participants had a mean score of 8.73 (SD=3.64, n=77) with a range of 2 points to 20 points.

6.4.5 Quality of Life

Quality of life was measured in terms of emotion (e.g. frustration, fear and concern), asthma symptoms and activity limitations (e.g. running up the stairs, shopping, visiting friends) by the administration of the Mini Asthma Quality of Life questionnaire (Juniper et al., 1999).

Scores on the scale are from 12 to 84 points where the lower scores indicate more impaired quality of life. Respondents had a mean score of 28.81 (SD=6.47, n=77) with a range of 15 points to 46 points.

6.5 Preliminary Analyses-Correlation Analyses

Correlation analyses for all continuous variables were conducted (FEV_1%, age, clinical anxiety, trait anxiety, illness specific anxiety, catastrophic cognitions on general physical symptoms, catastrophic thoughts of respiratory symptoms, behavioural avoidance and quality of life (Table 6.5).

a) From the findings of the correlation analyses we know that clinical anxiety had a strong positive relationship with catastrophic thoughts of respiratory symptoms [$r=.518$, $n=77$, $p<.0005$] with 27% of the variance in respondents scores on clinical anxiety explaining the catastrophic cognitions on respiratory symptoms. Clinical anxiety had also a medium positive relationship with trait anxiety [$r=.352$, $n=77$, $p<.005$] with an effect on the variance of trait anxiety of

12.4%. There was also a positive relationship with behavioural avoidance [$r=.327$, $n=77$, $p<.005$]. Clinical anxiety can explain 11% of the variance of avoidant behaviour. Finally, there was a negative relationship of medium strength with quality of life [$r=-.246$, $n=77$, $p<.05$] that helps explain 6% of its variance.

Clinical Anxiety as administrated by the Hospital Anxiety and Depression Scale (Zigmond & Snaith) was used as a screening tool to discriminate asthma patients with psychopathology from patients who have no clinical levels of emotional distress. Preliminary results from the correlation analyses showed that findings are in accordance with the assumptions of the cognitive model of panic that anxious asthma patients will display high levels of illness specific catastrophic cognitions and as a result exhibit high levels of behavioural avoidance.

b) Behavioural avoidance had a strong relationship with catastrophic cognitions of respiratory symptoms [$r=.538$, $n=77$, $p<.0005$]. The overall effect of avoidance in catastrophic thoughts on respiratory symptoms was 29%. Avoidant behaviour was also related to catastrophic cognitions of general physical sensations [$r=.287$, $n=77$, $p<.05$]. Avoidant behaviour can explain 8% of the variance of catastrophic thoughts of somatic symptoms in general. Avoidance also had a negative relationship with quality of life [$r=-.228$, $n=77$, $p<.05$] and it can explain 5.2% of its variance.

Considering the clinical reality of the sample, application of the assumption imposed by the cognitive model of panic would mean that anxious patients will display high levels of behavioural avoidance mainly as a result of their illness specific catastrophic cognitions and not so much from fear of their general somatic symptoms. Findings support this assumption. Furthermore, results support the hypothesis that behavioural avoidance which is the outcome of the illness specific physical catastrophic cognitions will affect the quality of life of anxious asthma patients.

c) Trait anxiety was significantly correlated with catastrophic cognitions of both general and respiratory symptoms [($r=.292$, $n=77$, $p<.05$) and $r=.248$, $n=77$, $p<.05$ respectively]. Trait anxiety explained 8.5% of the variance of catastrophic thoughts on general physical symptoms and 6% of the variance of catastrophic cognitions on asthma symptoms.

Trait anxiety was found to be significantly related with both illness specific catastrophic cognitions and catastrophic cognitions of general symptoms. Taking into account the clinical reality of the participants, the assumption was that anxious asthma patients will be more fearful and tend to catastrophise their body sensations that are core to their illness more than their general somatic sensations. However, trait anxiety was found to correlate much higher with fear of general body symptoms than illness specific symptoms, suggesting that measures of trait anxiety may not be so appropriate when screening for catastrophic cognitions in asthma patients.

d) Other significant correlations were the relationship between $FEV_1\%$ and asthma quality of life [$r=.258$, $n=77$, $p<.05$] that explained 6.6% of its variance. Catastrophic cognitions of illness specific sensations had a negative significant relationship with quality of life [r=-.259, n=77, p<.05] that explained 6.7% of its variance. The results support the assumption that the illness specific catastrophic cognitions will have an impact on the quality of life of anxious asthma patients. This is in accordance with findings from past work that the physical deterioration of the patients does not always account for impairment in asthma quality of life (Lavoie et al., 2005) suggesting that psychological factors may play a more important role.

e) Finally there was a negative relationship of age with clinical anxiety [r=-.231, n=77, p<.05] that explained 5% of the variance of clinical anxiety.

Interestingly, there was no significant relationship for illness specific anxiety with behavioural avoidance (r=.002, n=77) and quality of life (r=-.024, n=77). These results support the assumptions of the cognitive model of panic that it is the heightened levels of anxiety developed from the catastrophic processing of the illness specific somatic symptoms that account for greater levels of behavioural avoidance and subsequently for greater impairment of quality of life than levels of anxiety that is directly related to the illness.

Table 6.5 Correlation Matrix for all continuous variables (Pearson's Product Moment Correlations)

	Age	ASC	HADS	BA	STAI	BSQ	IBPQ	AQL
Illness specific anxiety (ASC)	-.139							
Clinical anxiety (HADS)	-.231*	.213						
Behavioural avoidance (BA)	.123	.002	.327*					
Trait anxiety (STAI)	-.146	.080	.352**	.178				
Catastrophic cognitions by BSQ	-.049	.052	.148	.287*	.292*			
Catastrophic thoughts by IBPQ	-.034	.209	.518**	.583**	.248*	.354**		
Asthma quality of Life (AQL)	.014	-.024	-.246*	-.228*	.051	-.200	.259*	
FEV_1 %	.013	-.020	-.095	-.613	.049	-.028	-.081	.258*

*Correlation significant at the 0.05 level (2-tailed)
**Correlation significant at the 0.01 level (2-tailed)

6.6 Hypotheses Testing

6.6.1 Hypothesis 1: Individuals who experience high frequency panic attacks will have higher levels of clinical anxiety than those with lower frequency of panic attacks.

An independent-samples t-test was conducted to compare the levels of clinical anxiety as measured by the Hospital Anxiety and Depression Scale (Zigmond and Snaith, 1983) for asthma patients who differ in the frequency of experiencing panic attacks as measured by the Panic Attack Questionnaire (Norton et al., 1985). There was a significant statistical difference in mean scores for patients with low frequency of panic attacks ($M=13.80$, $SD=2.18$) and patients with high frequency of panic attacks [$M=15.50$, $SD=2.24$; $t(65)=2.97$, $p=0.004$]. The results support the hypothesis that patients who experience more frequent panic attacks would have higher levels of clinical anxiety than those with lower frequency of panic attacks. The magnitude of the differences in the means was relatively large ($\eta^2=0.12$) and so it is concluded that 12% of the variance of clinical anxiety can be explained by high frequency of panic attacks.

6.6.2 Hypothesis 2: Individuals with high levels of trait anxiety will report more frequent panic attacks, but have low levels of specific illness anxiety.

After meeting the assumptions for multicollinearity, normality and linearity (Appendix R) a standard multiple regression was performed between trait anxiety as measured by the State-Trait Anxiety Inventory (Spielberger et al; 1970) as the dependent variable and frequency of panic attacks as measured by the Panic Attack Questionnaire (Norton et al; 1985) and illness specific anxiety as measured by the Asthma Symptom Checklist (Kinsman et al; 1977) as the independent variables.

Analysis was performed using standard multiple regression. The model reached statistical significance $F_{(2,64)}=3.64$ $p<0.05$ and predicted 10% of the variance of trait anxiety (7.5% adjusted R^2). From the two independent variables only the frequency of panic attacks contributed significantly to the prediction of trait anxiety ($\beta=.32$, $p=0.011$) and can explain 9.6% of the variance of trait anxiety, whereas illness specific anxiety failed to make a significant contribution ($\beta=.004$, $p=0.98$) (table 6.6). Results support the hypothesis that asthma patients with high levels of trait anxiety will report more frequent panic attacks but there is no statistically significant relationship to illness specific anxiety.

Table 6.6 Results of the multiple regression analysis with trait anxiety as the dependent variable

	Unstandardised Coefficients		Standardised Coefficients			95% Confidence Interval for regression coefficient	
Model	**B**	**Std Error**	**Beta**	**Test statistic**	**p-value**	**Lower bound**	**Upper bound**
Constant	54.674	3.293		16.601	0.000	48.094	61.253
Frequency of panic attacks	4.260	1.632	.320	2.611	0.011	1.001	7.519
Illness specific anxiety	-0.005	0.186	-.004	-0.029	0.977	-0.378	0.367

6.6.3 Hypothesis 3: Those asthma patients with high trait anxiety will report more catastrophic cognitions about their bodily symptoms, but have low illness specific anxiety.

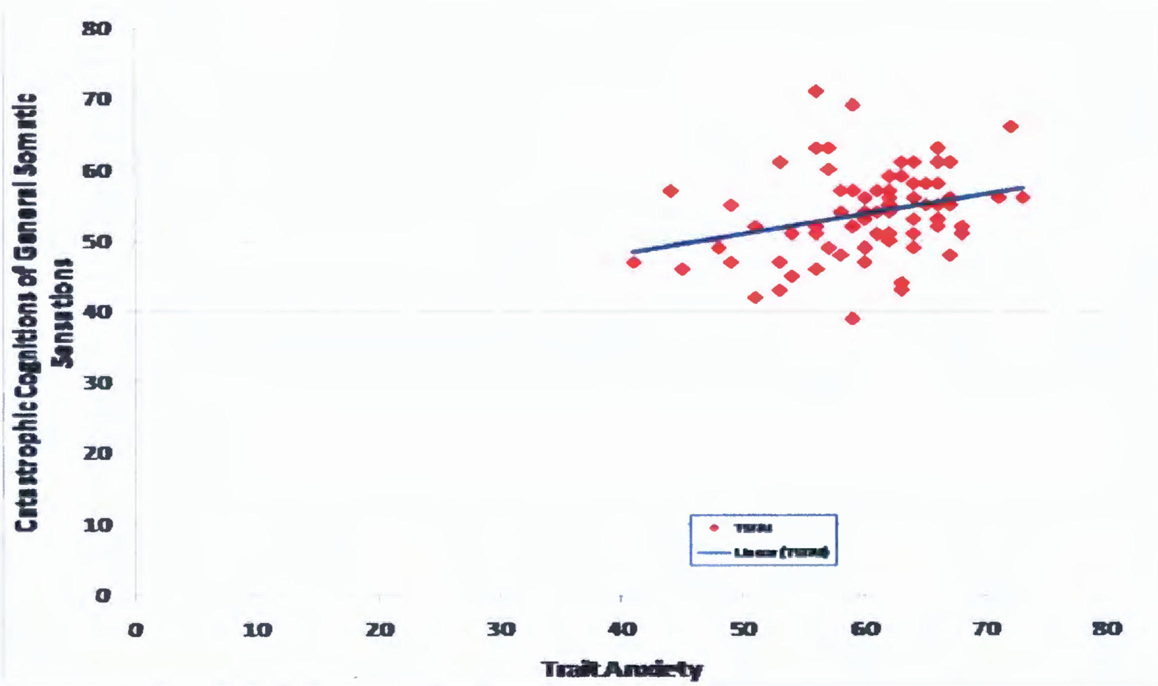
Catastrophic cognitions were examined in relation to general physical symptoms as measured by the Body Sensations Questionnaire (Chambless et al; 1984) and illness specific symptoms as measured by the Interpretations of Breathing Problems Questionnaire S-R (Regan, 2002).

After meeting the assumption of multicollinearity, normality and linearity (Appendix S) a standard multiple regression was performed between trait anxiety as the dependent variable and catastrophic cognitions of general body symptoms and illness specific anxiety as the predictors. The model reached statistical significance $F_{(2,74)}=3.63$ $p<0.05$ and predicted 9% of the variance of trait anxiety (7% adjusted R^2). From the two independent variables only catastrophic cognitions of general symptoms made a unique contribution to the model ($\beta=.29$, $p=0.11$) and explained 8.3% of the variance of trait anxiety (table 6.7 & Graph 6.1). On the other hand, illness specific anxiety failed to contribute significantly to the prediction of trait anxiety ($\beta=.065$, $p=0.56$).

Table 6.7 Results of the multiple regression analysis with trait anxiety as the dependent variable

Model	Unstandardised Coefficients B	Std Error	Standardised Coefficients Beta	Test statistic	p-value	95% Confidence Interval for regression coefficient Lower bound	Upper bound
Constant	42.467	6.710		6.329	0.000	29.097	55.838
Catastrophic cognitions of general symptoms	0.310	0.116	.288	2.596	0.011	0.070	0.532
Illness specific anxiety	0.098	0.169	.065	0.583	0.562	-0.238	0.435

Graph 6.1: Relationship between Trait Anxiety and Catastrophic Cognitions of General Body Symptoms



A second standard multiple regression analysis was performed between trait anxiety (dependent variable), illness specific catastrophic cognitions and illness specific anxiety as the independent variables. The model was of a very poor fit and failed to make a significant contribution to the prediction of trait anxiety $F_{(2,74)}=2.47$, $p>0.05$ and predicted just 6.3% of the variance of trait anxiety (3.7% adjusted R^2). However, illness specific catastrophic cognitions made a unique contribution to the prediction of trait anxiety ($\beta=.242$, $p=0.039$) and explained 6% of the variance of the dependent variable. There was no significant relationship between trait anxiety and illness specific anxiety.

Results of the analyses support the hypothesis that individuals with high trait anxiety report more catastrophic cognitions about their symptoms but there is no relationship to illness specific anxiety.

6.6.4 Hypothesis 4: Individuals who show high levels of avoidance will report higher levels of illness specific catastrophic cognitions than those with lower levels of avoidant behaviour but have low levels of catastrophic cognitions of general bodily symptoms.

After checking for the assumptions of multicollinearity, normality and linearity (appendix T) a standard multiple regression was performed between behavioural avoidance as measured by the Interpretations of Breathing Problems Questionnaire (Regan, 2002) and general catastrophic cognitions as measured by the Body Sensations Questionnaire (Chambless et al; 191984) and illness specific symptoms as measured by the Interpretations of Breathing

Problems Questionnaire S-R (Regan, 2002) as the independent variables. The model reached statistical significance $F_{(2,74)}=19.66$ $p<0.001$ and predicted 35% of the variance of behavioural avoidance (33% adjusted R^2). However only illness specific catastrophic cognitions made a unique contribution to the prediction of avoidance ($\beta=.550$, $p=0.001$) and explained 26.4% of the variance of avoidant behaviour (Table 6.8). Although the correlation between avoidance and catastrophic cognitions of general symptoms was $r=0.29$, $p=0.006$, catastrophic cognitions of general symptoms did not contribute significantly to regression (Table 6.8). Findings support the hypothesis that behavioural avoidance in clinically anxious asthma patients would be best predicted from illness specific catastrophic cognitions than catastrophic thoughts of general symptoms.

Table 6.8 Results of the multiple regression analysis with behavioural avoidance as the dependent variable

	Unstandardised Coefficients		Standardised Coefficients			95% Confidence Interval for regression coefficient	
Model	B	Std Error	Beta	Test statistic	p-value	Lower bound	Upper bound
Constant	-2.104	5.370		-0.392	0.696	-12.803	8.595
Catastrophic cognitions of general symptoms	0.092	0.099	.093	0.926	0.358	-0.106	0.290
Illness specific catastrophic cognitions	0.212	0.039	.550	5.473	0.000	0.135	0.290

6.6.5 Hypothesis 5: People who report more catastrophic cognitions will have more impaired quality of life than people who do not tend to catastrophise. This relationship will hold when illness levels (FEV_1%) and socio-demographic variables are entered.

After checking for the assumptions of multicollinearity, linearity and normality (Appendix U) a standard multiple regression was performed between asthma quality of life as measured by the Mini-Asthma Quality of Life Questionnaire (Juniper et al; 1999) as the dependent variable and illness specific catastrophic cognitions as measured by the Interpretation of Breathing Problems Questionnaire (Regan, 2002), FEV_1% values, age, marital status and employment status as the independent variables. For the purposes of the study marital status was collapsed into a binary variable to distinguish between patients with and without partners. The model reached statistical significance $F(5,71)=2.48$ $p<0.05$ and explained 15% of the variance of impairment of quality of life of asthma patients (9% adjusted R^2). From the five independent variables only illness specific catastrophic cognitions made a unique contribution to the prediction of quality of life of asthma patients ($\beta=.243$, $p=0.031$) and explained 6% of the variance of impairment of quality of life (table 6.9). Although the disease variable FEV_1% had a significant positive correlation with impairment of asthma quality of life it failed to contribute significantly to the regression. Findings support the hypothesis that catastrophic cognitions will predict impairment of quality of life even when illness and demographic variables are entered.

Table 6.9 Results of the multiple regression analysis with impairment of quality of life as the dependent variable

Model	Unstandardised Coefficients		Standardised Coefficients			95% Confidence Interval for regression coefficient	
Model	B	Std Error	Beta	Test statistic	p-value	Lower bound	Upper bound
Constant	28.399	8.724		3.255	0.002	11.003	45.795
$FEV_1\%$	0.122	0.068	.207	1.800	0.076	-0.013	0.258
Illness specific catastrophic cognitions	-0.102	0.046	-.243	-2.198	0.031	-0.195	-0.009
Marital status	0.622	1.533	.046	0.405	0.686	-2.435	3.678
Occupational Status	-1.561	1.664	-.115	-0.938	0.351	-4.878	1.756
Age	0.059	0.055	.123	1.085	0.282	-0.050	0.168

Graph 6.2: Relationship between Asthma Quality of Life and Illness Specific Catastrophic Cognitions

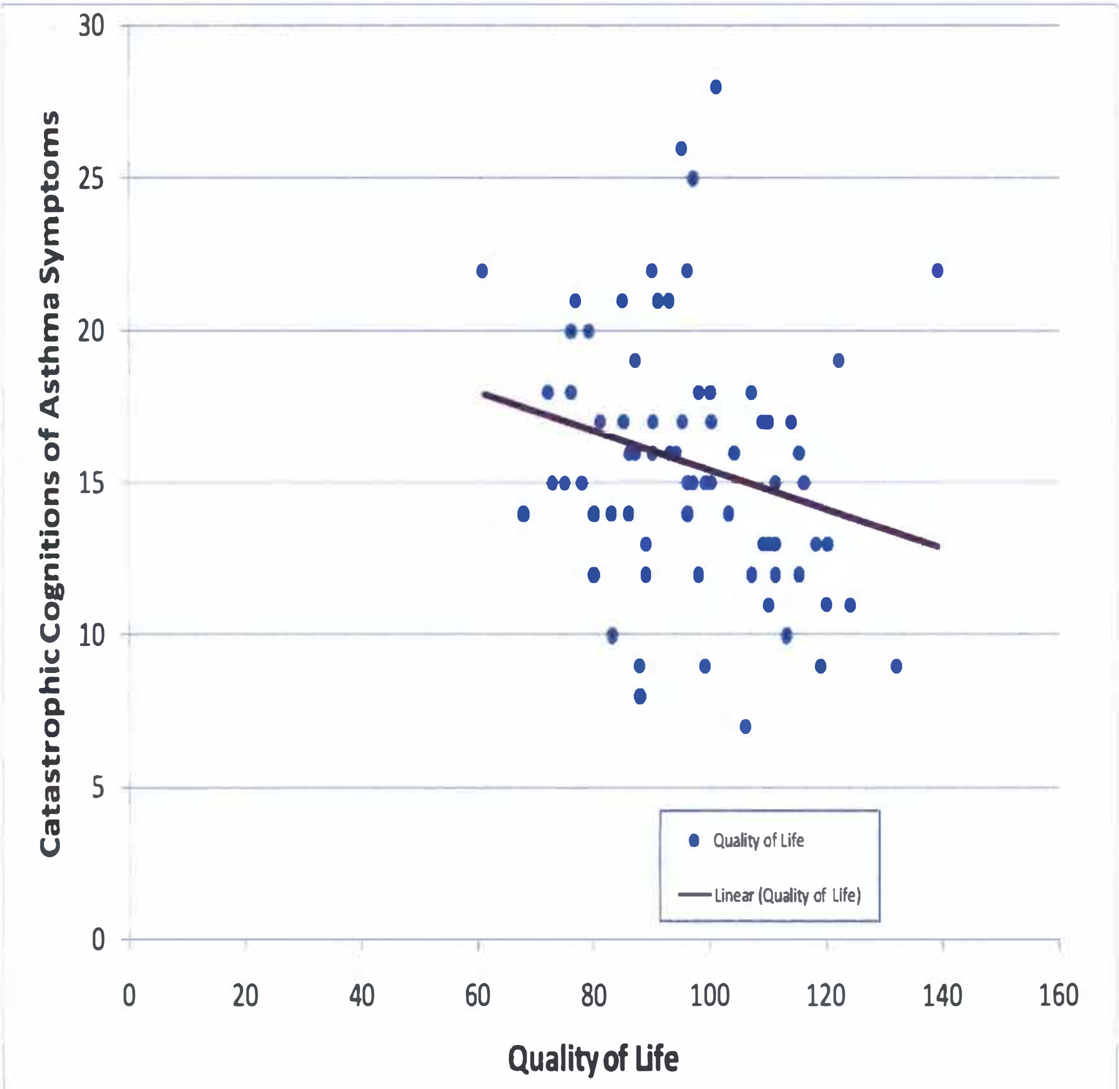


Figure 2: Relationship of Catastrophic Cognitions of Asthma Symptoms and Quality of Life

Chapter 7

Discussion of the Results of the Quantitative Phase

In this chapter the results are discussed in relation to theory and past research findings. Limitations of the present study are presented.

7.1 Introduction

Psychological factors appear to play a very important role in asthma. The main characteristic of asthma is sudden and unexpected attacks of impaired breathing. Both the attacks themselves and the prospect of attacks can cause much anxiety in asthma patients. (tenThoren & Petermann, 2000). Additionally, because asthma can be unpredictable, patients have learnt to pay close attention to their somatic sensations for internal cues in order to prevent an asthma attack from happening. However, such close attention to somatic stimuli may produce more anxiety towards their illness (Carr, 1999). Asthma attack symptoms such as dyspnea and suffocation may be experienced with high degrees of dread that may lead to the development of panic attacks (Yellowless et al; 1990).

There have been several studies to date that examined the prevalence of panic attacks in asthmatic populations. Yellowlees et al. (1988) found a prevalence of 12% of panic disorder in 49 patients with near fatal and severe asthma. Shavitt et al. (1992) estimated the prevalence of panic disorder at 6.5% in a sample comprised of 107 asthma outpatients. Van Peski-Oosterbaan and colleagues (1996) showed a prevalence of panic disorder of 9% in 78 patients with asthma whereas the results from Nascimento et.al (2002) revealed a higher prevalence of PD of 13.9% in 86 asthma patients. Perna et al. (1997) found that the prevalence of panic disorder was 13.5% and the prevalence of panic attacks was 45% in a sample of 51 outpatients with asthma. The authors suggested that the high prevalence of PD in patients with asthma may be related to a facilitating effect of asthma on the development of the disorder. This is in accordance with Carr (1999), according to whom, the presence of asthma alone should be considered as a risk factor for the development of panic because of the respiratory disturbances that underlie panic disorder. Goodwin and Eaton (2003) suggested that further investigation needs to be done to determine whether asthma may be a causal factor for the development of panic and they further proposed that genetic factors may be associated with the comorbodity of asthma and panic. However, clinical studies based on the neurobiological and hyperventilation theories of panic have failed to establish a causal relationship between genetic factors and hyperventilation for the development of panic attacks suggesting that psychological factors such as anxiety and its cognitive consequences may play a role in the development and maintenance of panic in asthma patients.

The psychological theories of panic tried to fill this gap by proposing that high levels of anxiety and its cognitive outcomes would predict the occurrence and maintenance of panic attacks. The hypotheses of this study were therefore based on the three assumptions of the cognitive model of panic (Clark, 1986):

a) According to the model asthma patients with high levels of anxiety (as measured in terms of both clinical and trait anxiety) will report more frequent panic attacks. Findings supported the hypothesis and showed that patients with higher levels of clinical anxiety and trait anxiety reported more frequent panic attacks than patients with lower levels of anxiety;

b) Asthma patients with high levels of trait anxiety will report high levels of catastrophic cognitions. Results supported the hypothesis but only partially as trait anxiety was only significantly predicted by catastrophic cognitions of general body sensations and not somatic symptoms related to asthma;

c) Behavioural avoidance of asthma patients would be best predicted by the catastrophic cognitive processing of illness specific somatic symptoms and not by general body sensitivity. Findings supported the hypothesis and found that high rates of avoidant behaviour of anxious asthma patients was only predicted by their illness specific catastrophic cognitions and

d) Catastrophic cognitions being the core subject matter for both the development and maintenance of panic and behavioural avoidance according to the cognitive model of panic, would significantly predict impairment of quality of life of asthma patients even when illness and demographic variables were accounted for. Results supported the hypothesis and showed that impairment of the quality of life of anxious asthma patients was highly related to the catastrophic cognitions of their asthma symptoms.

7.1.1 Clinical Anxiety and its Relation to Panic Attacks in Asthma

The first hypothesis of the study was based on the prediction derived from the psychological theories of panic and asserts that asthma patients with higher levels of clinical anxiety will report more frequent panic attacks than asthma patients with lower levels of anxiety. Results confirmed the prediction that different levels of clinical anxiety would predict the frequency of the occurrence of panic attacks in our sample and showed that asthma patients with higher levels of anxiety would experience almost twice the amount of panic attacks per week from those patients with lower levels of clinical anxiety. These findings are in accordance with the assumptions of the cognitive model of panic that asserts that the development of panic attacks is the outcome of heightened levels of anxiety.

7.1.2 Trait and its Relation to Panic Attacks in Asthma

Trait anxiety is the tendency to become anxious most of the time and is considered as a personality construct that influences the course of psychopathology (Vancleef & Peters, 2007).

Cognitive research into anxiety has focused upon the patterns of selective information processing, attentional processing and memory bias that are associated with high levels of trait anxiety (Pury & Mineka, 2001; Mathews & MacLeod, 1985; Broomfield et al; 2005). Research findings suggest that threatening stimuli seem to capture the attention of highly anxious individuals and therefore, the level of trait anxiety can serve as vulnerability factor that determines a person's reaction to somatic symptoms or external events. Such results support the cognitive theories of panic that state that highly anxious individuals are prone to the catastrophic misinterpretation of threatening stimuli and are more likely to experience panic attacks as a result of that than individuals with lower levels of anxiety.

The second hypothesis of this study was based therefore on the assumption that patients who have high trait anxiety will report more frequent panic attacks than patients with lower levels of trait anxiety but have low levels of illness specific anxiety. Multiple regression analysis revealed that asthma patients with higher levels of trait anxiety reported more frequent panic attacks than patients with lower levels of trait anxiety. Illness specific anxiety failed to make a significant contribution in the prediction of trait anxiety. Such results provide further support for the cognitive theory of panic. It appears that it is the maladaptive cognitive appraisals involved that contribute to the increase in levels of trait anxiety than fear of the illness.

7.1.3 Trait Anxiety and its Relation to Catastrophic Cognitions of Somatic Sensations in Asthma

Eysenck and colleagues (1987) argued that there are substantial cognitive processing differences between high and low trait anxious individuals. It has been suggested that high levels of trait anxiety provide a basis for the occurrence of heightened autonomic arousal (Reiss, 1991) According to Taylor

(1995) highly anxious personalities perceive this arousal as a harmful event with physical and mental consequences.

This suggestion formed the basis for the third hypothesis that asthma patients with highly anxious personalities will report more catastrophic cognitions about their physical sensations than patients that are not so anxious but will have low illness specific anxiety. Catastrophic cognitions of somatic symptoms were measured by the administration of two instruments.

The first, the Body Sensations Questionnaire is a generic instrument that measures the anxiety sensitivity on several somatic sensations (e.g. heart palpitations, sweating, pressure in the chest, numbness in different parts of the body etc). The second is the Interpretation of Breathing Problems Questionnaire that assesses catastrophic cognitions of somatic symptoms relevant to respiratory physiology (e.g. chest tightness, wheezing etc).

The outcome of the results is twofold: first, they support the cognitive model of anxiety which states that catastrophic cognitions are associated with heightened levels of anxiety. Second, they support past research findings that anxiety sensitivity (i.e. the catastrophic interpretation of autonomic arousal) is the direct product of trait anxiety (Warren et al; 1990; McNally and Eke, 1996) and is considered a trait cognitive characteristic that includes fears of physical and mental experiences that are believed to intensify pre existing anxiety (Reiss, 1991). Given the clinical reality of the sample it was assumed that illness specific catastrophic cognitions would be significantly associated with levels of trait anxiety. The results failed to give evidence of support for such assumption and verify the distinctiveness of anxiety sensitivity and trait anxiety. Results come in accordance with previous research findings that anxiety sensitivity (i.e. the catastrophic interpretation of autonomic arousal) is the direct product of trait anxiety (Warren et al; 1990; McNally, 1996) and is considered a trait cognitive characteristic that includes fears of physical and mental experiences that are believed to intensify pre existing anxiety (Reiss, 1991).

7.1.4 Catastrophic Cognitions and Behavioural Avoidance of Clinically Anxious Asthma Patients

Identifying the precursors and mechanisms of avoidance is of clinical importance because avoidance is thought to play an important role in the maintenance of anxiety. Results suggested that avoidant behaviour of clinically anxious asthma patients is greatly influenced by the catastrophic cognitive processing of the asthma symptoms these patients experience. Turner and colleagues (1986) have suggested, based on Klein's model of panic (1980), that panic disorder may be the precursor of agoraphobic behaviour.

However, Craske et al. (1987) pointed out that situational avoidance is not an inevitable consequence of panic as individuals may panic for years without developing agoraphobia and others may develop avoidance without the incidence of panic attacks. Other studies have tried to find a causal link between agoraphobia and panic attack frequency and intensity, suggesting that frequency of panic attacks and their magnitude may play an important role in the development of avoidance but Craske and colleagues (1987) found that individuals with different levels of avoidance did not differ in their panic attacks frequency and they suggested that although frequency or intensity of panic episodes may play some role in the development of avoidance they do not provide causal relations for the maintenance and continuation of agoraphobic behaviour. It appears therefore that while the anticipation of a panic attack may be present when behavioural avoidance is present, the materialization of such behaviour as a coping style is considered to be influenced by other factors as well. Safety signals according to Rachman (1984) are thought to be very important in the maintenance of situational avoidance. According to this point of view the continuum of agoraphobia largely depends on the establishment of safety signals (i.e. behavioural approach to safety). The cognitive model of panic states that in anxiety a behavioural approach to safety is particularly important in the maintenance of perceived threat. A person with agoraphobic behaviour believes that by avoiding certain situations (e.g. going to restaurants, crowded shops) they will avoid an imminent danger (e.g. in this case having asthma attack or asthma deterioration). Critics of the cognitive model of panic (Perna et al; 1997) have stated that it fails to explain why panic disorder patients continue to misinterpret somatic sensations when they have evidence to the contrary (i.e. when catastrophic misinterpretations do not come true). However, most panic disorder patients engage in avoidance behaviour as a precaution to prevent the occurrence of an attack and therefore they never truly realise that their panic attacks would not lead to a catastrophe (Clark, 1986). Moreover, as Salkovskis and colleagues (1996) have claimed that individuals not only avoid anxiety provoking sensations but also the feared outcome of these sensations thus the cognitive hypothesis predicts a logical counterpart between such beliefs and behaviours during panic. The authors also stated that the situation avoided is not so important as its external correlates. In other words, it is the social evaluation concerns of that situation that predicts avoidant behaviour (e.g. social embarrassment or fear of negative evaluation from others).

The fourth hypothesis was based on the prediction of the cognitive model of panic that patients who catastrophise more about their bodily symptoms will report more behavioural avoidance than patients who do not catastrophise as much. Again the hypothesis was tested for both generic body symptoms and asthma related symptoms to examine the extent to which the catastrophic cognitive processing of asthma related symptoms influence the behavioural outcomes of asthma patients and whether illness specific catastrophic cognitions will predict better behavioural avoidance than catastrophic cognitions of general body symptoms. Results supported the hypothesis and showed that only catastrophic cognitions of asthma symptoms predicted the behavioural avoidance of asthma patients. There are two possible reasons for these results. First, it seems logical that asthma patients would be more concerned about their respiratory symptoms than other general bodily sensations. Asthma patients need to be aware of their symptoms in order to protect themselves from experiencing deterioration in their physical functioning and develop an asthma attack. However, patients with heightened levels of anxiety are more likely to be more vigilant towards their respiratory symptoms than patients who are not so anxious. Heightened fear about unwanted experiences (e.g. asthma attack) is likely to produce maladaptive cognitions of their sensations to mean an indication of a forthcoming danger. These results support the cognitive hypothesis of anxiety. Nevertheless, the results indicated that 26% of the variance of the avoidant behaviour was explained by the physical catastrophic cognitions of asthma symptoms. It appears that there might be other factors or other types of catastrophic cognitions that may have an effect on behavioural avoidance.

7.1.5 Catastrophic Cognitions and Quality of Life in Asthma

Asthma is a disabling illness associated with impairment to both physical and emotional functioning. It can restrict mobility and cause great distress to the sufferers. Asthma patients with psychological distress have been reported to disclose more impaired quality of life than patients with healthier mental functioning. Previous research studies on asthma and quality of life (Lavoie et al., 2005) have found that severity of asthma alone fails to predict impaired quality of life and suggest that psychological factors may play a significant role in reducing wellbeing e.g. (Carr, 1999). There is a consistency in findings that anxiety disorders and asthma are co-morbid and such results are crucial for treatment planning (Goodwin, 2003). High levels of anxiety can provoke feelings of low self-control to some individuals with asthma that may cause inadequate management of their asthma symptoms. Poor self-management can lead to increased rates of hospital admissions and use of emergency care (Adams et al., 2000). Moreover, heightened anxiety can develop into panic for some patients. Panic prone patients are more likely to catastrophise about their somatic symptoms causing them greater distress and anxiety. Catastrophic cognitions of asthma symptoms represent an unwanted threatening outcome. Patients who tend to produce maladaptive appraisals of their somatic sensations are likely to engage in strategies to avoid experiencing either an asthma attack or the anxiety related symptoms that come with the thought of having an asthma attack. Low perception of safety can cause asthma patients to experience great distress and prevent them from living life to the best possible level they can. Behavioural avoidance can have severe outcomes in both the emotional and social life of the patients. Cognitive avoidance can produce much stress and anxiety as patients engage in extreme controlling tactics in order to lessen their anxiety about their illness. Additionally they may employ certain behavioural patterns that may eventually lead them to extreme activity limitation and even social withdrawal altogether. As is known emotional health is also related to the availability and quality of personal relationships thus social withdrawal will affect significantly their quality of life of these patients.

Based on past research findings the final hypothesis of this study stated that higher levels of impairment of quality of life would be predicted by the severity of the physical catastrophic cognitions of asthma patients and that this relationship will hold true despite the illness specific and demographic characteristics of the sample. Physical catastrophic cognitions of general bodily symptoms did not appear to have a significant effect on asthma quality of life. On the other hand, illness specific physical catastrophic thoughts predicted greater impairment in quality of life of clinically anxious patients even when disease and socio-demographic variables were entered. Closer inspection the results revealed that illness specific physical catastrophic cognitions predicted just 9% of the total variance quality of life. Moreover, when illness specific physical catastrophic thoughts were combined with disease and demographic variables they predicted 15% of the variance of quality of life. These findings strongly suggest that there must be other variables, either psychological or social, that may have a great impact in the quality of life of clinically anxious asthma patients.

7.2 Conclusion

The role of catastrophic cognitions for the development of panic and maintenance of anxiety has been investigated by numerous researchers in mental health populations, especially in panic disorder patients. A few studies have also investigated catastrophic cognitions in chronic obstructive pulmonary disease as a means of explaining the high prevalence of anxiety disorders in patients with Chronic Obstructive Pulmonary Disease (Porzelius et al., 1992; Sutton et al., 1999; Gurney-Smith et al., 2002). Two studies (Carr et al., 1995; Giardino et al., 2002) have examined the predictors of panic fear in asthma and the role of the catastrophic cognitions and asthma symptoms in relationship satisfaction respectively. To the best of our knowledge no study to date has examined the role of both generic and illness specific catastrophic cognitions in the quality of life of asthma patients with clinical levels of anxiety.

The cognitive hypothesis of panic asserts that anxious individuals would misinterpret their somatic sensations to mean an imminent disaster and as a result they would experience elevated levels of anxiety that would lead to the development of a panic attack. Whereas anxiety is the normal emotional reaction aroused by a threat and it disappears when the danger is no longer present, clinical anxiety on the other hand, is the disproportionate emotional response to the severity of threat and it continues despite the fact that the objective danger no longer exists. Moreover, trait anxiety is considered a personality trait and individuals with trait anxiety exhibit more worry and greater emotionality than a non-anxious persons. According to these distinctions of anxiety our first assumptions were that the higher the levels of clinical and trait anxiety in asthma patients the more frequent the experience of panic attacks. Results of this study supported the cognitive model of panic by Clark (1986) as asthma patients who were both high in clinical and trait anxiety reported more frequent panic attacks than patients with lower levels of anxiety.

An important distinction between trait and state anxiety lays in the existence of two important psychological constructs: worry and emotionality. Individuals with trait anxiety will be more concerned about impending danger or have low perceived control over the threat and be more susceptible to the perceived arousal element of anxiety (i.e. physical symptoms such as sweating, palpitations and other bodily sensations.). Based on this, asthma patients with highly anxious personalities would report more catastrophic cognitions about their symptoms than patients with lower levels of trait anxiety. Data analysis revealed that trait anxiety was related to the catastrophic cognitions of general bodily sensations and not illness specific symptoms. The results are in accordance with previous research findings that anxiety sensitivity (i.e. the catastrophic interpretation of autonomic arousal) is the direct product of trait anxiety (Warren et al; 1990; McNally, 1996) and is considered a trait cognitive characteristic that includes fears of physical and mental experiences that are believed to intensify pre existing anxiety (Reiss, 1991). Moreover, results suggest that measures of trait anxiety may be more appropriately used when investigating other psychological and personality traits than catastrophic cognitions in relation to physical symptoms in patients with physical illnesses.

The cognitive model of panic states that in anxiety, behavioural avoidance is particularly important in the maintenance of perceived threat. A person with agoraphobic behaviour believes that by avoiding certain situations (e.g. going to restaurants, crowded shops etc) will avoid an imminent danger (e.g. having a panic attack etc). Investigation of the body sensitivity and illness specific physical catastrophic cognitions in avoidant behaviour revealed that only asthma related physical catastrophic thoughts predicted behavioural avoidance. However the percentage of variance of avoidant behaviour predicted by physical catastrophic cognitions of respiratory symptoms was small. As Salkovskis and colleagues (1996) stated the situation avoided is not as important as its external correlates. In other words, it is the social evaluation concerns of that situation that predicts avoidant behaviour. It seems therefore that there might be other factors or other types of catastrophic cognitions that may have a more significant effect on behavioural avoidance such as mental or social catastrophic cognitions and low perception of asthma and panic symptoms.

According to ten Brinke et al. (2001), who found no significant differences in psychopathology in a sample comprised by both mild and severe asthmatics, the association between mental disorders and severity of asthma may have been overestimated. Other research studies on asthma and quality of life

(Lavoie et al., 2005) have found that severity of asthma alone failed to predict impaired quality of life in asthma patients.

Based on the assumptions of the cognitive hypothesis of anxiety and past research findings that failed to find severity of asthma being a significant predictor of quality of life in asthma, we proposed that asthma patients who tend to catastrophise more about their symptoms will report greater impairment of quality of life even when illness and demographic variables are taken into account. While the results reported here supported the assumptions of the cognitive model of panic, and illness specific physical catastrophic cognitions predicted lower levels of quality of life, they failed to make a substantial contribution to the total variance of asthma quality of life. These results suggest that investigation of other psychological constructs should be additionally considered when examining quality of life in asthma patients with clinical levels of anxiety such as perceptions of asthma control and self-efficacy.

Key Findings of the study:

1) Differences in the levels of clinical anxiety can predict the frequency of the occurrence of panic attacks in anxious asthma patients.

2) Asthma patients with highly anxious personalities are more likely to experience more frequent panic attacks than patients with lower anxious personalities.

3) Assessment of trait anxiety can predict anxiety sensitivity of anxious asthma patients but not their catastrophic cognitive processing of illness related symptoms.

4) Illness specific physical catastrophic cognitions can predict the existence of behavioural avoidance and may inform about the development and maintenance of such behaviour in anxious asthma patients.

5) Illness specific physical catastrophic cognitions account for the variance of the impairment of quality of life of anxious asthma patients.

6) Although illness specific physical catastrophic cognitions account for the variance of both behavioural avoidance and ultimately impairment of quality of life of anxious asthma patients, findings suggest that other types of catastrophic cognitions such as mental and social cognitions and other psychological constructs like perceptions of asthma and panic symptom control may also influence the behavioural patterns of asthma patients and eventually their physical and emotional wellbeing.

7.3 Limitations

Design

The most important limitation could be considered the design of the study itself. The cross-sectional design makes it impossible to determine the direction of causality between the variables under investigation.

Measures

One further limitation of the study could be that the measures included in the analyses were all self-report questionnaires and so the probability of significant relationships between the variables may result from the increased method of shared variances.

Additionally, measures of subjective and objective disease severity were included in the study (FEV_1 and asthma QOL). Nevertheless, in the present study asthma severity failed to make a significant contribution in the quality of life of the patients. One may argue that instead of the absolute level of function, it is the variability of lung function that characterises asthma severity, and therefore FEV_1% values may not provide conclusive outcomes for the severity of the patients but rather an indication of their impairment. However collecting this sort of data was not possible for this study.

The absence of a diagnostic psychiatric interview may be viewed also as a limitation of the study. However, the assessment of psychopathology was made with well-known psychiatrically calibrated questionnaires, applied to examine the mental state of asthma patients in numerous past research studies and therefore we feel confident that the measures used provide adequate information about the mental state of the participants.

Finally, while the current study aimed to balance the objectives of the research and the acceptability of the study to participants, the inclusion of a number of measures may have strengthened the study further. Inclusion of a generic quality of life measure may have delivered a better representation of the participants' well being than illness specific instruments which may not be so sensitive. Despite that, disease specific asthma quality of life measures are often perceived by researchers to be superior to generic quality of life instruments (Juniper, 1998). Moreover, inclusion of the Panic and Agoraphobia Scale (Bandelow, 1995) may have provided more information about the frequency of panic attacks and the role of anticipatory anxiety in the development of panic attacks and behavioural avoidance in our sample. Inclusion of self-reported questionnaires on self-efficacy and perceived control on both asthma and anxiety symptoms may have shed more light on the associations between anxiety, panic and illness specific catastrophic cognitions in behavioural avoidance and quality of life.

Chapter 8

Methodology of Qualitative Phase

In this chapter the rationale and the aims for the qualitative phase are introduced. The method, the procedure and the context of the interviews are described. Finally the method and procedure of the analysis of the qualitative data are also explained.

8.1 Rationale for qualitative study

The findings of the quantitative study highlighted areas for which there are important therapeutic implications. Results suggested that high rates of avoidance may occur because of the anticipated anxiety associated with the possibility of experiencing symptoms relating to their asthma in situations where patients felt they would be at greater risk of becoming ill or die. Anxiety/panic in asthma is the result of complex interactions between relatively stable psychological constructs and those specifically related to the illness. Data findings provided evidence for the importance of illness specific catastrophic cognitions and support the theory of Clark (1986). However, the mechanisms through which they interact are in need of further clarification and this depends upon solving problematic methodological issues such as the identification of catastrophic cognitions in asthma.

The Interpretation of Breathing Problems Questionnaire has been designed to specifically detect catastrophic thinking of patients with respiratory illness. Clark et al. (1997) speculated that anxiety related responses such as “I am going to panic” might disclose a specific feared outcome which may represent an impending physical or psychological emergency. On the other hand, it could be argued that it may be an informational self-statement that enables the person to label a situation as unpleasant panic but may not necessarily anticipate any catastrophic outcome. However, severity of illness in the quantitative study was found to be an important factor in predicting anxiety. This provides further evidence that some people may avoid certain situations or activities because of catastrophic thoughts about the consequences of experiencing symptoms at the time. The degree however to which these thoughts are realistic or unrealistic remains unanswered. Additionally, it may be that the items of the questionnaire were not appropriate stimuli to extract and identify all catastrophic thoughts and therefore further examination was needed.

The objectives of the study were: first, to explore and identify the illness specific catastrophic cognitions, in terms of physical, mental and social cognitions, and their behavioral outcomes of patients with asthma and clinical levels of anxiety, second to examine how these cognitions and the subsequent behaviours may affect the quality of life of asthma patients, third to evaluate the cognitive model of panic as a means to understand the relationship between anxiety, catastrophic cognitions and maladaptive behaviors in anxious asthma patients, and fourth to examine the possible mechanisms through which anxiety and catastrophic cognitions may interact.

8.2 Ethics

The proposal was approved by the three collaborative hospitals in Birmingham, Coventry and Manchester. It was made clear that potential participants have the right to withdrawn from the study at any time and were promised anonymity and confidentiality.

8.3 Participants

Fifteen patients were recruited for this phase of the study. To ensure the cases were representative, patients were drawn randomly from the original sample of the quantitative phase. Invitations for interviews were sent to patients until 15 agreed to undertake the interview. In total 19 invitation letters were sent, achieving an affirmative response rate of 79%. The sample for this phase constituted of 6 male and 9 female clinically anxious asthma patients.

8.4 Procedure of interview

All participants were invited to attend for an interview primarily by letter. This included a briefing about the project and the main interview questions. They were asked to confirm whether they wished to participate in the study and provide their contact details. Patients who accepted the invitation were called at a later stage to arrange the interview appointment at their own convenience at one of the two clinics in Birmingham and Manchester. Interviews had a mean duration of thirty minutes, were carried out by the lead investigator and were audio-taped. Two of the fifteen participants expressed an interest and undertook the interview via the telephone.

8.4.1 Interview method

Data were collected using a semi-structured, open ended interview guide on asthma and anxiety. This method of interviewing did not constrain the conversation and allowed new questions to arise as a result of the discussion and therefore provided the quality of the unstructured technique without losing focus from the topics of interest.

8.4.2 Context of interview questions

The main question used to start the discussion and establish rapport with the interviewees was “Can you tell me something about yourself?” followed by probes to get in depth information on topics of interest such as “How do you cope with your asthma?”; “In what ways would you say that asthma has affected your lifestyle?”; “How do you feel about your respiratory symptoms?”; “Have you experienced any asthma attacks?”; “Does it matter what other people think of you?”;”How do you socialise?”; “Does the prospect of experiencing any respiratory symptom or an asthma attack produce anxiety to you?”; “ Have you experienced any panic attacks?”; “Would you relate your anxiety to your asthma?”; “Would you be able to distinguish between asthma and panic attacks?” and “Has your anxiety affected your lifestyle?”.

8.5 Method of analysis

Content analysis is a research tool that helps to determine the presence of concepts within texts or set of texts (Neuendorf, 2001). Currently two principal uses of content analysis are evident, the quantitative approach and the qualitative approach.

Quantitative content analysis systematically identifies text properties, by quantifying and analyzing the presence, meanings and relationships of concepts. The assumption is that words or phrases mentioned most often are those reflecting important concerns in every communication. Yet such amounts of information must be categorised according to a certain theoretical framework or research findings which will inform the data analysis by providing at the end a meaningful reading of content under scrutiny (Kippendorff, 2004). Quantitative content analysis is therefore deductive in nature, trying to test a hypothesis or questions generated from theories or previous research. This method was used to evaluate the cognitive model of panic as a means of understanding the relationship between anxiety and catastrophic thinking in asthma, to identify catastrophic cognitions in asthma patients and to investigate how these cognitions may affect the quality of life of asthmatic individuals.

On the other hand, qualitative analysis is more of an inductive approach that interprets meaning from the content of text data and adheres to the naturalistic paradigm. According to Hsieh and Shannon (2005) there are three types of qualitative methods of analysis, conventional, directed and summative content analysis. In conventional analysis the coding themes derive directly from the text data. A summative method involves counting phrases or keywords and make comparisons. Finally, directed qualitative content analysis bases its coding on some theoretical framework or research findings for initial guidance. The conventional approach was employed, as certain themes emerged very frequently (section 8.7.2), to identify further potential mechanisms through which relatively stable constructs such as anxiety interact with illness specific catastrophic cognitions.

8.6 Procedure of analysis

8.6.1 Procedure of quantitative content analysis

a) Theoretical framework

According to the cognitive model of panic, asthma patients with clinical levels of anxiety misinterpret their somatic sensations as more threatening than they truly are. Such misinterpretations create elevated levels of anxiety which in turn would enhance the development of panic attacks. In order to avoid the development of future panic attacks and lessen their anxiety, asthma patients engage in a series of safety seeking behaviours. If this is taken to the extreme, patients with asthma are in danger of altering their lifestyles more than is needed and thus affect their quality of life.

Hicks and colleagues (2002) have identified three major categories of catastrophic cognitions that are central in the maintenance of panic disorder: physical, mental and social catastrophic thinking. The most likely behavioural outcome of these catastrophic thoughts has long been recognised to be the engagement of safety behaviours (Twaites & Freeston, 2005).

The core concept of safety behaviours is avoidance. Avoidant behaviours range from overt to more subtle efforts to lessen contact with the phobic stimulus and are divided into three major categories: Situational, interoceptive and experiential avoidance. Situational avoidance (Raffa et al. 2004) occurs when a person refuses to enter phobic locations (e.g. shops). Interoceptive avoidance (Moses & Barlow, 2006) takes place when a person refuses certain substances or activities that arouse feared somatic sensations. Experiential avoidance (Soriano et al. 2004) involves denying, withdrawing or minimising contact with the phobic stimulus through the use of avoidance tactics or thought strategies (e.g. distraction). Experiential avoidance is thought to occur when the patient is unwilling to remain in contact with certain experiences including sensations, emotions and thoughts.

b) Conceptualisation decisions and coding schemes

The data were coded using a content analytic framework in which the categories were determined in advance. The categories used for coding were based on the findings of previous research (Paragraph 8.6.1a), and on theoretical framework (Clark, 1986). For this part of the analysis only text data relevant to the theory and research findings of interest were coded. The unit of analysis was determined to be phrases that were related to the three categories of catastrophic cognitions (i.e. physical, mental and social) and the three categories of safety behaviours (i.e. situational, interoceptive and experiential avoidance). Concepts were then coded for existence for each interviewee (i.e. obtain the total number of people whose answers were related to a certain concept). The coding of the interview transcripts was initially carried out by the lead investigator by reading through the texts and manually writing down the concept occurrences. Inter-coder reliability was estimated by another member of the supervisory team specialised in qualitative analysis. When there were some differences between the two coders that reflected ambiguity in the data. To overcome the problem, the two coders looked at the overall presentation of concern of the participant. That way analysis of data was more effective and valid.

8.6.2 Procedure of the qualitative content analysis

Before examining the data and drawing conclusions, it was decided that further investigation of the information of the text that was not directly related to the theory under examination and therefore was not coded, should take place. The unit of analysis was decided to be themes that under the examination of the lead investigator would provide more information about the interrelationship between anxiety, catastrophic cognitions and safety-seeking behaviours. Three categories emerged: Asthma perceived control, Panic/anxiety perceived control and Self-knowledge of panic attack symptomatology.

Chapter 9

Results of the Qualitative Phase

In this chapter we first introduce the socio-demographic, illness related and psychological variables of the participants. Illness specific catastrophic cognitions and safety-seeking behaviours of the participants are described. Finally, the concepts of asthma and panic perceived control and knowledge of the symptomatology of panic attacks are also introduced.

9.1 Socio- Demographic characteristics of the sample

Nine female (60%) and six male (40%) patients constituted the sample for the qualitative phase of the study (Table 9.1). Female patients had a mean age of 42 years and male patients had a mean age of 51 years. The majority of the participants were married (40%), the most frequent reported level of education was secondary school (53%) and were currently unemployed (67%).

Table 9.1 Socio-Demographic Characteristics of the Sample

PATIENTS	AGE	GENDER	EDUCATIONAL LEVEL	MARITAL STATUS	OCCUPATIONAL STATUS
1	35	FEMALE	UNIVERSITY	LONG-TERM RELATIONSHIP	EMPLOYED
2	67	MALE	SECONDARY SCHOOL	MARRIED	NOT EMPLOYED
3	29	FEMALE	TRADE/PROFESSION	LONG-TERM RELATIONSHIP	NOT EMPLOYED
4	50	FEMALE	SECONDARY SCHOOL	DIVORCED	NOT EMPLOYED
5	49	FEMALE	UNIVERSITY	MARRIED	EMPLOYED
6	60	FEMALE	SECONDARY SCHOOL	SEPARATED	NOT EMPLOYED
7	44	FEMALE	TRADE/PROFESSION	MARRIED	EMPLOYED
8	33	FEMALE	COLLEGE	MARRIED	EMPLOYED
9	59	MALE	SECONDARY SCHOOL	LONG-TERM RELATIONSHIP	NOT EMPLOYED
10	41	FEMALE	COLLEGE	LONG-TERM RELATIONSHIP	NOT EMPLOYED
11	49	MALE	SECONDARY SCHOOL	SINGLE	NOT EMPLOYED
12	41	FEMALE	SECONDARY SCHOOL	LONG-TERM RELATIONSHIP	NOT EMPLOYED
13	34	MALE	SECONDARY SCHOOL	MARRIED	NOT EMPLOYED
14	51	MALE	COLLEGE	MARRIED	NOT EMPLOYED
15		MALE	SECONDARY SCHOOL	DIVORCED	EMPLOYED

9.2 Illness-Related Characteristics of the Sample

The majority of patients had an early onset of physician diagnosed asthma (60%) and no other major co-morbid disease (80%) (section 5.7.1).

Table 9.2 Illness-Related Characteristics of the Sample

PATIENTS	FEV_1%	ONSET OF ASTHMA	COMORBID DISEASE
1	66%	INTERMEDIATE	NO
2	78%	LATE ONSET	MINOR
3	64%	EARLY	NO
4	77%	INTERMEDIATE	NO
5	89%	EARLY ONSET	NO
6	82%	EARLY	NO
7	94%	EARLY	NO
8	93%	EARLY	NO
9	64%	INTERMEDIATE	MINOR
10	78%	EARLY ONSET	NO
11	89%	EARLY	NO
12	60%	EARLY	MINOR
13	65%	EARLY	NO
14	63%	EARLY	MINOR
15	76%	LATE ONSET	MINOR

9.3 Psychological Profile of the Sample

Inspection of the psychological profile was achieved by examining the data from the quantitative phase. In particular, patients' scores on Trait anxiety (as measured by the State-Trait Inventory), clinical anxiety (Hospital Anxiety and Depression Scale), frequency of panic attacks (Panic Attack Questionnaire), catastrophic cognitions of illness specific somatic symptoms (Interpretation of Breathing Problems Questionnaire) and on avoidance behaviour (IBPQ).

Scores on trait anxiety range from 20-80. Scores on the HADS range from 11-21. Catastrophic cognitions were divided into two categories: Safe-situations (e.g. "you are sitting at home with a friend and you notice you are wheezing..." and "you are visiting a physiotherapist at the hospital and you feel you chest becoming congested") and unsafe situations (e.g. "you are in a crowd in town and you begin to feel tired and exhausted" and "you are in a car, travelling down the motorway and you notice your chest becoming congested."). Scores for both situations range from 12-78. Avoidant behaviour was also divided according to safe or unsafe situations (described above). Scores on behavioural avoidance fall from 2-20.

Frequency of panic attacks was divided into 5 categories:

1. No panic attacks (during the last two weeks)
2. One panic attack (per fortnight)
3. One or two panic attacks per week
4. At least three panic attacks per week but less than one per day
5. One or more panic attacks per day

Table 9.3 Psychological Profile of the Participants

Patients	Trait anxiety	Clinical anxiety	Catastrophic cognitions-unsafe	Catastrophic cognitions safe	Behavioural avoidance unsafe	Behavioural avoidance safe	No of panic attacks
1	58/80	13/21	61/78	50/78	13/20	10/20	2
2	57/80	14/21	61/78	49/78	16/20	12/20	3
3	62/80	16/21	48/78	42/78	11/20	9/20	3
4	56/80	19/21	65/78	55/78	20/20	20/20	2
5	63/80	15/21	50/78	43/78	11/20	11/20	2
6	64/80	20/21	66/78	50/78	16/20	8/20	3
7	63/80	14/21	65/78	57/78	19/20	16/20	2
8	67/80	14/21	52/78	44/78	16/20	9/20	1
9	56/80	12/21	57/78	43/78	19/20	9/20	3
10	71/80	14/21	63/78	35/78	17/20	7/20	3
11	59/80	13/21	50/78	36/78	10/20	10/20	2
12	65/80	15/21	45/78	31/78	12/20	6/20	3
13	62/80	17/21	50/78	40/78	18/20	14/20	1
14	59/80	18/21	54/78	49/78	13/20	10/20	1
15	57/80	13/21	56/78	37/78	16/20	8/20	2

9.4 Investigation of Catastrophic cognitions

Catastrophic cognitions were examined in terms of physical, mental and societal context (table 9.4).

Table 9.4: Catastrophic Cognitions of Clinically Anxious Asthma Patients

	Number of patients who reported each cognition	Total Percentage
PHYSICAL CATASTROPHIC COGNITIONS		
Thoughts of dying	9	60%
Thoughts of becoming ill	8	53%
Thoughts of being suffocated	5	33%
Thoughts of having an asthma attack	2	13%
Thoughts of having a heart attack	2	13%
MENTAL CATASTROPHIC COGNITIONS		
Thoughts of becoming panicky	11	73%
Being unable to control thinking	5	33%
Being unable to relax	3	20%
Going crazy	3	20%
Losing senses	2	13%
Being unable to think rationally	2	13%
Hallucinations	1	7%
SOCIAL CATASTROPHIC COGNITIONS		
Feeling embarrassed	7	47%
Fear of negative evaluation from others	7	47%
Feeling unsafe	6	40%
People don't understand/are not supportive	6	40%
People think I am incompetent	6	40%
People stare at me	5	33%
People think I am a loser/lazy	4	27%
People think I am crazy/weird	4	27%
Feeling stigmatised	4	27%
Feeling different	3	20%
People think I am disgusting	3	20%
People want to cause me harm	2	13%
Total number of patients (N)	15	

9.4.1 Physical catastrophic cognitions

The majority of respondents revealed a strong fear of fatality (60%) and fear of becoming ill (53%). Other physical catastrophic thoughts concerning their asthma symptoms were thoughts of being suffocated (33%), thoughts of having an asthma attack (13%) and thoughts of having a heart attack (13%).

9.4.1.1 Thoughts of dying

Nine out of fifteen patients displayed consistent thoughts of dying as a result of their conviction that everyday will be the day they will not be able survive their asthma.

Patient no (6) said about her thoughts on dying: "It is just desperation that you are going to die, this time you are going to die"

Patient no (15) said "I always think I am going to die"

Patient no (4) said "You are frightened to close your eyes because you think that if I close my eyes I am not going to open them again"

Patient no (12) said "I am thinking I am going to die and I can't speak"

Fear of dying was also evident as an immediate result of experiencing respiratory symptoms.

Patient no (9) said "Altogether any symptom I may have can make me feel very fearful and I think I will just stop breathing"

Patient no (2) said "Every time I was coughing I was thinking that I am going to die"

Patient no (6) said "You do get very frightened, you do get very panicky when it starts (i.e. feeling breathless) and you think you are about to die"

9.4.1.2 Thoughts of becoming ill

Fear of becoming physically ill was considered primarily a direct consequence of experiencing an asthma symptom such as coughing or was associated with an undesirable outcome from a past experience.

Patient no (4) said: "I feel angry when I cough because I am going to be ill"

Patient no (3) said: "If I fall over, my asthma will get bad and "If I cut my finger when I am cooking my asthma will be bad for a day or two"

Patient no (12) said: "You get very frightened because it (an asthma symptom) can get you too far..."

9.4.1.3 Thoughts of being suffocated

Patient no (12) said: "People in the ambulance were blocking the oxygen and I couldn't breathe"

Patient no (2) said: "I was feeling suffocated every time I coughed"

Patient no (6) said "I feel suffocated...it's a stomach turning fear if you like"

9.4.1.4 Thoughts of having asthma attack/heart attack

Only two of the fifteen patients reported catastrophic thoughts about experiencing asthma and a heart attack.

Patient no (10) said "If I leave my inhaler at home I would worry so much it would bring up an attack"

Patient no (11) said "I thought I was having a heart attack, but they (medical staff) didn't believe me."

9.4.2 Mental catastrophic cognitions

Investigation of the mental catastrophic cognitions revealed a number of catastrophic thoughts and feelings in our sample with the feelings of becoming panicky and inability to control thinking being the most prevalent (73% and 33% of the sample reporting these cognitions respectively).

9.4.2.1 Get panicky

Feelings of panic and intense anxiety were most prevalent in this sample.

Patient no (12) said: "They (asthma attacks) scare me so much I would start feeling panicky."

Patient no (6) said: "Although you had asthma attacks again and again, you still panic."

Patient no (14) said: "I panic when I can't breathe properly."

Patient no (6) said: "I get desperate and I panic."

Patient no (8) said: "After I realise it's getting worse then it is just panic I think, I can't think."

Patient no (4) said: "When I have a cold panic sets in."

Patient no (2) said: "If I start coughing and it starts getting out of hand then I would panic."

Patient no (1) said: "I would panic on the thought I am not well and I need help."

9.4.2.2 Unable to relax

Patient no (12) reported: "...for some staff keep telling me to relax and take it easy and I just think for heaven's sake shut the ... I'm panicking now I can't breathe you know."

Patient no (1) said: "...and I'm like I can't sit down now, I'm feeling very anxious, I can't relax!"

9.4.2.3 Going crazy/be unable to control thinking/hallucinations/unable to think rationally

Patient no (4) said: "It totally messes up your brain, you just lose it."

Patient no (12) "I mean you have the staff saying you are absolutely fine and the lot but you are not listening to them, your mind is elsewhere, your panic takes over completely...you get berserk, because you just fear..." and "...once panic sets in, you get to the point of no return basically...you start to hallucinate, you can't think where you are and what you are supposed to be doing."

Patient no (1) said: "I would panic and then I would just lose it, I just get confused."

9.4.2.5 Loss of senses

Patient no (15) said: "Every time I felt panicky I thought I will pass out."

Patient no (2) said: "I would start coughing...and during the coughing I would black out."

9.4.3 Social catastrophic cognitions

Examination of the social catastrophic thoughts showed that feelings of embarrassment (47%) and stigma and fear of the negative evaluation from others (47%) were the most prominent in our participants.

9.4.3.1 Feeling embarrassed/People stare at me/People think I am disgusting

Forty seven per cent of the patients' demonstrated immense self-consciousness with feelings of embarrassment and shame.

Patient no (10) said: "I was at a friends' wedding and I was thinking about the embarrassment, at the end I had an attack in the middle of the open garden"

Patient no (7) said: "It (asthma) is dirty"

Patient no (12) said: "When I am alone it can be scary because you can't help but thinking that people are looking at you..."

Patient no (4) said: "With all these drugs I feel like a junkie."

Patient no (1) said: "I don't really like people's pity."

Patient no (2) said: "I feel embarrassed when I cough because people may understand I have asthma."

Patient no (12) "They (people) probably think I'm getting breathless because of my weight.

9.4.3.2 Feeling different/feeling stigmatised/fear of negative evaluation from others

Most patients felt their asthma has claimed their social identity and has discriminated them from the rest of the world.

Patient no (8) mentioned: "I feel I am disabled in a way so I guess other people must see me like that too."

Patient no (5) said: "I hate that people seem to remember me for my condition"

Patient no (11) said: "We are second rate citizens and ought to be stuck into a gas chamber."

9.4.3.3 People don't understand my condition

Patients stated that asthma is a greatly misperceived illness. They felt that the general population belief is that asthma is considered either an allergy or a childhood disease that patients grow out of it as they get older.

Patient no (9) said: "People don't understand what I am going through or any other asthmatic for that matter"

Patient no (4) said: "I get sick of people...they are ignorant"

Patient no (5) reported: "Boss said that perhaps I will grow out of my asthma"

9.4.3.4 People think I'm a loser/people think I am lazy

Patient no (14) said: "People think asthmatics are losers"

Patient no (4) reported: "People think one does it to get benefits"

Patient no (11) said: "We are all scroungers because we are on the disability living allowance"

9.4.3.5 People think I am crazy/weird

Patient no (6) said: "People make you think that you are very fussy and you feel you are a bit quirky or peculiar"

Patient no (8) said: "People think I am weird because I double check their food if they are cooking"

9.4.3.6 People want to cause me harm/ Feeling nowhere safe/people are not supportive

Patient no (6) mentioned: "I am nowhere safe, it is scary"

Patient no (11) said: "I have an absolute fear of hospitals, thinking they are basically going to kill me" and "I saw the doctor and his first words were *why do you need to be admitted?*"

Patient no (1) said: "I hated everybody. I thought it was a conspiracy to get me into hospital"

Patient no (4) "...at the end the consultant have nothing more to say to me, everything I need to know I have already learnt, they have got nothing new to say" and "I don't like going to the hospital...it's hospital abuse, you never feel safe"

9.4.3.7 People think I am incompetent

Patient no (1) said: "People would come all over me like I need help as a disabled person would need"

Patient no (5) said: "They think I am weak because I have asthma"

9.5 Safety seeking behaviours

Safety-seeking behaviours were examined in terms of situational, interoceptive and experiential avoidance (table 9.5).

Table 9.5: Safety-seeking behaviours of clinically anxious asthma patients:

	Number of patients who reported each behaviour	Total Percentage
SITUATIONAL AVOIDANCE		
I don't go out, I prefer to stay at home	9	60%
I don't go to other people's houses	7	47%
I don't go to pubs/clubs	7	47%
I don't go to crowded shops	6	40%
I don't go to restaurants	5	33%
INTEROCEPTIVE AVOIDANCE		
I avoid travelling	5	33%
I avoid smoky atmospheres	4	27%
I avoid dusty environments	3	20%
I avoid using the stairs	3	20%
I avoid cats/dogs	2	13%
I avoid smelling perfumes	2	13%
I avoid taking the bus/tube	2	13%
I avoid fresh painted rooms	1	7%
I avoid rooms with full on heating	1	7%
I avoid using the escalator	1	7%
I avoid going for a walk in spring	1	7%
I avoid freshly cut grass	1	7%
EXPERIENTIAL AVOIDANCE		
Planned behaviour for a lucky escape	9	60%
Escapism	7	47%
Hide condition from others	7	47%
Passive behaviour	4	27%
Distraction	4	27%
Minimise contact with anxiety provoking stimuli	3	20%
Denial	3	20%
Withdrawal	3	20%
Total number of patients	N=15	

9.5.1 Situational avoidance

The majority of the participants (60%) preferred to stay at home whereas forty seven percent would avoid going to other people's houses and crowded shopping stores.

9.5.1.1 I don't go out I prefer to stay at home

Patients displayed an agoraphobic tendency of staying at home since it was regarded the safest place for them to be.

Patient no (9) said: "It depends on my mood but generally I prefer to stay at home."

Patient no (13) said: "I don't go out, there is no point putting myself in that situation and bring up an asthma attack when I can avoid it."

Patient no (15) said: "I don't go out, why put myself in a situation I would most likely want to escape from?"

Patient no (12) "I don't go out a lot in general and I never go out in the night."

9.5.1.2 I don't go to other people's houses

A great deal of number of the participants would avoid visiting other people's houses out of fear they would react badly to possible house allergens.

Patient no (10) said: "I avoid going to other people's houses...I just think that allergen may bring on my asthma...I would just wheeze and it would be embarrassing, it doesn't worth it."

Patient no (6) said: "I won't go to other people's houses...I think of others' houses and I am like I can't go there I will have an asthma attack."

9.5.1.3 I won't go to clubs/pubs/restaurants/crowded shopping stores

Patient no (12) said: "I don't go out a lot and I have never been in a club."

Patient no (8) "I can't go to restaurants in case they put something to my food and I get an anaphylactic attack."

Patient no (12)" I don't go to clubs or pubs...I mean you go to a pub, you are with people you don't know and you are thinking if you are going to be alright and the answer is no you will not!."

Patient no (15) said: "I don't usually go out for shopping, especially when the stores are crowded."

9.5.2 Interoceptive avoidance

Patients would avoid several situations and/or activities where they believed would get in contact with allergens that would trigger their asthma symptoms: smoky environments (27%), dusty environments (20%), contact with dog and cat (13%), walking in the park during spring time (7%) and walking in the park where the grass was freshly cut (7%).

9.5.2.1 I avoid using the stairs/escalator

Climbing the stairs was the predominant activity the participants would either avoid altogether or minimise its use as much possible.

Patient no (13) said: "I try not to use the stairs as much as possible, I would have a shower in the morning and I won't go upstairs again unless I want to sleep in the night."

Patient no (14) said: "I won't climb the stairs!"

Patient no (8) reported: "I will not take an escalator full stop!"

9.5.2.2 Avoid allergens

The type of allergens patients were more likely to avoid, were primarily dust, smoke and dog and cat hair. Some patients exhibited some sensitivity towards perfumes, fresh paint, freshly cut grass and central house heating.

Patient no (6) "I never go where there are cats and dogs around"

Patient (10) “I would never go anywhere near a freshly painted room.” and “I would perhaps go for a visit to friends’ houses on the condition the heating is not full on.”

Patient no (13) “I don’t do much socialising to be honest...I would occasionally attend a family gathering but people must not wear any perfumes because it will trigger my asthma...”

Patient no (1) said: “I would most certainly avoid smoky atmospheres, I won’t go anywhere near people who are smoking.”

Patient no (6) said: “People say they have cleaned their house but I know that there is still some dust left, I cannot be in a dusty place.”

Patient no (15) said: “I would love to go for a walk in the park but I can’t do that during spring because of all the allergens in the air...summertime is bad too but not as worse as springtime.”

Patient no (1) said: “I like to go out for a walk with my dog but I can’t stand the freshly cut grass.”

9.5.2.3 Avoid travelling/avoid travelling with the bus/tube

Patient no (1) said: “I would definitely avoid taking the tube because I know that my breathing would become poor fast, it’s claustrophobic and there is no easy escape from it.”

Patient no (8) reported: “I won’t travel in case I become ill.”

Patient no (10) said: “I would like to be able to visit other places, but you just get afraid of what it might happen if your asthma becomes poor so at the end you decide not to go.”

Patient no (4) said: “I would take the bus only if it is not crowded and I can sit down...I can’t stand on the bus for long.

9.5.3 Experiential avoidance

Patients demonstrated eight different categories of experiential avoidance

9.5.3.1 Planned behaviour

A significant 60% of the interviewees were thinking very carefully about the course of action they should take once their asthma symptoms appeared and what situations should avoid in order to keep their asthma symptoms at bay.

Patient no (8) "If for example I start wheezing and I get the feeling I am going down, I will stop talking or stop drinking so in case I have an asthma attack I will not have to go to the toilet..."

Patient no (13) said: "I am careful in what situations I put myself in."

Patient no (6) said: "I stay dressed (after returning from ED) ready to go out of the door again." and "When I go to the bed if I am feeling unsure about my breathing I don't bother to get in bed, I would stay dressed and just lay on the top of the bed with slippers shoes everything at hand ready to just run out of the door."

Patient no (10) said: "I choose always to be close at home in case of emergency go back quickly and get myself fixed."

Patient no (15) said: "I don't do much to be honest so that I won't get in trouble."

Patient no (5) said: "I have to be very careful where I choose to go for example I would love to go to the theatre but I'm afraid going there in case it is dusty."

Patient no (14) said: "I must be near an exit"

Patient no (8) said: "I have to stay at the bottom of the stairs for some time and preoccupy my mind with something so that I will not think of my breathing."

9.4.3.2 Escapism

Patient no (15) said: "If I start coughing I would just get out of people's way."

Patient no (2) said: "If I start coughing and I am out I would either go to the toilet or go outside."

Patient no (6) said: "I would leave immediately...it the feeling that you are on your way to get some help and avoid the awful situation you are in." and "When asthma starts getting worse I get panicky and I can't stay indoors and I go for the door and walk out."

Patient no (14) said: "I go away when it (asthma) starts."

9.4.3.3 Hide condition from others/withdrawal

Patient no (15) said: "I try to hide it I don't want to be noticed."

Patient no (5) said: "I don't tell people straightaway. I leave it for a while and gradually I bring it up."

Patient no (13) said: "They don't have to know."

Patient no (10) said: "Not many people know I have asthma...during my working life I never ever said I had asthma..."

Patient no (7) said: "I will try not to show that I am out of breath. I don't speak because it is the only way to hide my breathlessness." and "If I am laughing I will try to stop laughing because it may trigger my asthma and people will notice."

Patient no (2) "If I start coughing and I am out I would go to the toilet or go outside so people won't notice."

Patient no (9) said: "I don't like people to know I have asthma."

9.5.3.4 Passive behaviour

Four patients (27%) demonstrated a passive attitude towards dealing with their asthma.

Patient no (4) "I have been in the position where I should have been at the hospital and I refused to do so I struggle at home." and "We leave it at the last minute before we call 999 because we know what it is on the other side of those doors."

Patient no (1) said: "...instead me going to the doctor, I didn't..., I should have done something but I didn't."

9.5.3.5 Deny condition

Patient no (15) said: "I guess I don't want to admit I am ill."

Patient no (1) said: "...for me an asthma attack happens when I need to go to the hospital but my doctor has asked me if I have realised that I have had more attacks than I thought I did."

Patient no (5) reported: "I suppose I try to ignore it really..." and "oh I am married now I have a new life, I won't have asthma."

Patient no (3) said: "Since I cannot control it would drive me crazy if I try to think about it so I pretend that it is just not there." and

Patient no (1) said: "I would rather forget it than worry about it."

Patient no (14) said: "I don't need all these tablets because I am absolutely fine."

9.4.3.6 Distraction/minimise contact with anxiety provoking stimuli

Patient no (5) said: "I do something else to get my mind out of it" and "I fear the worst and keep hoping that the worst will not happen."

Patient no (3) reported: "I am a listy person, If I write on a list I don't have to worry about the situation anymore." and "I don't allow myself to see them (medication) because that will remind me of my asthma."

9.6 Asthma perceived control

One major theme that derived from the secondary qualitative analysis was patients' perception of control over their asthma symptoms. Most of the participants stated they had no control over their symptoms and felt that basically asthma dictates to them the way they should run their lives.

Patient no (15) said: "I have no control over it"

Patient no (14) said: "I feel like a prisoner."

Patient no (12) said: "I feel like I have no control over it."

Patient no (4) said: "I call my asthma Hitler...it is a dictator basically..."

Patient no (1) said: "My whole life is involved around my asthma."

9.7 Panic/anxiety perceived control

The frustration and fear of low perceived capability to control their asthma symptoms was found to be a predominant reason for experiencing intense anxiety and panic. Once more their inability to be in charge of their anxious emotions led them to panic even more.

Patient no (6) said: "I do get very anxious and my anxiety makes it worse really so it's like a vicious circle..."

Patient no (12) said: "I try to control my symptoms but I can't so I get panicky."

Patient no (10) said: "It depends really where I am, that adds to the pressure...if I don't know my way around it scares me and I panic."

Patient no (8) said: "I get stressed and that worsens my breathing I can't control it."

Patient no (1) said: "I would panic if I can't control it, that would make me more stressful and I would panic even more."

9.8 Ability to distinguish between asthma and panic attack symptoms

The majority of the patients showed an inability to distinguish between asthma and panic symptoms.

Patient no (1) said: "Umm no not really I don't think so, I haven't really thought about it to be honest..."

Patient no (12) said: "no I can't say that I do..."

Patient no (8) said: "I think it's the asthma that starts first but I wouldn't be so certain about it..."

Chapter 10

Discussion of the Results of the Qualitative Phase

In this chapter the catastrophic cognitions of clinically anxious asthma patients are introduced and classified. Investigation and identification of specific maladaptive behaviours adopted by the participants to cope with their illness are also introduced. Further psychological concepts related to asthma and emotional outcomes are discussed. Finally, conclusions of the findings were drawn and the limitations of the study were acknowledged.

10.1 Summary

Fifteen semi-structured interviews were conducted with patients with clinical levels of anxiety. Patients were randomly picked from the original sample of the quantitative phase and were self-selected. The objectives of the study were: first, to explore and identify the illness specific catastrophic cognitions, in terms of physical, mental and social cognitions, and their behavioral outcomes of patients with asthma and clinical levels of anxiety. The second was to examine how these cognitions and the subsequent behaviors may affect the quality of life of asthma patients. Third, the aim was to evaluate the cognitive model of panic, as a means to understand the relationship between anxiety, catastrophic cognitions and maladaptive behaviors in anxious asthma patients. Fourth, the aim was to examine the mechanism through which anxiety and catastrophic cognitions may interact.

According to the cognitive model of panic, asthmatic individuals with anxious personalities should be more vulnerable to threat and they should be likely to misinterpret their somatic sensations in such a catastrophic way that will eventually lead to elevated levels of anxiety and thus the occurrence of a panic attack.

Investigation of catastrophic cognitions was based on past research findings conducted by Hicks and colleagues (2005) who identify three main categories: physical, mental and social catastrophic thoughts. We know from the analysis of the physical catastrophic cognitions that thoughts of dying and becoming ill were the most prevalent in our sample. The most frequent mental catastrophic thoughts were feeling panicky and inability to control thinking. Finally, feelings of embarrassment and stigma, and fear of negative evaluation from others were the most prominent social catastrophic thoughts. Examination of the safety seeking behaviour revealed three categories of avoidant strategies: situational (avoidance of certain locations), interoceptive (avoidance of certain substances/allergens and activities) and experiential avoidance (cognitive avoidance and escapism).

Results support the cognitive theory of panic in explaining anxiety and maladaptive behaviours in asthma, but only partially. First, the cognitive model of panic asserts that it is the catastrophic misinterpretation of symptoms that causes elevated levels of anxiety. Application to this hypothesis would mean that asthma patients misinterpreted their somatic symptoms to mean an imminent disaster, in this case exacerbations of respiratory symptoms and development of an asthma attack. However, it was not clear the extent to which patients misinterpreted their somatic sensations. Indeed, many patients felt unable to distinguish between their asthma and panic attacks, so it is possible that patients actually misinterpreted panic symptoms for asthma symptoms. It is not possible in this study to provide conclusive results. It could be that asthma patients tend to catastrophically interpret respiratory symptoms rather misinterpreted them. Future studies are needed to monitor the symptoms asthma patients feel during panicky states to shed more light on this matter.

Moreover, the cognitive model of panic disorder has failed to establish the order of sequence of symptoms. The assumption is that somatic sensations will precede the occurrence of a panic attack (i.e. patients with panic disorder will misinterpret bodily sensations in a catastrophic manner such misinterpretation will produce elevated levels of anxiety/fear which will lead into a panic attack). But so far, findings from various studies give inconclusive results (Westling & Ost, 1993). Additionally, another area that needs investigating is whether these cognitions influence panic disorder maintenance. This is an issue that still remains unknown (Rachman, 1994). These authors suggested that further research needs to be done to investigate whether it is the presence of the cognitions, their frequency or their severity or other factors that helps in the development and maintenance of panic disorder.

Further analysis of the interview data revealed some other factors that may play an important role in the maintenance of anxiety for some patients with asthma and may affect their cognitions and behaviours towards their condition. The majority of patients reported low perceived control for both asthma and panic symptoms (Paragraph 9.6 & 9.7). Our results suggested that perhaps the relationship between anxiety and catastrophic thinking is not so direct and that other factors may be related in the development, severity and maintenance of catastrophic cognitions in asthma and similarly other variables may be important too, for the development of panic in asthma patients apart from catastrophic cognitions.

Perceived asthma control may be affected by several factors apart from anxiety such as asthma education, adherence to a medical regimen as well as personality and social factors. Consequently, perceived asthma control may affect the severity and frequency of the catastrophic cognitions of symptoms in asthma and as a result have an effect on the behavioural patterns of the patients. We suggest therefore that the relationship of anxiety and catastrophic cognitions in asthma may interact through the concept of perceived control. Increase of patients' sense of control can lead to a decrease of anxiety and catastrophic cognitions and as a result prevent patients from adopting maladaptive behavioural patterns to cope with their anxiety about their illness and thus improve their quality of life.

Because of the exploratory nature of the present study it was not possible to draw conclusions about causal relationships between anxiety, catastrophic cognitions, behavioural and emotional avoidance and perceived control. However, the study has provided valuable data about the specific illness catastrophic cognitions and discussed some possible constructs that may interact with anxiety for the development and maintenance of these cognitions and their consequential behaviours. Such findings may have important implications in guiding physicians in respiratory health to work with asthma patients with co-morbid anxiety and panic.

10.2 Introduction

This section discusses the illness specific catastrophic cognitions and their consequential behaviours. It also examines other psychological constructs that may interact with the development of catastrophic thinking in asthma patients. Finally, the study's limitations are discussed.

10.3 Catastrophic Cognitions

This section focuses first on the themes extracted from the interview transcripts about catastrophic cognitions and considers them in relation to theory and research findings and second, it examines them in relation to asthma. Hicks and colleagues (2005) have identified three major categories of catastrophic cognitions that are central in the maintenance of panic disorder: physical, mental and social catastrophic thinking.

10.3.1 Physical Catastrophic Cognitions

The cognitive model of panic (Clark, 1986) suggests that bodily sensations of anxiety are misinterpreted as an indication of an imminent disaster. The vicious circle ending in a panic attack develops when a stimulus perceived as threatening creates a feeling of anxiety. Therefore, if the somatic sensations that accompany this state of anxiety are catastrophically misinterpreted, the individual starts to experience a further increase in anxiety, followed by elevated somatic sensations until a full-blown panic attack occurs (e.g. palpitation could be regarded as a sign of having a heart attack). There is considerable empirical evidence to support the cognitive hypothesis of panic (Marks et al.; 1991; Robinson & Brichwood, 1991; Kenardy et al; 1988; Westling & Ost, 1993; Carter et al; 1995; Zoellner et al; 1996; Salkovskis et al; 1996; Kamieniecki et al; 1997; Windhaber et al; 1998; Chambless et al; 2000).

10.3.1.1 Physical Catastrophic Cognitions in Clinically Anxious Patients

Despite overwhelming evidence of the prevalence of anxiety disorders in asthma, to date there have been only two studies which have tried to examine the relationship between catastrophic cognitions and asthma. Carr and colleagues (1995) investigated the predictors of panic in 86 asthma patients. They found that cognitive variables predicted significant variance of panic-fear after controlling for disease and demographic characteristics. On the other hand, severity of illness was not associated with panic once cognitions were controlled. Giardino et al. (2002) also examined the association of catastrophic cognitions and asthma in 50 asthmatic outpatients. The authors reported that catastrophic cognitions were significantly associated with asthma symptoms such as dyspnea, rapid breathing and congestion and suggested that catastrophic cognitions of asthma symptoms may play an important role in the self-management of the disease.

To date, no study has identified the physical catastrophic cognitions of patients with asthma. We identified five catastrophic cognitions: thoughts of dying, thoughts of becoming ill, thoughts of having an asthma attack, thoughts of suffocation and thoughts of having a heart attack.

The majority of patients displayed consistent thoughts of dying as a result of their conviction that everyday will be the day that they will not be able survive their asthma (e.g. "*I always think I am going to die*") or as an immediate result of experiencing respiratory symptoms (e.g. "*You do get very frightened, you do* *get very panicky when it starts (i.e. feeling breathless) and you think you are about to die"*). A similar number of participants revealed a great fear of becoming ill either as a direct consequence of experiencing an asthma symptom such as coughing (e.g. *"I feel angry when I cough because I am going to be ill"*) or such thought was associated with an undesirable outcome from a past experience (e.g. *"If I cut my finger when I am cooking my asthma will be bad for a day or two"*). Fear of suffocation was also prominent in our participants (e.g. *"I feel suffocated...it's a stomach turning fear if you like"*) on the other hand, a less significant number of patients showed fear of having an asthma or a heart attack (e.g. *"I thought I was having a heart attack, but they (medical staff) didn't believe me"* and *"If I leave my inhaler at home I would worry so much it would bring up an attack"*).

There are a number of considerations that need to be taken into account when investigating physical catastrophic thoughts in asthma patients. First, asthma can be fatal, however, there is a need to make a clarification of fatality prone asthma patients. Severity of asthma is considered a significant risk factor of asthma mortality with the excess use of long acting β^2 agonist (Lanes et al; 2002). Furthermore, age is a risk factor for asthma death with the increased likelihood of co-morbidity with other lung diseases such as Chronic Obstructive Pulmonary Disease (Kolbe et al; 2000). Finally, emotional and anxiety disorders can play a significant role in asthma fatality (Sturdy et al; 2002). A distinction, therefore, between fatality prone asthma patients and patients who fear of fatality is necessary. The majority of our sample had moderate levels of asthma severity, no other major physical illness and clinical levels of anxiety. Death caused by asthma exists and it may also be possible that people from our sample may have known patients who have died from asthma. This increased fear of fatality could be associated with uncertainty on future asthma attack outcomes and memory bias towards the illness through the unfortunate outcomes of fellow patients. Moreover, all participants had clinical levels of anxiety and according to the cognitive model of panic, patients with heightened levels of anxiety are likely to interpret their physical symptoms to mean an imminent danger. With regards to the cognitive hypothesis of anxiety our patients may have shown the tendency to catastrophically interpret their asthma symptoms to mean greater likelihood of dying or becoming seriously ill.

Second, it is important to mention that while the primary aim was to examine catastrophic thoughts in relation to asthma symptoms it was not always clear whether the feared thought was actually mediated by asthma (e.g. cough) or panic symptoms. Descriptive statistics of the psychopathological variables of the sample had revealed that participants had a great co-morbidity of clinical anxiety and panic attacks. Panic attacks have several symptoms (e.g. dyspnea, hyperventilation and choking) which are common between panic and asthma. Schmaling and Bell (1997) suggested that patients who have co-morbid asthma and anxiety, could be confused between their asthma and panic symptoms because of their similarities. The majority of patients reported experiencing panic after a perceived indication of asthma deterioration. Moreover, when asked during the interview session, most of the participants felt unable to distinguish between asthma and panic attack symptoms. Thus, it is possible that certain feared somatic sensations such as dyspnea and suffocation may represent panic related symptoms and not asthma symptoms.

Conclusion: Data analysis revealed a number of catastrophic cognitions of physical sensations with thoughts of dying and becoming ill being the most prevalent. Whether catastrophic interpretation of certain bodily symptoms such as dyspnea, suffocation and hyperventilation reflected fear of asthma outcome or panic is unclear since these symptoms are shared by both diseases and the majority of the respondents when asked felt unable to make a distinction between asthma and panic symptomatology.

10.3.2 Mental Catastrophic Cognitions

A study by Khawaja et al. (1993) found that mental catastrophic cognitions were better predictors of panic disorder than physical catastrophic thoughts in a sample comprised of students and patients with anxiety disorders. The authors found that although patients were different in respect of maladaptive appraisals of mental reactions from the controls, they did not differ in terms of how they perceived cues which indicated harm to their lives. As has been suggested, anxiety of autonomic arousal (i.e. anxiety sensitivity) is not a discriminating factor of anxiety disorders and individuals may have high levels of anxiety sensitivity without severe psychopathology. Mental catastrophic thoughts indicate the tendency to consider mental dysfunction as dangerous. More specifically, they represent difficulties in thinking in terms of mental blocking, loss of senses and faulty reasoning. Individuals with mental catastrophic cognitions perceive their intense cognitive activity as a sign of danger or even mental derangement (Clark, 1997).

10.3.2.1 Mental Catastrophic Cognitions in Clinically Anxious Patients

There have been a number of studies conducted to examine mental catastrophic cognitions primarily in patients with panic disorder (Khawaja & Oei, 1998; Zoellner et al; 1999). To the best of our knowledge there has not, to date, been a study carried out to explore mental catastrophic thoughts in asthmatic populations. Seven mental catastrophic cognitions were described: get panicky, being unable to control thinking, being unable to think rationally, and going crazy, being unable to relax, loss of senses and hallucinating.

The majority of the patients revealed mental catastrophic thoughts of becoming panicky (e.g. *"Although you had asthma attacks again and again, you still panic."* and *"They (asthma attacks) scare me so much I would start feeling panicky."*). Thoughts of being unable to think rationally or control thinking were also prominent in our sample (e.g. *"I mean you have the staff saying you are absolutely fine and the lot but you are not listening to them, your mind is elsewhere, your panic takes over completely...you get berserk, because you just fear..."* and *"...once panic sets in, you get to the point of no return basically...you start hallucinate, you can't think where you are and what you are supposed to be doing."*). Finally loss of senses and feelings of being unable to relax were also prevalent (e.g. *"...and I'm like I can't sit down now, I'm feeling very anxious, I can't relax!"* and *"I would start coughing...and during the coughing I would black out"*.

It appears that thoughts of becoming panicky were closely related to the feared asthma outcome of having an asthma attack. Whether there was a pragmatic indication of deterioration of their asthma symptoms or a perceived decline in their physical functioning is not very clear. If the first assumption is true then it becomes apparent that the participants have a low sense of perceived control over their asthma symptoms that causes them to experience great distress to the point of having a panic attack. On the other hand, if the latter postulation is factual, then our findings are in accordance with the cognitive model of panic that patients catastrophically interpret their symptoms to mean an asthma attack and as a result they experience panic. Finally, cognitive dysfunctions reported by the participants (i.e. unable to think rationally, control fearful thinking etc) are the direct consequences of experiencing a panic attack and in line with the cognitive model of panic that severity of the catastrophic interpretation of the physical sensations of anxiety predicts the panic outcome.

Conclusion: Investigation of the mental catastrophic cognitions of the sample has revealed that the most prevalent catastrophic cognition was feelings of becoming panicky that seemed to be a direct consequence of the patients' fear of asthma deterioration. However, whether it was the outcome of a factual or a perceived decline in their physical functioning it was not clear. Findings are in accordance with the cognitive model of panic that postulates that the more severe the catastrophic interpretation of the body symptoms the more severe will be the panic outcome.

10.3.3 Social Catastrophic Cognitions

Results from prior studies have provided sufficient evidence to claim that fears of physical and mental catastrophic thoughts can distinguish between patients with or without panic disorder. However, Arrindell (1993) has suggested that fears of social catastrophic thoughts may play a far more important role in predicting the course and the maintenance mechanisms involved in panic disorder. However, other studies have suggested that social catastrophic cognitions are not exclusively linked to panic but also to other anxiety disorders especially social anxiety disorder (Miller, 1995). Nevertheless, Telch and colleagues (1989) have pointed out that sociophobic traits are common in patients suffering from panic.

Feelings of embarrassment and fear of negative evaluation from others are considered the most significant social catastrophic cognitions in panic. According to Edelmann (1985) embarrassment is closely linked to fear of negative evaluation from others. Individuals who have high levels of fear of negative evaluation from others are more likely to think that other people think little of them. Moreover, individuals who get easily embarrassed are more likely to report greater fear of negative evaluation. It has been reported that socio-phobic traits are good predictors of behavioural avoidance (Pollard & Cox, 1988). Telch et al. (1989) have found that while patients with panic disorder without agoraphobia tended to be more concerned about the physical consequences of their panic attacks, patients with panic and avoidant behaviour were more worried about the social consequences of experiencing panic (i.e. social ridicule or loss of control). Personality theorists claim that self-conscious emotions (e.g. embarrassment) involve self-evaluating processes and according to Tracy and Robins (2004) an individual may experience self conscious emotions when s/he attributes external events to the self. However, it has been stated that when individuals repeatedly experience self-conscious emotions may become capable of regulating them by making external attributions (i.e. they may convert their embarrassment a self-conscious emotion into non self-conscious emotions such as anger or frustration) (Scheff, 1998). Finally, Shiota and Keltner (2005) claimed that self-conscious emotions that are internally attributed may have different behavioural outcomes from self-conscious emotions that are attributed to external events, with internal attributed self-conscious emotions resulting in hiding, escape or avoidance.

10.3.3.1 Social Catastrophic Cognitions in Clinically Anxious Patients

Examination of the social catastrophic thoughts of the sample revealed a number of cognitions that were related to an individual's perception of self-image, of social environment and of other peoples' perceptions of oneself.

The majority of patients reported feelings of embarrassment and fear of negative evaluation from others (e.g. *"I feel embarrassed when I cough because people may understand I have asthma"*; *"They (people) probably think I'm getting breathless because of my weight"*; *"It (asthma) is dirty"*). Thoughts on being different and being stigmatised were also prominent (e.g. "*I feel I am disabled in a way so I guess other people must see me like that too."* and *"I hate that people seem to remember me for my condition"*). Thoughts that other people think of them as crazy/losers/lazy/incompetent were also prevalent (e.g.

"People make you think that you are very fussy and you feel you are a bit quirky or peculiar"; *"People think one does it to get benefits"*; *"People would come all over me like I need help as a disabled person would need"*). Finally, thoughts that people don't understand, they are not supportive or they want to cause harm and thoughts that no place is safe for them were common among the participants (e.g. *"I get sick of people...they are ignorant"*; *"Boss said that perhaps I will grow out of my asthma"*; *"I saw the doctor and his first words were why do you need to be admitted?"* ; *"I am nowhere safe it is scary"*; *"I hated everybody I thought it was a conspiracy to get me into hospital"*).

Investigation of the social catastrophic cognitions in asthma patients needs to proceed with caution. Participants displayed high levels of embarrassment, feelings of being different or stigmatised and fears of the negative evaluation from others. Additionally, they felt their condition was highly misunderstood by others and as a result they felt they were lacking support and assistance. Patients appeared to be very conscious of their illness and the image they felt they projected outwards and felt their asthma has claimed their social identity and has separated them from the rest of the world. However, the degree to which these cognitions are a by product of internal attributions of their emotions is questionable. Asthma awareness has increased greatly in the last decade and more people nowadays receive information through campaigns about the aetiology and risk factors of the illness. However, it was not so long ago that asthma was considered to be an emotional disorder (O'Hollaren, 2003) and was treated in the general practices as a psychiatric illness (French & Alexander, 1943). Even now, the distinction between allergy and asthma is not always clear to the general population. Consequently, individuals who are not fully informed about the condition may underestimate the potential hazards of such chronic illness. As a result, patients with asthma may feel they are let down by people around them causing them further feelings of helplessness and uncertainty. Finally, certain respiratory symptoms such as cough and dyspnea can provoke feelings of embarrassment as they can easily attract the attention from other people.

It is seems, therefore, that the degree to which patients make social catastrophic cognitions as a consequence of their symptoms lies in the severity of the internal attributions of events. This is because social embarrassment for example, is a relatively subjective matter. This means that not all people are easily embarrassed and not all people need constant reassurance and assistance from others. The extent to which patients made their attributions about certain events rests heavily on self-perceptions about self and on sense of controllability. Furthermore, participants had high levels of clinical anxiety, thus it could be argued that as a result of experiencing panic related symptoms or panic episodes, they tend to exaggerate the extent to which people around notice their symptoms given that attentional bias is a distinct characteristic of panic disorder. Alternatively, if patients tended to make internal attributions about emotions and cognitions related to their asthma (e.g. thoughts of being weak, incompetent or abnormal because of their condition) then they are more likely to feel particularly anxious in a social environment. Heightened levels of anxiety and panic may actually attract some amount of social attention. As a result patients may experience intense shame and dread about the possibility of experiencing a similar situation again in the future.

To conclude, while asthma is a chronic disease still misperceived by many to be a non threatening illness and that naturally may cause some anxiety and feelings of lack of support to patients with asthma, not all patients need constant support and reassurance from others. It becomes apparent that there is a need to monitor patients who are susceptible to helplessness and increase their sense of controllability in order to manage their condition more efficiently without the need for regular external help. Additionally, it appeared that patients tended to make vast generalisations about the extent to which people around them misperceived their condition. It seems likely that past experiences of being in a situation where they felt unsupported by some people may have produced memory bias towards the general population as a whole. Such maladaptive cognitions may result in social dysfunction and thus decrease their sense of quality of life. Moreover, asthma symptoms can provoke some levels of embarrassment to the sufferers because of the social attention they may attract, nonetheless not all asthma patients are prone to heightened embarrassment and have the same levels of worry about the negative evaluation from other people. The degree to which self-conscious emotions become dysfunctional look like they depend principally on the catastrophic interpretation of these emotions and cognitions. Diminishing the catastrophic cognitions related to both self-image perceptions and social interactions will enhance self-worthiness and ability to accept oneself.

Key points:

1) Feelings of embarrassment and fear of negative evaluation from others were the most prevalent social catastrophic cognitions of this population.

2) Other people's perceptions about the illness and patients' self-conscious emotions seem to influence the social catastrophic cognitions of anxious asthma patients.

10.4 Safety-Seeking Behaviours

The core concept of safety behaviours is avoidance. Avoidance behaviours range from overt to more subtle efforts to lessen contact with the phobic stimulus and are divided into three major categories: Situational, interoceptive and experiential avoidance. Situational avoidance (Raffa et al. 2004) occurs when a person refuses to enter phobic locations (e.g. shops). Interoceptive avoidance (Moses & Barlow, 2006) takes place when a person refuses certain substances or activities that arouse feared somatic sensations. Experiential avoidance (Soriano et al. 2004) involves denying, withdrawing or minimising contact with the phobic stimulus through the use of avoidance tactics or thought strategies (e.g. distraction). Experiential avoidance is thought to occur when the patient is unwilling to remain in contact with certain experiences including sensations, emotions and thoughts. Safety seeking behaviours can play a significant role in maintaining catastrophic cognitions and in the continuum of anxiety (Salkovskis et al; 1996). There is a qualitative difference between coping with anxiety and avoiding a perceived danger. Coping strategies aim to control anxiety and are not catastrophe based. On the other hand, safety-seeking behaviours are intended to avoid a perceived disaster and are often prominent to other anxiety disorders apart from panic such as social phobia (Clark, 1996).

10.4.1 Situational Avoidance

Turner and colleagues (1986) have suggested, based on Klein's model of panic (1980), that panic disorder may be the precursor of agoraphobic behaviour. However, Craske et al. (1987) pointed out that situational avoidance is not an inevitable consequence of panic as individuals may panic for years without developing agoraphobia and others may develop avoidance without the incidence of panic attacks. Other studies have tried to establish a causal link between agoraphobia and panic attack frequency and intensity, suggesting that frequency of panic attacks and their magnitude may play an important role in the development of avoidance. But Craske and colleagues (1987) found that individuals with different levels of avoidance did not differ in their panic attacks frequency. They suggested that although frequency or intensity of panic episodes may play some role in the development of avoidance they do not provide causal relations for the maintenance and continuation of agoraphobic behaviour. It appears, therefore, that while the anticipation of a panic attack may be present when situational avoidance is present, the materialization of such behaviour as a coping style is considered to be influenced by other factors as well. Safety signals according to Rachman (1984) are thought to be very important in the maintenance of situational avoidance. According to this point of view the continuum of agoraphobia largely depends on the establishment of safety signals (i.e. behavioural approach to safety). The cognitive model of panic states that in anxiety, the behavioural approach to safety is particularly important in the maintenance of perceived threat. A person with agoraphobic behaviour believes that by avoiding certain situations (e.g. going to restaurants, crowded shops etc) will avoid an imminent danger (e.g. having a panic attack etc). Critics of the cognitive model of panic (Perna et al; 1997), have stated that it fails to explain why panic disorder patients continue to misinterpret somatic sensations when they have evidence to the contrary (i.e. when catastrophic misinterpretations do not come true). However, most panic disorder patients engage in avoidance behaviour as a precaution to prevent the occurrence of an attack and therefore they never truly realise that their panic attacks would not lead to a catastrophe (Clark, 1986). Moreover, as Salkovskis and colleagues (1996) have claimed, individuals not only avoid anxiety provoking sensations but the feared outcome of these sensations. Hence, the cognitive hypothesis predicts a logical counterpart between such beliefs and behaviours during panic. The authors also stated that the situation avoided is not so important as its external correlates. In other words, it is the social evaluating concerns of that situation that predicts avoidant behaviour.

10.4.1.1 The Role of Situational Avoidance in Clinically Anxious Patients

Situational avoidance (otherwise known as agoraphobia) has been investigated by Shavitt et al. (1992) who found that agoraphobic behaviour was 13.1% more prevalent in patients with asthma than in the general population. Participants in our sample showed great levels of agoraphobic behaviour. The majority of patients preferred to stay at home as it was regarded by them the safest place to be (e.g. *"I don't go out, there is no point putting myself in that situation and bring up an asthma attack when I can avoid it."* and *"I don't go out, why put myself in a situation I would most likely want to escape from?"*). A number of the participants would avoid visiting other people's houses out of fear they would react badly to possible house allergens (e.g. *"I won't go to other people's houses...I think of others' houses and I am like I can't go there I will have an asthma attack."*). Other patients expressed fear and avoidance towards crowded shops, restaurants and pubs/clubs (e.g. *"I don't go to clubs or pubs...I mean you go to a pub, you are with people you don't know and you are thinking if you are going to be alright and the answer is no you will not!."* or *"I can't go to restaurants in case they put something to my food and I get an anaphylactic attack."*).

The key issue in agoraphobic behaviour in patients with asthma seems to be their perception of safety. It is important for the efficient management of their disease that patients monitor their symptoms closely and prevent being exposed to situations or stimuli that may trigger their asthma symptoms. But patients with heightened levels of anxiety and or panic may feel particularly exposed and vulnerable to stimuli that may provoke their symptoms and as a result it may affect greatly their sense of safety. Past unpleasant experiences may have created attentional and memory bias towards specific situations and environments and catastrophic interpretations of the possible outcome may lead to great levels of agoraphobia.

Key points:

- Situational avoidance seems to be triggered by patients' perceptions of safety.
- Past unpleasant experiences seem to influence patient's perceptions of safety.

- Agoraphobic behaviour seems to be maintained through attention and memory biases developed by patients as a result of past unpleasant experiences.

10.4.2 Interoceptive Avoidance

Individuals who are prone to anxiety manifest an amplified detection between the observed and the expected body symptoms. Interoceptive avoidance is the avoidance of internal sensations that might trigger panic attacks. Anxiety prone individuals are often unaware of this interoceptive conditioning causing them to believe that panic attacks occur unexpectedly and without warning. Thus there is a lack of perceived control over panic which may lead to further arousal of bodily sensations (Hoffart, 1998)

10.4.2.1 Interoceptive Avoidance in Asthma Patients with Clinical Anxiety

Investigation of interoceptive avoidance in our sample revealed a number of specific activities or substances that participants were likely to avoid in order to prevent from experiencing asthma symptoms. These included avoidance of fresh paint (e.g. *"I would never go anywhere near a freshly painted room."*) heating (e.g. *"I would perhaps go for a visit to friends' houses on the condition the heating is not full on."*), smoke (e.g. *"I would most certainly avoid smokey atmospheres, I won't go anywhere near people who are smoking."*), dust (e.g. *"People say they have cleaned their house but I know that there is still some dust left, I cannot be in a dusty place."*), perfumes (e.g. *"I don't do much socialising to be honest...I would occasionally attend a family gathering but people must not wear any perfumes because it will trigger my asthma..."*), cats and dogs (e.g. *"I never go where there are cats and dogs around"*), cut grass (e.g. *"I like to go out for a walk with my dog but I can't stand the freshly cut grass."*).

Also patients avoided certain activities such as walking in the park during springtime (e.g. *"I would love to go for a walk in the park but I can't do that during spring because of all the allergens in the air...summertime is bad too but not as worse as springtime."*), taking the bus/tube (e.g. *"I would definitely avoid taking the tube because I know that my breathing would become poor fast, it's claustrophobic and there is no easy escape from it."*), using the stairs or escalator (e.g. *"I won't take an escalator full stop!"*) and travelling (e.g. *"I would like to be able to visit other places, but you just get afraid of what it might happen if your asthma becomes poor so at the end you decide not to go."* or *"I won't travel in case I become ill."*).

Asthma symptoms can be triggered by different substances or physical activities. Avoidance of these triggers is the logical way for patients to prevent attacks from developing. While identification of these triggers seems to be important for managing more efficiently their condition, it is not clear the extent to which these triggers actually affect their physical functioning or whether patients take severe precautions to the point that it is not essentially needed. It could be that despite the fact that certain allergens, substances and specific physical activities can have an impact on asthma deterioration; asthma patients may have developed specific memory and attentional bias towards these triggers from past unpleasant experiences that may have generated heightened levels of worry and anxiety. Thus, avoidance of these triggers could also serve as a mechanism to cope with their anxiety about the possibility of reoccurrence of similar experiences.

Key points:

- Patients with heightened levels of clinical anxiety seem to be more likely to associate certain activities or substances with catastrophic outcomes in relation to their physical functioning.
- Past unpleasant experiences as a result of certain triggers seem to play a role in the development of memory and attentional biases towards these triggers.
- Memory and attentional biases towards these triggers seem to provoke patients to engage into avoidant behaviours.
- Avoidance of these triggers act as a mechanism to cope with their anxiety associated with the possible catastrophic outcomes of these triggers.

10.4.3 Experiential Avoidance

Experiential avoidance is the process involving negative evaluations of unwanted feelings, thoughts or sensations and the unwillingness to experience these by developing strategies to control them or escape from them (Hayes et al; 1999). Experiential avoidance is considered maladaptive when it is applied inflexibly and the individual puts on an enormous time and effort of planning. managing and controlling unwanted thoughts, feelings, sensations or events. As a consequence, progress towards meaningful goals is in jeopardy because of the individual's unwillingness to cope efficiently with the anxiety thoughts or sensations associated with unwanted situations. By inhibiting and attempting to alter aspects of the self the individuals disrupt their psychological and social well being and not just the fearful negative experiences or events (Wilson &

Murrell, 2004). Often panic prone individuals express their fear as a desire to escape or minimize contact to avoid the worst thing that could have happened should they were unable to get out of a particular situation (Salkovskis et al; 1996).

10.4.3.1 Experiential Avoidance in Asthma Patients with Clinical Anxiety

Examination of experiential avoidance revealed a number of strategies adopted by the participants in order to cope with their asthma symptoms. Planned behaviour for a lucky escape was found to be the most used approach and participants seemed to think very carefully about the course of action they should take once their asthma symptoms appeared and what situations should avoid in order to keep their asthma symptoms at bay (e.g. *"If for example I start wheezing and I get the feeling I am going down, I will stop talking and I will stop drinking so in case I have an asthma attack I will not have to go to the toilet..."* or *"When I go to the bed if I am feeling unsure about my breathing I don't bother to get in bed. I would stay dressed and just lay on the top of the bed with slippers shoes everything at hand ready to just run out of the door."*). Escapism and hide condition were also prevalent in our sample (e.g. *"If I start coughing I would just get out of people's way."*; *"I will try not to show that I am out of breath. I don't speak because it is the only way to hide my breathlessness."*; *"I don't like people to know I have asthma."*). Other tactics used by the participants were denial (e.g. *"I guess I don't want to admit I am ill."*), passive behaviour (e.g. *"...instead me going to the doctor, I didn't..., I should have done something but I didn't."*); withdrawal (e.g. *"If I am laughing I will try to stop laughing because it may trigger my asthma and people will notice."*); and finally distraction and minimize contact with feared stimuli (e.g. *"I do something else to get my mind out of it."* and *"I have to stay at the bottom of the stairs for some time and preoccupy my mind with something so that I will not think of my breathing."*).

It could be argued that some tactics such as denial, passive behaviour and hiding the condition from others can be considered more dysfunctional and more problematic in managing asthma than other strategies like planned behaviour, escapism, distraction and minimize contact with feared stimuli. It has been long reported that denial of asthma and passive behaviour can be considered a significant risk factor for asthma morbidity and mortality as patients high in denial show evidence of non adherence with medical regimen and poor perception of asthma symptoms (Barnes, 1994; Osman, 2002). However, denial of illness can have a far more complex effect on patients' quality of life. It is important to consider how patients with asthma have labelled their condition and whether such labels were developed from internal viewpoints or external suppositions. It is likely that some patients may have internalised such labels (e.g. having asthma means you are weak or a loser etc) as reflections of their identities. Patients with heightened levels of anxiety are more likely to have low self-esteem and therefore be more susceptible to make catastrophic attributions about their condition. Negative self image can have a great effect on social interactions and is considered a significant trait in socially phobic individuals. Patients of our sample have revealed a consistent tendency to hide their condition from other people and thus affect their social life by either withdrawal or escaping from social interactions.

However, withdrawal and escapism have other dimensions too. They may reflect strategies to cope with both the emotional consequences and the physical outcomes of their somatic symptoms. By escaping from a situation or withdrawing from a certain activity (i.e. talking, laughing etc) or social environment patients aim to avoid triggering their asthma symptoms and experiencing an asthma attack. Patients with high levels of anxiety are more likely to feel inadequate in controlling their asthma symptoms and thus feel more vulnerable and threatened in specific situations. It is possible that their anxiety may interfere with their perceptions of controlling their symptoms causing them to believe that an imminent disaster is about to happen. By reducing their anxiety, patients will feel more in control and make less catastrophic cognitions about their symptoms. As a result they will improve their quality of life by being able to expand their social activities and enjoying social interactions.

Finally, while some forms of cognitive avoidance such as cognitive withdrawal and minimisation of contact with feared stimuli can help patients reduce their anxiety over their asthma symptoms and therefore maintain emotional and physical control, it is important to mention that extreme measures of cognitive avoidance can have adverse outcomes. Patients may employ these tactics to suppress their fear of unwanted outcomes (e.g. stop thinking about asthma deterioration because high levels of worry may actually provoke their symptoms or stop thinking about their illness and carry on as everybody else). However, extreme measures of suppression are known to be significantly linked to increased distress (John and Gross, 2004) and may affect patients' perceptions of self-efficacy. As a result this may cause them to believe they are more in control of their condition than they truly are.

Key points:

- Asthma patients with clinical anxiety seem to have low self-esteem and therefore be more susceptible to catastrophic attributions about their condition.
- Clinically anxious asthma patients seem to have developed a negative image about their selves as a result of their illness.
- Asthma patients who make negative internal attributions about their condition are more likely to employ certain avoidant tactics in order to avoid experiencing feelings of anxiety, uneasiness and embarrassment.
- Certain behavioural strategies such as escapism and withdrawal can seriously disrupt social interactions and affect patients' quality of life as a whole.

10.5 The Role of Catastrophic Cognitions and Safety-Seeking Behaviours in Quality of Life of Asthma Patients with Clinical Anxiety

Quality of life is considered as an individual's satisfaction with all dimensions of life (physical, emotional and social functioning) and is distinguished from health related quality of life that is limited to the health domain only. Asthma is a disabling illness associated with impairment to both physical and emotional functioning as it can cause immobility and great distress to the sufferers. It is important therefore to mention that when we examine asthma quality of life we are actually concerned with certain aspects that can improve the life of, in this case, asthma patients with clinical levels of anxiety. High levels of anxiety can provoke feelings of low self-control in some individuals with asthma that may cause inadequate management of their asthma symptoms. Poor self-management can lead to increased rates of hospital admissions and use of emergency care. A decrease in the prevalence of anxiety in the asthmatic population may help some individuals deal more efficiently with their symptoms and improve their physical functioning. Heightened anxiety can develop into panic for some patients. Panic prone patients are more likely to catastrophise about their somatic symptoms causing them greater distress and anxiety. Catastrophic cognitions of asthma symptoms represent an unwanted threatening outcome. Patients who tend to produce maladaptive appraisals of their somatic sensations are likely to engage in different strategies to avoid experiencing either an asthma attack or the anxiety related symptoms that come with the thought of having an asthma attack. Low perception of safety can cause asthma patients to experience great distress and prevent them living life to the best possible level they can. Behavioural avoidance can have severe outcomes in both the emotional and social life of the patients. Cognitive avoidance can produce much stress and anxiety as patients engage in extreme controlling tactics in order to lessen their anxiety about their illness. Additionally they may employ certain behavioural patterns that may eventually lead them to extreme activity limitation and even social withdrawal. It is known that emotional health is related to the availability and quality of personal relationships thus social withdrawal will affect significantly their quality of life.

10.6 Introduction to Perceived Control

Perceived control has long being considered as a cognitive trait serving as a precursor for physical and mental functioning and as a mechanism for effective disease self-management. According to the social cognitive theorists, personal control enables an individual to predict the outcome of an event and shape it according to his own liking (Bandura, 1997). Individuals then may act directly (i.e. act on their own behalf) or by proximity (i.e. get other people to act from their behalf). Perceived control is therefore a dimension of self-concept, how an individual sees himself and the extent over which one assumes that has control of life chances (Kempen et al; 2003). The same authors found that perception of control changes over time suggesting that may be a state characteristic rather than a trait that was considered long ago (Kempen et al; 2003) and stability over perceived control is crucial for maintaining function (Chipperfield et al; 2004). However, to date, no research has been conducted to identify strategies to enhance perceived control and develop interventions that affect perceived control.

10.6.1 Asthma Perceived Control

In asthma, perceived control is defined as patients' perceptions of their ability to deal with their illness and its exacerbations. Previous research findings have showed that perceived control has increased with asthma self-management educational programs (Janson et al; 2003) and that patients' knowledge onf asthma symptoms treatment had a direct effect in their perception of symptom control (Clow et al; 2005). Other studies have failed to establish a confirmatory connection between change of behaviour in treatment management and asthma health outcome suggesting that there may be some other underlying factors that have an impact on asthma outcomes as well. Calfee and colleagues (2006) examined the role of perceived control in asthma health outcomes in 865 hospitalised patients. They found that perception of control of asthma outcome was not completely mediated by severity of asthma and self-management and they suggested that further research is needed to examine how perceived control may affect asthma health outcome and through which mechanisms. Lavoie and colleagues (2005) have found that chronic psychopathology (i.e. anxiety disorders) had a direct impact on asthma control and quality of life. The authors stated that although there are studies conducted in the past that have examined the link between psychopathology and asthma outcomes the effect of psychiatric disorders on asthma control is still in its infancy and further research is needed to explore this association. Moreover research data on the impact of anxiety disorders on quality of life in asthma patients is limited. Deshmukh and colleagues (2007) conducted a review of research on asthma and psychopathology and found that there is an increased prevalence of anxiety disorders in the asthmatic populations. They suggested that cognitive behaviour therapy may prove an effective tool to treat anxiety disorders in patients with asthma and improve asthma outcomes. However, the cognitive behaviour therapy protocol must be designed specifically to target the mechanisms through which anxiety and panic affect asthma quality of life.

10.6.2 Panic Perceived Control

When panic episodes occur, individuals view panic as the focus of fears of uncontrollability. For these individuals a panic attack represents their failure of a desired outcome (Barlow, 1988). Realisation of their worst fear can contribute significantly to the magnitude of the panic episode. The integrated model of anxiety by Barlow (1988), states that panic prone individuals have a specific vulnerability towards panic that exists before and after the emergence of a full blown panic attack. In contrast, the cognitive model of panic by Clark (1986) indicates that it is the catastrophic cognitions of the panic symptoms that affect the outcome of a panic episode. Symptoms, perception and cognitions are associated and are important to the development of fear and anxiety in individuals with panic, and possibly affect the panic episode outcome by influencing the perceived control over panic sensations (Salzer et al; 1994). Cognitive behaviour therapy will aim to restructure maladaptive cognitions either physical or mental (e.g. thoughts of dying or becoming very stressed etc) and improve the panic outcomes.

10.7 Ability of Asthma Patients to Distinguish between Asthma and Panic Attacks

Panic disorder has several symptoms (e.g. dyspnea, hyperventilation, choking and increased anxiety) which are common between panic disorder and asthma. Schmaling and Bell (1997), suggested patients who have and are aware of their comorbid asthma and anxiety, could be confused between their asthma and panic symptoms because of their similarities. That may result in inappropriate treatment, leaving the patient with overuse of either corticosteroids or β agonists. The same authors conducted a study to compare the symptomatology of asthma and panic attacks and identify which symptoms discriminate between them. They found that four categories of symptoms differentiate panic from asthma attacks. Panic/fear and hyperventilation/hypocapnia were more dominant in the panic disorder group and airways obstruction, dyspnea and congestion in the asthma group. Katerndahl (2000) aimed to identify the aspects that defined the self-perceived worst panic attack. He found that from all panic symptoms, dyspnea and the hot/cold flushes were the most significant sensations. Generally, the course of a panic attack differs in both duration and peak of symptoms from that of an asthma attack but identifying discriminating symptoms in patients who suffer from both asthma and anxiety would be a challenge. According to Carr (1999) patient education on asthma attack related and panic attack related symptoms is the first step to help these patients reduce their sense of uncontrollability when they experience either type of attack. If dyspnea reflects a symptom of a panic attack the patients could benefit from antixiolytic medication and similarly they may put themselves at risk of worsening their panic symptoms if they treat it with asthma medication that can cause some further increase of anxiety levels (Smoller & Otto; 1998).

10.8 Conclusion

The objectives of the study were: A) to explore and identify the illness specific catastrophic cognitions, in terms of physical, mental and social cognitions, and their behavioral outcomes of patients with asthma and clinical levels of anxiety. It was found that the most prevalent physical catastrophic cognitions were thoughts of dying and becoming ill, thoughts of becoming panicky and being unable to control thinking were the most reported mental catastrophic cognitions and feelings of embarrassment and fear of negative evaluation from others were the most prevalent social catastrophic cognitions. Investigation of the behavioural patterns of the sample revealed that the majority of patients displayed great levels of both situational avoidance and cognitive avoidance. B) to examine how these cognitions and the subsequent behaviors may affect the quality of life of asthma patients. It was found that patients limited their lifestyles much more than was needed and thus disrupted their social life and emotional state a great deal. C) to evaluate the cognitive model of panic as a means to understanding the relationship between anxiety, catastrophic cognitions and maladaptive behaviors in anxious asthma patients. Although the assumptions of the cognitive model of panic provide an explanation about the way these constructs relate, these assumptions are not conclusive as results showed that these relationships in asthma may not be so directly related and that other factors may play a role in the development of catastrophic cognitions. D) to examine the possible mechanism through which anxiety and catastrophic cognitions may interact. Results showed that patients' perceptions of asthma, and panic control, may play a mediating role in the relationship between anxiety and catastrophic cognitions.

Epidemiological studies have established a strong link between asthma and anxiety disorders especially panic disorder. However, not all asthma patients are anxious. Investigation of whether such association is stronger when asthma symptoms are more severe has had some support but it does not elucidate the extent to which asthma severity may act as a primary cause of anxiety. Perhaps there are other factors, besides asthma severity, that play a role in the development and maintenance of anxiety disorders and can explain why some patients worry more about their condition than other patients. In addition, asthma patients with psychological distress have been reported to disclose more impaired quality of life than patients with healthier mental functioning. Previous research studies on asthma and quality of life (Lavoie et al., 2005) have found that severity of asthma alone fails to predict impaired quality of life and suggest that psychological factors may play a significant role in counteracting wellbeing e.g. (Carr, 1999). The cognitive model of panic proposes that anxious individuals are more likely to perceive somatic sensations as threatening and dangerous and as a result they experience more anxiety that eventually leads to a full blown panic attack. In order to lessen the probability of a panic attack, these individuals engage in safety seeking behaviours. As a result they may alter their lifestyle a great deal more than it is necessary in order to avoid future panic attacks. According to this model, asthmatic individuals with anxious personalities should be more vulnerable to threat and they should be likely to misinterpret their somatic sensations in such a catastrophic way that will eventually lead to elevated levels of anxiety and thus the occurrence of a panic attack.

Barlow (2002) has identified three major categories of catastrophic cognitions that are central in the maintenance of panic disorder: physical, mental and social catastrophic thinking.

Physical and mental catastrophic cognitions were common in our sample with thoughts of dying, becoming ill, feeling panicky and being unable to control thinking being the most prevalent. Similarly, social catastrophic cognitions were also prevalent with feelings of embarrassment and stigma and fear of negative evaluation from others being the most significant catastrophes. Results support the cognitive theory of panic in explaining anxiety and maladaptive behaviours in asthma but only partially. First, the cognitive model of panic asserts that it is the catastrophic misinterpretation of symptoms that causes elevated levels of anxiety. Application of this hypothesis would mean that asthma patients misinterpreted their somatic symptoms to mean an imminent disaster, in this case exacerbations of respiratory symptoms and development of an asthma attack. However it was not clear the extent to which patients misinterpreted their somatic sensations. Indeed, many patients felt unable to distinguish between their asthma and panic attacks so it possible that patients actually misinterpreted panic symptoms for asthma symptoms. However, it was not possible in this study to provide conclusive results. It could be that asthma patients tended to catastrophically interpret respiratory symptoms rather misinterpreted them. Future studies are needed to monitor the symptoms asthma patients feel during panicky states to shed more light in this matter.

Additionally, participants displayed a great deal of avoidance both behavioural and cognitive in order to avoid a feared outcome from happening. This is accordance with the cognitive model of panic that states that anxious individuals are likely to engage into safety-seeking behaviours in order to avoid experiencing an unwanted outcome in the future. Maladaptive behavioural patterns and emotional distress caused by catastrophic cognitions can affect greatly the quality of life of asthma patients additionally to the physical impairment imposed by their illness. Overall, our results are in agreement with the hypothesis of the cognitive model of panic by Clark (1986). Further analysis of the participants' interviews revealed some factors that may play an important role in the maintenance of anxiety for some patients with asthma and may affect their cognitions and behaviours towards their condition.

The cognitive model has obtained, so far, the greatest support. Most research findings showed that most panic attacks are accompanied first with catastrophic cognitions and second with behavioural avoidance. On the other hand, the cognitive model of panic disorder has failed to establish the order of sequence of symptoms. The assumption is that somatic sensations will precede the occurrence of a panic attack (i.e. patients with panic disorder will misinterpret bodily sensations in a catastrophic manner such misinterpretation will produce elevated levels of anxiety/fear which will lead into a panic attack). But so far, findings from various studies give inconclusive results (Westling & Ost, 1993). Moreover, another area that needs investigating is whether these cognitions influence panic disorder maintenance is an issue that still remains unknown (Rachman, 1994) . Research needs to be done to investigate whether it is the presence of the cognitions, their frequency or their severity or other factors that helps in the development and maintenance of panic disorder.

Results suggest that the relationship between anxiety and catastrophic thinking is not direct and that other factors may be related in the development, severity and maintenance of catastrophic cognitions in asthma. Other variables may be important for the development of panic in asthma patients in addition to catastrophic cognitions. Participants showed great levels of both asthma and panic perceived control. While it seems obvious that decrease in anxiety will result in an increase in perceived control in asthma, it could be argued however that not all people who have low perceived control are particularly anxious. Similarly, not all people who are anxious and experience panic have catastrophic cognitions. It appears that the relationship between anxiety panic and catastrophic cognitions may not be so direct when investigated in asthma populations. Perceived asthma control may be affected by several factors apart from anxiety such as asthma knowledge, adherence to medical regimen as well as personality and social factors. Consequently, perceived asthma control may affect the severity and frequency of the catastrophic cognitions of symptoms in asthma and as a result have an effect on the behavioural patterns of the patients. It is suggested that the relationship between anxiety and catastrophic cognitions in asthma may interact through the concept of perceived control. Increase of patients' sense of control can lead to a decrease of anxiety and catastrophic cognitions and as a result prevent patients from adopting maladaptive behavioural patterns to cope with their anxiety about their illness.

10.9 Limitations of the Study

As with any research limitations are inevitable but must be acknowledged and considered when interpreting the findings of the study. One aim of the study was to identify the catastrophic cognitions of clinically anxious patients. Since no other study to date had explored the catastrophic thinking in asthma the design of the questions for the semi-structured interviews was based mainly from the findings of the quantitative phase and may suffer from the possibility of the interviewer bias. Despite the fact that our aim was met and several catastrophic cognitions were classified, better designed questions may have elicited more accurate results. The present study's qualitative design gives it higher internal validity but perhaps lower external validity and therefore generalisation of the results is difficult. The study has added valuable data about the specific illness catastrophic cognitions and it is hoped that it will allow a more systemic verification of the findings reported here in a larger sample of participants.

Another aim of the study was to evaluate the cognitive model of panic in understanding anxiety and catastrophic cognitions in asthma. Despite the fact that the cognitive hypothesis offers a good basis in explaining the role of catastrophic cognitions in quality of life in clinically anxious asthma patients other factors such as perceived control of asthma and panic symptoms appeared to play an important role too. More specifically asthma perceived control seemed to be rather important in the maintenance of social catastrophic cognitions. In turn social catastrophic cognitions as found from previous studies may play a more important role in quality of life as they influence patients' behavioural patterns more than physical and mental catastrophic thoughts. Another limitation of the study was that it was not possible to determine whether there was a causal association between catastrophic thinking and perceived asthma and panic control. It should be also noted that because asthma and panic perceived control was not the focus of the study, data was limited to patients who provided concerns and thoughts about these concepts. Despite these limitations the present findings represent an important foundation in predicting asthma patients' cognitive and behavioural patterns that may significantly affect their quality of life.

PART IV

Concluding Comments

Chapter 11

11.1 Concluding Comments

Epidemiological studies have established a strong link between asthma and anxiety disorders especially panic disorder (Table 4.2). In addition, asthma patients with psychological distress have been reported to disclose more impaired quality of life than patients with healthier mental functioning (Lavoie et al., 2005). Severity of asthma alone fails to predict impaired quality of life and suggests that psychological factors may play a significant role in counteracting wellbeing (Carr, 1999). However, the mechanisms through which anxiety in asthma patients with heightened psychopathology may interact with their physical and emotional wellbeing had not been investigated to date.

The cognitive model of panic (Clark, 1986) developed in psychiatric populations, emphasises the importance of catastrophic cognitions in precipitating and maintaining panic and anxiety. The assumptions by the cognitive hypothesis of anxiety may offer an explanation about the ways through which anxiety may have an impact on the quality of life of anxious asthma patients. According to this model, asthmatic individuals with anxious personalities should be more vulnerable to threat and they should be likely to misinterpret their somatic sensations in such catastrophic way that will eventually lead to elevated levels of anxiety and thus the occurrence of a panic attack. Furthermore, the cognitive model of anxiety suggests that anxious individuals who tend to catastrophise their somatic symptoms are likely to engage in maladaptive behaviour patterns such as escapism and agoraphobia. Such suggestions may explain why some asthma patients have restricted physical and social activities that do not account for their actual physical functioning and thus limit their quality of life.

From the findings of the quantitative phase we know that:

a) Differences in the levels of clinical anxiety can predict the frequency of the occurrence of panic attacks in anxious asthma patients

b) Asthma patients with highly anxious personalities are more likely to experience more frequent panic attacks than patients with lower anxious personalities

c) Illness specific physical catastrophic cognitions can predict the existence of behavioural avoidance and may inform about the development and maintenance of such behaviour in anxious asthma patients. Also, that Illness specific physical catastrophic cognitions significantly predicted impairment of quality of life of anxious asthma patients.

However, while the results supported the assumptions of the cognitive model of panic and illness specific physical catastrophic cognitions predicted lower levels of quality of life, they failed to make a substantial contribution to the total variance of asthma quality of life. These results suggest that investigation of other types of catastrophic cognitions or other psychological constructs should be additionally considered when examining quality of life in asthma patients.

The qualitative phase of the study was primarily designed to address the above issues. It was concerned with a number of aims: First to explore and identify the illness specific catastrophic cognitions, in terms of physical, mental and social cognitions, and their behavioral outcomes of patients with asthma and clinical levels of anxiety. The second aim was to evaluate the cognitive model of panic as a means to understand the relationship between anxiety, catastrophic cognitions and maladaptive behaviors in anxious asthma patients. The third aim was to examine the mechanism through which anxiety and catastrophic cognitions may interact.

Investigation of catastrophic cognitions was based on past research findings conducted by Hicks and colleagues (2005) who identify three main categories: physical, mental and social catastrophes. We know from the analysis of the physical catastrophic cognitions that thoughts of dying and becoming ill were the most prevalent in our sample. The most frequent mental catastrophic thoughts were feeling panicky and inability to control thinking. Finally, feelings of embarrassment and stigma, and fear of negative evaluation from others were the most prominent social cognitions. Examination of safety seeking behaviour revealed three categories of avoidant strategies: situational, interoceptive and experiential avoidance.

Results support the cognitive theory of panic in explaining anxiety and maladaptive behaviours in asthma but only partially. The cognitive model of panic asserts that it is the catastrophic misinterpretation of symptoms that causes elevated levels of anxiety. Application of this hypothesis would mean that asthma patients misinterpreted their somatic symptoms to mean an imminent disaster, in this case exacerbations of respiratory symptoms and development of an asthma attack. However it was not clear the extent to which patients misinterpreted their somatic sensations. Indeed, many patients felt unable to distinguish between their asthma and panic attacks so it possible that patients actually misinterpreted panic symptoms for asthma symptoms. However, it was not possible in this study to provide conclusive results. It could be that asthma patients tended to catastrophically interpret respiratory symptoms rather misinterpreted them. Future studies are needed to monitor the symptoms asthma patients feel during panicky states to shed more light on this matter.

Further analysis of the interview data revealed some other factors that may play an important role in the maintenance of anxiety for some patients with asthma and may affect their cognitions and behaviours towards their condition. The majority of patients reported low perceived control for both asthma and panic symptoms. Our results suggested that perhaps the relationship between anxiety and catastrophic thinking is not so direct and that other factors may be related in the development, severity and maintenance of catastrophic cognitions in asthma and similarly other variables may be important too, for the development of panic in asthma patients apart from catastrophic cognitions.

11.2 Implications of findings in terms of Future Awareness among Health Service Staff of the Overlap between Asthma and Anxiety, Improvement of Patient Care and Future Research.

11.2.1 Promote awareness of the issues concerned with the overlap of anxiety and asthma among health services staff.

Through dissemination of the current findings in the form of publication in respiratory medical journals, health service staff (general practitioners, physicians, nurses and psychologists working in respiratory medical settings) will be informed about the effects of clinical anxiety in asthma management and quality of life of the affected patients. The findings of this study will inform clinicians about the ways anxiety can affect the thinking and behaviours of people with asthma and co-morbid anxiety. The findings can be used to increase awareness about the restrictions anxiety can cause in both the emotional and functional wellbeing of these patients, and help health service staff to understand better the experience of anxiety and asthma. A greater understanding of the interplay between anxiety and asthma may lead to more targeted treatment that will prove more effective for these patients by including either psychological therapy and/or anxiolytic therapy to alleviate the symptoms of anxiety.

11.2.2 Improvement of patient care

a) Health service staff (general practitioners, physicians, nurses and psychologists) can inform patients about the consequences anxiety can have in a chronic illness like asthma. There are some patients who could be either in denial of their anxiety issues or may think that anxiety is not really relevant to them. Nurses or psychologists can advice patients who have high levels of social catastrophic cognitions to attend self management programmes. The Expert Patient Programme is a group where patients with different chronic illnesses gather together and learn self-management skills such as problem solving/taking action etc. These techniques can be used by patients to help them deal with their condition better and improve their quality of life. Apart from the management skills, the Expert Patient Programme can offer social comparison and social support. By being involved with people with other major chronic illnesses, asthma patients could compare their situation with other people's and help them come in terms with their identity as a person with a chronic condition, as well as give and receive peer support.

b) Results suggest that both asthma and anxiety symptoms may lead to fearful cognitions (i.e. catastrophising) and a sense of being out of control and needing help and support. These underlying catastrophic cognitions and decreased confidence and sense of control to manage illness symptoms may be associated with decreased active behavioural management strategies such as taking medication adherence. Anxiety has long been associated with poor management of self care regimes. Healthcare providers who are treating asthma in terms of anxiety/panic co-morbidity need to train patients to discriminate effectively between asthma-related and anxiety-related somatic symptoms. The ability of the patients to distinguish between their asthma and panic symptoms and attacks can have important implications in clinical practice. Patients with co morbid asthma and anxiety can sometimes confuse their asthma symptoms for panic symptoms and vice versa because of the similarities of the symptomatology these two share. This may result in feelings of uncontrollability and helplessness as patients are not able to understand the condition they are dealing with and can lead to inappropriate treatment and management of the illness. Clinicians may need to develop ways of educating patients with asthma and anxiety to distinguish their symptoms. Patient education may help them achieve a sense of control which will eventually enable them to manage their condition more effectively.

c) By identifying the illness specific catastrophic cognitions and their subsequent behaviours, clinical psychologists can design psychological interventions such as cognitive behavioural therapy that is modified to the specific needs of those with both anxiety and asthma. Cognitive behaviour therapy could be employed to help these patients de-catastrophise about their symptoms which will help them reduce their anxiety. Moreover, cognitive behaviour therapy can teach these patients several techniques that they can be practice later on their own, to manage their anxious feelings, such as relaxation and breathing exercises, distraction techniques, problem solving and goal setting.

11.2.3 Future Research Directions

a) With the identification of the illness specific catastrophic cognitions in terms of physical, mental and social consequences and the behavioural patterns adopted by the patients to adjust to their condition, future research could design a questionnaire to use as a screening measure for both cognitions and behaviours of anxious asthma patients. Such a questionnaire can be used to identify patients with catastrophic cognitions and target their concerns and limitations and help them overcome their problems. Future research may utilise the results from this study to develop a questionnaire encompassing the range of catastrophic cognitions reported by our participants. In turn, this questionnaire may be used to determine which catastrophic cognitions to be addressed to improve the quality of in asthma patients who also suffer from anxiety and panic. Development of such a questionnaire will also provide clinicians with a practical tool to understand the fears and attributions these patients may bring in managing their illness and thus resulting in more effective asthma management plans. Any tool developed in this way would have the advantage that it was derived from actual patient cognitions, rather than theoretical speculation alone.

b) Analysis of the qualitative data revealed that low levels of perceived control of asthma and/or anxiety symptoms were quite prominent in the sample and suggested that whereas in the cognitive model of panic the relationship between anxiety and catastrophic cognitions seems to be direct, perhaps this is not the case when dealing with asthma patients who suffer from co-morbid anxiety. The results suggested that low perception of control of both asthma and panic symptoms may inter-correlate with anxiety, catastrophic cognitions and the behavioural patterns of the patients. Although no conclusive results can be drawn because of the nature of the analysis, the findings imply that the relationship between anxiety and cognitions may not be as direct in asthma as they are in mental health populations. Longitudinal and experimental studies are needed to examine these relationships prospectively to determine whether perception of control pose as a risk factor for the occurrence of catastrophic cognitions and the development and maintenance of avoidant behaviour in clinically anxious asthma patients.

c) Finally, illness specific social catastrophic cognitions seem to represent a central point for the treatment of anxiety and improvement of quality of life in this population. Findings suggest that illness specific catastrophic cognitions that are associated with the social evaluation concerns of the patients may significantly interfere with the behavioural patterns of these patients and ultimately with quality of life. Situational variables such as feeling embarrassed in social situations as a result of wheezing or coughing, or as a result of other people's perceptions of their illness for example, seem likely to exacerbate anxiety for anxious asthma patients. Analysis of interview data showed that the vast majority of patients were reluctant to expose themselves to social situations they perceived were outside their range of safety. Future research with experimental behavioural designs may be useful to address the catastrophic predictions of clinically anxious asthma patients to different situations in a graded way. This approach may prove useful to help these patients expand their perception of safety in more situations and environments and thus to teach them to live with less self-imposed limitations.

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APPENDICES

Appendix A: Demographic Questionnaire

DEMOGRAPHIC QUESTIONNAIRE

Please answer the following questions about you:

AGE (in years): ____________

GENDER (circle as appropriate): Female Male

MARITAL STATUS (please tick as appropriate):

Single ☐

In long-term relationship ☐

Married ☐

Separated ☐

Divorced ☐

Widowed ☐

EDUCATIONAL LEVEL (please tick according to your highest educational status):

Primary School ☐

Secondary School ☐

College/sixth form ☐

University ☐

Trade/Professional qualifications ☐

OCCUPATIONAL STATUS (please tick as appropriate)

You are currently employed ☐

You are not employed at the moment ☐

Appendix B: Illness Specific Questionnaire

Illness-Specific Questionnaire

Please answer the following questions:

1) When were you diagnosed by your physician with asthma?

____

2) Do you have any other major illness that may affect your life?

____

____

____

3) Do you take other medication apart from those described by your consultant? (for example sleeping pills, herbal remedies etc.).

____

____

____

Appendix C: Hospital Anxiety and Questionnaire Scale

Hospital Anxiety and Depression Scale

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

1) I feel tense or "wound up":

Most of time	3
A lot of time	2
Time to time, occasionally	1
Not at all	0

2) I get short of frightened feeling like butterflies in the stomach:

Not at all	0
Occasionally	1
Quite often	2
Very often	3

3) I get a sort of frightened feeling like something awful is about to happen:		**4) I feel restless as if I have to be on the move**	
Very definitely and quite badly	3	Very much indeed	3
Yes, but not too badly	2	Quite a lot	2
A little, but it doesn't worry me	1	Not very much	1
Not at all	0	Not at all	0

5) Worrying thoughts go through my mind:		**6) I can sit at ease and feel relaxed:**	
A great deal of time	3	Definitely	0
A lot of time	2	Usually	1
From time to time but not too often	1	Not often	2
Only occasionally	0	Not at all	3

7) I get sudden feelings of panic

Very often indeed	3
Quite often	2
Not very often	1
Not at all	0

Appendix D: Self Evaluation Questionnaire

Self-Evaluation Questionnaire

Directions: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the number that suits you most to indicate how you generally feel. They 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 ALWAYS	OFTEN	SOMETIMES	ALMOST NEVER
I feel pleasant	4	3	2	1
I feel nervous and restless	4	3	2	1
I feel satisfied with myself	4	3	2	1
I wish I could be as happy as others seem to be.	4	3	2	1
I feel like a failure	4	3	2	1
I feel rested	4	3	2	1
I am "calm, cool and collected"	4	3	2	1
I feel that difficulties are piling up so that I cannot overcome them.	4	3	2	1
I worry too much about something that it really does not matter	4	3	2	1
I am happy	4	3	2	1
I have disturbing thoughts	4	3	2	1
I lack self-confidence	4	3	2	1
I feel secure	4	3	2	1
I make decisions easily	4	3	2	1
I feel inadequate	4	3	2	1
I am content	4	3	2	1
Some unimportant thought run through my mind and bothers me	4	3	2	1
I take disappointments so keenly that I cannot put them out of my mind	4	3	2	1
I am a steady person	4	3	2	1
I get in the state of tension or turmoil as I think over my recent concerns and interests.	4	3	2	1

Appendix E: Asthma Symptom Checklist

Asthma Symptom Checklist

Instructions: Please circle the frequency of each symptom which applies best to you when you have an asthma attack.

1) Scared never rarely sometimes almost always
always

2) Worried never rarely sometimes almost always
always

3) Panicky never rarely sometimes almost always
always

4) Frightened never rarely sometimes almost always
always

5) Worried never rarely sometimes almost always
always
about attack

6) Worried never rarely sometimes almost always
always
about myself

7) Afraid of never rarely sometimes almost always
always
dying

Appendix F: Panic Attack Questionnaire

Panic Attack Questionnaire

A panic attack means a sudden increase in anxiety during which four or more of the following sensations are experienced:

1) Palpitations or heart racing
2) Dizziness, unsteady feelings or faintness
3) Chest feeling uncomfortable or painful
4) Sweating
5) Feeling unreal or distant
6) Nausea or discomfort in the stomach
7) Hot or cold flushes
8) Trembling or shaking
9) Numbness or tingling (pins and needles)
10) Fear of dying
11) Fear of going crazy or doing something uncontrolled

Please circle any of the sensations you have experienced.

If you have circled four or more sensations, please circle a number on the scale below to indicate the frequency of your panic attacks during the last two weeks:

0. No panic attacks

1. One panic attack per fortnight

2. One or two panic attacks per week

3. At least three panic attacks per week but less than one per day

4. One or more panic attack per day

Appendix G: Body Sensations Questionnaire

Body Sensations Questionnaire

Below are some feelings or sensations that you might experience when you are in a distressing situation. Please indicate how frightened you would be by the sensation. Rate each sensation from 1-5 using the scale below.

Rate **1** if you would **not be frightened or worried by this sensation**

Rate **2** if you would be **a little worried about this sensation**

Rate **3** if you would be **frightened by this sensation**

Rate **4** if you would be **very frightened by this sensation**

Rate **5** if you would be **extremely frightened by this sensation**

	Rating
Heart palpitations	....
Pressure in chest	....
Numbness in arms or legs	....
Tingling in fingertips	....
Numbness in another part of your body	....
Feeling short of breath	....
Dizziness	....
Blurred or distorted vision	....
Nausea	....
Butterflies in stomach	....

Knot in the stomach	....
Lump in throat	....
Wobbly or rubber legs	....
Sweating	....
Dry throat	....
Feeling disorientated and confused	....
Feeling disconnected from your body, only partly present	....

Appendix H: Interpretations of Breathing Problems Questionnaire S-R

Interpretations of Breathing Problems Questionnaire: Short Revised Form.

This questionnaire has been developed specifically for people with respiratory diseases. It is designed to assess people's thoughts that result from various symptoms they experience as a result of their respiratory disease.

Each question contains of a physical symptom (e.g. wheezing) in a particular situation (e.g. at home). Please read each description and then answer the questions that follow. It is important that you write down the first answer that comes into your mind without thinking too much about it.

You may have not experienced all of the symptoms or the situations described. If this is the case please answer the question anyway by imaging how you might respond.

1. You are in a crowd in town and you begin to feel tired and exhausted.

What might you do in this situation? ....

What thoughts go through your mind? ....

What is the worst thing that you think could happen to you? ....

....

Please read the above scenario again and then rate how anxious you would be in this situation by circling the appropriate number on the scale below:

1 2 3 4 5 6 7 8 9 10

No anxious at all ---extremely anxious

Please answer the following questions below by circling the appropriate number on each scale:

How much do you believe you would become ill in this situation?

1 2 3 4 5 6 7 8 9 10

I would not become ill at all---extremely ill

How much would you believe that you would die in this situation?

1 2 3 4 5 6 7 8 9 10

Absolutely no chance of dying----------------------------I would definitely die

Given this experience, how likely is it that you would avoid going into town when it is crowded?

1 2 3 4 5 6 7 8 9 10

Unlikely--very likely

2. ***You are sitting at home with a friend and you notice you are wheezing.***

What you might do in this situation? ....

What thoughts go through your mind? ....

What is the worst thing you that you think could happen to you? ....

...

Please read the above scenario again and then rate how anxious you would be in this situation by circling the appropriate number on the scale below:

1 2 3 4 5 6 7 8 9 10

No anxious --extremely anxious

Please read the following questions below by circling the appropriate number on each scale:

How much do you believe you would become ill in this situation?

1 2 3 4 5 6 7 8 9 10

I would not become ill------------------------------------extremely ill

How much would you believe that you would die in this situation?

1 2 3 4 5 6 7 8 9 10

Absolutely no chance of-------------------------------I would definitely die

dying

Given the experience, how likely is it that you would avoid sitting at home with a friend?

1 2 3 4 5 6 7 8 9 10

Unlikely--very likely

3) You are in a car, travelling down the motorway, and you notice your chest is becoming congested.

What might you do in this situation?

...

What thoughts go through your mind?

...

What is the worst thing that you think could happen to you?

...

Please read the above scenario again and then rate how anxious you would

become in this situation by circling the appropriate number on the scale below:

1 2 3 4 5 6 7 8 9 10

No anxious---extremely anxious

Please read the following questions below by circling the appropriate number on each scale:

How much do you believe you would become ill in this situation?

1 2 3 4 5 6 7 8 9 10
I would not become ill------------------------------------I would become extremely ill
at all.

How much would you believe that you would die in this situation?

1 2 3 4 5 6 7 8 9 10

Absolutely no chance of---------------------------------I would definitely die
dying

Given the experience, how likely is it that you would avoid driving down the motorway?

1 2 3 4 5 6 7 8 9 10
Unlikely---very likely

4) You are visiting a physiotherapist at the hospital and you feel your chest becoming congested.

What might you do in this situation?

...

What thoughts go through your mind?

...

What is the worst thing that you think could happen to you? ....

Please read the above scenario again and then rate how anxious you would be in this situation by circling the appropriate number on the scale below:

1 2 3 4 5 6 7 8 9 10

Not anxious--extremely anxious

Please answer the following questions below by circling the appropriate number on each scale:

How much do you believe you would become ill in this situation?

1 2 3 4 5 6 7 8 9 10

I would not become ill----------------------------------I would become extremely ill

How much would you believe that you would die in this situation?

1 2 3 4 5 6 7 8 9 10

absolutely no chance-----------------------------------I would definitely die

of dying

Given this experience, how likely is it that you would avoid visiting the physiotherapist?

1 2 3 4 5 6 7 8 9 10

Unlikely---very likely

Appendix I: Mini Asthma Quality of Life

Mini Asthma Quality of Life Questionnaire

Please complete **all** questions by circling the numbers that best describes how you have been during the last **2 weeks as a result of your asthma**.

IN GENERAL, HOW MUCH OF THE TIME **DURING THE LAST 2 WEEKS** DID YOU:

	ALL OF THE TIME	MOST OF THE TIME	A GOOD BIT OF THE TIME	SOME OF THE TIME	A LITTLE OF THE TIME	HARDLY ANY OF THE TIME	NONE OF THE TIME
1.Feel **SHORT OF BREATH** as a result of Your asthma?	1	2	3	3 4	5	6	7
2.Feel bothered by or have to avoid **DUST** in the environment?	1	2	3	4	5	6	7
3. Feel **FRUSTRATED** as a result of your asthma?	1	2	3	4	5	6	7
4. Feel bothered by COUGHING?	1	2	3	4	5	6	7
5. Feel **AFRAID OF NOT** HAVING YOUR ASTHMA **MEDICATION AVAILABLE?**	1	2	3	4	5	6	7
6. Experience a feeling of **CHEST TIGHTNESS** or **CHEST** HEAVINESS?	1	2	3	4	5	6	7
7. Feel bothered by or have to avoid **CIGARETTE SMOKE** in the environment?	1	2	3	4	5	6	7
8. Have **DIFFICULTY GETTING A GOOD NIGHT'S SLEEP** as result of your asthma?	1	2	3	4	5	6	7
9. Feel **CONCERNED ABOUT** HAVING ASTHMA?	1	2	3	4	5	6	7

10. Experience a **WHEEZE** in your chest?	1	2	3	4	5	6	7
11. Feel bothered by or have to avoid going outside because of WEATHER OR AIR **POLLUTION?**	1	2	3	4	5	6	7

HOW **LIMITED** HAVE YOU BEEN **DURING THE LAST 2 WEEKS** DOING THESE ACTIVITIES **AS A RESULT OF YOUR ASTHMA**?

	TOTALLY **LIMITED**	EXTREMELY LIMITED	VERY **LIMITED**	MODERATELY **LIMITED**	SOME **LIMITATION**	A LITTLE **LIMITATION**	NOT AT **ALL** LIMITED
12 STRENUOUS ACTIVITIES (such as Hurrying, exercising, Running up stairs, Sports)	1	2	3	4	5	6	7
13. MODERATE ACTIVITIES (such as Walking, housework, Gardening, shopping, Climbing stairs)	1	2	3	4	5	6	7
14. SOCIAL ACTIVITIES (such as talking, playing with pets/children, visiting friends/relatives)	1	2	3	4	5	6	7
15. WORK-RELATED ACTIVITIES* (tasks you Have to do at work)	1	2	3	4	5	6	7

* If you are not employed or self-employed, these should be tasks you have to do most days.

Appendix J: Patient Information Sheet for Heartlands Hospital, Birmingham

Birmingham Heartlands and Solihull Hospital NHS

NHS Trust

Asthma Management: The Role of Anxiety

Patient Information Letter

We would like you to take part in a study looking at the relationship between asthma and anxiety. Asthma is a chronic disease that may create psychological distress for patients and, as a result, could affect their quality of life. We are especially interested in how you think and feel about your symptoms. Your perceptions of asthma and your personal control over breathlessness will enable us to have a further understanding about asthma management. In the long term, the study could provide knowledge that leads to better therapies to relieve the symptoms of anxiety involved in asthma and therefore affect quality of life. The aim is to learn more about the relationship between asthma and anxiety so that patients in the future might be helped more effectively. The members of the research team are: Professor Donald Pennington, Professor Louise Wallace (Clinical Psychologist), Dr Mansur (Consultant Physician) and Jenny Dimopoulou, (PhD candidate from Coventry University), who will be collecting the data from you.

You will be contacted by your consultant or on his behalf by a member of the research team. If you agree to take part, we will ask you to sign three copies of the consent form. Please keep one copy and return the other two to a member of the research team (you can return them to: Health Services Research Centre, CW110 School of Health and Social Sciences, Coventry University, Priory St, Coventry, CV1 5FB in a stamped addressed envelope provided). Jenny Dimopoulou will be available as below to answer any questions you may have.

When we have received your consent form, Jenny Dimopoulou will ask you a number of questions covering your recent medical history, and ask you to fill in seven questionnaires (10 pages overall). She will be available to discuss these with you and help you complete them, or complete them for you if you wish. The questionnaires cover a range of topics. You will be answering questions on worry and anxiety, both in life generally and in relation to your asthma, your quality of life, how your body feels when you are upset, and how you might feel in different situations where you might experience breathing problems. This will take approximately 45 minutes.

We will make a short summary of the research available to you at the end of the research. A small number of people will be also asked to be interviewed in the clinic, to allow us to get a fuller picture of how you cope with problems with asthma. This will be tape-recorded. All tapes will be kept secure and erased once analysed, and no personal details will be kept which could identify your responses. The information you will provide to the research team will be strictly confidential and not been seen by anyone outside the investigators. If you decide not to take part in the study this will not affect your medical care. Otherwise, if you decide to take part in the study and you receive medication, you will continue to receive it throughout the study period, and it will not be affected by any means by taking part in the study. You are free to withdraw from the study at any time without giving a reason. This will not affect your medical care.

The study has no known side effects. However, the legal position is that if you are harmed by taking part in this study, there are no special compensation arrangements. If you are harmed due to someone's negligence, then you may have the grounds for legal action. Finally if you have any problems with the conduct of this study you can telephone the secretary of the Ethics Committee who has considered this application on 0121 424 0594, who will arrange for your worries to be investigated.

If you would like to speak to Jenny Dimopoulou about the study, her contact details are:

Health Services Research Centre, CW110

School of Health and Social Sciences

Coventry University

Priory St

Coventry

CV1 5FB

Office number: 02476 888334

Mobile Number: 07763835020

Or you can get in contact with her at:

Severe Asthma Unit

c/o Ward 24

Birmingham Heartlands Hospital

Bordseley Green East

Birmingham

Appendix K: Consent Form for Heartlands Hospital, Birmingham

Birmingham Heartlands and Solihull Hospital NHS

NHS Trust

PATIENT

I , ... , the patient of.. have read the Explanation (overleaf) of the proposed Study/Trial of: ....

The aims and purposes of the study/trial have been explained to me by:

Jenny Dimopoulou and/or Dr Mansur (please circle as appropriate)

I agree to take part in the study/trial and I understand that I am free to withdraw from the study/trial at any time without having to give a reason.

Signature:

Date:

CONSULTANT PHYSICIAN

I confirm that the above named patient has read the Explanation (overleaf) and this Consent and that I have explained the study/trial to the patient and answered any questions arising there from.

Signature:

Date:

Appendix L: Patient Information Sheet for Wythenshawe Hospital, Manchester

South Manchester University Hospital NHS

NHS Trust

Asthma Management: The Role of Anxiety

Patient Information Letter

Introduction

You are being invited to take part in a research study looking at the relationship between asthma and anxiety. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading this.

Asthma is a chronic disease that may create psychological distress for patients and, as a result, could affect their quality of life. We are especially interested in how you think and feel about your symptoms. Your perceptions of asthma and your personal control over breathlessness will enable us to have a further understanding about asthma management. In long term, the study could provide knowledge that leads to better therapies to relieve symptoms of anxiety involved in asthma and therefore affect quality of life. The aim is to learn more about the relationship between asthma and anxiety so that patients in the future might be helped more effectively

The members of the research team are: Jenny Dimopoulou (PhD candidate from Coventry University), Prof Louise Wallace (Clinical Psychologist), Prof Donald Pennington (Social Psychologist) and Dr Robert Niven (Consultant Physician).

What will I have to do if I take part?

The study will last approximately 24 months and it will involve 75 people with asthma. If you decide to participate, you will be asked to fill in a package of questionnaires and Jenny Dimopoulou will be available to discuss these with you and help you complete them, or complete them for you if you wish. The questionnaires cover a range of topics. You will be answering questions on worry and anxiety, both in life and in relation to your asthma, your quality of life, how your body feels when you are upset, and how you may feel in different situations where you might experience breathing problems. This will take approximately 45 minutes. This will be the first part of the study. In the second part interviews will be conducted to a small number of people who will be asked to be interviewed in the clinic, to allow us to get a fuller picture of how you cope with problems with asthma. Fifteen people out of the 75 who had been previously participated in the first part of the study will be asked to be interviewed. Participating though in the first part of the study does not commit you to take part in the second part (i.e. interviews)

What are the possible risks of taking part?

Taking part in this study will not restrict you on any aspect of your life. If you decide to take part in the study and you receive medication, you will continue to receive it throughout the study period. If you decide to take part you are still free to withdraw at any time and without giving any reason. A decision to withdraw at any time, or a decision not to take part, will not affect the standard care you receive.

Are there any possible benefits?

There will be no direct benefits to you by taking part in this study. In the long term, the study could provide knowledge that leads to better therapies to relieve symptoms of anxiety involved in asthma and therefore affect quality of life

Do I have to take part?

It is up to you to decide whether or not to take part. If you decide to take part you will be given this information sheet and be asked to sign three copies of the consent form. Please keep one copy and return the other two to a member of the research team (you can either return this directly to: Health Services Research Centre, CW110, School of Health and Social Sciences, Coventry University, Priory Street, CV1 5FB in a stamped addressed envelope provided). If you decide to take part in the study and you receive medication, you will continue to receive it throughout the study period. If you decide to take part you are still free to withdraw at any time and without giving any reason. A decision to withdraw at any time, or a decision not to take part, will not affect the standard care you receive.

What do I do now?

Once you have read this, your consultant physician will ask you later for your verbal consent form at the clinic. You will be given then the questionnaires to complete at home.

If you wish to obtain independent advice about this research you may contact:

Jenny Dimopoulou

Health Services Research Centre, CW110

School of Health and Social Sciences

Coventry University

Priory St

Coventry University

CV1 5FB

Office number: 02476888334

Home number: 02476505779

Mobile number: 07763835020

Appendix M: Consent Form for Wythenshawe Hospital, Manchester

South Manchester University Hospital
NHS Trust

NHS

CONSENT FORM

Title of Project: Asthma Management: The role of anxiety

Name of Researcher: Jenny Dimopoulou

1. I confirm that I have read and understand the information sheet dated…………….(version…..) for the above study and have had the opportunity to ask questions. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected. ☐

3. I agree to take part in the above study. ☐

Name of the patient	Date	Signature
______________________	_________	____________________
Researcher	Date	Signature
______________________	_________	____________________

Appendix N: Patient information Sheet for Coventry University Hospital

University Hospitals Coventry and Warwickshire NHS Trust

Coventry and Warwickshire Hospital
Stoney Stanton Road
Coventry
CV1 4FH

Tel: 024 7622 4055
Fax: 024 7622 1655

Asthma Management: The Role of Anxiety

Patient Information Letter

You are being invited to take part in a research study looking at the relationship between asthma and anxiety. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading this.

The researcher of this project is Jenny Dimopoulou (a PhD student from Coventry University), Prof Louise Wallace and Prof Donald Pennington are the supervisors and Dr Lawford Piers is the hospital consultant.

What is the purpose of the study?

Asthma is a chronic disease that may create psychological distress for patients and, as a result, could affect their quality of life. We are especially interested in how you think and feel about your symptoms. Your perceptions of asthma and your personal control over breathlessness will enable us to have a further understanding about asthma management. In long term, the study could provide knowledge that leads to better therapies to relieve symptoms of anxiety involved in asthma and therefore affect quality of life. The aim is to learn more about the relationship between asthma and anxiety so that patients in the future might be helped more effectively.

Why have I been chosen?

In this study we are interested in how people experience and feel about their asthma symptoms. Your experience and the way you have learned to cope with your asthma symptoms will enable us to have a better understanding about this condition. One hundred and three people with asthma will be contacted overall.

Do I have to take part?

You will be approached by the principal investigator at the clinic who will ask you if you would like to participate in the study. If you decide to take part you will be given this information sheet and be asked to sign three copies of the consent form. Please keep one copy and return the other two to a member of the research team (you can either return this directly to: Health Services Research Centre, CW110, School of Health and Social Sciences, Coventry University, Priory Street, CV1 5FB in a stamped addressed envelope provided). If you decide to take part in the study and you receive medication, you will continue to receive it throughout the study period. If you decide to take part you are still free to withdraw at any time and without giving any reason. A decision to withdraw at any time, or a decision not to take part, will not affect the standard care you receive.

What will happen to me if I take part?

This study compromises of two phases. The first phase of the study will consist of 75 people with asthma who will agree to participate. If you decide to participate you will be asked to fill in a package of questionnaires and Jenny Dimopoulou will be available to discuss these with you and help you complete them, or complete them for you if you wish. The questionnaires cover a range of topics. You will be answering questions on worry and anxiety, both in life and in relation to your asthma, your quality of life, how your body feels when you are upset, and how you may feel in different situations where you might experience breathing problems. You will be also asked about some personal information regarding your marital status, educational level and occupational status. This will take approximately 45 minutes. In the second phase of the study participants will be asked to be interviewed. For this phase, 15 individuals with asthma will be needed. Jenny Dimopoulou will contact randomly participants from the previous phase. Participating in the previous phase though, does not commit you in participating in the last one if you do not wish to. The interviews will take place at the clinic and will last approximately half an hour. The interviews will allow us to get a fuller picture of how you cope with problems with asthma.The duration of the study will be approximately 24 months.

What do I have to do?

Taking part in this study will not restrict you on any aspect of your life. If you decide to take part in the study and you receive medication, you will continue to receive it throughout the study period. If you decide to take part you are still free to withdraw at any time and without giving any reason. A decision to withdraw at any time, or a decision not to take part, will not affect the standard care you receive.

What are the possible disadvantages and risks of taking part?

The study has no known side effects. However, the legal position is that if taking part in this study harms you, there are no special compensation arrangements.

What are the possible benefits of taking part?

There will be no direct benefits to you by taking part in this study. In the long term, the study could provide knowledge that leads to better therapies to relieve symptoms of anxiety involved in asthma and therefore affect quality of life.

What if something goes wrong?

If you wish to complain, or have any concerns about any aspect of the way you have been approached or treated during the course of this study, you can contact Helen Langton, the Associate Dean of the Health and Social Sciences School in Coventry University. Her contact number is 024765807

Will my taking part in this study be confidential?

The information you will provide to the research team will be strictly confidential and will not be seen by anyone outside the investigators. If you decide to participate in the second part of the study your views will be taped-recorded. All tapes will be kept secure and erased once analysed, and no personal details will be kept which could identify your responses.

What will happen to the results of the research?

The results will be published. You will be provided with one copy of the published report if you wish. You will not be identified in the published paper.

Who is organising and funding the research?

The study is self-funded through Coventry University

Who has reviewed the study?

Coventry Research Ethics CommitteeContact for further information

If you would like to speak to Jenny Dimopoulou about the study, her contact details are:

Health Services Research Centre, CW110

Coventry University

Office number: 02476888334

Appendix O: Consent Form for Coventry University Hospital

University Hospitals NHS
Coventry and Warwickshire
NHS Trust

Coventry and Warwickshire Hospital
Stoney Stanton Road
Coventry
CV1 4FH

Tel: 024 7622 4055
Fax: 024 7622 1655

CONSENT FORM

Title of Project: Asthma Management: The role of anxiety

Name of Researcher: Jenny Dimopoulou

1. I confirm that I have read and understand the information sheet dated...............(version.....) for the above study and have had the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected. ☐
3. I agree to take part in the above study. ☐

Name of the patient	Date	Signature
____________________	________	________________
Researcher	Date	Signature

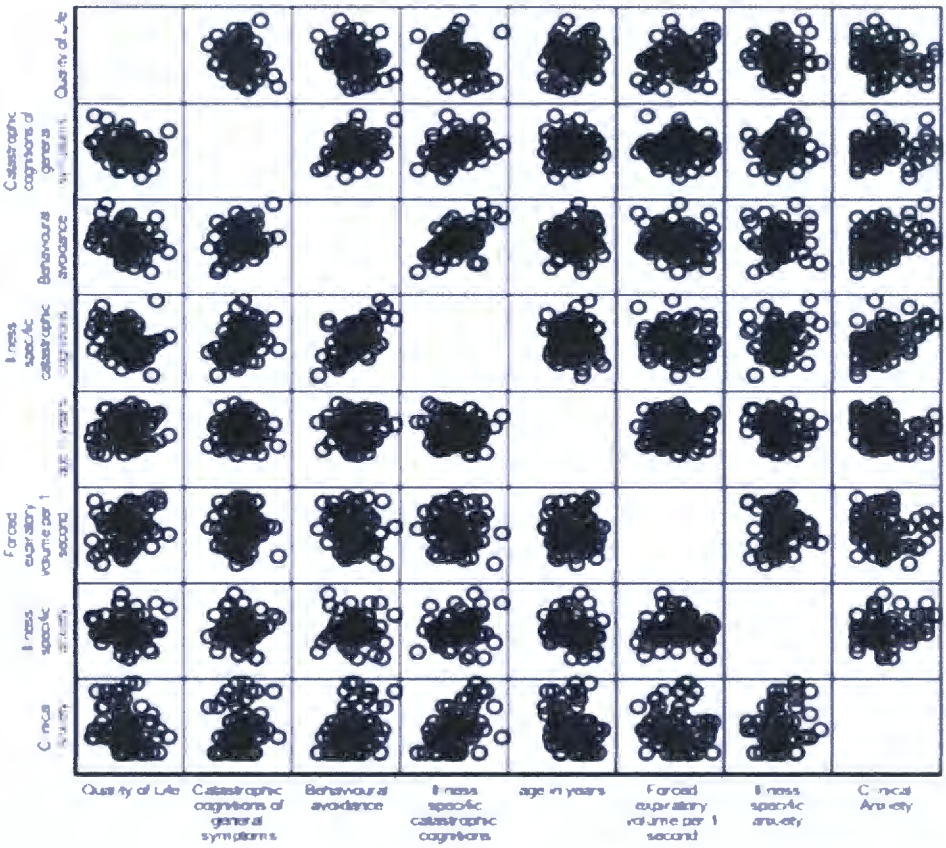
Appendix P: Coding Criteria for Open-Ended Questions of Illness Specific Catastrophic Cognitions as measured by the Interpretations of Breathing Problems Questionnaire, S-R (Regan, 2002).

The criteria for rating catastrophisation of illness specific cognitions were as follows:

- Score 1 if there is no element of catastrophisation
- Score 2 if there is a moderate level of catastrophisation (e.g. "People will notice me" or "I will panic").
- Score 3 if there is a severe element of catastrophisation (e.g. "I will pass out" or "Something bad is going to happen to me"; "I will stop breathing").

Appendix Q: Scatter-plot Matrix for all Continuous Variables:

Quality of Life, Illness specific catastrophic cognitions, and catastrophic cognitions of general symptoms, illness specific anxiety, trait anxiety, clinical anxiety, behavioural avoidance, FEV_1% and age.



Appendix R: Hypothesis 2-Checking Assumptions for Standard Multiple Regression

Multicollinearity

According to Tabachnick and Fidell (2001) the variables included in the model as predictors should not have a bivariate correlation of more than 0.7. The bivariate correlation of the two independent variables was r=0.260 which is less than 0.7 and therefore all predictors will be retained in the model (Table 6.5: Correlation Matrix for all Continuous Variables).

Multicollinearity can also be checked from two values: Tolerance (i.e. how much of the variability of the specified independent is not specified by the other independent variable in the model) and VIF. According to Tabachnick and Fidell (2001) suggestion of possible multicollinearity comes when the value of Tolerance is smaller than 0.10 and the VIF value is above 10. The values received from the output of the table of Collinearity Statistics suggest that the assumption of multicollinearity has not been violated.

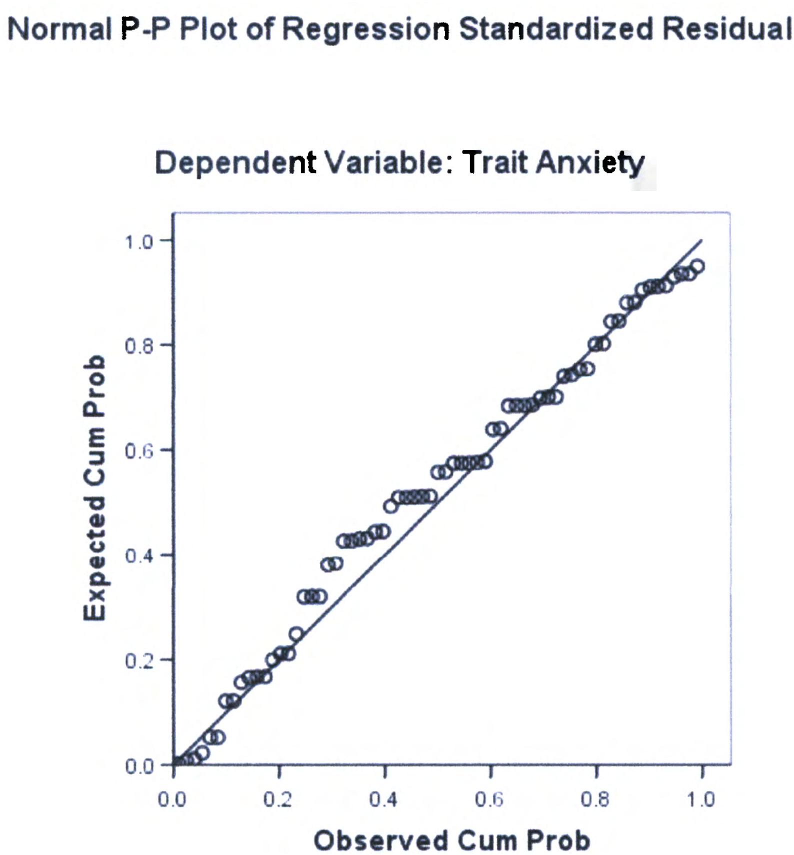
Table for Collinearity Statistics

	Tolerance	VIF
Frequency of panic attacks	0.933	1.072
Illness specific anxiety	0.933	1.072

Normality

To check for the assumptions of normality and linearity inspection of the Normal Probability Plot was required. According to Tabachnick and Fidell (2001) the points should lie in a reasonably straight diagonal line from bottom left to top right. The output of the Normal P-P suggests that there is no major deviation from normality.

Graph for Normal Probability Plot with Trait Anxiety as the Dependent Variable



<u>Outliers</u>

Inspection of the Cook's Distance is required to check whether there are cases that have undue influence on the results of the model as a whole. According to Tabachnick and Fidell (2001) cases with larger values than 1 may cause a potential problem. The maximum value of the Cook's distance was 0.137 suggesting no major problems and therefore all cases were retained.

Appendix S: Hypothesis 3-Checking Assumptions for Standard Multiple Regression

Multicollinearity

According to Tabachnick and Fidell (2001) the variables included in the model as predictors should not have a bivariate correlation of more than 0.7. The bivariate correlation of the two independent variables was r=0.052 which is less than 0.7 and therefore all predictors will be retained in the model (Table 6.5: Correlation Matrix for all Continuous Variables).

Multicollinearity can also be checked from two values: Tolerance (i.e. how much of the variability of the specified independent is not specified by the other independent variable in the model) and VIF. According to Tabachnick and Fidell (2001) suggestion of possible multicollinearity comes when the value of Tolerance is smaller than 0.10 and the VIF value is above 10. The values received from the output of the table of Collinearity Statistics suggest that the assumption of multicollinearity has not been violated.

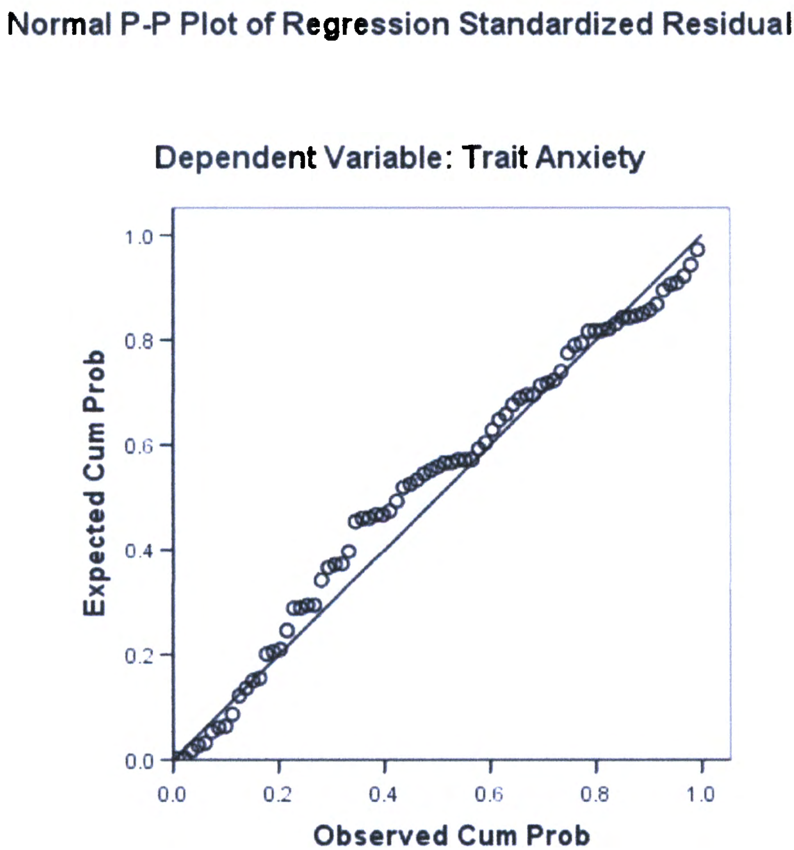
Table for Collinearity Statistics

	Tolerance	VIF
Catastrophic cognitions of general symptoms	0.977	1.003
Illness specific anxiety	0.977	1.003

Normality

To check for the assumptions of normality and linearity inspection of the Normal Probability Plot was required. According to Tabachnick and Fidell (2001) the points should lie in a reasonably straight diagonal line from bottom left to top right. The output of the Normal P-P suggests that there is no major deviation from normality.

Graph for Normal Probability Plot with Trait Anxiety as the Dependent Variable



<u>Outliers</u>

Inspection of the Cook's Distance is required to check whether there are cases that have undue influence on the results of the model as a whole. According to Tabachnick and Fidell (2001) cases with larger values than 1 may cause a potential problem. The maximum value of the Cook's distance was 0.155 suggesting no major problems and therefore all cases were retained.

Appendix T: Hypothesis 4-Checking Assumptions for Standard Multiple Regression

Multicollinearity

According to Tabachnick and Fidell (2001) the variables included in the model as predictors should not have a bivariate correlation of more than 0.7. The bivariate correlation was r=0.354. The value is less than 0.7 and therefore all predictors will be retained in the model.

Multicollinearity can also be checked from two values: Tolerance (i.e. how much of the variability of the specified independent is not specified by the other independent variable in the model) and VIF. According to Tabachnick and Fidell (2001) suggestion of possible multicollinearity comes when the value of Tolerance is smaller than 0.10 and the VIF value is above 10. The values received from the output of the table of Collinearity Statistics suggest that the assumption of multicollinearity has not been violated.

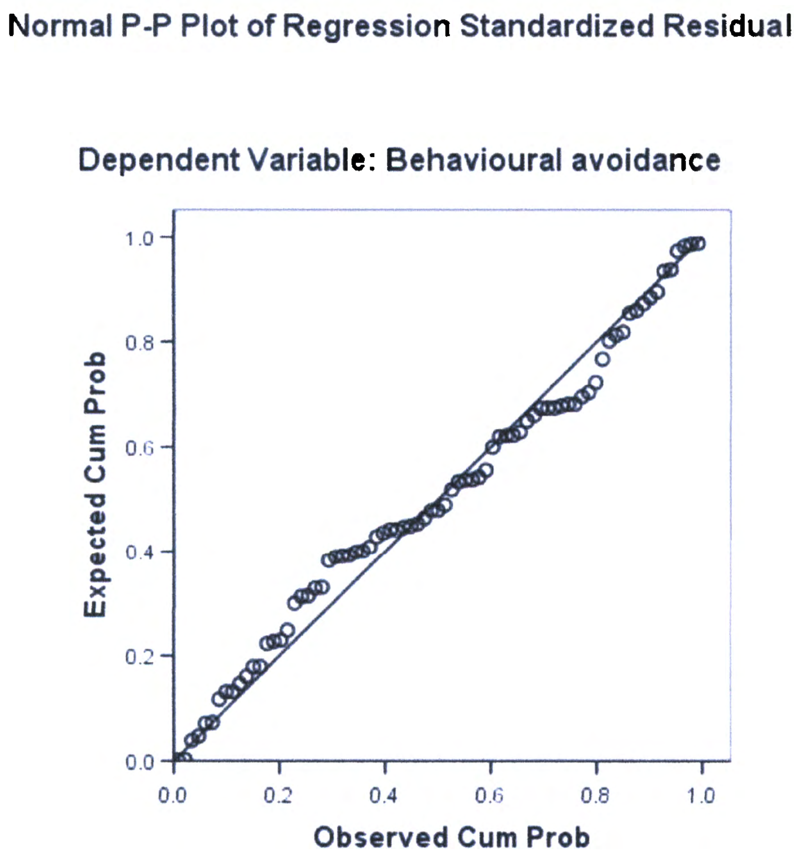
Table for Collinearity Statistics

	Tolerance	VIF
Illness specific catastrophic cognitions	0.875	1.143
Catastrophic cognitions of general symptoms	0.875	1.143

Normality

To check for the assumptions of normality and linearity inspection of the Normal Probability Plot was required. According to Tabachnick and Fidell (2001) the points should lie in a reasonably straight diagonal line from bottom left to top right. The output of the Normal P-P suggests that there is no major deviation from normality.

Graph for Normal Probability Plot with Behavioural Avoidance as the Dependent Variable



<u>Outliers</u>

Inspection of the Cook's Distance is required to check whether there are cases that have undue influence on the results of the model as a whole. According to Tabachnick and Fidell (2001) cases with larger values than 1 may cause a potential problem. The maximum value of the Cook's distance was 0.186 suggesting no major problems and therefore all cases were retained.

Appendix U: Hypothesis 5- Checking Assumptions for Standard Multiple Regression

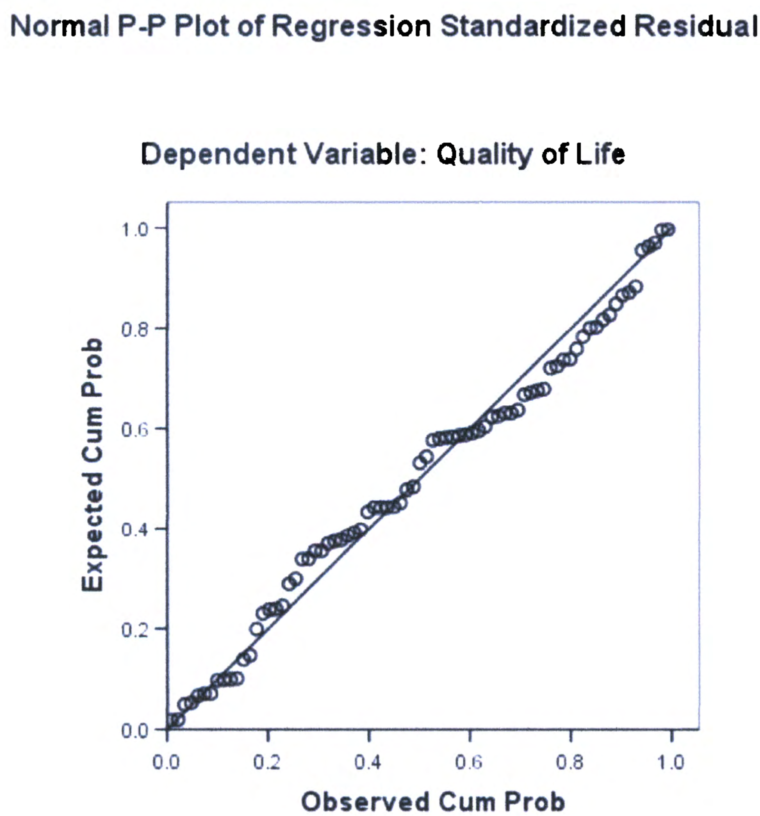
Multicollinearity

According to Tabachnick and Fidell (2001) the variables included in the model as predictors should not have a bivariate correlation of more than 0.7. The bivariate correlation between asthma quality of life and catastrophic cognitions was r=-0.292; the bivariate correlation between asthma quality of life and FEV_1 values was r=0.258; the bivariate correlation between asthma quality of life and occupational status was r=-0.154; the bivariate correlation between asthma quality of life and age was r=0.104 and the correlation between asthma quality of life and marital status was r=0.040. These values are less than 0.7 and therefore all predictors will be retained in the model.

Normality

To check for the assumptions of normality and linearity inspection of the Normal Probability Plot was required. According to Tabachnick and Fidell (2001) the points should lie in a reasonably straight diagonal line from bottom left to top right. The output of the Normal P-P suggests that there is no major deviation from normality.

Graph for Normal Probability Plot with Asthma Quality of Life as the Dependent Variable



<u>Outliers</u>

Inspection of the Cook's Distance is required to check whether there are cases that have undue influence on the results of the model as a whole. According to Tabachnick and Fidell (2001) cases with larger values than 1 may cause a potential problem. The maximum value of the Cook's distance was 0.191 suggesting no major problems and therefore all cases were retained.

Appendix V: Invitation Letter for Interview

Birmingham Heartlands and Solihull Hospital

NHS Trust

NHS

Asthma Management: The Role of Anxiety

Invitation Letter for Interview

Dear ....

We would like to thank you for participating in the first phase of the study on asthma and anxiety. This part of the study will soon come to its end after two years since it first commenced. Psychological distress is often overlooked in primary care. Our aim is to make known that additional treatment for anxiety should be provided to those who are in need.

We would like to invite you to participate to the last phase of this study which will consist of fifteen interviews. During the interview we will ask you questions about your feelings and thoughts regarding your asthma, your anxiety about your asthma symptoms and how it has affected your emotional and physical wellbeing. These interviews will take place at Heartlands Hospital at the Asthma Severe Unit ward 26. The interviews will be conducted by Jenny Dimopoulou and they will last around 45 minutes. Refreshments will be provided.

Your participation is voluntary. If you do decide to participate you will need to fill a consent form. You will also need to provide us with some contact details to get in touch with you to arrange a date for the interview to take place that will suit you best.

Thank you for considering taking part in the interview study,

Sincerely yours,

Jenny Dimopoulou, Ph.D. candidate in Health Sciences

On behalf of Dr A Mansur

Would you be interested to participate to this study? (Please tick as appropriate)

Yes.........

No..........

The interviews will take place on days that the asthma clinic runs by Dr A Mansur from 1.30pm to 5.00pm.

We would be mostly grateful to you if you could provide us with some contact details.

Your telephone number:______________________

Your mobile no (optional):____________________

Email: ___________________________________

Appendix W: Invitation Letter for Interview

South Manchester University Hospital
NHS Trust

Asthma Management: The Role of Anxiety

Invitation Letter for Interview

Dear ....

We would like to thank you for participating in the first phase of the study on asthma and anxiety. This part of the study will soon come to its end after two years since it first commenced. Psychological distress is often overlooked in primary care. Our aim is to make known that additional treatment for anxiety should be provided to those who are in need.

We would like to invite you to participate to the last phase of this study which will consist of fifteen interviews. During the interview we will ask you questions about your feelings and thoughts regarding your asthma, your anxiety about your asthma symptoms and how it has affected your emotional and physical wellbeing. These interviews will take place at Wythenshawe Hospital at Dr Robert Niven's office. The interviews will be conducted by Jenny Dimopoulou and they will last around 45 minutes. Refreshments will be provided.

Your participation is voluntary. If you do decide to participate you will need to fill a consent form. You will also need to provide us with some contact details to get in touch with you to arrange a date for the interview to take place that will suit you best.

Thank you for considering taking part in the interview study,

Sincerely yours,

Jenny Dimopoulou, Ph.D. candidate in Health Sciences

On behalf of Dr R Niven

Would you be interested to participate to this study? (Please tick as appropriate)

Yes.........

No..........

The interviews will take place on days that the asthma clinic runs by Dr R Niven from 1.30pm to 5.00pm.

We would be mostly grateful to you if you could provide us with some contact details.

Your telephone number:______________________

Your mobile no (optional):____________________

Email: ________________________________

Appendix X: Interview Questions

Can you tell me something about yourself?

How do you feel about your asthma?

Does it matter what other people think of your asthma?

What measures do you take to cope with your asthma?

What do you believe it is going to happen to you when you start wheezing etc?

Does it matter what other people think of you when you start coughing, wheezing etc

What thoughts go through your mind when you are experiencing an asthma attack?

What is the worst thing that could happen to you when you are experiencing an asthma attack? Do you think about this?

What measures do you take in order to avoid an asthma attack?

Does the prospect of an asthma attack cause you anxiety?

Have you experienced panic attacks?

Would you feel able to distinguish between your asthma and panic attacks?

To what extent have panic attacks restricted or changed your lifestyle?

Appendix Y: Flowchart of the numerical recruitment procedure of patients.

Total number of patients approached

N=283

↓

Total number of eligible patients (HADS score equal/more than 11)

N= 134

↓

Total number of eligible patients who responded

N= 77

Appendix Z: Letters of Approval-Ethics Research Committees

a) East Birmingham Local Research Ethics Committee

b) Research and Development Department, University Hospitals Coventry and Warwickshire

c) North Manchester Local Research Ethics Committees

EAST BIRMINGHAM
LOCAL RESEARCH ETHICS COMMITTEE

Administrator Ext 42679
Secretarial Assistant Ext 43675

email: Linda.Hubbard@heartsol.wmids.nhs.uk

SJR/LMH/1040
15 April 2003

Ms J Dimopoulou
Health Services Research Centre
School of Health & Social Sciences
Priory Street
Coventry
CV1 5FB

Dear Ms Dimopoulou

Clinically anxious asthmatic patients: the role of catastrophic cognitions

Your project has been approved by the Ethics Committee, who have considered that this is quite acceptable as outlined in your submission. This approval is subject to the proviso that there is no significant deviation from the Protocol outlined and that any untoward reactions and complications are immediately reported to the Committee.

In order to comply with the Royal College of Physicians guidelines, I look forward to receiving a report on the outcome of this study.

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NB This Committee abides by the guidance of the Department of Health. The committee endorses the Royal College of Physicians Report on 'Fraud & Misconduct in Medical Research Practice 1991'. This states that all original data (such as questionnaires, lab books, and hard copies of any computer data), are kept for a minimum of ten years in a retrievable form. If storage is going to be outside Birmingham Heartlands Hospital, the submission should state the site of storage. It is a condition of ethics approval that such storage occurs.

NHS

University Hospitals
Coventry and Warwickshire
NHS Trust

Research & Development Department
R&D Director Dr Howard Shaw – Tel: 02476 535995
Business Manager Christine Dickson - Tel 02476 538988
R&D Finance Manager Kaly Johal – Tel: 02476 537207
Research Liaison Officer. Gillian Surr - Tel: 02476 535121
Co-ordinator Sam Ellix Tel 02476 535169

Walsgrave Hospital

Clifford Bridge Road
Coventry
CV2 2DX

Tel: 024 7660 2020
Fax 024 7662 2197

4th February 2004

Miss Jenny Dimopoulou
Health Services Research Centre
Coventry University
Coventry
CV1 5FB

Dear Miss Dimopoulou

Re: JD01/0803

We have now received a copy of your Ethics approval letter for the above study. I am pleased to inform you that this study has now been approved. I would be grateful if you could confirm the exact start date with the R&D co-ordinator on 02476 535169.

The Research & Development Department will require an annual report on activity and a final report upon the study's conclusion from yourself. You will be sent a request for report letter from the R&D Co-ordinator when it is due.

If any difficulties arise with the study or if the planned completion date alters considerably, I would be grateful if you could inform either myself or the R&D Co-ordinator.

I hope your study proves a success, please do not hesitate to contact me if you require any further information or assistance.

Yours sincerely

NHS

North Manchester Local Research Ethics Committee
Room 181
Gateway House
Piccadilly South
Manchester
M60 7LP
Telephone: 0161 237 2166
Fax: 0161 237 2383
niall.bowcock@gmsha.nhs.uk

Miss J Dimopoulou
29 Joan Ward Street
Cheylsemore
Coventry
CV3 5FW

Our ref: *03/NM/696*

01 June 2004

Dear Miss Dimopoulou

03/NM/696 Please quote this number on all correspondence

Clinically anxious asthmatic patients: the role of catastrophic cognitions

The Chairman of the North Manchester Local Research Ethics Committee (on behalf of South Manchester LREC) has considered the amendments submitted in response to the Committee's earlier review of your application on 25th March 2004 as set out in our letter dated 13 April 2004.

Ethical opinion

The Chairman gave a favourable ethical opinion to the above research on the basis described in the application form, protocol and supporting documentation.

The favourable opinion applies to the following research site:

Site: South Manchester.
Chief Investigator: Miss Jenny Dimopoulou

Conditions of Approval

The favourable opinion is given provided that you comply with the conditions set out in the attached document. You are advised to study the conditions carefully.

Approved documents

The documents reviewed and approved were:

- **Response from Ms Jenny Dimopoulou (received 14th May 2004)**
- **LREC Application Form (signed and dated 9/1/04)**
- **Patient Information Sheet (Version 2, dated 10/05/04)**
- **Consent Form (Version 1, dated 9/01/04)**
- **'Hospital Anxiety and Depression Scale' Questionnaire**
- **Self-Evaluation Questionnaire (STAI Form Y-2)**
- **Interpretations of Breathing Problems Questionnaire: Short Revised Form**
- **Panic Attack Questionnaire**
- **Mini Asthma Quality of Life Questionnaire**
- **Asthma Symptom Checklist**
- **Body Sensations Questionnaire**

Management Approval

The study may not commence until final management approval has been confirmed by the organisation hosting the research.

All researchers and research collaborators who will be participating in the research must obtain management approval from the relevant host organisation before commencing any research procedures. Where a substantive contract is not held with the host organisation, it may be necessary for an honorary contract to be issued before approval for the research can be given.

Statement of compliance (from 1 May 2004)

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

Submissions to other LRECs in Greater Manchester

If you are conducting research at other sites in Greater Manchester it is your responsibility to ensure that you seek approval for locality issues from the relevant LREC before starting their research. To do this you should submit three copies of the following to the relevant LRECs:

- Part C the NHS REC Application Form (*available from* www.corec.org.uk)
- a copy of the local investigator's CV